I have discovered only one statement of personal experience in this thesis — viz that the author has treated 103 cases with butyl chloral hydrate &c & with 2 deaths.
Surely some details ought to have been given of so considerable & satisfactory an experience.
The thesis is well written but apart from the above statement is a compilation from only a few books. [illegible]

Pertussis

Its History, Pathology, Symptoms, Complications Diagnosis, Prognosis, Prophylaxis and Treatment.

by

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Preface.

Before writing this dissertation the following articles (the authors of which are placed in alphabetical order) were carefully digested, viz.—

Aitken, Dr. Wm., Article "Hooping cough" in the "Science and Practice of Medicine," vol. i. p. 764 (seventh edition, 1880).

Dolan, Wm. T. M., "Whooping cough, its pathology and treatment" (1882).

Lancet, The, January 1880 to June 1884.

Meigs, Dr. J. F. and Dr. Wm. Pepper, the article p. 230 in their "Practical Treatise on the Diseases of Children" — 1870.

Smith, Dr. Ed., Article "Hooping Cough" in "Reynold's System of Medicine" vol. i. p. 52 (1879).

Smith, Dr. J. Lewis, the article on this subject in his work on the diseases of Children (1879).

Steffen, Dr., Article "Whooping-cough in Ziemssen's Cyclopaedia; vol. vi. p. 765 (1876).

Watson, Sir Thomas, Lecture XLIV in the "Principles and Practice of Medicine," vol. ii. p. 68 (1871)

West, Dr. Charles, Lectures XXVI and XXVII in "The Diseases of Infancy and Childhood" p. 454 et seq. (6th Ed. 1874).

They are frequently referred to throughout the thesis, and to avoid repetition it has been considered

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sufficient to mention the writer's name and the page; the work quoted from having been now indicated. I regret that in the case of Dr. Ed. Smith and Dr. J. L. Smith I have been unable to state the particular page in the article quoted from; the works containing them, having been borrowed from a circulating library, were only a short time in my possession and that some months ago.

On each point all the views and theories of any importance are stated in sufficient detail, and criticised at length where criticism seemed called for.

As regards new remedies very few are left to propose. Cocaine has not yet been suggested in the treatment of pertussis. This drug has the most powerful anaesthetic effect on mucous surfaces, and pulverizations with it might prove useful in the second stage of the disease: but the great expense of the drug excludes it from consideration, and even should it become much cheaper as is likely the treatment by pulverizations is with difficulty carried out in practice. New remedies doubtless will from time to time be proposed and lauded by their introducers, but I question if our armoury against pertussis will be reinforced by more effective weapons of precision than butyl-chloral hydrate, and chloral hydrate in sufficient doses. In regard to the former of these, formerly

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known as Croton-chloral hydrate, I am the first to systematically advocate its advantages in the treatment of pertussis.

Resident in a country town far removed from medical libraries the books to which I have had access were very limited in number. Consequently in many cases quotations and information could not be traced to their original source, and so had to be taken at second hand; at the same time I have no reasons in any instance to doubt their correctness. Frequently in stating the views of a writer I have abridged his language as far as possible without affecting the meaning. Had it been my good fortune to have lived within reach of the library of my "alma mater" something different would have been produced. As it is I am aware of the presence of faults — of deficiency in some places and redundancies in others. Still with all its defects I submit that it is a very full, well arranged and lucid account of the disease. I place it in the hands of its Examiner — the only reader I suppose it will ever have — knowing it will have his careful perusal, and hoping also his kind indulgent consideration; and I am strengthened in this hope by pleasant memories that now arise of intercourse with former examiners in the days gone by.

Geo. E. Swail.

27 Park-St;
Macclesfield;
12th. Oct. 1885.

Pertussis.

Nomenclature

Synonyms— French, Coqueluche; German, Keuch-husten or stick-husten; Italian, tosse convulsiva o tosse canina; Latin, tussis convulsiva, tussis ferina and pertussis. "This last, bestowed upon it by Sydenham and adopted by Cullen, is the technical appellation in England"[1], as whooping cough, hooping cough, kink-cough, chincough, kink-host &c. are the popular names.

Definition

Cullen's definition, admirable both for its clearness and brevity, is "Morbus contagiosa, tussis convulsiva, strangulans cum inspiratione sonora iterata, saepe vomitus." This might be translated and amplified as follows— It is a highly infectious disease, (the infection residing in the breath of the patient and the exhalations from his surface) and consequently it usually prevails as an Epidemic, though sometimes Sporadic Cases appear; in the latter case the attacks are mild and accompanied by a variable amount of pyrexia. It consists of three stages, beginning and ending with a catarrh. Of these the middle one is characterized by paroxysms of convulsive coughing. These paroxysms consist

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[1] Sir T. Watson, p. 68.

Definition. Continued. of numerous short rapid forcible expirations, suddenly followed by a long shrill inspiration not unlike the crowing of a cock and popularly named the kink hoop or whoop. This sequence is repeated a variable number of times at each paroxysm, during which the child may seem on the verge of death from asphyxia; and the paroxysm usually though not always ends with the expectoration of viscid mucus or vomiting. The malady occurs usually during childhood, and with rare exceptions once only during life, and it lasts several weeks.

Historical notes. We know nothing of the ancient history of this disease — of when and how it first arose, when and by whom it was first observed, &c. The fathers of medical literature Greek and Roman are silent about it, and there is no account I am aware of that dates earlier than the 16th Century. Are we to infer from its not having been recognized previously that it must have made its first appearance about that time? The majority of writers hold this view, and possibly they are right. It is possible however that the disease did previously exist. Sprengel[1] asserts that its origin is not beyond the year 1510 A.D. in which year

(1) W. Aitken M.D. Practice of medicine 1880 Vol 1 page 765

Historical notes (Continued)

it was endemic in Paris, and that its epidemic character was not determined till the year 1580. In that year no less than 7000 persons perished from it at Rome. Bailou (circa 1600) and Schenk (circa 1650) writing in the seventeenth describe epidemics in the preceding century.(1) Dr. Ed. Smith, writing in "Reynold's System," asserts that the earliest account we have of the disease dates from the middle of the seventeenth century, and that Willis was the first to write of it. Willis's definition — "tussis convulsiva seu suffocativa, et nostro idiomati chincough vulgo dicta(2)" — is sufficiently clear, and shows that at the time of writing the disease was common enough and had existed long enough to have a popular name; and it certainly seems improbable that should be the case before it was noticed by medical writers. The first time the name occurs in the bills of mortality is in the year 1698, when among 20,471 deaths in London one case of whooping cough and two of chincough are mentioned. For fifty years after this whooping cough and Chincough were registered separately, as though they were different diseases till in 1730 they were entered together, when the

(1) Steffen, p. 679. (2) Quoted by Dr. Edward Smith in Reynold's System.

Historical Notes Continued

mortality was 152 in 24,000, or one death in 1474. Gradually the mortality increased till it reached the average of one in 29 for London. During the 18th Century it spread over Europe and other parts. Of late years the proportional mortality registered in Great Britain has been higher than at any time previously.[2] It is now one of the most common diseases of childhood, and is said to be the most fatal disease of early infancy. According to Dr. West it ranks in London fourth among the causes of death, pneumonia convulsions and tubercular meningitis being the only ailments that are more fatal.[1]

An interesting question here arises — Has the disease actually increased, as the figures at first sight would lead us to suppose, or is the explanation that medical men recognize it more frequently now than formerly? I am inclined to take the latter view.

Another question that confronts us is — What cases are we to include under Pertussis? Dr. R.J. Lees does not require the symptom of the whoop to satisfy his diagnosis, being of opinion that it very rarely occurs in infantile pertussis.

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[1] Diseases of Infancy & Childhood, 7th Edit 1874 p. 454 (2) Dr. R.J. Lees in the Lancet, 20th Nov. 1880, p 817.

Historical notes Continued

In support of this opinion he quotes the words of Dr. Cullen — "I have had instances of this disease which, though evidently arising from Chin-Cough Contagion, never put on any other form than that of a common catarrh." (1) and again — "when the disease beginning in the form of a simple catarrh is attended with fever and difficult breathing and with little expectoration it often proves fatal without taking on the form of Whooping Cough." Other writers assert that adults may have it without whooping. Holding these views Dr. Lees asserts that the disease is very common — far more common than is generally supposed. He estimates that among the children of the poor in large cities it constitutes one tenth of the cases of illness that come under the notice of those who devote themselves to that kind of practice. (2) This, however, seems to Sir Thomas Watson very doubtful. He submits that Catarrhs are exceedingly common, and "he would be slow to consider any case pertussis unless the characteristic paroxysms and the stridulous inspirations were present." (3) Consequently he thought

(1). Also quoted by Sir T. Watson, p. 72 (2) Dr. R. J. Lees, in the Lancet for 20th. Nov. 1880, p. 814. (3) Watson, p. 72.

Historical notes continued.

the disease rare in early life. Certainly for the purposes of statistics those cases should be excluded whose diagnosis is doubtful, and of that character are the majority of the cases where the whoop is absent.

In the latter quarter of the 18th Century several monographs on the disease were published. Since the commencement of the 19th its literature has enormously increased, and at the present day is of immense bulk. A full account of the history and literature of the disease is contained in the "Hand book of Geographical and Historical Pathology" by Hirsch Vol II. p. 103 (1862-4), and now being published in English by the New Sydenham Society. A list of authors of various nationalities is given by Steffen in Ziemssen's Cyclopaedia taking up five or six closely printed octavo pages, a glance at which will satisfy anyone that to "give a full statement of the literature of the question, with accurate references and critical investigation of the views or facts cited" would be utterly impossible within the limits of an ordinary lifetime however diligent.

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(a) Causation and modes of propagation.

This disease is common to all seasons and climates, at least I am not aware of any that is free from its attacks. Indeed Climate seems to have no Effect whatever on the developement a intensity of the disease, and according to Hirsch no differences exist among different races in respect of liability to attack or dissemination: and though as this author has shewn the seasons have no influence on the reception a diffusion of the disease, there is a general concensus of opinion that in the colder months of the year — those of Winter Spring a Autumn — single cases whether Sporadic a Epidemic have a tendancy to run a slower and severer course, and are more likely to have a fatal issue.(1)

{ Climate & Season

Both sexes are liable but M. M. Blache, Barthez & Rilliet, Valleix, & West, and most writers who have a considerable amount of material at their command, agree that females are more liable to attack and that the mortality is greater among them. The differences between the sexes in these respects are not however very

{ Sex.

(1) West, while admitting that Epidemics break out at all seasons, says the disease is more frequent in the cold than in the warm months (h 477)

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(a) Causation and modes of propagation

striking. Of 208 cases observed by Meigs and Pepper 106 occurred in boys and 112 in girls. Of 100 cases at the Children's Hospital London 55.3 per cent occurred in females and 44.7 per cent in boys."

Age. As regards age the experience of authors varies a little. It has been found in the youngest infants. Sir Thomas Watson tells us "his bed maker's daughter at Cambridge had a child ill with whooping cough in the house with her during the last week of her pregnancy, and the new comer whooped the first day he appeared in the world."(2) Barthez and Rilliet saw a case in a new born child whose mother was attacked four weeks before her confinement;(3) on the day after birth violent seizures occurred. Dr. J. L. Smith saw a new born infant with it whose mother had the disease during the two months preceding her confinement." When fifteen minutes old and during washing it had a convulsive seizure, which appeared to consist chiefly of spasm of the laryngeal muscles with temporary suspension of respiration attended by lividity of the features with some frothing of the mouth. attacks occurred

1 West p. 475 (2) Sir T. Watson, p 69. (3) Dr. Steffen p. 685.

(a) Causation and modes of propagation

Influence of age continued.

every hour. Death took place on the third day. The mother, the intelligent wife of a clergyman, believes that the infant had similar attacks before its birth" — &c. Dr. Johnson mentions a case at three months. It is very rare however within the first two or three months of infancy or even up to the end of the first half year, more frequent from six months to a year. West says (p 474) that more than half the cases occur before the completion of the third year, after five it rapidly diminishes, and after ten it is so extremely rare that of 1364 cases in which he noted the age he found but eleven in which it exceeded ten years. Probably most cases occur, as Barthez and Rilliet believed, from one to five years.(1) Of West's cases 82·9 per cent were within the first five years. Steffen saw the greatest number from the first to the eighth year,(2) and J. Lewis Smith from one to eight or ten years. It is not frequent from the fifth to the seventh year, and grows constantly less frequent from this to puberty, and the nearer children approach this period the less frequently does it attack them. I have constructed

(1) and (2) Dr. Steffen p. 685.

Pathology.

(a) Causation and modes of propagation.

Influence of age. (continued)

the following table from the work of Meigs and Pepper.[1]

Number of cases	Observed by	Number under 7 years	No over 7 years
188? 158	Meigs	162	26
130	M. Blache	106	24
29	Barthez & Rilliet	26	3
Total 3			
347? Total 317		294	53

The mortality returns point to its being a disease of early childhood: 68 per cent of the deaths take place under the second year of life, six per cent only after the fifth year.

It is met with occasionally in adults and even aged persons who have not been previously attacked. Steffen observed it in some instances between forty and fifty years of age. Dr. Murell of London saw a woman who had it when she was sixty, and whose husband had his second attack at sixty six.[2] Biermer cites cases from Berger who had seen it in a woman of fifty seven, and from Heberden who had seen a woman of seventy years and a man of eighty.[3] Such cases, however, are very rare and the fact remains that the

(1) Diseases of children p. 231 (2) Lancet, 17th. april, 1880 p. 603
(3) Dr. Steffen p. 686.

Pathology.

(a) Causation and mode of propagation.
Influence of age (Continued).

great majority of cases are met with in young children. It is one of the most common of these diseases, so common that very few escape having it. Why is it so frequent at this period? Is it because it attacks the weak rather than the strong? The fact that it is more common and fatal in females than males seems to point in this direction: also the fact that children who are or have lately been suffering from an acute exanthem show a greater tendency than others to be attacked. But the real explanation to my thinking is the disease is so highly infectious that almost all get it during infancy or childhood, and, like many other infectious diseases, it rarely affects the same individual twice one attack in the great majority of cases protecting from future attacks. Hence its rarity among adults; but adults who have not had it during childhood are readily affected when exposed to contagion. I say in the great majority of cases one attack protects for the future, but not in all; it sometimes occurs a second time (Heberden). Barthez and Rilliet report a case of its second occurrence, West another — a girl having it severely at thirteen and seven respectively.(1)

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(1) Dr. J. L. Smith

Pathology.

(a) Causation and mode of propagation

Influence of age (Continued)

J. Lewis Smith attended two adult patients, both women of intelligence, who stated that they had had previous attacks in early life. Blache gives a case of a grandfather and grandmother taking whooping cough a second time from their grandchild all three having it together.(1) Such cases however are exceedingly rare indeed, a second attack of whooping cough both repated by trustworthy observers being as rare as a second attack of an acute exanthem, as scarlatina, measles, roseola, small pox. Few practitioners have observed a case of repeated whooping cough; so exceptional is the occurrence as to prove the rule, that once only during life does a person suffer from Pertussis.

Constitution

Some writers think that hereditary influence and constitution predispose to attacks. It seems however to attack indifferently those who are exposed to infection.

Causation

What is the explanation of the fact that a single crop exhausts the soil? This leads us to investigate the question of the cause of the malady. Whooping Cough is an infectious disease; the laity are unanimous about this and the profession almost so. Though it must be admitted

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(1). Quoted by Dr. Wm Aitken, Practice of Medicine, Vol. I. p. 765.

(a) Causation and modes of propagation. Continued.

there is no decided evidence against the possibility of its originating de novo it must also be admitted that it has in no case been possible to prove that it has originated in this way. Propagation by direct contagion has been observed innumerable times, for it is rare that one member of a family contracts the disease without its affecting all the others who are not protected by a previous attack. The importation of the contagion from without has often been proved beyond posible doubt in remote and sparsely inhabited islands. So that the evidence is overwhelmingly in favour of the position, that in modern times at least the disease arises solely from infection and never de novo. It is not only infectious but very infectious, and consequently occurs much more often as an epidemic than as a sporadic disease: it is said, and I believe correctly, that in the former case it is apt to run a severer course. The disease has also been thought to be most infectious when it is at its height. Further, as it is impossible to isolate the patient at home so as to prevent it spreading to other

Pathology.

(a) Causation and modes of propagation. Continued.

children in the same house, we infer that the infection is capable of being carried to considerable distances. Indeed it travels not only from patient to patient but from house to house and from town to town. It travels mainly through the atmosphere which one can imagine to be charged with the breath or dried and dissipated sputa of the patient; but it may also be conveyed through fomites. Further we know that just as typhoid fever infects with typhoid, scarlatina with scarlatina, and small pox with small pox, whooping cough infects with whooping cough and nothing else. We infer from this, and the inference is irresistible, that there must be a materies morbi — a specific animal poison — a virus — generated and multiplied in and evolved from the body of the patient, and which can be carried by the atmosphere from person to person reproducing and multiplying itself as it spreads. What is the nature of this poison? How is it generated? In what part of the patient is it present? Taking the last question first, it is undoubtedly present in the patients' expectoration, because if

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{ Causation and modes of propagation. continued.

we inoculate with it an animal capable of exhibiting the disease the disease certainly results. Letzerich and others succeeded in producing whooping cough in rabbits by inoculating the trachea with the sputa of the human subject. Dolan's experiments showed that the disease cannot be conveyed by inoculating with the blood, any more than in typhoid fever.[1] It is also present in the breath of the patient because it is the usual mode of infection; but then the breath is laden with particles of epithelium and fatty matters detatched from the mouth and air passages. — Parkes Hygiene, Edit. V, p. 104. It is therefore probable that in the sputum and in it only that the virus resides. This virus — this something in the sputa of pertussis which is different from what is found in the sputa of one not suffering from the disease — can we in any way detect it? Chemical analysis has hitherto failed us here as it has with the poison of typhoid and other contagious fevers.

Does the microscope give us any help! During the last fifteen years a very active search has been made with this instrument for the contagium of infectious diseases. Many supposed it had been discovered as regards diphtheria in the innumerable bacteria which abound during the disease not

{ Fungus theory

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[1] T. M. Dolan, Whooping cough p. 12.

Pathology.

(Causation and modes of propagation. (1) the fungus theory — continued)

only in the false membrane but even in the tissues and exhalations. And of late has not Koch discovered the bacilli of tubercle, carbuncle and cholera. So Letzerich proceeded in search of the bacillus of pertussis. He investigated this subject in the year 1871. (Virchow, Archiv. Vol. XLIX) and announced that he found in the mucus coughed up during the first or catarrhal stage, and in the dilated alveoli of the lungs, masses of spores of fungi. These were of an eliptical shape, and of a brownish red colour. At a more advanced stage he found that some of these spores had germinated and produced mycelium. He made a number of experiments introducing the mucus into the fauces and trachea of rabbits. They recovered rapidly from the operation and afterwards had whooping cough, or a cough exactly resembling whooping cough. The expectoration was identical with that of children affected with the disease, and when killed their lungs contained the fungus. Dr. Mott of New York says he 'found the spores discovered by Letzerich, but not of the brownish red colour. The growth of the mycelium goes on rapidly in the masses of phegm, and the threads acquire considerable length especially when the disease is at

Pathology.

(a) Causation and modes of propagation.
(1) The fungus theory continued.

its height. In the latter stages there is a large quantity of mycelium, and a rapid formation of spores takes place. If the fresh spores be treated with iodine and concentrated sulphuric acid the colour of the mycelium becomes of a beautiful blue, while the spores normally white then become brown." (1) The holders of the fungus origin of the disease believe these spores to be the seeds of Whooping Cough, which when taken in during the process of respiration undergo a rapid and considerable increase, and by imparting an irritating property to the mucus produce the paroxysms and other peculiar symptoms of the disease.

(a) Criticism of the fungus theory

This view has the double charm of novelty and simplicity, and seems to derive confirmation from the alleged discovery of the bacilli of other diseases. Unfortunately for it, it has not been confirmed by the experiments of succeeding investigators, Eminent in science and skilled in microscopy, who have since sought for but failed to find the fungus of whooping cough. (2) Consequently there are many now who dispute the existence of this fungus, while others maintain, and probably they are right, that the bacilli found are effects not causes. We are bound therefore in view of these facts to dismiss the theory

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(1) J. L. Stickney in Lancet 8th May 1880, p. 749.
(2) Steffen.

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(a) Causation and modes of propagation. } of Letzerich as unproved

(2) The Neurotic Theory

The paroxysmal nature of the disease has led the majority of investigators to look for its origin in the nervous system, and we find accordingly that many have maintained it is a neurosis pure and simple. Among these

Varieties of } there is great diversity of opinion. Some placed the seat of the malady in the nerve centres. It

Encephalic irritation. } was ascribed to cerebral and meningeal irritation by Webster in the Medical Gazette (1) and by other pathologists

Inflammation of the medulla oblongata } Copland believed that there was in every case inflammatory appearances about the medulla oblongata. (2) Now the conditions discovered at autopsies deemed to support this view, but it is more probable that the hyperaemia of the brain and its membranes, and of the medulla oblongata, and the exudation connected with this hyperaemia, are the results not causes of the whooping cough. Probably too hyperaemia of these parts has been often supposed to be present when it was merely a case of post mortem congestion.

Others attributed the disease to morbid

The phrenic. } states of particular nerves – to the phrenic

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(1) Dr. W. Aitken p. 765. vol. 1.
(2) Dr. Edward Smith in Reynold's System.

Pathology.

(1a) Causation and modes of propagation.
(2) Neurotic theory

nerve by Jahn and Sir Thomas Watson, the nervous supply of the stomach by Chambon, to the nervous supply of the lungs by Wendt and Baldame.

Inflammation of the pneumogastric

Of course the vagus was suspected, and so we have at the end of the last century Killian Autenrieth and at the beginning of this numerous authors especially Hufeland, Hoffman Breschet, Autenrieth (1) &c maintaining that inflammation of this nerve was at the bottom of the malady. The two latter (Tübingen Blätter Vol. I. p 33, 1815) maintained that the nerve in this disease was red swollen and inflamed. Subsequently however, the condition of the nerve was carefully investigated at autopsies with the result of showing that pneumogastric neuritis does not exist or only very exceptionally in pertussis. The redness occasionally found in the nerve, if not a post mortem tinge, would be produced soon before death by the forged condition of the lungs.

Pressure on the pneumogastric

A modification of this view was held by Friedleben (2), M. Guéneau de Mussy (1876) and others who maintained that enlargement of the tracheal and bronchial glands,

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~~By a clerical error I have twice referred to the theory of irritation keeping engl to inflammation of the pneumogastric nerve.~~

(1) Steffen p. 709.
(2) Steffen p. 681.

Pathology.

1) Causation and modes of propagation. 2) Neurotic theory—pression of vagus.

by pressing upon the pneumogastric nerve and its branches bronchial and recurrent laryngeal, produced the disease and its characteristic seizures. Those who took this position asserted that when the bronchial glands are enlarged from any other cause the cough of pertussis has been noticed. M. Guéneau de Mussy in the British Medical Journal, 25. Oct. 1879, states that since he had directed his attention to it he had observed even in life the clinical signs of adenopathy, and that in all the post mortem examinations in the Children's Hospital of Paris this enlargement when sought for was found.

To this view there are several substantial objections—

Criticism of this view.

(1) Mr Hardy showed that if bronchial enlargement were the cause of pertussis it would be present in every case of the disease,[1] whereas it was quite exceptional to meet it. At a meeting of the Pathological Society of London 21. Jan. 1879, Dr. Barlow stated that enlargement of the glands was by no means commonly or markedly found at necropsies in whooping cough cases. Dr. Burney Yeo

(1) J. M. Dolan, Whooping-cough p. 5

Pathology.

(A) Causation and modes of propagation.

(1) Neurotic theory — Compression of vagus — Criticism of the view.

says that in the "post mortems" which he made in cases of whooping cough, acute enlargement of the bronchial glands was rarely met. Tanner, Bristowe, Roberts and Dolan tell us that enlargement of these glands is only occasionally seen.

(2) M. Cohn argued that if enlargement of these glands were the cause of pertussis their enlargement from any other cause would produce paroxysmal coughing, but as a matter of experience there are many children who have considerable swelling of these glands and yet are free from whooping cough." Dr. Barlow at the meeting above referred to showed a specimen from a child of seven months the subject of tuberculosis having hyperplasia of most of the glands of the body. There was very considerable enlargement of the bronchial glands, and the vagus which was flattened was adherent to one of them about the size of a chestnut above the root of the lung. The child's cough had not the slightest resemblance to whooping cough.(2)

We very commonly observe among the children of the poor enlargement of the superficial lymphatic glands — the posterior cervical

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(1) T. M. Dolan, Whooping Cough p. 5.
(2) Dolan p. 6.

Pathology.

(a) Causation and mode of propagation.
(2) Neurotic theory — compression of vagus — criticism of this view.

zygomatic &c. Their bronchial glands must be in a similar condition: yet they are free from paroxysmal cough.

(3) It is obviously improbable as M. Blot pointed out that a permanent lesion like glandular enlargement should cause an intermittent cough."

(4) If whooping cough were due to swelling of the glands the two conditions where they coexisted would coincide in duration. But this is not always nor even usually the case, the glandular enlargement being much more often the more lasting affection.

In addition to the above mentioned theories there is that of Guibert who placed the cause and seat of the disease in the general nervous system

The general nervous system

Besides the foregoing authorities the neurotic theory in some form or other was held by the following — Lubenstein, Löbel, Cullen, Leroy, Pinel, Todd and Gibb.

The authors of the Compendium de Médecine Pratique (t. ij, p. 56) argue that it is a neurosis on the following grounds (1) In the majority of cases the respiratory apparatus presents no kind of

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(1) Dolan, Whooping Cough p. 5

(1) Causation and modes of propagation

(2) Neurotic theory. Barthez & Rilliets arguments for

alteration or the lesions are multiplied or variable. (2) The remittent course of the symptoms, and total absence of fever unless complications are present, which is not observed in inflammation. (3) Cessation & sudden return of paroxysms from emotions a change of place. (4) Complete return to health in slight cases, resistance to antiphlogistic treatment, success of narcotics and antispasmodics peculiar to pertussis and most of the neuroses." ||

These arguments admit of dispute. It is contrary to the weight of evidence that 'in the majority of cases the respiratory apparatus presents no kind of alteration'. The remittent course of the symptoms does not prove it to be a neurotic, else we should have to include ague in that class of diseases. As regards the statement that fever is totally absent unless complications are present that requires to be proved; whooping cough, nearly all authorities say, sets in with a variable amount of pyrexia. The fact that change of place & position & emotion will excite coughing does not prove it is a neurosis because these things will excite cough in bronchitis & phthisis. Neither does a complete return to health in slight cases

Criticism of these arguments.

|| Quoted by Meigs and Pepper, p. 240

Pathology.

(a) Causation and modes of propagation }
(2) Neurotic theory } Criticism of.

prove anything because slight cases of measles, chicken pox &c. &c. completely return to health without being diseases of the nervous system.

Against this theory certain weighty considerations have been advanced. (1) The origin and subsequent diffusion by infection, and the allied fact that it usually occurs as an epidemic: no neurosis it is said occurs in this way. The possible objection to this argument that some forms of hysteria, religious and otherwise, occur in epidemics is met by the explanation that these neuroses are caused by imitation and do not occur in Epidemics except where imitation is possible, whereas pertussis often occurs where imitation is impossible (2) It runs a definite course and one attack protects for the future, whereas, with neurosis relapses are very apt to occur.

Dr. Meigs, taking an intermediate position believes that it is "neither a pure neurosis nor pure inflammation but a combination of both and more of the former than the latter; that it is probably a morbid state of the blood due to the introduction of some specific poison which irritates the pneumogastric nerves."

Pathology.

(a) Causation and modes of propagation

(3) Catarrhal Theory

(a) That it is due to decomposed secretion.

The next theory ~~was introduced in opposition to Letzerich's germ theory, after which I intended to have discussed it but an accidental shuffle in my papers frustrated the design.~~ I shall call it the catarrhal theory, a name which is sufficiently descriptive. One form of it was held by Bronsais and Desruelles (Annales de la Méd. Physiolog. p 471, 1824) by Marcus, Blache, Oppolzer and Especially by by Loshner.[1] The doctrine of these writers may be fairly stated thus — Whooping Cough is simply a form of bronchitis in which the secretion of the bronchioles and alveoli undergoes a peculiar decomposition, and produces paroxysms by reflex irritation. This decomposed secretion is infectious as is the secretion of other acute catarrhs, as e.g. those of the conjunction and genito-urinary tract.

The two principal assertions in the foregoing statement I shall separately examine.

Criticism of this view.

(1) It is said that whooping Cough is a form of bronchitis. To this I answer the two diseases are very different in many respects. Their onset is quite different. Bronchitis is attended with marked pyrexia, while pertussis in its simple form is not attended with fever to any very appreciable degree.

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[1] Steffen, p. 681.

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(a) Causation and modes of propagation.

(b) Catarrhal theory

Criticism of view that it is due to decomposed secretion.

(2) It is said that the secretion of whooping cough is decomposed. That assertion is quite gratuitous and I assert is incapable of proof. But even granting for the sake of argument that it is decomposed how does it thus become infectious? Will mere putrescence of sputa cause whooping cough? The sputa of bronchiectasis and gangrene of the lung are putrid enough, and yet no seriors writer would assert they are contagious. But even if they be they don't produce pertussis. The sputa of chronic phthisis, coming from old cavities show signs of decomposition. The circumstances in which they are produced — organic products freely exposed to the action of air, moisture and warmth are such as necessarily induce decomposition and yet — though the contagiousness of phthisis is a moot point — the decomposed sputa do not produce whooping cough. The position, therefore, that whooping cough is due to decomposition of the expectoration is utterly illogical and untenable. It rests on two propositions which are false, namely that the expectoration is decomposed and that decomposed expectoration is

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(A) Causation and modes of propagation.
(B) Catarrhal theory.

infections. The poison of pertussis — the infecting substance whatever it be, whether it be gaseous or liquid or consist of minute particles — has never yet been isolated, and consequently its nature and mode of generation have yet to be discovered.

(B) The view that it is a supraglottic laryngeal catarrh.

A modification of the catarrhal theory was submitted by Gendrin and Bean. These writers, struck by the similarity between the paroxysms of whooping cough and those caused by the entrance of a foreign body into the larynx, assumed the existence of a catarrhal inflammation of the mucous membrane of that part of the larynx which is above the glottis. From this a drop of secretion would fall into the glottis and a seizure would result."

Objections to this view.

Against this ingenious view lie several objections. It has been argued that when the malady is at its height the paroxysms are apt to be more frequent and more violent at night when patients are in the horizontal position, but we should expect it to be otherwise if they were due to the dropping of secretion from above into the glottis. Bean endeavoured to support his view by laryngoscopic observations, and

" Dr. Steffen p. 690.

(b) Causation and mode of propagation. (β) Catarrhal theory.

of course the laryngoscope revealed what was wanted of it. But when subsequently interrogated by disinterested investigators, especially Rehn ~~Roches~~, it returned a totally different answer. This observer "found in adults the supra-glottic region normal, while the infra-glottic region and upper part of the trachea were red and swollen."[1]

(c) The view that it is a specific catarrh.

Another modification of the catarrhal theory held by many is that whooping cough is a specific catarrh of the larynx and glottis only (Dawson), or of a larger portion of the respiratory tract (Guersant, Steffen, &c. &c.) This view is stated by the last mentioned writer with such clearness that I cannot do better than quote his ipsissima verba slightly abbreviated — "A catarrh of the respiratory organs lies at the foundation. This affects principally the mucous membrane of the larynx within the glottis, trachea, bronchi and their ramifications extending sometimes even to the alveoli. In rare cases especially in small children the nasal mucous membrane is also involved. This catarrh arises from inflammation, and it, as well as its secretion, has a specific quality. It is specific

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[1] Dr. Steffen, p. 691.

(a) Causation and modes of propagation.

(13) Catarrhal Theory.

because others are infected, and the same disease produced. The contagious substance gains access to the respiratory organs during respiration and there sets up the specific catarrh and its specific secretion. The paroxisms are reflex phenomena due to excitement of branches of the vagus or of the internal twig of the superior laryngeal. The reception of the contagium is principally effected by inhaling an atmosphere impregnated with the infectious substance exhaled by patients. The fresh sputa are also infections. Some believe the dry sputa are infections."(1)

Among others identified with the catarrhal theory in some form or other are Laennec, De Vees, Watt and Banham.

(a) Zymotic Theory

We now come to the theory held by Lebert,(2) ~~Holtz~~, J. ~~Franklin~~ and many others including the Royal College of Physicians of London that whooping cough is a zymotic disease of the general system in which the exciting cause is localized in the organs of respiration. This word, zymotic, springing from the Greek ζυμη a ferment, literally means a fungoid affection — an affection due to the presence of a ferment in the blood; but almost all the writers who

(1) Dr. Steffen, p.p. 688, 689. (2) Dr. Steffen, p 682

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(a) Causation and modes of propagation. } (4) Zymotic theory }

have hitherto used it repudiate this significance and apply the term to diseases of the general system due to morbid poisons, of which thirty four are enumerated by the Royal College of Physicians. The poison is supposed to be multiplied by a process analogous to that of fermentation. In fermentation the yeast-plant resolves sugar into alcohol and carbonic acid gas, while it feeds grows and multiplies at the expense of the nitrogenous substance present in the infusion, and which substance is thus partly or completely removed. So the contagium is supposed to use up some constituent of the blood on which it feeds thus producing the systemic disturbance, and protecting from subsequent attacks.

Those who place whooping cough in this class regard the nervous affection as due to the irritation of the poison in the blood. This acting on the glottis excites spasm, and upon the mucous membrane of the bronchi excites Cough and the peculiar secretion, the latter being the effort of nature to cast it out.

~~Undoubtedly, there are many points in common between whooping cough and this class of disease. It is contagious, has its period of incubation efflorescence and defluxescence, runs a regular course and rarely~~

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(3) Causation and modes of propagation.

(4) Miasmotic theory.

~~occurs more than once during life~~.

The writer can see no reason why whooping cough should not be included in this class of diseases, but he does object to its being included as a subgroup of this class viz. the exanthemata, which Cullen defines as follows:— "Morbi contagiosi, semel tantum in decursu vitae aliquem afficientes; cum febre incipientes; definito tempore apparent phlogoses, saepe plures, exiguae, per cutem sparsae" (1) It must be admitted that there is much in whooping cough that answers the foregoing description. It is a contagious disease, generally affects a person once only during life, has its period of incubation of increase and decrease, its fact runs a regular course. These facts are laid stress upon, but the chief argument advanced is that Epidemics of whooping cough often accompany & follow epidemics of the acute exanthemata, as it was by Voltz and J. Franklin (2) No doubt the poison of pertussis and that of an exanthem may simultaneously exist in the same person. It often accompanies measles, Cowpox and whooping cough is not a rare combination. I have attended several patients suffering at the same time from scarlet fever and whooping cough. Enteric fever has been often (3)

(1) Quoted by Sir Thomas Watson, Practice of Medicine Vol 1 p. 842
(2) Dr. Steffen p. 682. (3) The writer has at this date (Oct. 1885) two cases of this combination in his care.

(a) Causation and modes of propagation.
(b) Zymotic theory.
The view that it is an exanthem.

observed with it and the combination is a particularly bad one. Still these concurrences are not so frequent as has been represented by some. "Hirsch has shown that out of 416 epidemics of whooping cough in only 104 could any coincidence whatever be shown with acute exanthemata."[1] That the concurrence is found so often is easily explained. Epidemics of whooping cough and of the exanthemata are both so frequent that it would be cause for wonder if they did not occasionally concur. Besides if it be true that the weak are most prone to attacks of whooping cough, who so feeble as one who is passing or has just passed through the ordeal of an exanthem. The explanation of whooping cough following on attack of measles is obvious enough. In measles the throat and respiratory tract are in a hyperaemic state and thus form a greedy soil for the reception of the seeds of whooping cough. A somewhat similar explanation applies in the case of scarlet fever where there is always pharyngitis present. But even supposing this explanation were not at hand, and that epidemics of whooping cough and of the exanthemata more frequently occurred together that would be far from proving

[1] Dr. Steffen in Ziemssen's Encyclopaedia, p 688.

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(a) Causation and modes of propagation

that they belong to the same sub-class. In frosty weather the practitioner has plenty of bronchitis to treat and numerous cases of Potts and Colles's fractures to put up, yet we dont include the latter among diseases of the respiratory apparatus. We dont class together wild birds an cereals because the former infest cornfields in harvest-time. Horses and cats go together, and bull-dogs are said to affect the society of miners — but enough.

The view that it is an Exanthem.

Several considerations argue against the view that whooping Cough is an Exanthem (1) It is practically free from pyrexia, and may be quite free from it. If pyrexia be present it is very trifling, or if considerable it is due to some other disease which may be present as a Complication — bronchitis e.g. Now fever is an Essential and prominent fact of all the exanthemata. (2) In the intervals between the paroxysms a patient with Whooping Cough seem quite well: he might undergo a medical examination without anything being found the matter with him. That cannot be said of any exanthem During ~~the~~ its whole course, from the day it comes till the day it goes, there is no time when a fever patient feels looks or is well. (3 and last) There is no rash — "phlogoses per cutem sparsae" —

Objections to this view.

in Whooping Cough. It has been asserted that the ulcer beneath the tongue represents the rash in whooping Cough, but it is not always present, and has been shown to be caused by the action of the teeth; the proofs of which need not now be adduced, as they will be given later.

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b. Morbid Anatomy

Does post mortem examination throw any light on the causation of pertussis. We rarely indeed have an opportunity of performing an autopsy upon a case of simple whooping Cough. When we do we find no characteristic or pathognomonic lesion — nothing which in the present state of our knowledge would enable us, if we did not know the previous history of the case, to say with certainty death had taken place from whooping Cough. There are traces of the disease no doubt, just as a Storm leaves traces of its violence on the town or tract of country on which it has spent its fury; and when we reflect upon the Clinical facts of the malady — the frequent prolonged paroxisms, and the disturbance of the respiration and circulation involved — we have no difficulty in understanding how if it have lasted any time traces should be left in the Organs of respiration, in the brain and its membranes, and in the alimentary tract. These results of the disease — this progeny of Complications which it begets — Constitute the danger of the disease, and it is through them

There is no essential lesion.

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(b) Morbid Anatomy. that death almost always takes place. Thus the morbid appearances found are principally the morbid appearances of the complicating disease. This latter, authors are agreed, is in the majority of fatal cases an affection or combination of affections of the respiratory organs — bronchitis, a broncho-pneumonia with collapse of the lung. I here give a précis ~~of cases~~ of the reports of some of those who have made autopsies.

Dr. G. Hewitt's autopsies. Dr Graily Hewitt during an Epidemic in 1855 made nineteen necropsies, and found the most common lesion pulmonary collapse. This was situated chiefly in the margins of the lungs, and adjoining the parts affected there was of course very great distention of the air-vesicles. He found also congestion of the mucous membrane of the air passages, lobular pneumonia, interlobular emphysema, and enlarged bronchial glands.

Mr. Dolan's autopsies. Mr. Dolan gives particulars of seven fatal cases, four being from diseases of the respiratory system, and three from those of the nervous system. Two were due to capillary bronchitis, two to pneumonia, two to convulsions, and one to spasm of

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(1). Quoted by Dr. Aitken, p. 765.

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of the glottis.[1] "This experience" is that the whole of the mucous membrane of the air and alimentary passages is in an irritable red and swollen state. When death took place in the later stages the bronchi were filled with thick mucus. {b, Morbid Anatomy.

Meigs, with his usual carefulness of diction, remarks that there is no essential lesion except perhaps slight inflammation of the bronchial mucous membrane. In most cases the lining of the trachea and the larger and smaller tubes is reddened and perceptibly thickened, the tubes containing considerable quantities of pellucid mucus or viscid phlegm. {Dr. Meigs's autopsies

Steffen asserts that in every case catarrhal inflammation is present in some part of the air passages. Blau and Gendrin maintained that this condition constantly occurred at the entrance of the larynx and supra glottic region. But this says Steffen has been proved to be erroneous: in the great majority of cases though not in all it is present on the surface of the glottis and the part below. Very often the process begins in the larger bronchi, further up the mucous membrane being pale and not swollen.

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[1] J. M. Dolan, Whooping Cough p. 42

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4. Morbid anatomy.] Dr. J. L. Smith, in words so nearly identical as to excite a certain suspicion, says "in not a few cases the surface of the larynx and trachea is pale and not swollen, & the inflammatory appearance is limited to a small part as the ventricles of the larynx, while the mucous coat of the bronchi and their branches is swollen, red and covered with tenacious mucus. The mucous membrane where inflamed has the usual appearances; it is swollen, soft, pale & deep red, and covered with tenacious muco-purulent frothy masses." Steffen adds that the larger bronchi are often filled with these masses, that if the bronchioles be affected they are blocked with this secretion, and if the alveoli, their yellowish white contents may simulate tubercles, especially when they lie under the pleura; but by puncturing them and pressing out the contents mistakes may be avoided.

Summary.] The authorities quoted above are agreed that there are no pathognomonic morbid appearances — that the appearances found are those of the complicating disease which has caused death. This in nearly every case

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B. Morbid anatomy.

is an affection of the lungs or brain.

A) Affections of the respiratory organs.

Acute bronchitis is one of the most frequent complications. The inflammation may be confined to the large and medium sized tubes, or may extend to the smaller (General and Capillary bronchitis). The tubes present the same inflammatory appearances as when the disease is primary, the lining membrane being soft, swollen, and red, with abundant mucus blocking the passages. When the inflammation has been more intense the tubes instead of mucus contain muco-pus. Not unfrequently we may find dilatation of one or more bronchi (bronchiectasis).

Lobular Collapse, according to Alderson Hewitt and other writers, is rarely absent. It is a result of bronchitis where the mucus has been abundant and the child weak.

Emphysema is usually present. It is generally of the vesicular kind, chiefly affecting the peripheral and marginal portions of the upper lobes: but in some cases the air has escaped into the connective tissue causing interstitial (1) or mediastinal

(1) Dr. J. L. Smith.

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b. Morbid anatomy
II Affection of the respiratory apparatus.

emphysema, and sometimes though exceedingly rarely it is general over the body. Of course if pneumothorax have resulted from subpleural emphysema, that half of the chest is enlarged, and the intercostal spaces bulge; and if the pleural surfaces dont adhere the lungs are pressed inwards backwards and upwards by the air that has escaped. But pleurisy need not necessarily follow a pneumothorax arising in this way. It is frequently secondary to collapse, which it is an effort of nature to compensate.

Pneumonia usually is

I/ of the acute kind of which there are two forms lobar and broncho-pneumonia. Both present the same appearances as when the disease is primary (A) Lobar pneumonia is not a common lesion in whooping Cough. If it be found, then according to the time at which the patient has died we have one of the three stages (a) engorgement, in which the lung is deep red but not solid (b) red hepatization, in which the lung is completely solidified, non crepitant, &c. (c) Gray hepatization, in which the lung has a grey colour, and yields much

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fluid on pressure. (B) Broncho-pneumonia (catarrhal pneumonia, peripneumonia notha) is a common lesion. In it we have bronchitis and inflammation of individual lobules, the latter being in one of the three above mentioned stages. Pneumonia is probably always accompanied by some bronchitis.

(II) Chronic pneumonia may be present as a sequel of the acute form. In this we find retraction and thickening of interstitial tissue, and appearances resembling those of phthisis.

Pneumonia may be accompanied by Pleurisy, constituting pleuropneumonia or pneumo-pleuritis according as the pneumonia or the pleurisy is the principal disease. If the pleura be inflamed the affected portion is found thickened and overlayed with more or less fibrinous exudation.

It is not unusual to see numerous ecchymoses on the pleura especially on the posterior surface of the lung. Haemorrhages into the substance of the lung are also found in some cases.

The pericardium is also sometimes affected similarly to the pleura. Endocarditis has been

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(b. Morbid anatomy.) met. The heart as a rule presents no permanent lesion, but the coronary arteries may be distended, and the small vessels in the intermuscular connective tissue may be intensely injected (Dolan, p. 38)

Hyperplasia of the tracheo-bronchial glands is often met with in children of a strumous or delicate constitution, in whom there is hyperplasia of the other lymphatic glands throughout the body. The glands may be inflamed or undergoing cheesy degeneration in their centres. Dr. Ley suggested that the enlargement might be due to bronchial catarrh, and Watson asserts he found this condition of the cervical glands occurring during pulmonary irritation."[1]

Besides the foregoing affections, acute and chronic miliary tuberculosis, croup, laryngitis, and oedema glottidis have been found (though some of them are very rare) at autopsies after whooping Cough. The morbid appearances of these maladies do not require description here.

Complications belonging to the nervous System. Passive congestion of the cerebral and meningeal vessels ~~are~~ is often found, and the

(1). T. M. Dolan, Whooping Cough p. 40.

effects of this Congestion are often found, viz effusion of blood of various sizes and of serum into the substance of the brain, into the ventricles, and between the membranes. } (a) Morbid anatomy. (b) Affections of the Nervous System.

Meningitis of the tubercular kind has been found, but not often. It is usually simple. In the latter there is excessive vascularity of the membranes, dullness or paleness of the arachnoid, effusion of fluid on the surface of the convolutions and in the ventricles. Fluid in the ventricles has been often found when there has been no symptom of meningitis. This is found in severe cases only.

The same conditions may be found in the Spinal chord that have been mentioned as met with in the brain and its membranes.

Various writers have seen the pneumogastric nerve in some cases reddened and sometimes swollen and softened; and they have ascribed these appearances to the presence of inflammation. Even these observers however have met with it but seldom, while others have sought for it in a large number of bodies without finding it once. Albers of Bonn examined forty seven. In four he found one of the vagi slightly

(b. Morbid anatomy) reddened, the redness being on the side on which the body lay. West looked for it in twenty four cases and found it only in one. We think it is only a post mortem thing, and of no importance.

Morbid appearances found in the digestive system. In children who have died before the third stage there is in the great majority of cases the ulcer on the under surface of the tongue, but this has no significance.

Steffen states that in his autopsies he found the mucous membrane of the stomach red and swollen from inflammation. Inflammation of the intestinal follicles was not unusual, and sometimes there was considerable ulceration of these follicles, at the ileo-caecal valve.

When the body is much emaciated the liver is found more often hyperaemic, and generally as the result of the hyperaemia having undergone some fatty degeneration

As regards the kidneys it was first pointed out by Gibb that the urine is frequently saccharine. Dolan examined the urine of fifty children with pertussis and could only find traces in thirteen. Steffen states that the kidneys show

in the general congested state, and that albumen may be found in the urine shortly after violent paroxysms."[1]

To sum up the foregoing evidence: there seems to be a pretty general concensus of opinion that the more common morbid appearances are those of tracheal and bronchial congestion, bronchitis broncho pneumonia, collapse of the lung, cellular emphysema, haemorrages into the lungs, haemorhage into the brain and its membranes and between the latter, simple meningitis, oedema of the brain and exudation into the ventricles, gastric catarrh, enteritis enlargement of the bronchial glands: and that the following are less frequently or rarely found— viz. lobar pneumonia, interstitial mediastinal and general emphysema, acute and chronic miliary tuberculosis, endocarditis, croup, oedema of the glottis, general dropsy, tubercular meningitis. The lesions found are coincidents or results not causes of pertussis. They throw no light on its causation, nor do they enable us to say where in a System of medicine the disease should be placed.

Now comes the question — How do we account for the occurrence of these morbid

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[1] J. M. Dolan, Whooping Cough p. 41.

Production of complications by the paroxysms.

appearances? What is the explanation of their origin and existence in the course of pertussis? Why are they so common in the head and lungs? The impediment to the respiration caused by the spasmodic closure of the glottis, which lasts more or less through each paroxysm, and the interference with the circulation involved, cause the majority of the complications.[1]

In the first place let us take the hyperaemias a congestions so commonly found. Congestions are active or passive; but I shall now speak of the passive or mechanical kind, in which the excess of blood is in the veins and capillaries, and the flow retarded. There are four causes of this kind of congestion, and three of these we have in pertussis.

Paroxysms Cause Congestions by obstructing venous returns

(a) Obstruction to the venous returns is the most common cause of passive congestion,[2] as the obstruction obviously, causes distension of the vessels and retarded flow of blood behind the obstruction. We see this sometimes during pregnancy the pressure of the gravid womb giving rise to a varicose condition of the veins of the leg and lower part of the trunk, to haemorrhoids, and to distension or varix a even rupture of the small veins of the

(1) Dr. Edward Smith holds the same view. He says in the pathological part of his dissertation in Reynolds's System — "The interference with the circulation of the blood which occurs when the respiration is so greatly impeded is doubtless the cause of the complications in the head and lungs."

(2) Vide Dr. Green's "Pathology and morbid Anatomy" p 387 (4th Edition)

vagina. We see it in some of the abdominal viscera (Stomach &c) from obstruction of the portal circulation by cirrhosis of the liver. We see it in the lungs when there is stenosis or regurgitation at the mitral valve. We see it in the general system when there is incompetency of the tricuspid, and during the paroxysms of pertussis. Dr. Johnson's stopcock theory is familiar to every typo in medicine — that impeded respiration means impeded circulation, and a good example and proof of that theory occurs in the seizures of whooping cough. The glottis is closed, air ceases to enter the lungs, blood ceases to flow from the right ventricle through the lungs: the right ventricle is forged and the blood is thrown back in the whole venous system. In the patients livid face and lips, the eyes starting from their sockets, the darkened hands, is patent intense congestion of the general system, for the condition apparent on the surface is no doubt even more accentuated in the highly vascular tissue of the viscera, such as the lungs, brain, liver, spleen, stomach &c. In severe cases

Paroxysms cause congestions by obstructing venous return.

of whooping cough where the paroxysms are very frequent and long continued the congestion is almost constant, the circulation hardly having time to recover itself before it is interfered with again. So that to a large extent the paroxysms are directly responsible for the congestions that occur.

Another cause of passive Congestion is Cardiac weakness, and it is by no means an important factor when combined with obstruction of venous returne. We meet with heart weakness in the diseases that are exhausting and chronic, as phthisis, chronic bronchitis, and also in the acute exanthemata as typhus and typhoid fever: in these diseases passive congestions are common. Now in severe and protracted cases of whooping cough we have a chronic and debilitating disease. The frequent violent and protracted paroxysms, the loss of rest at night, the interference with nutrition from loss of apetite and frequent vomiting all combine in the formidable case of whooping cough to produce exhaustion. The heart becomes weaker, and the diminished vis a tergo favours the occurrence of venous

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hyperaemia.

(c) A third cause of ^ congestion is gravitation, and it is an important factor when combined with the two foregoing. Congestion thus caused is called hypostatic. Its action is seen in the lower extremities of weak people who have to remain standing for a large part of the day, and it ^ is seen in the posterior and lower parts of the lungs, and in the integument of the back in conditions where the patient is unable often to change his position, as in the treatment of fracture of the femur and during the chronic exhausting and acute febrile diseases. I have seen cases of pertussis where hypostatic congestion of the back and base of the lung was present due to this cause, the patient having maintained the same recumbent position for days. We see then how passive congestions are produced in pertussis.

What are the results of passive Congestion?

Among the more common effects are

(a) transudation of serum producing oedema, dropsical accumulations, and anasarca, due to stretching and damaging of the walls of the vessels. This accounts for the oedema of the face and hands in pertussis ^ seen during life,

{ How the paroxysms produce serous exudations.

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and fa the accumulations in the ventricles of the brain &c. after death.

How the paroxysms produce haemorrhages

(b) Another result of passive congestion is haemorrhages. These occur when the obstruction to the venous flow is very severe, and it takes place in two ways (α) The vessels may rupture, and when they do it is usually those that are not so well supported. (β) But blood escapes also, as shown by Cohnheim, without any laceration whatever of the vessels, the red corpuscles passing into & through the walls of the Capillaries, the corpuscles becoming constricted in the middle as they do so. Familiar examples of haemorrhages from obstruction occur in the stomach from cirrhosis of the liver obstructing the portal vein, and in the lung from mitral disease. They are also frequently observed during the paroxysms of whooping Cough, when they may occur in the Schneiderian, Conjunctival, pharyngeal & intestinal mucous membrane: and that they are just as common in the brain and lungs is not only what we should expect but what we actually do find at autopsies.

What are the effects of these haemorrhages? amount,

Intracranial haemorrhage if of considerable

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whether it be into the substance or upon the surface of the cerebrum or cerebellum, or into the ventricles, constitutes sanguineous apoplexy. If the brain be examined a few hours after the occurrence there is only flattening from pressure of the extravasation, but after a few days the membranes show signs of inflammation (Aitken), Haemorrhage into the substance of the cord, or beneath its membranes would result in an attack of paraplegia. Haemorrage into the lung-substance would produce a localized pneumonia.

(c) Thrombosis and embolism may result from passive Congestion especially when combined with diminished Cardiac power, and this Combination of Conditions we have in severe and protracted cases of pertussis. ~~I am not aware that~~ Thrombosis ~~or~~ Embolism have been quite frequently found at autopsies.[1] ~~Mentioned as Complication of pertussis, and~~ I am somewhat surprised ~~that~~ they have not been found. The clinical fact of hemiplegia is not an uncommon occurrence.

Are there any other morbid appearances that we may trace to the paroxysms of Coughing with a closed glottis? We read of Emphysema in all its forms — Cellular, interstitial, mediastinal and General.

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[1] See post mortem appearances in convulsions, p. 999 this dissertation.

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How the paroxysms produce Emphysema

There are three theories as to the production of Emphysema — the inspiratory, the expiratory and the atrophic. (a) The inspiratory, adopted by Steffen, was first expounded by Professor Gairdner.[1] According to this author when a portion of lung is **non-expansible** through collapse and an inspiratory effort is made a compensatory emphysema is produced. (b) The view held by the majority of Englishmen is that of Sir W. Jenner, who propounded his theory in the fortieth volume of the medico-Chirurgical Transactions. According to Jenner the most efficacious cause of emphysema is expiratory efforts. In the act of coughing all the air-cells are dilated with air, then the glottis is closed, and finally the lungs are suddenly and violently compressed by the chest wall and diaphragm. Gairdner's and Jenner's views are not exclusive of each other, and in my view both are correct; and if they be they account for emphysema as produced in pertussis. (c) Emphysema sometimes occurs unassociated with other diseases of the lungs, and to such cases the atrophic theory applies, the septa between the vesicles disappearing from mal-nutrition. It is possible this last process may account for some of the vesicular emphysema found in protracted cases of pertussis.

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[1] "The Pathology of Bronchitis &c" Edinburgh 1850 and the Edinburgh Monthly Journal Vol XIV.

Pathology.

How catarrh produces pulmonary collapse

How do we account for Collapse of the lung — the condition variously known as disseminated lobular pneumonia, marginal pneumonia, and carnification (Jaccoud)? It is produced by the plugging of a bronchial tube by a mass of thick tenacious secretion. The secretion may be too copious or too viscid to be expectorated; the patient may be too weak, or he may from dread of coughing postpone expectoration. In whichever way the accumulation takes place in the central or other part of the lung it acts like a ball-valve, permitting the escape and preventing the entrance of air, until the portion of lung is emptied of air and collapses. In pertussis we have always or almost always a certain amount of catarrh, which may be confined to the larynx or extend to the trachea and bronchi. There may in fact be acute bronchitis. We know how children dread the on-coming of a paroxysm, and put it off as long as possible. We know the secretion is sometimes very copious — the weakness of the little sufferer, the small calibre of the tubes. Collapse is far more apt to follow bronchitis in a child than in an adult, and it is as a result of bronchitis that collapse is so common in pertussis.

Pathology.

How tuberculosis is developed.

Tubercular affections have been found in the lungs, pleura, bronchial tubes, in the bowels the mesenteric and other glands, in the brain and its membranes. How do we explain the occurrence of tuberculosis as a concomitant or sequela of pertussis? Whooping cough when severe and protracted is an exhausting disease. The paroxysms in these cases are frequent violent and long-continued, lowering the little patients stock of strength. ~~The loss of apetite, and~~ The vomiting which in these cases so frequently accompanies the paroxysms, and the impaired apetite must seriously interfere with nutrition. Now it is by bad nutrition in early life however produced, and especially when combined with insufficient clothing, impure air, and hereditary influence, that not only tuberculosis but its twin condition scrophulosis are generated. These conditions being normally associated in the children of the poor, what wonder if in their cases an attack of pertussis should prove but the spark ~~that~~ was necessary to ~~light~~ kindle the slow-consuming fire of tuberculosis!

The Symptoms of Pertussis.

After a period of incubation a latency, the duration of which has not yet been exactly determined, (Ristowe says it is about a fortnight, Squire about a week,[2] Dr. R. J. Lees about ten days)[3] the symptoms of the disease begin to manifest themselves. In describing these symptoms it will be convenient to speak first of simple whooping cough, and secondly of the complicated disease.

I Uncomplicated Pertussis.

Simple whooping cough is characterized by paroxysms of coughing, followed by intervals free from cough & other signs of illness. Most authors describe three stages corresponding to the *Stadium prodromi*,[1] *Stadium Convulsivum*, and *Stadium decrementi* of Eberle. The first called the *Stadium prodromorum*, stage of invasion, or catarrhal stage, is the period which follows infection, and is characterized by catarrh of the air passages with more or less violent cough. The second — variously called the stage of increase, convulsive, paroxysmal, or spasmodic stage — sets in and ends with the characteristic attacks. In the third — called the stage of decline, or of convalescence, or secondary catarrhal stage — there is catarrh of the respiratory passages with abundant secretion, but without the characteristic

{ The three stages of whooping-cough

Prodromus, i (from the Greek πρόδρομος, a man sent on before to reconnoitre, a scout — Liddel and Scott) "a certain north-east wind that blows eight days before the rising of the dog-star" — Andrews' Latin-English Lexicon.

(2) Dr. W. Aitken, p. 65. (3) Dr. Edward Smith says it "probably does not ten days."

Symptoms of uncomplicated pertussis.

of cough. This division into stages, though convenient for the writer and practitioner, does not strictly speaking exist; because the transition from one to the other is a very gradual one. And even with this qualification these three several stages are not always present. In attacks of unusual severity the first stage ~~may have been~~ is sometimes so short in duration as to escape observation. It is even thought that cases occur though rarely in which this stage has been absent altogether.[1] On the other hand in very mild cases the disease may terminate at the end of the first stage, there being no second stage whatever. I have seen many instances of this.

The first stage

lasts from the commencement of the illness to the first paroxysm. Practitioners rarely see the disease at this stage at least among the working classes, who dont call in medical aid till the violent seizures of the next stage appear. Roughly speaking it may be said to present the characters of a catarrh of the air passages. In the great majority of cases it commences, as one of these catarrhs ordinarily does, with coryza and sneezing, slight injection of the conjunctiva and dry cough. The onset is insidious and unsuspected. There

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[1] Meigs and Pepper, p. 231— and many other writers.

Symptoms of uncomplicated pertussis.

no premonitory signs whatever. A child who may have been in the best of health simply commences to cough. First Stage

Some writers say they can recognize the cough at its commencement, but there is really nothing which will enable us to distinguish it from an ordinary cold, except that it is occasionally more teazing from its frequency and violence, and that there is generally more languor and irritability than in an ordinary catarrh. It is not as yet spasmodic. It is accompanied by thin frothy sputa, but the expectoration at this stage is scanty,[1] or may be entirely absent. As the case proceeds the cough becomes more frequent, louder and more prolonged. Rousseau says there may be forty or fifty a minute, and that this may last for days.[1] Pyrexia if present is slight. Where it is present it is said not to be marked by chills, nor does it follow any regular course. Children look pale and weak. They are fretful, thirsty, restless, at night, and have little appetite. The conjunctiva is slightly injected and there is coryza; but these are less marked than at the commencement of measles. Sometimes the disease commences with catarrh of the Schneiderian membrane, with frequent and severe sneezing, and some muco-purulent secretion. Often there is simultaneously

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(1). Dr. Steffen, in Ziemssen's Cyclopaedia, p. 690.

Symptoms of uncomplicated pertussis.

First Stage } with the coryza catarrh of the pharyngeal mucous membrane; but what we most frequently observe from the beginning is catarrh of the larynx travelling down the trachea to the bronchi and its subdivisions. In rare cases laryngeal catarrh sets in suddenly, especially towards night, with acute swelling of the parts which narrows the glottis, and results in a cough and breath sounds like those of laryngeal croup: but as morning appears these symptoms vanish and the first stage of whooping cough has set in. Dr R. J. Lees says that "usually there is an increase of fever, difficulty of breathing, and cough during the night. The pulse and respiration are moderately accelerated, and these are the symptoms that accompany a mild catarrh, viz. hyperexia, thirst and anorexia." In the foregoing symptoms there is nothing which foreshadows an attack of whooping cough. They are such as are present in any catarrhal inflammation of the air-passages.

The duration of this stage is very variable. It depends in each case upon the violence of the infection, and upon the age and predisposition of the child. I mentioned before that this stage may be very brief, and that in a small proportion of cases

it is entirely absent: this remark applies especially to very young infants. In Dr. Smith's (Lewis') new-born child the glottic spasm occurred soon after birth. But even among young infants it has lasted from one to two weeks. As a general rule the younger the child the briefer this stage is apt to be. In all cases it is difficult and in many impossible to fix with certainty when the stage began, or when it passed into the second. Hence the variations among writers. Dr. Smith (Lewis') says 'in severe cases it may last two or three days, and in mild cases be protracted to five or six weeks.' Dolan averages the duration of the stage at from two to fourteen days, and Berger at eight to fourteen days, Willan and Rousseau at one week to form. Meigs & Pepper say "it is about two weeks on an average, though it may be much longer." (2) Winderlich's average is from half a week to six, Lombard's at from four to six, (3) a six to eight weeks; Sir Thomas Watson's "eight or ten days or a fortnight or a day or two longer." (4) In Dr. West's analysis of 55 cases the average was 12.4 days (p. 454). It may be roughly stated to be about two or three weeks. West avers that "unusual protraction of this stage is usually met with either at the commencement or close of an Epidemic of the disease, and the longer this stage the milder the subsequent course," and

First stage its duration.

Mr. Dolan, p. 74 (2) Diseases of children p 231 (3) Steffen p. 693. These data are given by Dolan without acknowledging the source. (4) Watson, p. 68.

Symptoms of uncomplicated pertussis.

First Stage. { vice versa (p. 458).

Under favourable circumstances, as when the predisposition is slight and the infection not severe, the attack may not pass beyond the Catarrhal stage; Spasmodic symptoms never appear, and the diagnosis would be doubtful but for the occurrence of pertussis in other children of the same families. This is often observed in large Epidemics, and occurs most frequently among children at the breast. During the last Epidemic at Macclesfield I observed many instances of this. In the great majority of cases the first is followed by

The Second Stage

a Stadium convulsivum, the commencement of which is marked by the first paroxysm.

Transition from first to second stage } Ordinarily the transition is so gradual as to be imperceptible, sometimes it is quite sudden. The pyrexia which may have been present in the former stage diminishes, and there are intervals when no pyrexia is present. In the first stage incessant coughing was the characteristic; in the second attacks of coughing are not so frequent, but they are now and then spasmodic, especially at night and when the patient is in any way excited. The Spasmodic element goes on increasing so that

Symptoms of uncomplicated pertussis.

all doubt as to the nature of the disease is set at rest. Regular paroxysms appear — kinks as they are called — the peculiar spasmodic fits of coughing which are characteristic of the disease, and with the first of these paroxysms the second stage of the disease appears. { Second Stage.

If near the patient when the fit is coming on we can foretell its approach; the patient looks restless and anxious, the pulse and respiration are somewhat quickened, and there is audible rattling of mucus in the trachea and larger bronchi. This gave rise to the theory that the seizures were caused by the specific secretion brought up from the deeper air passages irritating the infra glottic portion of the larynx, already the seat of catarrh and sensitive from it. In support of this theory it is alleged that after expectoration the attack stops. There is some truth in this; still it must be admitted on the other hand that there are attacks without anything being expectorated, and that there may be irritation of the bronchial mucous membrane produced by the presence of a foreign body or in any other way without a fit of whooping cough being induced. { Signs of an approaching paroxysm.

The paroxysm sometimes commences quite

Symptoms of uncomplicated pertussis.

Second stage — Forewarning of a paroxysm

abruptly with little warning; but commonly the little patient knows when when one is about to happen, and that for some ten minutes beforehand. Older children and adults tell us they have sensations of tickling, prickling or scratching in the throat a middle line of the chest, as if some foreign body had got in there. Sometimes there is a feeling of the larynx being compressed, and this sensation sometimes extends down the trachea. Thus forewarned of the coming storm very young children try to repress it as long as they can; they look restless and anxious and immediately before the onset run to some

Phenomena of a paroxysm.

object for support, grasping a mother's skirt or a play-mate, or it may be a chair or table. Older children make for the spittoon, or the kitchen sink, or it may be the back door, to deposit the sputa and vomited matters when they come. When the fit occurs the body is bent forward, and a rapid succession of short expirations takes place, by which air is ~~expelled~~ very violently and quickly, so that the lungs are almost emptied. The patients face and eyes ~~very~~ become suffused, a actually purple and swollen, and asphyxia seems threatening when the whoop — a long and deep inspiration accompanied

Symptoms of uncomplicated pertussis.

Second stage — Phenomena of the paroxysm.

by a loud crowing noise takes place. This sound is not unlike the crowing of a cock. There may be a single series of expirations terminated as above, but it generaley happens there are several series in a paroxysm; and so as soon as inspiration is completed a very soon after a second series of convulsive expirations occur, followed as before by the crowing inspiration. This succession of phenomena — a series of expirations followed by a spasmodic inspiration — recurs two or three times or oftener,(1) and the paroxysm terminates with a few expirations, and generally with the ejection of a considerable quantity of thick glairy mucus from the air passages sometimes from the stomach. If the attack be violent, and especially if it occur soon after meals, the food comes up. If the fit be violent and the fluid copious it escapes by the nostrils as well as the mouth, and may be mixed with blood. Often if no sputum has been expelled a second attack follows immediately, and then generally expectoration takes place with the second. Cullen remarked that the expectoration or vomiting usually takes place after the second series of expirations and ends the paroxysm.(2) During the fit there is temporary arrest of blood in the lungs, leading

(1) Dr. T. Watson p. 69. W. J. L. Smith esq. that "during a paroxysm in cases of ordinary severity there are often as many as fifteen to twenty series of expirations." If he had said single expirations instead of series of expirations it would, the writer thinks, have been more accurate.

Symptoms of uncomplicated pertussis.

Second stage — Phenomena of the paroxysm.

to congestion of the right side of the heart, and of the venous system throughout the body. Hence the face is flushed and swollen, and occasionally, in very severe cases, haemorrhage occurs from one of the mucous surfaces — the mouth nose lungs or beneath the Conjunctiva — the most frequent form of haemorrhage being epistaxis. The fits vary greatly in severity. Such is a brief account of what is called a paroxysm of whooping cough.

After the seizure is over, if there be no complicating disease, the pulse and respiration become normal again, the lividity of the face disappears; but there is often puffiness of the features due to serous infiltration of the subcutaneous connective tissue, and this puffiness may remain for days a week, till the paroxysms abate in severity. The skin is usually moist with perspiration, and hence is cool. The child looks fatigued and exhausted for a short time. The exhaustion may proceed the length of syncope, or result in an attack of general convulsions (Meigs & Pepper); the latter however are not common. Generally the child recovers itself completely, and returns to its play.

Symptoms of uncomplicated pertussis.

Second Stage.

Duration of a paroxysm.

The attacks last from a few seconds to several minutes — from a quarter to a half or a whole minute (Dr. J. L. Smith). Meigs and Pepper say "the ordinary duration is from a quarter to three quarters of a minute, though it may last two minutes or longer". Dr Meigs relates a case in which "the paroxysm lasted the extraordinary period of fifty five minutes, the greater part of which he witnessed himself." (1)

~~During the fit in cases of ordinary severity there are often or usually as fifteen to twenty series of expirations.~~

The resonant inspiration has been called the kink, hoop or whoop, and hence arose the popular names of the disease such as kink-host, hooping cough, whooping cough, chincough kink-cough. It is caused by the drawing of air rapidly and forcibly through a rima glottidis partly closed by the spasmodic contraction of the muscles of the larynx. The intensity of the sound depends on the degree in which the glottis is narrowed at the time, and upon the force and velocity of the inspiration. In the milder cases the constriction is slight, and the sound may be hardly audible; while if the constriction be considerable

(1) Diseases of children, p. 233.

Symptoms of uncomplicated pertussis.

Second stage. The sound may resemble those produced in croup. The more violent the attack, the more rapidly the expirations follow, the more the glottis is narrowed, the more the inspirations will be spasmodic long-drawn and accompanied by the whoop. The number of whoops during any paroxysm depends on its length. In the milder cases but one is heard. In those more violent and long-continued there are several. It is often absent especially in infants.

Severity and frequency of the paroxysms.

During the paroxysm in cases of ordinary severity there are often as many as fifteen to twenty series of expirations. The seizures vary greatly in frequency and severity in different cases, and in the same case at different periods; but generally they are severe where they are frequent. Dr. J. L. Smith says that at the height of the disease they are more severe when they occur at long intervals. There may be only a few in the twenty four hours. In ordinary cases they occur every hour (J. L. Smith)[11], or two hours; but in severe cases every half a quarter of an hour or even oftener than that. Meigs found them "during the height of the disease to number about forty in the twenty four hours, but in some rare cases," he says, "they are much

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[11] Dr. Wm Aitken says p. 764 "in ordinary cases they occur every two hours." The writer thinks that this is rather an underestimate even for ordinary cases.

more numerous amounting to seventy or eighty."[1] McCall states he knew a child of eight months that had a hundred and forty in a twenty four hours.[2] Sir Thomas Watson says that "in the earlier paroxysms the mucus expelled is scanty and thin, and in proportion as this is the case the fits are the longer and more violent. By degrees the expectoration becomes more abundant, and at the same time thicker and more easily brought up, and then the fits are less protracted."[3] They are generally most frequent in the third or fourth week, after which they remain stationary for two or three weeks, and then gradually decline.

{Second stage.}

{Severity and frequency of the paroxysms.}

They may come on at any time, they are apt to occur after meals, and then almost certainly vomiting takes place; hence the loss of flesh in these cases. Various circumstances may excite them — fright, a fit of temper, mental excitement of any kind, seeing another child in a paroxysm, violent exercise, change from warm air to cold,[4] or even the slightest change of position will induce attacks. But they may occur spontaneously while the child is perfectly quiet, and may even wake him from his sleep, as I have often witnessed.

{Circumstances which favour their occurrence.}

~~"Trousseau maintains they may be repeated forty or fifty times a minute and that this violence may show itself through a course of days." Steffen p. 690.~~

(1) Diseases of Children p. 233
(2) Steffen p. 697.
(3) Sir T. Watson p. 69.
(4) Perhaps this accounts for the fact stated by Dr. J. L. Smith that the paroxysms are apt to be more frequent in the night than in the day.

Symptoms of uncomplicated Pertussis.

Second Stage. Some authors say they are more numerous by day than by night. Dr Smith, Dr. West and others assert on the contary that they are more frequent and violent at night than in the day-time, and that when the nocturnal attacks begin to diminish in frequency and severity the height of the disease is passed, and the second stage is drawing to a close. Sir Thomas Watson says with his usual clearness "the nocturnal paroxysms are commonly more severe than those of the day," (1) and West (p. 456) points out that the same "nocturnal exacerbation occurs in asthma, and many other affections of the respiratory organs."

As the case proceeds the paroxysms alter in their character. The expirations become full and the inspirations more numerous in each attack. The mucus becomes more opaque and less viscid, while vomiting is more frequent. The whoop is not so loud or prolonged and is occasionally omitted. So the longer this stage lasts the more feeble the attacks become and the longer the intervals between them. The whoop gradually disappears, and the croup cease to be characteristic. "During the decline however," says West, (p 457) "exposure to cold neglect of bowels or mental

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(1). Sir T. Watson, p. 69

excitement will in many cases bring back the whoop and increase the previously diminished severity of the attack."

{Second stage.

{Physical examination of lungs during paroxysm

Inspection of the patient during the paroxysm shows that the respiration and circulation are much embarrassed. The face which at the beginning is moderately suffused becomes livid. The nostrils and mouth work convulsively. Tears flow from the eyes. Faeces and urine are often passed involuntarily. In young children there is stupor lasting for a short time after the paroxysm and due to congestion of the brain. What we find by inspection is confirmed by

Auscultation and percussion.

(1) The Respiratory System. Previous to the fit if the stethoscope be applied over the lungs there is only slightly hurried breathing with some dry and moist rales, or the vesicular murmur is quite clear. During the paroxysm examination of the larynx whether by the laryngoscope a stethoscope is obviously impracticable, but if the stethoscope be applied to the Chest walls between the short shocks of cough there are some snatches of wheezing or vesicular breathing, but during

Second Stage.

Physical examination of lungs during paroxysm.

the inspiration no breath sounds whatever are heard in the lungs. The whoop is distinctly audible. The air rushes violently into the trachea, stops there for one or two seconds till the muscular ~~& contractile~~ fibres of the tubes relax from their state of spasm, and then enters the lungs. That was Laennec's view. It does not enter the bronchioles and air-cells till the fit is over, and respiration once more goes on quietly (D. West); then all we hear as before are catarrhal sounds — slight ronchus, sibilus, or moist râles — if the vesicular murmur be not quite clear. Percussion, which during the expirations yielded a short note, is during the inspiration normally resonant. In the intervals the sounds are those of health; the vesicular breathing being quite clear, & there are symptoms of tracheal & bronchial catarrh, and if the process extends to the bronchioles the sounds will be modified accordingly.

(2) Interference with the respiration always results in interference with the circulation. During the paroxysm the heart's action is much impeded, and as a result the pulse becomes very frequent: in severe attacks it cannot be counted.

Though the frequency is increased the force is diminished. The latter is greatest at the commencement and diminishes as the paroxysm proceeds. Sometimes the heart stops for a moment or two altogether. The venous congestion causes transient dilatation of the heart cavities, and this frequently recurring dilatation necessarily acts injuriously on the heart afterwards. Accordingly we find that while early in the illness the pulse in the interval may be of normal strength, towards the termination of the case it becomes weak, partly from this cause and partly from the systemic weakness produced in other ways. { Physical examination of heart during paroxysm.

After the fit is over the pulse-respiration ratio becomes normal again. In mild cases the patient runs about and resumes its play & previous occupation as if nothing had happened, and seems as if it were in ordinary health. The eyes which seemed starting from their sockets appear natural again. The conjunctiva may be slightly injected; but in a few minutes all is as it was before the paroxysm. But when the attacks are violent and frequent their effects don't pass away so soon. The patient lies down for a while exhausted and irritable: the eyes remain { Between the paroxysms.

injected; the face is puffed and red. If the attack be very frequent and severe, and especially if they be frequently accompanied by vomiting, the patient does not recover itself at all in the intervals, but depressed and apathetic it lies rolled up upon the couch probably with its face turned away from the light. It complains of headache is thirsty, and feverish and thoroughly exhausted. Such unfavourable symptoms forebode convulsions a serious mischief in the brain a lung or both.

Duration of this stage.

The duration of the second or Spasmodic Stage varies in different cases, and sometimes cannot difficult be determined exactly owing to the impossibility of defining the limits. As we should expect under the circumstances authorities differ very much on this point, various writers putting it at from two to ten weeks, three to eight weeks, four to five &c. Dolan saw it last five, eight, fourteen and thirty days.(1) Barthez and Rilliet say it lasts fifteen to sixty five days.(2) Dr J.L. Smith assigns thirty to sixty days, "but it may be considerably longer or shorter." Meigs and Pepper put it at "thirty or forty days in most cases.(3)" Gerhardt fixes it at from two to ten weeks; Steiner at three to eight weeks; and Burnier assigns four to five weeks as the medium duration, but has also seen it last but two weeks, and on the other hand

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(1) Whooping cough p. 78.
(2) Steffen p. 900, also quoted by Dolan. A similar estimate to Barthez and Rilliet is made by Dr. W. Aitken who assigns two to six or eight weeks — p. 767.
(3) Diseases of children p. 233.

several months. The average may be roughly put at about three or four weeks. In the milder cases it terminates soon without producing much ill effects on the sufferer; in the severer cases it is more lasting. In all cases it is attended by loss of strength, especially where the child is feeble at the beginning, where it is of early age, where there is frequent vomiting, but especially where this stage is severe and protracted. Where the latter has been the case the succeeding stage is also severe and protracted, and marked by anorexia with irritability of the stomach attended by frequent vomiting and consequent emaciation and debility. {Duration of this stage.

This stage of the disease, where it is survived, gradually merges into the

third or final catarrhal Stage.

the stage of convalescence. This is said to commence when the spasmodic cough begins to abate, and the disease is evidently on the decline: and it is therefore obviously impossible in any individual case to fix precisely the date of its beginning. The attacks of coughing are now less frequent especially at night, and are no longer preceded by a feeling of obstruction to the breathing. {Mode of development.

Uncomplicated pertussis — third stage.

Phenomena of this stage.

They are also much altered in their character. The spasmodic inspiration or whoop disappears entirely. The expirations are not so violent, and the intervals between them longer. The cough is become like that of an ordinary catarrh. The secretion has also become altered: in the former stage it was mucous thin and frothy, now it is of a muco-purulent character, of a thicker consistence, and more opaque yellowish or greenish in colour. Between the coughing the pulse and respiration are normal or nearly so. Catarrhal symptoms in the chest disappear. The vomiting and disturbance of the circulation cease; the ecchymoses of the skin and mucous membrane disappear; the cough and expectoration go away; the apetite becomes good again; sleep becomes sound and tranquil; the strength is invigorated; and the general health of the child is improved. Nothing remains but more or less emaciation in all but the mildest cases — a consequence of the frequent vomiting in the preceding stage; but in a longer or shorter time strength and health are completely recovered if the recuperative power have not been destroyed. Of course the patient cannot be considered well till he has quite ceased to cough.

Not uncommonly the disease almost disappears during warm weather to return with

the cold weather or upon a catarrhal seizure, the spasmodic fits returning with nearly their former frequency and intensity. Sometimes again as Dr. Lee says "all the symptoms of whooping cough suddenly disappear, and after an interval of several months reappear without any definite reason, such as exposure to a second infection." Smith says that after complete recovery has taken place paroxysmal coughing may reappear at times for one or two years. Of such apparent relapses the writer of this paper has seen several instances. They are not serious, dont usually last long, and are much more amenable to treatment than first attacks.

{ Course of the disease in older children, and adults.

The foregoing remarks apply to simple whooping cough as it occurs in young children. After the tenth or twelfth year, and especially among grown up people, the disease takes a very much milder course: the attacks are less violent, the respiratory and circulatory symptoms less developed, the whoop is often absent, and the duration of the complaint shorter. Then again in some epidemics the disease is milder than in others, and it is apt to be milder at the commencement and towards the close

of an epidemic.

Duration of this stage.

The duration of the final stage like that of the two others is uncertain. It varies in different attacks. It is usually short, but sometimes long. Barthez and Rilliet say that in uncomplicated cases it is from ten to fifteen days. In very mild cases it may last only a few days, in cases of moderate severity two or three weeks (Smith); but in the severer the patient may be harassed with a cough for many weeks and even months. (1) There are children that take a year to get well, and there are children that never recover the blow their system has received. Barthez and Rilliet are of opinion that when it has been supposed to have lasted several weeks or months it has been the result of some complication as bronchiectasis, tubercular disease &c. (2)

Duration of the whole disease.

"The ordinary duration of the whole disease says," Sir Thomas Watson, "is from six weeks to three months, but it may run its course in three weeks, and it may continue for six months or more." (3) West estimates two weeks for the preliminary catarrh, four weeks for the second stage, and four weeks for the last; and remarks that not unusually among the poor it is protracted to three or four months through neglect of hygiene.

(1) Dr. W. Aitken. Practice of Medicine Vol. I. p. 767.
(2) Drs. Meigs and Pepper Diseases of Children p. 233.
(3) Practice of Medicine p. 69. Vol II.

II Complicated Pertussis.

Almost any disease may complicate whooping cough. The complication may arise in two ways — a child while suffering from some other disease gets whooping cough, or what is far more common a child with whooping cough gets another disease. The most frequent complications are diseases of the respiratory organs, and following them closely come diseases of the nervous system.

Among 304 cases Macall found 81 complicated with other diseases of the air passages.(1) Of thirty five cases that died of whooping cough under Dr. West seventeen perished through bronchitis and pneumonia, and eighteen from convulsions or tubercular meningitis (p 465)

Statistics on this subject however are liable to mislead; In a case for example where convulsions have supervened on bronchitis one writer might ascribe death to the former another to the latter complication

I Complications of the Respiratory System.

These are congestion of the lungs, bronchitis, collapse, emphysema, pneumonia, broncho-pneumonia, &c.

A certain amount of congestion is said to be found in all severe cases (Dr. Smith) The cause is mechanical, viz. interference with the circulation through stoppage of the respiration during the paroxysms. When this complication is present there are in the intervals a dusky (1) Congestion of the lungs

(1) Dr. Steffen, Ziemssen's Cyclopaedia, vol 7. p. 702.

Pulmonary Congestion. Complexion, rapid breathing and a rapid pulse. Pyrexia if present is very slight. The physical signs are seldom well marked. The respiratory sounds are feebler with slight dullness on percussion. Haemoptysis sometimes occurs, which may be more or less copious and which may yield more or less relief.

Acute Bronchitis. Acute bronchitis has always been held to be the most frequent complication of whooping cough, and it is one of the most important. There is a certain amount of pulmonary catarrh in every case of whooping cough, but when we speak of it as a complication there must be a true bronchitis, i.e. sufficient inflammation of the bronchial mucous membrane to produce the ordinary symptoms of that disease" (Meigs)[1] There is no doubt this exists in a great many cases. Mm. Barthez & Rilliet found it existing alone or combined with pneumonia in half the fatal cases. Of the 208 cases observed by Meigs it existed to a greater or less extent in 42.[2] West points out that sometimes severe bronchitis precedes the full development of the disease, and that this most often occurs at the commencement of epidemics of whooping

(1 and 2) J.F. Meigs & W. Pepper, Diseases of Children, p. 237.

cough a in children whose bronchial mucous membrane has become irritable from many previous attacks. Sometimes the complication occurs early in the disease, and then the bronchitis and whooping cough develop simultaneously. But there are more serious cases, he adds, in which bronchitis or pneumonia comes on after the cough has assumed its paroxysmal character. One or both lungs may be affected, or only a portion usually an upper lobe. It is in the greater number of cases limited to the larger bronchii as when it is a primary disease. (b)

{ Acute bronchitis

In acute bronchitis of the larger and medium sized tubes the chief symptoms are the following — There is persistent dyspnoea, which is moderate if the disease be not extensively diffused. In the early stages we find on auscultation ronchus, which is owing to the narrowing of the tubes, and later on large crepitations. There is moderate pyrexia, the temperature ranging from 99°.5 to 102° Fahr. The pulse is frequent and often weak.

{ (a) of the larger and medium-sized tubes.

Acute bronchitis of the smaller tubes and tubes generally — general and capillary bronchitis — the bronchopneumonia of Trousseau, and the peripneumonia

{ (b) of the capillary and larger tubes.

Dr. W. Aitken Practice of medicine vol. 1 p. 767 says that capillary bronchitis is the most usual complication; but this is against the weight of evidence.

Symptoms of Complicated pertussis.

Capillary bronchitis } notha of the older writers, may result from extension of the inflammation from the larger tubes, but in infants it may be primary. In this the breathing soon becomes and remains quickened and laborious. The respirations are from thirty to forty a minute, the dyspnoea being proportioned to the intensity and extent of the capillary bronchitis. The cough is distressingly frequent, and causes the patient to complain of pain in the front of the chest and epigastrium. There is cyanosis, and as the case proceeds cyanosis and dyspnoea increase and we have orthopnoea. This as Tanner remarks is "only what we might expect, for to congest and thicken the lining mucous membrane of the capillary bronchi, and then to coat it with viscid mucus is virtually to completely occlude these air-passages."[1] The great interference with the respiration which this implies is attended by proportionate constitutional disturbance: there is headache, the tongue is furred; the apetite is diminished; the patient is very thirsty; the urine is scanty; the skin clammy; the face has an anxious expression, with frequent flushing, heaviness of eyes and extreme restlessness; the pulse irregular and feeble ranging from 130 to 150 a minute.

(1) Practice of Medicine Article "Capillary bronchitis."

Symptoms of Complicated pertussis.

When the mischief is extensively diffused children are apathetic from stasis of black blood in the brain, they take no notice of anything and rarely respond when spoken to or touched,— sometimes so stupified that for hours they cannot be roused, the faces and urine passing involuntarily. Somnolence and delirium are sure forerunners of death. Inspection of the chest-walls shows laboured breathing the supplemental muscles of respiration working vigorously. The upper portions of the thorax bulge forwards, while the suprasternal, infra- { Capillary bronchitis — Symptoms.

zyphoid and other spaces surrounding the thorax are sucked in at each inspiration, the depression below being called by Trousseau the peripneumonic furrow. The physical signs resemble those of pneumonia, but the percussion is normal, the respiratory murmur almost absent, and there are on deep inspiration fine rales (subcrepitant) in the parts affected with the capillary bronchitis. There is often also ronchus and sibilus. Sometimes the process begins in certain parts, diminishes, and then involves others. There is no appreciable dullness on percussion thus markedly differing { Physical signs

from pneumonia. Of course there is dullness if there be collapse. In favourable cases the subcrepitant rales are replaced by large crepitation and the vesicular murmur.

Catarrhal or broncho-pneumonia is otherwise called lobular because it is limited to lobules, and patchy because it occurs in scattered patches.

Pathology

This is bronchitis that has gone down to the alveoli of the lung, and therefore is always preceded by bronchitis. The inflammation of the alveoli and bronchioles passes into the neighbouring tissue, and patches of pneumonia form, which coalesce if they be close together. The portions affected are more or less wedge shaped, and abound chiefly towards the surface. They are impervious to the air, and a dilated bronchial tube filled with mucus may be seen in the centre of them. The more points affected the more lung is condensed. In this way a large part of a lobe or even a whole lobe may become consolidated. At the same time diffuse pneumonia with exudation into the alveoli and bronchioles is very seldom found in pertussis. But broncho-pneumonia, though not so common a complication as bronchitis, occurs more frequently in pertussis than

in any other constitutional affection of early life except measles (J.L.Smith) According to Barthez and Rilliet pneumonia is about as frequent as bronchitis, but these writers include under lobular pneumonia many cases of Collapse. {Broncho-pneumonia

The <u>symptoms and physical signs</u> are the same as in primary forms of the disease. They are like those of Capillary bronchitis, especially when the latter is associated with it. If neither process be extensive the symptoms are milder than in general bronchitis without pneumonia. If either bronchitis or pneumonia be present there is pyrexia, hot and dry skin, acceleration of the pulse not only during but between the paroxysms, and continuous dyspnoea the latter being evidenced by dilatation of the nostrils and hurried respiration with difficulty in speaking. There is cyanosis, and a short frequent cough, and there is more or less depression in the infra mammary region. In both complaints the paroxysms are less marked, and are diminished in frequency as well as violence. In pneumonia the cough is always painful, and the fever is always high.

Symptoms of Complicated pertussis.

Bronchopneumonia } While in simple capillary bronchitis the temperature seldom exceeds 102° Fahr., when broncho-pneumonia supervenes it may reach 104° or 105° Fahr. With such a temperature as might be expected the pulse is rapid and the face flushed. Dyspnoea and cyanosis are permanent, but generally not so noticeable. If however they be present well-marked children are apathetic. There is not much delirium. These symptoms are continuous along as inflammation is present, whereas in uncomplicated pertussis the patient is nearly quite well between the paroxysms. The symptoms and physical signs revealed by ~~physical examination~~ in cases of pneumonia whether local or general are well known and make diagnosis easy. Although the general character of the cough changes now and then it is sufficiently spasmodic to indicate the primary disease. Bronchitis or pneumonia or any other febrile complication usually alters the severity of the cough, as the inflammatory element increases the spasmodic decreases. On abatement of inflammation the cough regains its former convulsive character. Now and then it happens that one or more

Symptoms of Complicated pertussis.

of the tubes become choked up with phlegm with the result of producing

Pulmonary Collapse (condensation of the vesicular substance of the lung). This is collapse of the air-vesicles. Knowing the causation of collapse leads us to expect that it should not unfrequently develop in the course of pertussis, especially when associated with capillary bronchitis; and all modern writers are agreed that it is one of the most frequent complications of whooping cough. Dr. J. L. Smith says "it is occasionally seen in severe cases of pertussis"; and Sir Thomas Watson "this more frequently than any other complication is formed in long drawn out cases that have terminated fatally."(1) Meigs & Pepper say that "of all the lesions formed in whooping cough it is the most frequent."(2) Dr. Graily Hewitt in his lecture before the Harveian Society in 1855 said, that "the catarrhal inflammation of whooping cough is in fatal cases attended almost universally by collapse of the lungs." His observations were made on nineteen subjects aged from one month to four years. "In all the state of the lungs was carefully

{Collapse of the lung—frequency of its occurrence.

(1) Practice of Medicine, Vol. 1. p. 70. (1871).
(2) Diseases of Children p. 236 (1870).

Symptoms of complicated pertussis.

Collapse of the lung—frequency of its occurrence.

noted. The chief lesion found after death was collapse of the lung substance. The test of MM. Bailly and Legendre—namely the inflatability of the portions of the lungs thus affected—was used in almost all the cases; and on that and other grounds it was determined that the particular part of the lung in question was collapsed and not hepatized. In the cases, with the exception of one in which there was extensive tuberculosis of the lungs, presented a greater or less amount of lung substance affected in this manner.(1).

It is most apt to occur in the young, and in those who are weak from prolonged illness or otherwise. It is found in scattered points, but may involve larger areas. It is usually found in the upper lobes, while emphysema is most common in the upper part of the lung.

Mode of production

Most often this condition arises mechanically. The tube or tubes leading to the condensed portion becomes constricted by more or less prolonged spasm of the circular muscular fibres, and obstructed by inspissated mucus. The mass of mucus that

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(1) Meigs and Pepper, Diseases of Children, p. 236. (1870)

Symptoms of complicated pertussis.

cannot be expelled, lying in a diminishing tube, acts as a ball-valve; it allows the air to be forced out of the part but prevents its ingress. The residual air is subsequently removed by absorption, and the portion of lung left empty collapses, the place being filled up by the pressure of the neighbouring cells. This Condensation having been formerly ascribed to inflammation was termed lobular pneumonia (Tanner). By this process large portions of lung may be emptied of air in a few hours. For its production all we require is secretion which, from its copiousness or the debility of the patient, is not expectorated. We look for it when there is permanent dyspnoea without fever.

{Collapse of the lung - its mode of production.

The physical signs when the part affected is small are not well-marked; but when a large area is affected we have diminished expansion of the intercostal spaces, and absence of the breath sounds over the affected part, the disappearance of the respiratory murmur taking place suddenly and being replaced by bronchial respiration. There is dullness on percussion.

{Physical Signs

Symptoms of complicated pertussis.

Collapse of the lung – its diagnosis.

Having these physical signs, and occurring as it generally does in common with other febrile processes, it is difficult to distinguish from pneumonia; and it is probable that many of the cases hitherto ascribed to pneumonia and to bronchopneumonia have been cases of collapse. But the onset of the two complaints is different, that of collapse being sudden that of pneumonia more gradual. A case which well shows its mode of attack is narrated by Dr. J. L. Smith. The patient was a boy of four. "One morning, about the close of the second month of the malady, the parents first observed a depression on the right side of the thorax. It occurred somewhat suddenly, when the cough was most severe, and there was no fever or loss of appetite. The depression gradually increased for a few weeks, and has been permanent. The patient did not present any marked evidence of rachitis, but was decidedly strumous." Meigs and Pepper also report a characteristic case. "The child had had the disease for three months, and was thought to be doing well, till he was taken one day a long drive into the country. After the ride he was much fatigued, and that night was

Symptoms of Complicated pertussis

was seized with very great dyspnoea, increased violence of the coughing-spells, and after a time with general convulsions. On the following day he was breathing very rapidly and with much effort. There was a great deal of subcrepitant râle through the chest. The skin was cool, and about the mouth had a cyanotic tint. These symptoms persisted through the day with occasional convulsive seizures, and on the following day he died. The autopsy disclosed extensive collapse of both lungs, as proved by anatomical appearances and inflation. There was no pneumonia and very moderate bronchitis." (1)

{ Collapse of the lung—its diagnosis

A frequent result of collapse is

Emphysema

and according to West, p. 478, it is a common accompaniment of pertussis; but this is denied by others. Meigs thinks it is not of common occurrence: he did not observe it. (2) It is most apt to occur in the severer and protracted cases, especially in young and feeble infants, and those suffering from impaired nutrition. It is said to be common in the children of parents suffering from chronic bronchitis, (3) and is one of the most common conditions found in fatal cases. (4)

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(1) Meigs and Pepper, Diseases of Children p 236 (1870)
(2) The same treatise p. 237
(3) Dr. Edward Smith, Hooping Cough, Reynold's System (1879)
(4) Dr. J. L. Smith, Diseases of Children, 1879.

Symptoms of Complicated pertussis.

Emphysema—The process of its production. } The direct cause is mechanical. While escape of air from the lungs is prevented or very much hindered at the larynx by the spasmodic narrowing of the glottis, it is very forcibly compressed by the respiratory muscles. This severe compression of the air in the lungs is apt to injure the air vesicles, and emphysema results. According to the respiratory theory loss of volume in one part of the lung is compensated for in inspiration by increase of volume in a non-obstructed portion.

Its presence aggravates the dyspnoea, and if extensive the respiratory sounds are lessened and the resonance increased.[1] Usually however it is not extensive involving only the superficial and peripheral portions and that but slightly. If the pertussis do not last too long and the elasticity of the alveoli be retained, the air is absorbed and the emphysema spontaneously disappears. But where the whooping-cough is very lasting and the paroxysms unusually severe, the emphysema may increase by rupture of the alveoli to interstitial emphysema, and even by perforation of the pleura to pneumathorax;

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[1] Dr. Edward Smith, article Hooping Cough, in Reynolds System

but even here should the point of escape close reabsorption of the air and recovery would ensue. Such an event however is very unusual the fits of coughing forcing out air afresh so that the ruptured point cannot heal nor reabsorption of the escaped air take place; so that generally pneumathorax in whooping-cough leads to general Emphysema extending over the greater part of the body and a fatal result. These latter forms of Emphysema are fortunately of excessive rarity, and are hardly ever met with except in the Encyclopaedic "handbooks" of German medical writers. (1)

{ Emphysema — its terminations

Bronchiectasis, a dilatation of the bronchi, is often met in fatal cases. (2) It is a sequela of bronchitis. Several explanations are given of its formation. It is probably a kind of "compensatory emphysema".

{ Bronchiectasis

Tuberculosis and Scrofulosis are said to occur not unfrequently after whooping-cough in cases where a marked disposition to these conditions pre-existed. They are most common in the ill-fed, ~~and~~ ill-clad and feeble children of the poor. Comparatively rare among the better-off classes (Meigs). Phthisis may be simply Chronic tuberculosis, (I have seen an instance of this) or pneumonia that has been latent or passed

{ Tuberculosis and Scrofulosis.

(1) Dr. Hoffmann's Encyclopaedia Vol V p. 699
(2) Sir T. Watson Practice of Medicine Vol II p. 70.

Symptoms of complicated pertussis.

Phthisis—its mode of development.

life by the whooping-cough. But usually it arises from caseation in pneumonic foci, or in bronchial glands irritated by long-continued bronchitis or pneumonia. It may be long after these inflammations have apparently terminated favorably that the tuberculosis makes its appearance.

Pleurisy

Lobar pneumonia and pleurisy are not often met. The latter very generally accompanies pneumonia, but occurring in this way there is apt to be little effusion. I am not aware that anyone has observed pleurisy occurring during the course of whooping apart from pneumonia, but possibly an exploration of some of the ponderous tomes which constitute a German "handbook" would result in the discovery of instances.

Excessive laryngismus (spasm of the glottis) is a complication that is most apt to occur in children of a nervous temperament, in the anaemic and debilitated, and in certain epidemic types (Meigs). It is sometimes so violent and persistent as to cause stupor, & even sudden death, from apnoea. Meigs mentions a case which in many of the attacks ceased for the time to breathe, became entirely unconscious, and had to be fanned and

carried to an open window to be revived. It ultimately recovered". He gives another case where "the spasm was so violent that after a few days each attack was attended by convulsions, the case soon ended fatally."

Oedema of the glottis and croupous laryngitis are so rare as only to require mentioning. Barthez saw a case of the former. The latter is almost always fatal. (1)

II. Complications of the Nervous System,

are almost as frequent as the former class, and may come on at any time, early in the disease, during its course, or towards its decline (West p. 465). We may have

1) Congestion of the brain (Cerebral congestion.)

followed by fits, and these by fatal coma. We have seen before how the paroxysms impede the return of blood from the head, producing a brief passive cerebral congestion. In children who have suffered long and severely from whooping cough we often have this condition as a more or less permanent complication. The patient complains of pain in the head, and on looking at him we observe that the face and lips which

(1) Dr. Steffen in Ziemssens Cyclopaedia Vol 6 p. 702.

Symptoms of Complicated pectussis.

Complications of the nervous System. Cerebral Congestion.

are livid and puffed wear an anxious expression. The skin is moist and cool, the pulse soft and frequent.

These symptoms point to an overloaded condition of the cerebral vessels. If the circulation be further disturbed by a paroxysm the child may die in a fit, or after some convulsions sink into a coma from which he never wakes.

Post-mortem appearances in

At the autopsy the vessels of the brain and its membranes will be found universally gorged with black blood: the choroid plexuses of a deep purple, and more bloody points than natural on a section of the brain (Westp. 51).

We may have as a complication of pectussis

Simple meningitis

(2) Acute (simple) Mennigo-Cerebritis. It is difficult to diagnose inflammation of the brain from inflammation of its membranes, because they are generally present together — the name Encephalitis or more properly, Mennigo-Cerebritis being applied to the combined disease. This is said by Steffen to be a rare complication, but it is one which I believe in a practice of average extent will be seen more than once during an epidemic of whooping Cough. It is most apt to occur in the severest forms of

pertussis and in children who have a tendancy to it hereditary or acquired. The onset is apt to be very insidious, and to be different in different cases. The patient complains of pain, which may be acute or dull, continuous but liable to exacerbations. The head is hot, and the face alternately flushed and pale. It turns away from the light, and wishes to be let alone. It is drowsy, starts in its sleep, and is delirious when awake. The surface is hot, the pulse rapid and hard, the breathing irregular and sighing. Vomiting on moving the body is very constant at the beginning, and constipation of the bowels throughout. When hemiplegia occurs there can be little doubt about the presence of hydrocephalus.

{ (2) Complications of the nervous system. Simple meningitis — its symptoms

(3) Tubercular Meningitis

{ Tubercular meningitis

This says West (p. 491) is now and then, but fortunately not frequently, met with as a complication. It may supervene in weakly children who have become emaciated through long-continued whooping cough.

(4) Cephalalgia is commonly present in the first or catarrhal stage. It subsides with the pyrexia. When persistent it often presages

{ Headache

Symptoms of Complicated pertussis.

Complications of the nervous system. } fatal convulsions or meningitis ending in hydrocephalus, and death.

Eclampsia

b, Convulsions, (Eclampsia)

or Clonic convulsions affecting the external muscles. Though these are not properly speaking a disease but a symptom it will be convenient to treat them separately.

The frequency in pertussis. } Steffen says they dont frequently complicate pertussis, Dr. Tanner, Dr. J. Lewis Smith and others, however, assert that they are not at all uncommon, and the experience of the writer compels him to side with these. Convulsions occurred in five out of twenty nine cases observed by Barthez and Rilliet, and in twelve out of 208 by Meigs.(1) They are certainly not common in adults being more usual before the seventh or eighth year, and most common of all during the first year of infancy. Sir Thomas Watson says that "when the disease (whooping-cough) occurs during the first two years of life it is usually attended by convulsions and many more die within that period than afterwards."(2) The younger the child the more liable it is. This is confirmed by the report of the registrar General for the year

(1). Meigs and Pepper, Diseases of Children p. 234.
(2) Sir T. Watson Practice of medicine Vol. II. p. 42

1866 from which it appears that 24 out of every 29 deaths from convulsions occurred in infants under one year. {Complications of the nervous system.— Convulsions.

Their occasional occurrence is what from a priori reasons we should expect. Convulsions are caused by anything which suddenly deranges the nutrition of the brain. Diminished supply of blood to the brain will cause them, as in mal-nutrition from improper feeding, diarrhoea, &c. Impurity of blood going to the brain will cause them, whether the impurity be febrile products urea, &c. or defective oxidation as from spasm of the glottis. Structural disease of the nerve centres will cause them, as congestion of the brain, cerebritis, meningitis simple or tubercular. So commonly are some of these conditions present in pertussis that it would be cause for astonishment if convulsions were not ~~un~~frequently met. During the paroxysms the pulmonary circulation being impeded the return of blood from the head is prevented. Passive mechanical congestion is produced, as is evident from the visibly great distension {How produced

Symptoms of Complicated pertussis.

Complications of the nervous system—

Convulsions how they are produced

of the veins of the neck, the countenance, the livid lips and cheeks, the blood-shotten, the haemorrhage from the nose & ears. While in this condition the patient may fall into convulsions, even apoplexy may take place, & the train be fired which may end in lighting up fatal meningitis. Their production is favoured by concurrence of the first dentition, disorder of the bowels, the scrofulous diathesis, a hereditary predisposition. As we should expect they are most apt to take place in the severe cases —those where the paroxysms are frequent violent and prolonged— at the height of the disease, and during & directly after a paroxysm, though sometimes they occur in the interval, when the child is quiet. They may be slight at first there may be merely occasional Contractions, slight twitching of the muscles of the face, with occasional strabismus, but a paroxysm may usher in general convulsions. In all the cases seen by Meigs & Pepper the Convulsions were general and extremely violent. Of five fatal cases four supervened on bronchitis, and one on violent laryngismus.

Of six that recovered, and which are stated in detail, two followed on bronchitis, one accompanied the onset of pneumonia, one was due to febrile dentition, one occurred during a paroxysm, another followed an outing.

Complications of the nervous System.

Convulsions

The appearances found after death are those indicative of cerebral congestion, partly due to the preceding paroxysm, partly to convulsions; and along with the congestion there is often serous exudation. In two cases examined by J. L. Smith the cerebral sinuses were filled with clots, generally soft and dark indicating post mortem formation; but in the lateral sinuses the colour was light, showing they were formed before death.

Post mortem appearances in

III Complications of the Circulatory System.

As a consequence of the extreme passive congestion that occurs during the paroxysms small vessels often burst, and the resulting haemorrhages may occur in a great many situations. Epistaxis[1] is not infrequent, and though it shows the attack to be a severe one it produces a salutary effect in taking the strain off the cerebral vessels.[2] Bleeding from the mouth is not unusual, the congested vessels having given way

(1) Dr. J. L. Smith says that epistaxis is the most frequent form of haemorrhage – Diseases of Children

(2) Dr. Ed. Smith's article Hooping cough in Reynolds System Vol I.

Symptoms of complicated pertussis.

Complications of the Circulatory System:

Haemorrhages:

in the mucous membrane of the buccal pharyngeal or laryngeal cavities; bleeding from the deeper air-passages it is said has not as yet been observed during life. Conjunctival ecchymoses are sometimes extensive, and generally bilateral, as are also ecchymoses of the surrounding tissues. Trousseau saw the blood escaping from the conjunctiva mixed with tears. Ecchymoses of cheek and throat are not common, and are generally the result of falling. Hemorrhages from the ears with perforation of the membrana tympani has frequently happened: the writer has seen several instances. This accident produces deafness or hardness of hearing more or less lasting. Sometimes bleeding from the rectum occurs in considerable quantity. Haemorrhages into the brain, the meninges, and between have occurred but are rare. The Haemorrhages above mentioned are generally small and of no consequence, but sometimes are copious and accompany almost every paroxysm for weeks imperiling the life of the patient by the weakness induced. Generally when bleeding occurs the case is severe.

Endocarditis and pericarditis are complications of exceeding rarity.

Symptoms of Complicated pertussis.

IV. Complications in the digestive system.

In the majority of severe cases there is an ulcer on one or both sides of the fraenulum linguae, often often upon the dorsum linguae. They are shallow with elevated edges, and of a greyish yellow colour. They are simply deep abrasions caused by the thrusting forward during the paroxysms of the tongue between the teeth, where they are inclined to prominent. This Complication disappears with the Spasmodic stage.(1)

The ulcer under the tongue

Anorexia, indigestion and frequent vomiting are frequent accompaniments of whooping cough. When the latter emesis occurs in simple cases, or those complicated with bronchitis or pneumonia it seems advantageous, and consequently ought not to be regarded as a complication unless it be due to some disease of the brain or of the digestive organs (Meigs). Gastro-enteric catarrh is also common (Dr. Smith) When it is present there is no vomiting: the patient after the paroxysm is so exhausted as to be unable to vomit, expectorate a whoop and is hence said to have the dumb Kink. "In severe cases the stools are often black and offensive, & consist of colourless mucus."(2) Dr R.J. Lees of Leyden has seen serious and

Excessive vomiting.

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(1) Dr. Steffen in Ziemssens Cyclopaedia Vol. vi. p. 699.
(2) Dr. W. Aitken Practice of Medicine (7th Edition) Vol. i. p. 768.

Complications of the digestive system.

and fatal diarrhoea. These functional derangements of the digestive organs may be due to cerebral congestion or mischief in the lungs (West p. 172), in which case they are of ominous import; but apart from these conditions they are disagreable complications, sometimes leading to the development of rickets or struma or of a marasmus which may be slight or terminate fatally.

Hernia and prolapsus ani have been produced,(11) or increased where present. Duncy was on one occasion observed by Steffen.

Complications in the Urinary System

Among other congestions found in whooping-cough and due to the paroxysms is to be included congestion of the kidneys, for albumen has been found in the urine during and shortly after the seizures (Steffen): sometimes also anasarca has been observed, but this might be due to other causes than renal congestion or general debility. Sometimes there is only oedema of the face and upper extremities, sometimes there are effusions into the great and small cavities.

More difficult of explanation is what Sir D. Gibb asserts is found in many cases viz. Glycosuria; but the quantity of sugar being generally small

(11) Dr. Steffen in Ziemssen's Cyclopaedia, Vol. IV. p. 699.

often merely a trace this condition deserves to be ranked more as a curiosity than as a complication.

VI. The Acute exanthemata as Complications.

Measles, scarlatina, enteric fever, and small pox sometimes complicate pertussis. In the great majority of cases the whooping cough follows or develops in the last stage of the exanthem. A child convalescing from the latter is very liable to be attacked with whooping-cough if it be hovering about, the morbidly irritated and congested mucous lining of the air-passages proving a favourable soil for the reception of the contagium of pertussis. It is a curious fact and difficult to explain, that in many cases where pertussis is complicated with an exanthem the paroxysms greatly diminish in violence and frequency occasionally disappearing altogether. Sometimes however the contrary occurs.

Measles most commonly of all the exanthemata complicates pertussis. There is an affinity between the two diseases, many epidemics having occurred at the same time. It has preceded, developed synchronously

Symptoms of complicated pertussis.

Complication with the exanthemata. Measles.

with, or in the middle of the occurrence of whooping cough, and it has followed it. It is an exceedingly unfavorable complication. When whooping cough follows after measles it attacks respiratory organs in a weakened state, and when it develops in the course of measles, there is a greater probability than in any other complication that capillary bronchitis a pneumonia will occur and a fatal termination ensue.

Enteric fever.

Enteric fever (infantile remittent), according to Dr. Edward Smith in Reynold's System, is a very frequent complication when this fever or diarrhoea is prevalent. With this complication we have corresponding signs and symptoms — coated tongue, offensive breath, tumid and tender abdomen &c. As might be expected there is in these cases a tedious convalescence.

Diagnosis.

First Stage. Dr. Aitken says that the fever of invasion is Characteristic, that it is more intense and lasting than in an ordinary catarrh, that it may last from seven to fourteen days while in a simple catarrh it seldom exceeds two or three.(1) On the other hand Dr. Steffen is of opinion that the first stage might be taken for a simple catarrhal bronchitis where whooping cough has not been epidemic, and it is not known that the patient has been exposed to infection. Dr. Meigs goes further and says it is impossible to distinguish it from simple laryngitis; and Dr. J.L. Smith, in almost identical language, holds that the catarrhal stage cannot be distinguished from a common cold - that it can only be conjectured when the child has been known to have been exposed to infection, or when the disease is prevalent as an Epidemic. I think that while at the very outset of the disease there may sometimes be doubt in the mind of an educated practitioner, later on ~~it is~~ ~~difficult~~ been in ordinary cases it is difficult and in severe cases hardly possible

(1) Dr. W. Aitken, Practice of Medicine vol. 1 p. 768 (7th edition).

Diagnosis of pertussis.

First stage. } to make a mistake. The character of the cough at an early period arrests our attention. It is more frequent than in a cold, occurring from fifteen to thirty times a minute, and continuing at that rate from four to ten days[11]. It is more obstinate, it does not yield to remedies as a common cold does. It is more severe, more powerful, more paroxysmal: there is more throat spasm in it. The patient complains more of tickling in the throat and windpipe. There is the character of the expectoration. In young children it is generally swallowed, but when it is ejected in pertussis it is viscid, while in a cold there is no expectoration at first, and when it comes it is thin and frothy for some time. There is the thermometer: the temperature is said to be higher in pertussis. There is the age of the patient: it is almost always a child. There is absence of the continuously rapid pulse and of the physical signs of bronchitis.

But it must be admitted there is no one symptom in the first stage, nor in the second stage, universally present and pathognomonic of the disease. The preliminary catarrh may a may not be present; in the

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[11] Dr. W. Aitken, Practice of Medicine, Vol. I. p. 768.

vast majority of cases it is. The glairy { First stage.
tenacious mucus may or may not be present;
in the vast majority of cases it is. The
patient may be young or old: in the great ma-
jority of cases it is a child. The paroxysms
of spasmodic cough which are characteristic
of the second stage are nearly always present,
but may be absent. The difficulty of diagnosis
is however generally only in the first stage.

The second stage is almost always char-
acteristic and easily diagnosed even by parents.
Indeed after this stage has been fairly entered
upon it is in the vast majority of cases scarcely
possible to confound it with any other malady.
There is the aura preceding the paroxysm — the
tickling in the throat and oppression in the chest.
There are the pathognomonic paroxysms con-
sisting of short rapidly repeated expirations,
attended with livid face and possibly with
haemorrhages, then the crowing inspiration,
the seizure closing with expectoration of viscid
mucus or vomiting. In the intervals the face
is free from lividity, the breathing and pulse
are normal, the child seems well with
the exception perhaps of some oedema and

The second Stage. pallor of the features. This stage is free from fever if uncomplicated. Then there is ulceration under the tongue in the majority of cases.

The disease has however been mistaken for other maladies, in which spasmodic coughing occurs not unlike that of pertussis — for tracheo-bronchitis, capillary bronchitis, tuberculosis of the lungs, acute and chronic pneumonia, hysterical coughs, and foreign bodies in the air-passages. It has been mistaken for

Diagnosis from capillary bronchitis

1) Tracheo-bronchitis and Capillary bronchitis.

Barthez and Rilliet say that acute bronchitis with paroxysmal coughing is not unfrequently mistaken for pertussis,(1) and Meigs says he made the mistake himself in the case of a girl of five.(2) It must be admitted that bronchitis during the evening exacerbations in very young children somewhat resembles whooping cough. In young infants with that complaint mucus often collects in the air-passages which there is much difficulty in expectorating, hence attacks of suffocative cough. But bronchitis is an acute disease. The invasion is sudden; there is violent fever, great and continuous dyspnoea, rapid pulse, and other febrile symptoms, associated with which there may be cyanosis and more or less stupor, and

(1) Dr. Steffen in Ziemssen's Cyclopaedia, Vol VI. p. 713.
(2) Meigs and Pepper, Diseases of Children, p. 238.

Diagnosis of pertussis.

the physical signs of bronchitis. The disease is violent and rapid in its course. The cough is only suffocative at times, is not accompanied by the whoop, and rarely ends in vomiting. All this is widely different from what occurs in pertussis. Spasmodic coughing only occurs in pertussis when the febrile symptoms have abated. { Second stage. { Diagnosis from bronchitis.

(2) In some cases of pneumonia during the stage of resolution there may be abundant moist râles, &c. but the Clinical history of the two diseases is very different. Pneumonia sets in with rigors and high fever, and the patient takes to his bed at once. There ought to be no difficulty in differentiating a case of pertussis from this disease. { Diagnosis from pneumonia.

(3) Acute tuberculosis according to the same authors (Hill, Barthez & Rilliet) gives rise to a cough which may be mistaken for pertussis. Tuberculosis is a non-contagious disease, that does not occur in epidemics, and is not divisible into stages. It is marked by excessive frequency of breathing that cannot be otherwise accounted for, and ~~is not divisible into stage~~ though the cough is teazing it is not like that of whooping cough. The paroxysms are generally very short without the whooping, ropy expectoration, or vomiting { Diagnosis from acute phthisis

Second stage. which are present in pertussis. There are the physical signs of tuberculosis — persistent

Diagnosis from acute phthisis. high temperature with evening exacerbations, nocturnal sweating, progressive and marked emaciation. The pulse is rapid; the voice is sometimes hoarse; there are no intervals in which the symptoms disappear; and the course of the disease is comparatively slow. Pertussis on the other hand is a contagious disease generally occurring in epidemics, whose course is divisible into three stages, the second marked by progressive paroxysms attended by a distinct whoop ropy expectoration and frequent vomiting. The physical signs of tuberculosis are absent. In uncomplicated cases during the intervals the respiration pulse and temperature are normal; in fact the child is well. There is no marked emaciation. The duration of the disease is comparatively brief.

(4) Chronic general tuberculosis is as its name implies a chronic disease, attacking those whose family history is bad, and who have been previously in bad health; and it is not divisible into three stages. It is marked by constantly increasing emaciation, a greater or less degree

Second Stage.
Diagnosis from chronic phthisis.

of persistent dyspnoea, and more or less active fever. There is no interval in which the child is free from these symptoms. The liver is usually enlarged, and this only occurs in pertussis when rickets is present at the same time.(1) Auscultation and percussion should remove all doubt.

(5) In Spasmodic hysterical cough, the cough is not attended by the whoop; the expectoration is scanty, and there is no vomiting, & it is non-contagious.

(6) Foreign bodies in the larynx and deeper air-passages produce exceedingly violent attacks of coughing, which are of a spasmodic character and very like those of pertussis. But the history of the two cases is different. In pertussis there is a preliminary catarrhal stage, in the other the cough begins abruptly. If the object were in the trachea or larger bronchi the laryngoscope would in a large proportion of cases disclose its presence; if it were in the smaller tubes there would be sudden cessation of respiratory murmur in the part below.

Third Stage.

A practitioner called in at this stage, and not knowing

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(1) Dr. Steffen in Ziemssen's Cyclopaedia, vol. vi. p. 715.

Diagnosis of pertussis.

Third stage } that spasmodic attacks have previously occurred, might diagnose bronchitis subsiding, especially if the ulcer on the under surface of the tongue had healed. An inquiry into the previous history of the case would prevent this mistake: and still more certainly would the use of the stethoscope.

Prognosis of pertussis.

Whooping cough is one of the most fatal of the diseases of early life. Dr. Aug. Hirsch[1] tells us that in England and Wales between the years 1848-5 42,000 died of pertussis, a one in forty of those who died from all other causes: and Wilde in his reports shows that among the diseases of Ireland it stands fifth as regards mortality. Dr. J. L. Smith says that in the state of New York, during the half century ending with 1853, 4840 died from pertussis, a one in every seventy six deaths from all other causes. Under the more rational treatment of the present day pertussis does not produce so many deaths as it formerly did. Biermer has collected the statistics of mortality given by various authors. The highest is Whitehead's 15 per cent, the lowest Kutlingers 2.7 per cent, and the average of all 7.6 per cent. It appears to me that Kutlingers average or even a lower one ought to be obtained with a rational mode of treatment.

Generally speaking the prognosis of uncomplicated pertussis is decidedly favorable, the vast majority of cases recovering completely. Of 208 cases observed by Meigs 143 were simple cases and all recovered.[2] "But simple

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(1) Handbook of Geographical & Historical Pathology vol 3 p. 105, quoted by Dr. J. L. Smith

(2) Meigs and Pepper, Diseases of Children, p. 239.

Prognosis of pertussis.

pertussis is sometimes fatal from excessive violence of the paroxysms. The danger depends almost entirely on the complications. Of Meigs's 208 cases 65 were complicated, and of these 12 died. As regards comparative risk from complications authorities differ. Some say that the largest number of deaths is due to suffocation from spasm of the glottis, and the next most frequent cause sanguineous or serous exudation into the encephalon and its membranes. Meigs asserts that the most dangerous complication is convulsions, and after that bronchitis and pneumonia. Of his 12 fatal cases 5 were from convulsions; of these 4 were secondary to bronchitis and pulmonary collapse, and 1 to violent laryngismus. Of the remaining 7, five died from bronchitis with probably more or less collapse, one from collapse of the lungs supervening on bronchitis, and one from tuberculosis. Or we might put it this way of 12 that died 10 were from bronchitis and collapse, one from tuberculosis, and one from laryngismus stridulus.

In individual cases the considerations

Prognosis of pertussis.

which will modify our prognosis are age, sex, state of previous health, individual predisposition, mode of life, intensity of affection, the presence & absence of Complications, and the way in which the case has been treated.

(1) As regards age — the older the child the better its chance and vice versa, though West says the disease is not so formidable before the commencement as during dentition (p. 496) One author, Dr. E. Smith says that under one year it is the most fatal of the diseases of Childreu. Lombard says it is most fatal between the first and second year,(1) but the want of precision in this statement detracts from its value. 68 per Cent of the deaths occur under two years, and only 6 per cent above five years. (Dr. E. Smith). Gibb and Friedleben say that by far the largest per centage of mortality occurs in the first two years of life, and it diminishes rapidly in the third.(2) Macall's statement is in harmony with this. He estimates the mortality in the first year at 13.25 per cent after the third year at 2·38 per cent. K. Major reports that 96 a 99 per cent of all fatal cases occur under five years,(3) and this statement

{ age, as affecting prognosis

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(1) Quoted by Dr. W. Aitken, Practice of Medicine Vol. I. p. 769.
(2) Dr. Steffen in Ziemssens Cyclopaedia, Vol. VI. p. 716
(3) Same author and page.

Prognosis in pertussis.

Age as affecting prognosis

is borne out by the table West has given of 85 fatal cases, in which it is to be noticed that no fatal case occurred under six months, and only six after five years. In the fifth report of the registrar general the deaths from hooping cough in London were to the deaths from all other causes in the proportion of

5·6 per cent under 1 year	10·2 per cent between 3 & 5 years
10·6 " between 1 & 3 years	5·0 " " 5 & 10
	0·8 between 10 & 15 years[1]

From the authorities here quoted it is clear that the great majority of fatalities occur between birth and the fifth year, that after the latter period the mortality undergoes an immediate and very great diminution, and that the older children are the more rarely they succumb. After puberty fatal cases are extremely rare.

There are several reasons why the mortality preponderates during infancy and early childhood. (a) Convulsions and acute affections of the encephalon are easily provoked in the very young. When pertussis occurs in a child under four months,[2] and still more when dentition is going on, there is a great tendency to convulsions

[1] West p. 476.

[2] Dr. Ed. Smith in Reynold's System, Vol. I.

Prognosis in pertussis.

unless it be a very mild case. Generally speaking cases of pertussis under the fifth year are often attended by eclampsia, from extreme passive congestion of the brain. Now this complication is very apt to prove fatal in young children, particularly during the first year, unless proper treatment be adopted. In that case death may generally though not always be averted. Other forms of cerebral mischief are apt to occur in infants. (b) Bronchitis, also a common complication, is fatal in direct proportion to the youth of the patient. (for one reason that in the very young it is apt to extend to the capillaries.) Older children may be seized with convulsions from nervous irritability and congestion of the brain, and they may die of them, but in them and in adults complications in the chest are more likely to arise.

{ Age as affecting prognosis.

Sex. Most fatalities occur among females. West puts the proportion at three to two: of the 35 deaths in his table 21 were among girls and 14 boys. In the fifth report of the Registrar General[1] the mortality from whooping cough under 10 years of age is to the total mortality at that age in London in the proportion of 8.9 per cent among females and 6.1 per cent among males. This is accounted for to a great extent by the fact

{ Sex as affecting prognosis

[1] quoted by West p. 475.

Prognosis in pertussis.

that more girls than boys are attacked with the disease.

Intensity of the disease as affecting prognosis

(3) Intensity of the disease. In severe cases the prognosis is grave[11] — in cases where the paroxysms are frequent — say over 40 in 24 hours, where they are unusually prolonged, and the spasm severe. On the other hand the milder cases, where there are about 20 fits in the 24 hours, are rarely fatal. Epidemics vary very much: in some the type is severe and the fatality great, in others the type is mild and very few die. Sporadic cases are apt to run a milder course than epidemic cases. Impure atmosphere increases the intensity and therefore the mortality of the disease. For this reason and others it is more severe and fatal among the poor; of 10 fatal cases 9 belonged to the poorer class (Lombard).[2] But in their case the influence of insufficient clothing and unsuitable food must also be taken into account. For the same reason it is more severe and fatal in towns than in rural districts, as is shown by the Registrar Generals reports. It is more severe in winter and spring than in the warmer parts of the year. The

and the gravity is greater in these seasons

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(11) Sir T. Watson says "when the disorder is very intense it may have a fatal issue without any organic complication. The child dies of apnoea from spasm of the glottis." p. 69.

(2) Quoted by Dr. Wm Aitken in Practice of Medicine, Vol. i. p. 769.

presence of bronchitis is said to increase the violence and frequency of the paroxysms, and so to influence the prognosis unfavorably.

(4) The Stage of the disease. Very very few indeed die in the first stage. I have never seen a case nor read of one, except in German medical literature. Steffen says that "very young and ill-conditioned children may succumb to marasmus, the fever and constant cough that accompanies bronchitis depriving them of sleep and apetite. Death may also occur during this stage from effusion of blood a transudation into the nerve-centres, especially in connection with rickets & scrofula." Such cases are of excessive rarity, and Steffen's statement is here quoted more as a curiosity than for any consideration it requires. It is the second stage that is most to be dreaded. In it most of the fatalities occur, and almost all the sudden deaths. When the height of this stage is passed, when the interval between the paroxysms lengthens, the hopes of recovery brighten; and as the disease outsides in the third stage our fears may be almost dismissed, for a death in this stage from simple whooping cough is one

{Stage of the disease as affecting prognosis.

{The second stage the most dangerous.

of the rarest of incidents. Of course death may happen in this stage from complications — from great emaciation and exhaustion, or from phthisis pulmonalis.

5. The presence of complications obviously make the prognosis worse in proportion to the gravity of the complicating malady. The patient having two diseases to contend with there is much greater depression of strength.

Lung complications, as affecting prognosis.

A Complications of the respiratory system, are indicated ~~a) Acute bronchitis~~ by persistent dyspnoea, fever and acceleration of the breathing not only during but between the paroxysms.

Acute bronchitis of the larger tubes

a) Acute bronchitis of the larger and medium-sized tubes is not in itself a serious complication, but in childhood it is to be dreaded owing to the danger of the catarrhal process extending to the capillary bronchi, or of bronchial obstruction occurring, which may lead to collapse, degeneration, atrophy and emphysema. Of 42 cases observed by Meigs, in which the disease was present to a greater or less extent, 28 were mild or moderately severe, and of these all but one recovered. In 14 it was severe and went into the capillary, and of these six died. In several of the fatal cases it was attended by collapse

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of the lung."[1]

Lung Complications as affecting prognosis — Capillary bronchitis.

(2) Acute catarrh of the smaller tubes and tubes generally is a much more serious matter, and greatly increases the danger. The more widely diffused the more serious it is. The prognosis depends on the age and strength of the patient, and on the number of the smaller tubes involved. There is great danger in the very young, especially if weak from any cause, as rickets, scrofula &c. In favorable cases the rhonchus and sibilus are replaced by large crepitation and the vesicular murmur. When there is going to be a fatal termination the pulse becomes more rapid large and compressible, then small and thready, the face becomes livid, the cough smothered, the respiration less violent and frequent, then the cough and expectoration cease, and delirium is followed by recent drowsiness. Of those attacked with this complication the majority — say from half to two thirds[2] — die suddenly after a week or two. Tanner estimates[3] that from a half to three fourths die between the sixth and tenth day of the disease. West says death takes place more rapidly from this than any other complication; he has seen death on the sixth day from the

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(1) Meigs and Pepper, Diseases of Children p. 237.
(2) Dr. Steffen in Ziemssen's Cyclopædia Vol vi p. 718.
(3) Practice of Medicine, article on bronchitis.

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Lung complications as affecting prognosis — Capillary bronchitis,

from the appearance of the complication, but he says "when it comes on after whooping cough has been ten days or a fortnight going on, bronchitis is usually very tractable". The danger from bronchitis is said to be greater towards the end of the disease. If recovery take place from this complication the affection of the bronchioles and alveoli first subsides, that of the larger bronchi lasting longer, and a long time passes before the patient completely recovers.

Broncho-pneumonia

3) Catarrhal or broncho-pneumonia may run a rapid course, or it may last weeks or months whether recovery take place or not. When its course is thus dragged out it produces great emaciation. When resolution occurs it commences gradually and goes on slowly and steadily. Recoveries in which no trace of the affection are left behind are exceedingly rare. Usually there remains partial emphysema, due in part to the whooping cough in part to the inflammatory condensation of the lung. In the regions attacked retractation of the interstitial tissues takes place, and partly from this arises bronchiectasis. If the affected parts undergo caseous degeneration patients sink with symptoms of phthisis. As in the preceding complication the occurrence of somnolence, are ominous

increase of apathy, & especially

signs. This disease is but slightly amenable to treatment. We may say of it as we did of the preceding affection that it is always serious, and that the danger is in proportion to the youth of the patient and the extent of the inflammation.

{Lung Complications as affecting prognosis
Broncho-pneumonia.

The majority of the fatalities from whooping cough are due to it and the preceding affection. About two thirds of those affected die.(2)

The fact that it is less amenable to treatment than bronchitis adds to the danger."

(4) Collapse of the lung may be temporary. It may continue for weeks or months subsequently to pertussis and then gradually disappear;(3) the obstacle to the entrance of air being removed it finds its way into the alveoli again, and all ill effects pass away. But sometimes it is permanent and then either the collapsed portion becomes atrophied compensatory emphysema being established in the anterior margins, or circumscribed pneumonia develops at these places when the prognosis becomes bad. When a large part of the lung collapses it is a very serious matter, and a frequent cause of death.

{Pulmonary Collapse.

(5) Emphysema may be vesicular and, if not extensive, it may disappear or continue without causing much inconvenience: if however it be present to a considerable extent it may lead to permanent and more

{Emphysema

(1) Dr. Ed. Smith in Reynold's System, Art. Hooping-Cough, vol. j.
(3) Dr. J. Lewis Smith, Diseases of children, Article Hooping Cough
(2) Dr. Steffen in Ziemssen's Cyclopaedia, vol vj p. 704.

a less marked dyspnoea. When it is of the interstitial variety (true emphysema) and general it renders the prognosis doubtful. "Perforation of the subpleural air-cells and the production of pneumothorax is always fatal" — Steffen.

(B) Intra cranial Complications are very unfavourable. West says they are more dangerous and perplexing than those of the respiratory system. If there be congestion or effusion within the cranium the case is generally fatal (Aitken). Rupture of Cerebral or meningeal vessels in a immediately after a paroxysm may result in immediate death.

Convulsions. Convulsions is always a complication of the utmost gravity. McCall ascribes one sixth of the fatalities from whooping cough to this cause,(1) but probably this estimate is too low. Of twelve cases given by Meigs and Pepper, and which are stated with valuable detail, five died;(2) while of seven observed by Barthez and Rilliet six died. Somewhat in harmony with these results is Steffen's remark that in the majority of cases they prove fatal if not the first time after some repetitions; nor will it cause surprise that Barthez and Rilliet from their experience should hold "that almost all infants succumb to this complication, ordinarily in the twenty four hours

(1) Dr. Steffen in Ziemssen's Cyclopaedia vol 7 p. 706
(2) Diseases of Children, p. 248.

which follow the first attack though in other cases life may be prolonged two or three days" (article sur Coqueluche)[2]. In the fatal cases mentioned by Meigs and Pepper death took place in from seven hours to two days. In four of his five fatal cases the convulsions supervened on bronchitis, and in the fifth on violent laryngismus. All the five were accompanied by insensibility to the last, while in those that recovered insensibility lasted from a few minutes to half an hour.[1] My experience is more favorable than this; and I believe that far better results than those instanced above will be obtained where the method of treatment which I shall state in a later part of this thesis is followed out. At the same time it must be admitted that the mortality from convulsions in whooping cough has been very great. Their gravity is less if the patient quickly recovers consciousness, thus showing there is no serious congestion present. Great drowsiness, or a semi comatose condition, remaining points to persistent cerebral congestion, perhaps even the formation of clots in the sinuses. Coma usually precedes death. Occasionally when congestion apoplexy supervenes, and death is

{ Affections of the nervous system as affecting prognosis.

{ Convulsions.

(1) These writers believe convulsions "to be the most dangerous complication, after that bronchitis and pneumonia." p. 239.

(2) Quoted by Dr. J. L. Smith, Diseases of Children

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is immediate. If recovery take place the nervous system is for a long time morbidly irritable.

(C) Complications of the digestive system

Vomiting. Emesis serves some useful purposes. It brings the paroxysms to an end. In capillary bronchitis it prevents accumulation of bronchial secretion which might lead to development of collapse a circumscribed pneumonia. If however it be very frequent and severe it may produce so much emaciation and debility it may lead to a fatal result.

Diarrhoea. Diarrhoea in itself is not dangerous. It is comparatively seldom fatal (West p. 47) But in the very weak if it continue it may produce extreme exhaustion, in which case the prognosis should always be guarded. Where the patient is of a rickety a scrofulous Constitution the prognosis is generally unfavourable. In the former marked swelling of the liver would be found: in the latter phthisis may be come developed. In any case diarrhoea adds to the danger.

Enteric fever. In infantile remittent fever (typhoid) "the pts are protracted and there is left an enfeebled state from which the patient will not emerge though he live many years" (Smith)

Prognosis in pertussis.

The remarks on the subject of prognosis may be summed up by saying that if the patient between the paroxysms seem well and lively and be without fever or dyspnoea it is doing well; but if it appear languid, ill, apathetic, drowsy, fretful, feverish, with loss of apetite or diarrhoea it is not doing well, but is probably suffering from some complication which in proportion to its gravity makes the case serious, and the prognosis in such cases cannot be too guarded.

Prophylaxis in pertussis.

It should be the duty of local boards of health when an Epidemic is present in any locality to warn parents to keep their children as far away as possible from infection, not to allow them to play with those who are already however slightly affected, ~~still less~~ nor to visit a house or enter a room where a patient is staying or has lately stayed, and this warning may be given in the usual way by bills posted on the hoardings and by notices in the local press. The duty of separation should be exercised by all parents who have children that have hitherto escaped infection, but who from their age or their not having had it before are likely to contract the malady, but it should be especially exercised in regard to those children who would be likely to have the disease in a severe or dangerous form — Children in their first year, the rickety, strumous, weak-chested, those who are suffering from or have lately suffered from an exanthem, those who are in any respect or from any cause debilitated should not if possible be exposed to infection. If from its prevalence there be strong probability of their being affected, and still more if one of the family be already affected, the others if possible should be sent away at once to some

locality where it is not present preferentially to the country or seaside. That is the ~~surest~~ way of escaping the disease. Once infection has taken place no remedy we at present possess will prevent the disease from going further.

{Isolation of those already affected.}

As regards isolation of the infected, among the poor this would be impracticable owing to the smallness and crowded condition of their homes; but in hospitals and other public institutions and in the homes of the middle and upper classes it may be carried out easily enough, and it should in all these cases be carried out. Legislation is urgently required making parents liable to fine who send children affected with the disease to school or church, allow them to play with the children of the neighbourhood, take them in public conveyances, or otherwise publicly expose them. ~~Children when suffering from the disease~~.

Considering that the contagium may be carried by clothes and articles used by patients it would be prudent and perhaps the cheapest way in the end to burn the articles used (Dolan p.55): and as the infection can be circulated by nurses medical attendants, &c.[1] these cannot be too careful in their subsequent intercourse with healthy children.

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(1) Dr. J. L. Smith asserts, however, that it is not usually contracted by children in the same house if there be no personal contact, and thinks that it is doubtful if the disease can be communicated through a third person. Of course if such be the case there is no need as he adds of caution on the part of nurses or physicians with other children, — Diseases of Children.

Treatment of Simple Pertussis, in its first stage.

Obviously those cases that are so mild as to be unattended by suffering or injury to health, where the paroxysms are mild and far between require no drugs or treatment beyond guarding against cold and regulation of the diet and bowels. But in those severer cases in which the paroxysms are so frequent violent and prolonged as to exhaust the patient and threaten with suffocation or convulsions, where the vomiting is so frequent as to produce marked Emaciation a dangerous debility — in these cases there can be no doubt that treatment is necessary and to them prompt and striking relief can be given.

For those cases then that require interference what is to be the key-note of our therapeutics? Sir Thomas Watson and others believed the disease will run its course do as we will, and that all we can do is to conduct it to a safe end. There is some truth in this. "The disease will run its course." We cannot with any drug or combination of drugs kill the disease at once, without at the same time killing the patient. But it is not correct to say that 'all we can do is conduct the case to a safe end.' We can diminish the severity of the paroxysms, and the sufferings of the patient, and by carrying

Treatment of uncomplicated pertussis

out this indication I firmly believe that we take the best means to ward off complications, to conduct the malady to a safe termination, and to shorten its duration. If this belief be correct, then our chief aims in this stage and the next should be to palliate and to palliate effectively. In working out this aim we must — {First stage.

(a) provide the patient with as pure an atmosphere as possible. Hawke made experiments at St Anne's Hospital Vienna on the inhalation of various gases during this disease, and published the results in 1862. He found that carbonic acid gas and Ammonia made the attacks worse. The breathing of a breath or dust-polluted atmosphere therefore aggravates the course of the malady. In view of this fact as the air is purest in the country it might be advisable if practicable to remove the patient thither. If this be not practicable he must if possible have secured for him a large and well-ventilated apartment. If it be Summer-time he may be allowed out of doors, but only during the warmer parts of the day, and then only with the nurse who must be strictly charged not to permit violent exercise. {Provide pure air.

Treatment of uncomplicated pertussis

First stage.

(b) keep the patient warm.

(b) Care must be taken that the patient is kept warm. In hot climates — during an American or Australian Summer — nature does this very effectively, but in the uncertain and ungenial climate of Britain means must be adopted. Summer or Winter Spring or autumn flannel should be worn next the skin during the day, and extra blankets be placed on the bed at night. The child must stay within, and a fire should be kept in the room especially at night, which will secure not only ventilation but that the air inhaled is warm. West recommends that the temperature of the apartment should be kept at about 60° Fahr. I think it should not be allowed to fall below 65° Fahr. In cold or damp weather the patient should certainly not go out of doors no matter what season.

(c) Attend to nutrition.

(c) Knowing how apt the nutrition is to be injured during the next stage we should in this see that the apetite is good, and a due plenty of nourishing easily digested food at frequent intervals, absolutely forbidding heavy or rich diet. There is seldom much need of medicine, beyond aperients and gentle expectorants; Certainly none should

Treatment of uncomplicated pertussis.

{ First stage.

be employed which would impair apetite or otherwise reduce strength.

{ To mitigate the cough if it be troublesome

1d) If the attacks of cough be severe and frequent they should be mitigated. To this purpose some sedative narcotic or antispasmodic should be chosen the action of which is fairly reliable as regards uniformity, and we should give it often enough and strong enough to allay the cough. West (p. 480) recommends a mixture containing a small quantity of ipecacuan and antimonial wine with laudenum or paregoric; and if there were much wheezing at the chest such a mixture would do it good, though it would at the same time considerably diminish the apetite. The drug I prefer above all others for this purpose is butyl-chloral hydrate, and next to this chloral hydrate. Both of them in the dose which I shall mention are quite safe, do harm in no way, and give us complete control of the cough; and there things cannot be said of any other drugs in the pharmacopoeia. They ought to be administered boldly in large and frequent doses. Taking fifteen grains to a scruple of either as the dose for an adult I administer them to children in doses proportioned to the age of the patient

Treatment of uncomplicated pertussis

First stage. } according to the table of Gaubius, ordering it
(d) Mitigate the cough if it be troublesome. } to be given often enough to subdue the violence and frequency of the spells. For example to children of nine & ten months I have been in the habit of prescribing something like the following

℞ Butyl-chloral hydrate gra. XV
Vini ipecacuanhae mXX
Syrup. Aurantii floris ʒvj
Aquam ad ʒij

Sig. A teaspoonful every two three or four hours, according to the severity of the cough.

In the above prescription I sometimes substitute chloral hydrate for the butyl-chloral hydrate, and simple syrup & chloroform water for the syrup of orange flower water, leaving the quantities the same.

(e) Keep the air tubes clear of mucus. } (e) If the catarrh be excessive expectorants are indicated. Ipecacuan generally answers well; but if there be much difficulty in expectorating, and the child be feeble, squills might be "exhibited." We cannot be too cautious in the administration of antimony.

Treatment of Simple Pertussis in its second Stage.

It is during this stage that the utmost care is necessary on the part of the medical attendant, and on the part of those who have immediate charge of the patient, in order to carry the case to a successful issue. It is in this stage that therapeutic measures are chiefly called for and employed. It is admitted that we have no Specific — that we cannot "cure," — and therefore we are compelled to palliate, in other words to treat symptoms. As to that there is no difference of opinion among writers. But the author of this thesis goes further, holding that palliation dwarfs in importance all other considerations — that where it is steadily boldly and intelligently endeavoured to diminish the severity and number of the paroxysms few difficulties will be encountered, complications will be warded off, and the case proceed safely and quickly to its conclusion. (1) This rule is proposed only as a general one to which as to every other there are exceptions. The nursing may be inefficient, the child may have an invincible aversion to medicine, or its Constitution may be so undermined by previous chronic disease that it is unable to contend with a fresh assailant. While these exceptions but

The great and preeminent importance of palliating the paroxysms.

and from these causes deaths will now and then happen whatever treatment be adopted.

(1) The above view was formed as the result of my own experience long before thinking of writing this thesis or looking up the literature of the subject. I find however that Dr. Ed. Smith previously held and enunciated the same doctrine. He says — "In simple hooping cough the Chief if not sole aim should be to allay Spasm, and thus prevent the resulting complications, and reduce the disease to a common cough." — Article Hooping-Cough in Reynolds' System, Vol. I.

Second Stage.

Preeminent importance of mitigating the paroxysms.

prove a rule which has been abundantly confirmed by my experience of its working. I find that since its adoption I have attended 103 cases, and that out of that number I have had two deaths. In one of these cases, a female aged three and a half years exceedingly stout and short-necked, the nursing was at fault, the mother insisting she could not get the medicine into the child: any way it was not taken. The child succumbed to intense Cerebral Congestion with Convulsions. The second was a strumous and rickety child of two and a half years, that had "bronchitis" almost without intermission from birth. It died from extensive collapse of the lungs. Stimulating expectorants, counter-irritation to the Chest, inhalation of steam &c. were tried, the nursing was all that could be desired, but nothing would save it.

In showing how this aim may be carried out I will speak of Clothing & temperature, food, and lastly through most important medicine.

(1) Keep the patient warm—
(a) by appropriate clothing

1. The patient must be warmly clad. Whether it be Summer or Winter woollen under clothing should be worn during the day, and at night the patient should sleep between blankets having as much over him as he can bear;

and it is worth while in the case of very young children taking precautions against the patient's stripping himself during the night. { Second Stage.

(b) If the patient's home be small and ill-ventilated, if the attack be mild and the weather very warm, he may be allowed out of doors during the heat of the day, providing the exercise be not unduly violent. But under all other circumstances the patient had better be confined to the house throughout this stage. { (b) by confining to the house.

This opinion as far as I am aware has not been stated before, and, as it is contrary to the teaching of eminent specialists in the diseases of infancy and childhood, it is due from me to state the grounds on which it is based.

During the summer of 1882 pertussis was epidemic in Macclesfield, and my two little daughters, aged respectively six and a half and one and a half years, contracted the disease and had attacks of average severity. In the course of their illness they were frequently out of doors. Sometimes the elder girl went out "shopping" with her mother, sometimes both were taken to the Park or outskirts of the town. Now it was always noticed by the

Treatment of uncomplicated pertussis.

Second Stage. Nurse as well as by the mother that the spells of coughing were more frequent during the cramps, and for some minutes after getting home again. As this seemed to be something which had escaped observation hitherto, & took pains throughout the epidemic to inquire of those who had the disease in their families, if their children were similarly affected. I found their experience uniformly the same as our own. Accordingly, I have since when attending the children of "well to-do" people advised that the patients during the second stage be confined to the house whether the season be warm or cold, provided the air of the house be not vitiated by overcrowding & excessive smallness of the rooms; and the result of my experience is that this instruction is not only a safe but an important one to give. If the patient be confined to one room that apartment should have whether it be summer or winter a fire in it for ventilating and heating purposes. Cold will excite paroxysms consequently the temperature of the apartment in which the patient stays should not be allowed to fall below 60° Fahr, but it is better

It is generally best, during this stage, to confine patients to the house.

(c) By causing this apartment to be heated.

kept at from 65° to 70° Fahr. and this temperature should be maintained night and day without loss of ventilation. The air the patient breathes cannot be too pure, and for this reason it would be better if the bed-room during the day should be well aired, and remain unoccupied. Where fires are kept in the dining and breakfast rooms the patient may with advantage be allowed the run of both; but care should be taken that it is not exposed to draughts or a sudden change from hot to cold. — Second Stage. — But temperature must not be secured at the expence of ventilation.

Knowing how apt vomiting is to occur at the paroxysms it is obvious that the food should be such as is easily and quickly assimilated. It should therefore be mainly if not exclusively in a fluid state. Sir Thos. Watson says that the amount should be reduced, and "the child allowed to eat but little meat; it may be nourished as well and more safely upon milk and unstimulating farinaceous matters."(1) Possibly milk itself in the fresh state is the best diet of all, and where there is any difficulty in getting this of good quality there are the various Condensed milks. Milk and — II. Regulate the diet.

(1) Sir T. Watson, Practice of Medicine, Vol. 1. p. 414.

Treatment of uncomplicated pertussis.

Second Stage } II Regulate the dietary. } eggs taken separately, & cooked together in the form of Custard are well spoken of. Of milk in any form the patient may take as much as it pleases during the twenty four hours, only it is better not to have too much at once. In addition the child may have soup made from mutton, chicken & beef, & the Kreochyle of Messrs Barff and Wire — a pleasant preparation well taken by children. Very little bread should be allowed even when cooked with milk. Indigestible vegetables should be forbidden, though fruits in moderation are allowable. Cold and stimulating drinks do apt to excite attacks of coughing should be avoided. If pyrexia and other signs of inflammation be present animal diet should be disallowed, but if the attack be mild and the child not too young it may be given in small quantities and finely divided.

A fit of ill-temper will bring on paroxysms; accordingly pains should be taken that the child is not teazed by other children, but is allowed as far as possible to have its own way.

III Drugs. } We now come to the quaestio vexata of drugs. The therapeutics of a disease generally depends

Treatment of uncomplicated pertussis.

{ Second stage.
III Drugs the multiplicity of those proposed.

on its pathology, and considering that so many diverse theories of pathology have prevailed can we wonder that the remedies proposed are so many that it is almost a task to enumerate them. Dolan says "nearly all the drugs of the pharmacopoeia have been tried", and mentions the following in alphabetical order as having been proposed by various writers — "Arsenic, alum, acetic acid, antimony, benzine, belladonna, bryony, chloral, cannabis indica, cantharides, cochineal, croton oil, chloroform, carbolic acid, drosera, ether, hydrocyanic acid, hyoscyamus, ipecacuan, iodide of silver, lobelia, morphia, and nitric acid, petroleum, potassium salts, turpentine, salicylic acid, quinine;"(1) and this list might be greatly extended. Of these some have been employed to abate inflammatory action, as leeches and antimony; some to promote expectoration, as antimony, ipecacuan, squills and emetics; some to diminish bronchial secretion (astringents) as zinc, alum, &c; some to allay spasm directly, as prussic acid, henbane, nightshade, morphia and its salts, musk, valerian, ether, chloral, &c; some to allay spasm indirectly by strengthening the general system as iron, zinc, copper,

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(1) J. M. Dolan, Whooping Cough, p. 60.

Treatment of uncomplicated pertussis.

Second stage. III Drugs. } silver and other metallic salts, the mineral acids, quinine and other vegetable tonics, change of air; and not a few have been recommended as specifics. They may be grouped for convenience under three "heads," named, Specifics, Antiphlogistics and Sedatives. Taking them in the order in which they have been named we have

(A) Specifics, and the number of these throws suspicion on their worth. There is

(a) the phenol group — tar-water internally, tar inhalations, inhalations of Carbolic acid, or the air of gas-works. The employment of this group is based on the view that whooping cough is a zymotic disease amenable to germicide remedies. We will first notice

the gas-works treatment. This originated in France. It was said by some practitioners that children living in the neighborhood of gas-works speedily recovered from whooping cough, while others went so far as to assert that children living in these neighborhoods escaped having the disease altogether.(1) In consequence of these statements it came to be a custom with medical men to send patients

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(1) J. M. Dolan, Whooping-Cough, p. 64.

Treatment of uncomplicated pertussis.

with this disease to inhale the chlorine and other exhalations of the purifying chamber, the rationale being that these exhalations destroyed the contagium. The results of this practice were stated by local medical men to be highly satisfactory. Certainly the treatment soon became very popular, and was resorted to not only by the profession but by the public on a large scale. M. Bertolles stated[1] that during the previous six months at the gas-works of Ternes 901 patients were subjected to treatment; of these 209 were cured and 122 relieved. We are not told what became of the other 570 — how many of these died &c. M. Commenge (l.d. loc.) reported the results of this treatment in 142 patients at the gas-works of St. Mandé. He states that in general eleven or twelve sittings of about two hours duration each are required for the cure, and expresses his belief that the treatment produces excellent results at all stages of the disorder. The reports of these gentlemen and others were so vague, incomplete and wanting in precision as to be utterly worthless from a scientific point of view. However as the treatment excited a good deal of discussion some denouncing while the majority commended

Second Stage —
iii. Drugs —
(A, Specifics
(a) the air of gas-works.

[1] Brit. med. Journal, 5. Nov.[r] 64, quoted by Meigs and Pepper p. 246.

Treatment of uncomplicated pertussis.

Second stage. 1st Specifics— (a) The gas-work treatment. M. H. Rogers's report on

the French Academy of Medicine appointed a Commission of three members, with M. Henri Rogers (Gueneau de Mussy, and Mollard Martin as President (Lancet 30. Oct. 1880) to investigate the question. In due time M. Rogers presented an elaborate and valuable report on the effects of the emanations from gas-works in checking & moderating whooping cough. He describes the modus operandi as follows — "The purifying-chamber is a large room with doors and windows freely open. It contains twenty four vessels, each holding five cubic metres. Some of them are filled with lime, some with lime and saw-dust mixed, and through these gas is passed for the purpose of purification. When the workmen are emptying and refilling these the children with whooping-cough are made to stand around and inhale the vapours, which consist of ammonium sulphide, carbolic acid and tary products."[1] He examined the various statistics published in France on the subject some of which I tabulate as follows —

Recorded by	No of cases persevered with	No not persevered with	Cured	Improved	Complete failure of treatment	Deaths
M. Commenge	169	641	101	48	20	not mentioned
M. Berthole	341	not mentioned	219	122	none	none
Total	510	641 + those not mentioned	320	170	20	?

It will be at once obvious that these figures throw suspicion upon the cause they were at first adduced to support

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[1] Lancet 30. Oct. 1880. p. 705.

Treatment of uncomplicated pertussis.

Second stage.
(a, Specifics —
(b, The gas-works treatment.

To begin with it is plain that from the remote situation of most gas-works, and the exposure involved in visiting them, that only mild and uncomplicated cases could be thus treated. Then we want further information about the 641 cases not persevered with. How many of these derived no benefit whatever? And how many died? M. Rogers came to the conclusion that 'this method of treatment is far from having merits superior to others, and while admitting that it modifies in quality and quantity the bronchial secretions, holds that it is unsuitable for febrile and complicated cases, and has no real abortive or specific action on the disease: in fact, he says, 'there is no such remedy.' Others have taken a more hostile position. Maingault, Blanche, Bergeron, Barthez and Bouchut have declared against making this use of the gas-works, partly from want of results, and partly because they regard these inhalations as hazardous.[1] To the latter objection much importance does not attach. The general opinion now is that in a minority of cases some benefit has been derived, but in the majority no amelioration has resulted either in the symptoms or duration of the disease. I take leave of this method of treatment with the observation that it requires further

M. St. Rogers report on.

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[1] T. M. Dolan, Whooping Cough, p. 67.

Treatment of uncomplicated pertussis.

Second stage.

(A) Specifics
(a) The gas-works treatment

more accurate and more scientific investigation, the evidence hitherto placed before us being inconclusive if not actually self-destructive. I believe that where good is apparently derived from this method of treatment it is during the third stage, when the disease is spontaneously dying out, and that it is derived more from the change of air involved, &c. than the carbolic acid inspired.

(b) Carbolic Acid.

The foregoing practice suggested the desirability of trying other forms of inhalation. Dr. Burchardt of Berlin recommends inhalations of steam from solutions of carbolic acid of the strength of one and a half to two per cent (Deutche Klinik 41. 1874)[1]. It was used by him and others with apparently good results. In 1875 Lee published a paper on the treatment by carbolic acid vapour (Brit. Med. Journ. Vol ij. p. 475). Jefferis followed in the same path recommending this treatment. His directions are that the patient be placed in a room with closed doors and windows. "Heat the kitchen shovel and place on it two drams of common carbolic acid. This should be repeated three times a day, and the rooms frequented by the patient should be carbolized especially the bed-room." He states that 'if the patient have apt of coughing it will be cut short by breathing the car-

[1] Steffen

Treatment of uncomplicated pertussis.

Second stage.
(a) Specifics
(b) Carbolic acid inhalations.

bolized air (Steffen)[1]. Mr Robt. H. Smith of Blackburn says — I have "edited" his account — "During March last I had been troubled with pertussis, and early in April found myself whooping in an unmistakeable manner; indeed two medical friends called my attention to the fact. On one day I had nineteen paroxysms of whooping. As I was in the habit in the course of my duties of using the carbolic spray I regularly inhaled it about every five minutes. After three days of this treatment the paroxysms were reduced to five. Since then I have quite recovered without having taken any medicine" — (Lancet 21. May 1881). Dr. R. J. Lees of London has obtained "singularly good results from the inhalation of carbolic acid." Others speak well of this treatment. There is no doubt that carbolic acid produces mild anaesthesia of the mucous surfaces, but I am bound to say that I have tried carbolic inhalations in my own practice, making the apartment in which the patient stayed hardly tolerable night and day for the fumes of the acid, without observing the slightest benefit to the patient.

Quinina is another reputed specific, and (c) Quinina.
as a germicide it will be proper to consider it after

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(1) Quoted by T. M. Dolan, Whooping-cough, p. 69.

Treatment of uncomplicated pertussis.

Second Stage.
(III) Drugs —
(A) Specifics —
(c) Quinina

carbolic acid. Internally Peruvian bark had long been used in the treatment of tussis convulsiva by Mellin, Rosen, Cullen, Hufeland, Stoll, &c., but it was during the third stage, and with the object of strengthening the patient. The local treatment by pulverizations of quinina originated with Letzerich. His argument was — quinina has been proved by experiments to be injurious to low forms of vegetable life; whooping cough is due to the reception and subsequent development of fungus spores: therefore it must be the proper remedy for this disease. He administered the drug by inhalation, and employed the hydrochlorate combined with bicarbonate of sodium and gum Arabic. We have his report of three cases thus treated, and we are told that the convulsive attacks diminished after from eight to ten days, and the third stage was of short duration. It was Binz, however, who having embraced the theory of Letzerich first strongly recommended quinina and brought it under the notice of the profession, and to him according to Steffen belongs the credit of introducing it. "At first he employed small doses, but subsequently with better effect larger doses and more frequently repeated. He also used the hydrochlorate on account of its solubility. He records the cases of two girls in the Jahrbuch für Kinderheilkunder N. S. T. p 235.

Treatment of uncomplicated pertussis.

Second stage.
(III) Drugs
(A) Specifics
(1) Quinina

One aged eight months who had been ill for two weeks was cured in forty days. The other aged seven years, who had been attacked with whooping cough three weeks before, was cured in thirty eight days.(1) In the same journal (IV. p. 103) he asserts that we don't get good and prompt results unless when large doses of quinina are given before the disease has reached its height. Beidenbach in 1869 reported that in an extensive epidemic he has seen the best results from this treatment.(2) Steffen also mentions cases, and he believes that large doses of quinina have a decided influence in moderating and shortening the spasmodic stage. He thinks the results obtained with this remedy call for further experiments in the first and second stage.

The writer's estimate of its value.

The experiments of Schakow and Eulenberg prove that quinia diminishes the reflex excitability of nerves (Archiv. von Reichert und Dubois — Reymond, 1865).(3) It must accordingly have some effect in mitigating the violence of the spasmodic cough. It is undoubtedly an admirable tonic: it improves the apetite, and tends to prevent those depressing effects which might occur from belladonna. It will most probably help to shorten the stadium decrementi. It has this in its favour that it is said to be readily taken by children if given in a pleasant vehicle as

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(1) Dr. Steffen in Ziemssen's Cyclopaedia Vol. VI. p. 728: Also quoted by Dolan.
(3) Same article p. 729
(2) T. M. Dolan, Whooping Cough, p. 74.

Treatment of uncomplicated pertussis.

Second Stage.
III Drugs
A) Specifics
Quinina – the writers estimate of.

as simple syrup,[1] syrup of orange flower water. But in regard to pulverizations, the form recommended by Letzerich and Binz, we must admit that it is difficult to employ them with very young children. That is a strong objection to this method of treatment, an objection which might be overlooked had the results obtained been very favorable. But I submit that they have not been so. Would not the convulsive attacks in all probability diminish after from eight to ten days — Would not a case that had already lasted two weeks be cured in forty days, and one that had been in progress for three weeks be cured in thirty eight days under any treatment, or no treatment at all? My own experience of its action in the first or second stage is not such as to lead me to use it again. I am strongly of opinion that the same good will not be got from it as from belladonna, and that it is not to be compared with butyl-chloral hydrate or chloral hydrate.

Chlorate of potassium.

Chlorate of potassium was used by Mr. Dolan in a ~~similar~~ manner and with a purpose similar to the above. Mixed with bicarbonate of sodium and gum Arabic it was sprayed into the fauces by one of the small spray-producing instruments sold by instrument makers. He tested this method in a large number of cases, and says it can be

[1] This was Dr. Mott's method viz quinina grs II – V dissolved in sugar & water ℥ij ʒij ʒi pro doses. Dr. J.L. Smith recommends very large doses; he would give a child of five years two grains four times daily as an antiperiodic, but would in some cases give larger doses.

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used with infants without causing struggling or crying as it does not hurt. "It seems," he says, "to relieve the intensity of the paroxysms and from his own personal experience believes it is a useful palliative."(1) Such a commendation will hardly lead to the "remedy" being adopted by others. {Second stage. III Drugs & Specifics

To the class of antiseptics belongs benzol, which has been used by Dr. John Lowe of King's Lynn for ten twelve years with results that appeared to him excellent and often striking. He found it useless during the early stages, its efficacy appearing during the stage of recovery. His prescription is "Benzol mv - x tinct. hyoscyam, tinct. chlorform. Co, Mucilag. Acaciae, Aq. ʒ ss. To be repeated every four hours."(2) In this Complex prescription how does Dr. Lowe know that the virtue belongs exclusively to the benzine? And if he have such faith in it, why does he add the hyoscyamus and spirit of chloroform? I am disposed to be sceptical of remedies, whose efficacy appears only when the disease is disappearing spontaneously. {Benzol. Dr. Lowes testimony. {Criticism of the above.

Tincture of Cantharides has had its advocates, and doubtless according to its introducers possesses many merits. I have never used it in whooping cough, and it is not likely that I ever shall; so it would hardly be fair for me to criticise its advantages. {Tincture of Cantharide.

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(1) J. M. Dolan, whooping Cough p. 76
(2) Lancet 15. May, 1880, p. 783.

Treatment of uncomplicated pertussis.

Second Stage. III Drugs & Specifics. } There are various metallic salts that have been recommended as Specifics — Arsenic, Copper, and others besides those mentioned below.

Acetate of lead. } Acetate of lead was very strongly recommended by Dr. Rees. He says that a quarter of a grain every six hours removes the spasm in one day.(1) What could be more satisfactory! Eureka! the reader cries, why go any further? The remedy is very rarely used for whooping cough at the present day. Others, it is presumed, have not been so fortunate with it as Dr. Rees.

Nitrate of silver. } Dr. E. Watson's remarks on. } As regards nitrate of silver it was first advocated by Dr. Ebenezer Watson in 1849, and subsequently by Gibb. The former recommends that the tonsils, uvula, back of the fauces, and if possible the Epiglottis and interior of the larynx, be swabbed with a solution of the strength of fifteen to forty grains in an ounce of water, every second day; it is said to subdue the spasm in less than a week. Dr. West's remarks on. } Dr. West tried this method frequently, and had no doubt the cough is sometimes lessened, and its frequency diminished; but this was by no means frequent, the milder cases being benefited, but when bronchitic complications were present little if any good followed. "In 1866 Rehn employed solutions of nitrate of silver in inhalations at the height of the second stage. He experimented on six children over four years of age, and on two adults. After the third

(1) Dr. Ed. Smith, article Hooping Cough in Reynolds's System Vol. j.

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inhalation there occurred a remission of the symptoms, and after from eight to ten inhalations there remained only a simple bronchial catarrh." (Dolan, p. 681) This treatment however has failed in other hands.

Second Stage. III. Drugs. & Specifics. Nitrate of Silver

If whooping-cough were a germ-disease, and were confined in its action to the fauces and larynx, we could understand the rationale of this method. But the specific catarrh is not confined to these parts: it extends down the trachea and bronchi, sometimes to the minuter ramifications, so that in a large proportion of cases only a small part of the affected tract could be got at in this way. So that prima facie there are strong grounds for doubting the efficacy of this method. But besides this and other inhalations suffer from the drawback that they are difficult to carry out. Having the throat painted with a solution of nitrate of silver is a most unpleasant experience to the patient, and one to which adults will hardly submit more than once. It would be very difficult to paint the larynx of an infant, and in the case of children there would be so much alarm and struggling, such general unpleasantness, it would be virtually impracticable

The writer's remarks on.

The impossibility of getting at all the parts affected in this way.

The extreme difficulty of getting at any part.

Treatment of uncomplicated pertussis.

Second Stage.
III Drugs.
A Specifics.
Nitrate of Silver to the interior of the Larynx

The writers remarks on

West, fearing me out in this, observes that children have an extreme repugnance to it and dread its repitions. He succeded by coaxing and promises in using it for three a four days, but no persuasion enabled him to go further, and on several occasions he saw paroxysms brought on through fear of its application (p. 484). So that even if there were any advantages attending this method they are more than counterbalanced by disadvantages. I venture to predict that this treatment will never become popular with practitioners patients or parents.

Compressed air, turpentine and Creasote.

Before leaving the subject of inhalations I may add that compressed air was employed by Brunniche, Chloroform by Roger, and inhalations of oil of turpentine by Kjellberg of Stockholm.[1] The use of turpentine and Creasote is said by Dr. J.R. Lees of London to be attended with considerable succes, but he does not give the grounds on which this opinion is based.

(B). Antiphlogistics — Remedies directed to abate inflammation and catarrh.

Among these that have been used are appercents, leeches, tartarized antimony, liniments to the front and back of the chest, poultices, &c. Of course if bronchitis

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(1) J. M. Dolan, Whooping-Cough, p. 68.

Treatment of uncomplicated pertussis.

pneumonia ~~or~~ meningitis or any other inflammatory complication be present then, require appropriate treatment, but the measures taken to subdue them should be of a mild description the primary disease not being lost sight of. In the case of simple whooping-cough whoever trusts to antiphlogistics will not have the success he would wish. Taking them in the order in which they have been named

Second stage.
III. Drugs
B. Antiphlogistics

Apperients.

1) Apperients are seldom used in the simple disease, except when the bowels are confined, or in delayed digestion; and then the mildest ought to be used as castor oil, magnesia, a syrup of rhubarb. In congestion of the brain something stronger might be used, as calomel.

Blood-letting

Blood-letting is rarely necessary. Dr. West says (p 483) "If drowsiness, with a flushed face becoming livid during the fit, and other symptoms betoken presence of cerebral congestion the application of a few leeches to the head will greatly relieve these symptoms, and diminish the frequency and severity of the cough." Meigs is of opinion that those cases which might be treated by venesection or leeches to the head "may safely be treated by reduced diet, and a few doses of saline cathartic." (1)

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(1) Meigs and Pepper, Diseases of Children, p. 241.

Treatment of uncomplicated pertussis.

Second stage. III Drugs B. Antiphlogistics Counter-irritation.

Counter-irritation to the chest and spine is a popular remedy, and it has been employed in many forms — the pustulants, as ung. ant. tart, and ol. crotonis; the vesicants; even the heroic remedy of a seton in the neck has been recommended by Mercatus

Tartar emetic ointment.

Autenrieth, believing that inflammation of the pneumogastric nerve was the cause of the disease, gave no internal medicine but applied friction with an ointment composed of a dram and a half of tartarated antimony in an ounce of lard — a portion the size of a nut to be rubbed over the epigastric region three times a day. To ensure the efficiency of his treatment he was not satisfied with pustulation, but continued the remedy for eight or twelve days till ulceration came on.(1) Lorate followed his plan. The objection to the use of tartar emetic ointment is the foul and troublesome sores it produces.(2)

Ether externally.

Lubelski, holding the same theory, recommended the application to the neck along the course of the pneumogastric of ether in spray; and states that in the case of his own child it was followed by almost immediate relief. He regards this method as the only palliative especially practicable where

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(1). J. M. Dolan, Whooping-Cough, p. 64.
(2) Sir T. Watson, Practice of Medicine, vol. ij. p. 476.

Treatment of uncomplicated pertussis.

the child is harassed by frequent and violent paroxysms.[1] Ether administered in this way would no doubt do good in so far as it was inhaled by the patient. } Second Stage. III Drugs. Antiphlogistics

Painting the skin over the larynx with nitrate of silver has been recommended, and various liniments, as Compound Camphor liniment, liniment of ammonia turpentine and tincture of Cantharides. Roche's Embrocation is said to be very popular with nurses. It consists, according to Dr. Paris, of oil of cloves and oil of amber, of each one part, and olive oil two parts. } Counter-irritation.

Dr. West's remarks (p. 486) on counter-irritation appear so judicious that I quote them in some detail as a fitting conclusion of the subject. He believes that 'during the increase of the disease attacks of dyspnoea may often be much relieved by mustard poultices to the chest, and the immersion of the lower parts of the body in a hot bath on three or four successive evenings. As an alternative he would apply friction to the chest with lin. saponis, tinct. lytae or Roche's Embrocation, so as to keep up slight redness of the surface. Blisters he would not use, except when the symptoms were suggestive of congestion of the brain, and even then would not push them. He thinks there is not much good to be gained by counter-irritants till the disease is beginning to decline, and then they are often of much service.' To sum up — if

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[1] J. M. Dolan, Whooping-cough, p. 64.

Treatment of uncomplicated pertussis.

Second stage. II Drugs — B. Antiphlogistics. pertussis were an inflammatory affection, a if any inflammatory Complication be present, Counter irritants might be used with advantage; but in the treatment of simple whooping cough they are of no use whatever,

Expectorants, nauseants and emetics — these in all their variety have been used pom. chlride of ammonium and sulphur & tartarated and sulphurated antimony. They are indicated when from the excessive quantity of the phlegm & the weakness of the child there is difficulty in keeping the tubes clear, and consequent danger of pulmonary collapse. Meigs regarded them, as "amongst the most important remedies in the treatment of whooping cough exerting a powerful influence on the disease." (1) Antimony, it ought to be remembered, irritates and inflames the gastro-intestinal mucous membrane, and tends to produce diarrhoea and exhaustion. It might be employed in very stout short-necked children where the cough is of a suffocative character. Generally ipecacuan and squills will be more suitable, and are valuable expectorants. Meigs used the former in nauseating doses three times a day, believing it moderated the severity of the paroxysms. (2) ~~Emetics are much used when the~~

(1) and (2) Diseases of Children, p. 243.

Treatment of uncomplicated pertussis.

If the mucus be very tenacious an alkali may be used with advantage. Niemeyer had great faith in the carbonate of potash, and says "its effects in shortening the fits of coughing is often surprising". The formula generally used was _ Potass. Carb. ℈j, Cocci ʒss, Sacchar. alb. ʒj, Aquae f℥iv. M. Sig. ʒij ter die (for a child a year old). Meigs left out the cochineal, believing the carbonate of potash to be the active ingredient, and this he believed to be one of the most useful agents for keeping down the violence of the disease. He "has given it for several weeks in doses of a grain three or four times in the twenty four hours without witnessing any injurious effects."(1) Other alkalies, the solution of potash, the citrate and bicarbonate of potash, the bicarbonate of soda, and the solution of ammonia have been used. They certainly diminish the viscidity of the sputa and aid their expectoration, and in this way must mitigate the coughing. They also tend to relieve disordered bowels.

Second stage.
VII. Drugs.
B. Antiphlogistics
Expectorants
Alkalies.

Others have used astringents when there was excessive catarrh in the absence of acute inflammation. Among these may be mentioned the dilute mineral acids. Some have recommended hydrocholic acid, others sulphuric acid, and most of all nitric acid. The latter has been given in very large doses. It is usually administered

Astringents.

(1). Meigs and Pepper, Diseases of Children, p. 244

Second Stage. III. Drugs – B. Antiphlogistics – Astringents.

in syrup and followed by a gargle of bicarbonate of soda to prevent injury to the teeth. It was first recommended by Arnoldi of Montreal, and

Nitric acid.

was highly praised especially by Gibb,[1] who supposed it acted as a tonic and sedative. It formed the basis of his treatment, and his formula was:– Acid. nitric. dil ℥xij; Tinct. Card. Co. ℥ij; Syrup. ℥iiiss, Aq. ℥j: Sig. ʒj or ʒij every two hours.

Alum.

Alum has been used for the same purpose as the dilute mineral acids – namely to diminish cough by checking excessive secretion. It was first recommended as a remedy by Dr. Golding Bird in Guys Hospital Reports, April, 1845. He says that in the second or nervous period, "when all inflammatory symptoms have subsided, and with a cool skin and clear tongue the patient is harassed by a copious secretion from the bronchi, the attempt to get rid of which produces the exhausting and characteristic cough, alum will be found of much value. I have not yet met with any other remedy which has acted so satisfactorily or afforded such marked and rapid relief."[2] These are strong remarks, and coming from such a source command attention. Dr. Meigs reading them made trial of the remedy, and believes "it exerts a more decided influence in moderating the violence of the disorder than any

(1) Meigs and Pepper, Diseases of Children p. 246.
(2) Same article p. 244.

Second stage.
III Drugs –
B. Antiphlogistics –
Astringents –
Alum.

other we have ever made use of. He administered it in 139 cases, beginning in the second course of the second stage. In nearly all it was beneficial, and in some the effects were strikingly useful, the improvement being more rapid than we have ever seen to result from other remedies, or to occur when the disease has been allowed to pursue its natural course."(1) He gives several cases, and repeats that, "so far as his experience in the 139 cases goes, the effects of alum have been more decided and satisfactory than that of any other remedy. I have never known it produce ill effects, no matter how long continued. It sometimes fails to do any good, and in these cases I have substituted belladonna or carbonate of potassium alone or combined; and in some instances the latter remedies succeeded where the former failed. Of late I usually give alum and belladonna together, and obtained better results from it than from any single remedy I have used. I give half a grain to a grain three or four times a day to a child under one year, my formula being _ Extract. belladonn. gr. j, aluminis ℈ss, Syr. zingib., Syr. acaciae, Aquae āā. f℥j. S. ʒj every six hours, if the cough be troublesome. Dr. Bird's formula for a child of two or three years" (as quoted by Meigs) was Alum. gr xxv, Extract. Conii gr xii, Syr. Rhoeados f℥ij,

(1) Meigs and Pepper, Diseases of Children, p. 244.

Treatment of uncomplicated pertussis.

Second Stage
IV. Drugs—
B. Antiphlogistics—
Astringents.

Aq. Anethi f℥iij. Sig. ʒij 3 h's hours." (1)

Tannic Acid has also been used with hyoscyamus or benzoic acid and other vegetable acids. Sulphur, already mentioned, was recommended by Kopp and other German authorities to be used both at the beginning and throughout the course of the disease. "It may be given in milk syrup or emulsion, in doses of three grains three times a day to children of two to four years."

Tonics—

Akin to the Astringents in their action are the tonics. These have been supposed to allay spasm by invigorating the general system. In this way various metallic salts have been used very extensively. The Carbonate of Iron has been employed successfully by Dr. Graves of London,(2) by Lombard of Geneva and by Dr Legman, and others have used the Sulphate from an early date. Zinc is said to allay spasm by lessening secretion. It may most conveniently be given as oxide in honey. To a child under twelve months a grain may be "exhibited" three or four times a day. In the same way Copper and silver have been used. Strychnine is said to have been given with advantage in this stage. Some have great faith in quinine. As regards change of air to some place where the disease does not prevail and by preference

(1). Meigs & Pepper, Diseases of Children, p.245. Dr. Ed. Smith states it somewhat differently viz— Alum gr.25. Extract. Conii gr.12. Syr. et Aq. Dil. ad ℥iii

(2) Dr. Edw. Smith, in Reynolds System, article Hooping-cough, Vol. i

to the Country there can be no doubt of its value. It is not, however, often available to us. It is in the third stage that change of air and the other foregoing tonics are especially valuable, and when we come to that part of our subject I shall refer to them again. { Second stage. III Drugs— B. Antiphlogistics.

Emetics were much used at the time when the humoral pathology was in fashion. Fr. Hoffman Hufeland and Cullen were enthusiastic in their praise. Some recommend one every day or every other day, according to the necessities of the case. In regard to them Steffen says—"although abandoned long ago they may still be serviceable occasionally if the secretion be excessive in the bronchi and bronchioles, producing respiratory insufficiency, and threatening collapse; when ipecacuan, sulphate of copper or subcutaneous injections of apomorphia are the most suitable." (1) In all that Dr. Steffen says I concur with him, except as to the suitability of subcutaneous injections of apomorphia, or any other powerful drug, in young children. In the circumstances mentioned by Steffen Dr West (p. 482) recommends 'an emetic of ipecacuan to be given once a day or oftener according to the degree in which the child { Emetics.

(1) Article Whooping Cough in Ziemssen's Cyclopaedia, Vol. VI. p. 721.

Second stage. III. Drugs. } Suffers from the accumulation of phlegm. When given once a day evening should be the time. Trousseau used sulphate of copper a good deal when the cough was of a suffocative character, and his formula was, ℞ Cupri sulphat. gr. V – IX Aq. destill. ℥iii Sig. ʒij every ten minutes till emesis ensues.

(C) __Sedatives__, __narcotics__ &c. — the large group of remedies used in pertussis with the object of allaying reflex excitability in the parts supplied by the pneumogastric.

Some authorities, who see in whooping cough simply a catarrhal bronchitis, dreading lest the regular discharge of sputa may be prevented, advise against the use of this class of remedies. Of course if bronchitis or pneumonia and especially if collapse have supervened it is of the greatest importance that the tubes be kept clear, and in these conditions drugs which prevent expectoration must be used with caution if at all.(1) But where these complications are not present this class of remedies appear to me by far the most important and valuable we have yet considered. For this reason: it is the severe and frequent paroxysms that cause the chief dangers of pertussis — the great

(1) But providentially when bronchitis or pneumonia set in the severity of the paroxysms is usually moderated (J.L. Smith) and moderated in proportion to the severity of the complication. Therefore the direction subsequently given – to mitigate the paroxysms when severe – is a safe one in all cases: for where they are already mild they do not require mitigation and where there might be danger from checking expectoration sedatives not being called for would not be used.

Treatment of uncomplicated pertussis.

passive Congestions of organs, and all the train of maladies that follows these Congestions, the cerebral hæmorrhages and effusions of serum, convulsions, &c. From this it follows that the use of medicines which destroy the severity of the paroxysms and reduces their number must greatly diminish the liability to these complications, and the danger from them even after they have occurred. In very mild cases of pertussis all are agreed that we have nothing to fear; and these medicines, when early and properly employed, make the severest cases mild and that "cito, tuto, et jucunde."

Second Stage.
III. Drugs —
(C). Sedatives.

The particular drug selected should be effective; that is the consideration first in importance. It should be uniform in its action. It should be as free as possible from danger and other drawbacks. Then it should be given strong enough and often enough to allay spasm. The dose should be sufficient to produce slight drowsiness, and the medicine should be administered often enough to maintain this drowsiness till the spasm subsides, and nothing remains but a common cough. If it be pushed in this way for four or five days during the height of the disease we shall probably have nothing but

Treatment of uncomplicated pertussis.

Second stage. III drugs - C Sedatives.

"plain sailing" afterwards.

I shall now enumerate and criticise the various drugs of this class that have been recommended, beginning with those that appear to me least useful; and shall conclude the section with some remarks on those which I have found and believe to be the most valuable.

The spinal antispasmodics, assafoetida, valerian and musk, have been used and are said to be valuable. Meigs used the former "in a number of cases with" he says "decided benefit in relieving the general restlessness, and in moderating the number and severity of the paroxysms. He gave two or three grains in pill to a child four years old." (1) Dr Meigs's testimony is strong, and commands our respectful attention. Still, with all deference to him and others, this class of remedies does not act so quickly or so effectively as others to be mentioned later on. If used at all they are more fitted to the next stage of the disease.

Assafoetida.

Lobelia. Lobelia (tinct. lobeliae aetheriae) was used by Sydney Ringer, he says, with good effect. He gave large doses — five minims to a child of one or two years, increasing the dose with age, and repeating every ~~four~~ hour. (2) Lobelia in small doses is an expectorant and diaphoretic, and in larger doses an emetic

(1) Diseases of Children p. 242
(2) Dr. Ed. Smith, Article Hooping-Cough, Reynolds System, Vol.

and cathartic. Whether the latter effects resulted from Dr. Ringer's treatment he does not tell us, but it is fair to assume from his silence that they did not. In very large doses it produces convulsions and even death.[1] Such a remedy would hardly be safe to use among the poor, who are apt to administer doses in a rough way, sometimes giving far more than is ordered, sometimes as I have witnessed allowing the child to drink from the bottle. It has not been employed so far as I am aware except by Dr. Ringer, a fact which does not say much in its favour.

{ Second Stage.
III. Drugs-
C. Sedatives.

{ Lobelia.

Inhalations of Chloroform and ether, shortly producing anaesthesia, are said to be of great advantage where the spasm is very severe. Chloroform was found by West of great service in cases where each paroxysm was accompanied by general convulsions, administering it just before the paroxysms came on. This anaesthetic is comparatively safe with children under six years, still a medical man would not be justified in trusting its administration to unskilled persons. West remarks that its efficient employment requires the constant presence in the house of a physician, adding that if death occurred in a convulsion it would be attributed to the an-

{ Chloroform.

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[1] Vide D. Garrods Materia medica.

Treatment of uncomplicated pertussis.

Second Stage. III. Drugs — C. Antispasmodics, &c.

aesthetic' (p. 484) Another objection (if others were needed) is its aptness to produce vomiting, and a stronger still the extreme dislike in which it is held by all children young and old, and its unpopularity with parents.

Aether — Objections to its use

Aether, while ordinarily a safer anaesthetic, suffers also from the objection that its administration is attended with insuperable difficulties. In addition it is unpleasant to the patient, irritating to the tubes and apt to induce bronchitis — a complication particularly to be dreaded in pertussis. Even more than Chloroform it produces emesis. While holding that the treatment by inhalation of aether is carried out with difficulty in ordinary practice it is only fair to add the testimony on the other side by Dr. James Weaver of Longton. This practitioner speaks very highly of the Ether-Spray, not as a cure but as an important aid in the cure of whooping-cough. He tells us he had in the same house two young patients very ill with the disease, and when the younger one an infant of only ten weeks seemed at the last gasp — when all medicines had been abandoned from inability to swallow — he procured a six-penny Spray-producer and some Compound Spirits of Sulphuric Ether, and blew the vapour of the Ether freely into the child's

Dr. Weaver's method of administering

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face and over its clothes. He also directed the nurse to blow it freely about the room at frequent intervals. Dr. Weaver has no hesitation in saying that the free use of these articles saved the life of his patient. Since then he has used the remedy in scores of cases, and has not yet met with one in which there was not a marked relief to the spasmodic cough.(1)

{ Second stage
III Drugs —
C. Antispasmodics.

With reference to the Bromides Dr. J. L. Smith says — 'When there is frequent congestion of the brain, producing convulsions or warnings of convulsions, the use of these compounds is indicated from their prompt and decided action in averting these dangers. Even if the symptoms be mild they have a prophylactic effect. If headache fretfulness with marked stupor occur, if sudden twitching of the muscles or carpo-pedal contractions take place during the paroxysms, the bromides may be given in large and frequent doses.' Bromide of potassium is favoured among others by Falconi and Sydney Ringer. Drs. Gibb and Harley recommend bromide of ammonium as a pharyngeal and laryngeal anaesthetic, to diminish the spasm of these parts, while at the same time it renders the secretion from these parts more free and

{ The Bromides.

(1) Lancet, 5. June, 1880.

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Second Stage. III Drugs — C. Antispasmodics. easily expectorated. They are quite satisfied with its action. Bromide of potash acts in the same way, but is less stimulating.

Without denying the value of the bromides it appears to me more scientific to treat not the convulsions but their cause — viz. the virulence of the paroxysms. By so doing the danger of eclampsia may be more promptly and decidedly averted than in any other way. Nothing can be more contemptible than the ignorant and vulgar habit of prescribing the bromides in all cases of convulsions, treating as a disease what is merely a symptom of many widely different conditions, such as Cerebral Congestion and Cerebral anaemia, confined bowels and diarrhoea, mischief in the kidneys, the setting in of a fever, or the occurrence of some mental disturbance in an epileptic subject. Remove the cause — bleed or nourish the patient, move the bowels & check the relax, relieve the kidneys, calm the circulation & soothe the mental storm by appropriate sedatives, stop the paroxysms that cause the convulsions, and the effects will cease to appear. For the latter purpose the bromine compounds are not without their value, but they are not as powerful and reliable as other remedies.

Conium was introduced as a specific

Treatment of uncomplicated pertussis.

~~As a Specific~~, and is highly spoken of by many physicians on the Continent and elsewhere. It has been used alone and in combination with other remedies. The preparation recommended is the fresh extract. The dose commonly employed for a child of four months is 1/40th of a grain, for a child of one year a twentieth to a sixteenth of a grain, and for older children one tenth of a grain to a grain every six hours. (1)

{ Second stage.
III. Drugs —
C. Antispasmodics &c.

{ Conium.

These doses are utterly useless, and to employ them for the purpose of checking severe paroxysms is nothing less than sheer trifling. I have given it in doses of a grain every four hours to a child of ten months without producing the slightest unpleasantness, and at the same time without affording very much relief. It has its drawbacks. The extract may or may not be fresh, and different specimens even when fresh vary considerably in their potency. It is not so convenient nor so uniform and reliable in its effect on the paroxysms as belladonna and other drugs to be referred to shortly.

{ The writers remarks on.

Hydrocyanic Acid and its compounds (as Cyanide of zinc) have many strong advocates, among whom are Drs Granville, Hamilton Roe, Alee, Elliotson and West. (2) Roe asserts that it will quickly cure whooping Cough, or at any rate abridge its

{ Hydrocyanic Acid.

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(1) Dr. Ed. Smith, article Hooping Cough, in Reynolds's System Vol. I.
(2) Same article.

Treatment of uncomplicated pertussis.

Second stage.
T. Drugs —
C. Antispasmodics &c
Hydrocyanic Acid

duration. He gave to a child of ten to twelve months old one and a half to two minims of Schulz acid every three or four hours or oftener. To older children he gave in proportion to their ages. He has administered one and a half minims every quarter of an hour for twelve hours to a girl of ten. These are dangerous doses! West gives more moderate doses than Rae, but still strong. He begins with half a minim (Lond. pharm.) every four hours for a child of nine months, combining with it if there be much bronchitis small doses of tartarated antimony or ipecacuan wine. In regard to its action he says it "sometimes exercises an influence almost magical on the cough, diminishing its frequency and severity almost immediately; while in other cases it seems perfectly inert, and again in others, without ~~without~~ diminishing at all the severity of the cough it manifests its peculiar poisonous action on the system so as to render its discontinuance advisable. But though he employed it in hundreds of cases he only once saw really alarming symptoms. In that case he gave a boy of two and a half years one minim of dilute hydrocyanic acid every four hours. He never persevered with it unless it gave a very decided

earnest of good within three or four days." The writer of this thesis from a smaller dose than that last mentioned has seen an effect produced about which he considers it discreet to say no more, but which can be conjectured from the fact that he has never used the drug to allay the paroxysms of pertussis since. The same agent in another form — aqua lauro-cerasi — has been given in doses of ℳ vj to children, and ʒß to adults every two or three hours. This preparation has the advantage that the prescription containing it may be read by the recipient without being understood. It is however of variable strength, and for that reason the acid ought to be preferred for use. Mr. Dolan says of Prussic acid that he did not find it very useful: he thinks it dangerous for children and especially for infants."(1) The writer of this dissertation has used it in large doses in severe cases of pertussis, and though bound to admit it has some effect in reducing the violence and frequency of the paroxysms, and might yield sufficient relief in mild cases of the disease, he does not think it will in the severer cases compare favourably with other remedies as an antispasmodic. He would not use it again, except where there was undoubted gastric irritability, and even then in moderate doses.

Second stage. III. Drugs — C. Antispasmodics &c

Hydrocyanic Acid.

(1). T. M. Dolan, Whooping-Cough, p. 75.

Treatment of uncomplicated pertussis.

Second stage.
III. Drugs—
C. Antispasmodics.

Hyoscyamus.

Hyoscyamus and belladonna belong to the same class as hydrocyanic acid. Hyoscyamus is said to be safe and good. There can be no doubt of its safeness as ordinarily used (or even in doses much larger than those commonly employed), Sir T. Watson recommends, if the cough be very troublesome and urgent, to give of the extract "as many grains per day as the child has years." (1) The extract is a very good form in which to administer the drug; but the alkaloid would I think be found the pleasantest most uniform and reliable mode of exhibition. The latter (hyoscyamia) might be combined with hydrocyanic acid and ipecacuanha wine & make a fairly effective mixture in mild cases.

Belladonna.

Belladonna and its alkaloid atropina have been in use for a long time, and are still largely used. They have quite a host of supporters — among the Germans, Boerhave and Hufeland; among the French, Guersant, Barthez and Rilliet, Trousseau and Pidoux; and among the English and Americans, Williams, Jackson, Churchill, G.A. Rees Meigs & Pepper, Fuller & Dolan, (2) &c: and even by later authors they have been much praised. They are said to be more efficient than the preparations of hyoscyamus. Barthez and

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(1) Sir Thos. Watson, Practice of Medicine Vol II. p. 75.
(2) Enumerated by Dr. Ed. Smith article Whooping Cough in Reynolds's System, Vol. I. also by J.M. Dolan, Whooping Cough, p 75

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assert that belladonna is "beyond contradiction the drug most deserving of confidence."(1) Dolan used it largely, and found it to give relief in a large proportion of cases. Powdered belladonna root was recommended by Vallant, a fifth of a grain once a day increasing to four times daily, and diminishing as the spasms subside. He says the spasmodic stage may be positively arrested in three a four days (Sydenham Society's Year-Book, 1862)(1). Almost identical language was used by Dr. Brown-Sequard in his speech before the United States medical Association in May 1866. He asserts that the spasmodic stage of pertussis may be abbridged to a few days by a dose of atropina sufficiently large to produce toxic effects; and recommends it to be administered in doses which will cause and maintain delirium for three or four days, after which he says the cough is no longer spasmodic.(2) The extract is a favourite preparation. Meigs "used it in a very large number of cases with such unquestionable benefit that he regards it as one of the most valuable remedies for this disease. He has not seen it shorten the disease, but almost universally diminish the severity duration and frequency of the paroxysms. He gave ¼ gr. of the extract with alum

{ Second stage
III Drugs—
C. Antispasmodics.

{ Belladonna.

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(1) Quoted by Dr. Wm. Aitken, Practice of Medicine Vol. 1. p. 769.
(2) Dr. J. Lewis Smith, Diseases of Children
(3) Diseases of Children, p. 242.

Treatment of uncomplicated pertussis.

Second Stage. III. Drugs — Antispasmodics.

Belladonna.

every four hours to a child of one year. Dr. Fuller used it largely combined with zinc sulphate with excellent results, and remarks that though there is great tolerance of the drug in children toxic results may occur even when it is given in doses of from 1/24 th to 1/12 th of a grain. (1) MM. Trousseau and Pidoux specially recommend this preparation, giving a child under four years 1/5 th of a grain and the same quantity of powdered leaves made up in pill and dissolved in syrup when given. Another of their formulae was Pulv. belladon., extract. opii aquos. aā. gr iv, extract. valerianae ʒj; M. et div. in pil. xvj; Dij. One to four in the course of the day. They also employed atropia giving 1/174 th of a grain dissolved in distilled water to infants & young children twice daily, and for older children a larger proportionate dose. Another way in which belladonna has been used is in the form of plaster or liniment applied to the back and front of the chest and in this way it has been said to be of much advantage. Dr. Meigs has known a plaster 2' × 3' applied over the larynx and worn several days to afford relief when the laryngismus was severe. (2) Dr. West sometimes gave the tincture when the cough was distressingly frequent, beginning with m ij. every four hours for a child of one year. Dr. J. L. Smith thought the tincture the most convenient

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(1) Meigs and Pepper, Diseases of Children, 1. p. 242, 243.
(2) The same, p. 244.

form. Of this he gave doses of the same strength as West, but only morning and evening, commencing with a small quantity and continuing the dose which produced the rash, unless a smaller one moderated the cough. In the majority of his cases no decided effect was observed until the rash was produced, then the cough became less frequent and severe. He says "by this method the spasmodic stage may not only be rendered mild but abridged to two or three weeks; in some cases the cough begins to yield almost immediately, while in others its continuance for some days is necessary with other remedies as adjuvants before there is any appreciable benefit." With some of Dr. Smith's statements I don't concur. That the tincture is the most convenient form of administering the drug I question. It is more convenient than the extract or powdered leaves, but there is no doubt that the liquor atropinae B.P. and the liquor atropinae sulphatis B.P. are the most convenient, because the most pleasant and the most reliable forms in which belladonna can be administered per. lion's. Then would it not have been better instead of giving ten drops twice a day to have given five drops four times? As regards doses, infants and

Second stage.
III Drugs – C. Antispasmodics &c.
Belladonna.

Treatment of uncomplicated pertussis.

Second stage.

III. Drugs — (Antispasmodics &c)

Belladonna.

Children bear and require a large, proportionate dose than adults, and it can with few exceptions be administered to even the youngest infants in a quantity gradually increased till the cough is moderated & physiological effects are produced. These effects are more readily produced in some than in others. Dr. J. L. Smith in the case of a child of three and a half years gradually increased the dose of the tincture to twelve drops without producing the characteristic efflorescence, while equally large doses produced it in older children. Trousseau and others confined themselves to moderate doses, but the majority of writers recommend the remedy to be pushed till slight symptoms of poisoning appear. Now these symptoms are sometimes alarming. Dr. J. L. Smith observed in one of his cases suddenly developed muscular weakness, so that the head and trunk were supported with difficulty, and there was such diminution of the urine that he had to discontinue the remedy. Steffen who at one time used belladonna in many cases and with some benefit thinks the symptoms of poisoning produced by large doses not unimportant. He has observed where it has been used for a

Doses.

Second stage.
III. Drugs —
C Antispasmodics.

Belladonna.

long time and especially in young children a depression of strength which threatened danger at the time. At the same time he is of opinion that very moderate doses produce but slight advantage.[1] The view now stated contains much truth. Employed by itself belladonna is decidedly effective only in doses which produce poisonous symptoms. In whatever form the remedy is administered it will therefore be proper to watch its effects that it may not be pushed till extreme dilatation of the pupils, redness of the conjunctiva, faucial irritation, and the efflorescence be produced. Employed by itself in moderate doses it is of little avail, but it will be found of decided advantage when used as an adjuvant with other antispasmodics, as the liquor morphiae hydrochloratis, or hydrocyanic acid, or still better butyl-chloral hydrate or chloral-hydrate.

Opium.

Opium preparations have been much used and praised. The tincture was Sir William Watson's favourite, his prescription being Tinct. Opii ♏xx, Antim. tart. gr j, Aq. ℥j: Sig. ʒj or ʒij every evening or other evening.[2] Dr. Pearson's favourite formula was tinct. opii ♏j, Vin. ipecac. ♏v, Sodae bicarb. gr ij, every four hours after the operation of an emetic.[3] Mr. Dolan used

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(1) Dr. Steffen, in Ziemssen's Cyclopaedia, Vol. VI, p. 726.
(2) Sir T. Watson, Practice of Medicine, Vol. II. p. 75
(3) Quoted by Dr. Ed. Smith, article Hooping Cough, Reynolds' System, Vol.

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Second stage
III. Drugs
C. Antispasmodics &c

Opium and its preparations

paregoric in doses proportioned to the age of the infant when the cough was troublesome and there was some dyspnoea. Chlorodyne, nepenthe and Battley's solution are superior preparations, though they have the disadvantage of being secret complex mixtures. The last mentioned and codeia have been highly praised. The plasta and liniment applied to the back and front of the chest have proved it is said advantageous. Dr. Ed. Smith "believes morphia the best remedy we have, as it is more certain and uniform than belladonna hyoscyamus or Opium, and that it has a less injurious effect on the bowels and sensorium than the tincture. The dose should be just sufficient to produce slight drowsiness for a few days, when the cough will probably subside and become merely a common cough." He adds that in certain cases the addition of bicarbonate of soda has lessened the irritability and promoted expectoration. There is a certain amount of truth in the foregoing remarks. The best way of administering opium in pertussis is for obvious reasons in the form of morphia and its salts, and I think the most convenient preparations are the liquor morphiae hydrochloratis or liquor morphiae acetatis of the pharmacopoeia. There

Treatment of uncomplicated pertussis.

especially when combined with specacuan form a valuable palliative remedy for simple pertussis. If I were using opium in a case of whooping-cough I would prescribe somewhat as follows for a child of ten or eleven months— ℞. Liq. morph. hydrochl. m. xviii, liquor atropinae m ii (= gr. 1/60 ℞) acid. hydrocyan. dil. B.P. m iv, Vini ipecac. ʒj, Syr. simplicis ʒij, Aq. ad ʒiij. Sig. ʒj 4tis horis: and for older children in proportionate doses.

{ Second Stage. III. Drugs— C. Antispasmodics, &c.

{ Opium.

Chloral Hydrate. How it came to be first employed in the treatment of pertussis I cannot say. Possibly as the paroxysms are apt to be more severe at night, and the patient in consequence deprived of the necessary sleep and rest, this convenient hypnotic suggested itself. Possibly Chloroform having been found so effective in reducing spasm of all kinds suggested the resort to Chloral hydrate. Whatever first suggested its use it has long been employed, and possibly no remedy is more largely employed in the treatment of pertussis at the present day. It is recommended by Murchison, Ballantyne, Richardson and Lorrey. The latter observed, not merely an amelioration of the attacks, but the shortening of the duration of the disease; but Steiner denies the latter action. (1)

{ Chloral-hydrate.

(1) Dr. Steffen, in Ziemssen's Cyclopaedia, Vol. vi. p. 726

Second stage.
II. Drugs –
C. Antispasmodics &c.
– Chloral.

I have employed it extensively myself, and now seldom use anything else. I can find no words sufficiently strong to praise it. It has no drawbacks whatever. It is free from the risk of producing sudden death, as in hydrocyanic acid; it does not produce great prostration, as belladonna does when given in effective doses; it does not destroy the appetite, confine the bowels and check expectoration as the opium preparations do. It is incomparably more uniform ~~and~~ reliable and effective in its action than any remedy yet mentioned. If given in sufficient doses it at once suppresses the violence of the spasmodic seizures. No paroxysms can withstand it: it destroys them and prevents the whole brood of complications to which they give rise. The doses I have found necessary are for a child under one year from 1/2 to 1 2/3rds of a grain, as e.g. Chloral-Hydrate gr xv – ʒj, Vin. Ipecac. m xv, Syrup. simpl. ʒiv – ʒvi, Aq. ad ℥ iss: Sig. A teaspoonful every 2nd, 3rd or 4th hour according to the frequency and severity of the paroxysms. For a child of two years I prescribe two grains; as e.g. Rx Chlor. hydrat. ʒij, Aq. Chloroformi ʒiv, Aq. ad ʒii: A teaspoonful &c. as above. In the case of medicine dispensed at my own house I always use graduated bottles, carefully

explaining to the nurse that she is to give down to a line exactly at every dose. This practice is most satisfactory in its working, and I consider an important one in the case of young children.

Second stage.
III. Drugs —
C. Antispasmodics &c.

Butyl-Chloral hydrate (formerly improperly known as Croton-Chloral hydrate) has not been much used hitherto, I suppose because Chloral was in the field before it; and when used in Britain it has been in very small doses. Mr. Robert Wharry (Lancet 29th April 1882) thinks the death-rate from pertussis might be much reduced by its more general use. In his experience its value in whooping cough is as great as that of salicylate of soda in acute rheumatism.

Butyl-Chloral hydrate

Many severe cases in which he feared a fatal result have yielded to it in a manner beyond his expectation. He considers it safe and best given to children in small often repeated doses which may be increased from day to day. With Mr. Wharry I quite concur in all but his concluding remark. I dont see any reason for increasing the dose from day to day, but would at once proportion it to the age of the patient and the severity of the case. It has all the efficiency of Chloral hydrate, and in addition the great advantage of not acting as a cardiac depressant.(1) Of late I have employed it much

(1) Vide article Croton chloral hydrate in Dr. Garrod's "Materia Medica".

Treatment of uncomplicated pertussis.

Second stage. III. Drugs — C. Antispasmodics &c. giving it in the same doses in which I prescribe chloral hydrate. E.g. For a child eleven months old I pescribed — ℞. Croton-Chloral Hydrat. ℈i, Syr. Simpl. ʒv, Aq. ℥iss.

Butyl-chloral hydrate ʒi 3tis horis vel frequentius si opus sit. The results I have obtained leave nothing to be desired. I regard it as the best remedy we have for pertussis even ranking it before chloral-hydrate. I think that if this drug should ~~it~~ come to ~~supersede~~ all others in the treatment of the disease the mortality from it would be almost abolished. The drug is comparatively new and but little known, and that is the only reason it is not more generally used; but there is or ought to be a very great future before it.

Before leaving the treatment of the second stage I must add that it is proper during this period as at the commencement and throughout the course of the disease to enquire after the action of the bowels, regulating them if necessary by a dose of magnesia or syrup of rhubarb and castor oil, daily or every second day or otherwise as the case requires. The latter mixture is a popular one, well taken by children, and reliable in its action. Nearly as good in this respect is calomel and powdered sugar in equal parts, and coloured with carmine, or the lozenges containing two grains

which are sold by wholesale druggists, and which may be given whole, a a half, third or fourth at a time according to the age of the patient. Sir Thomas Watson, ~~used to give~~ recommends a grain or a grain and a half of Ipecacuan three or four times a day. He says "it generally keeps the bowels sufficiently open, and seems to have a beneficial operation on the mucous membrane of the air-passages also."(1) He suggests as an alternative that a few grains of rhubarb and Ipecacuan be given every night. No doubt it would act if the Child could be induced to swallow it, but it would be cruel to put a child through such an agony.

Second stage
II. Drugs —
C. Antispasmodics &c.

(1) Sir T. Watson, Practice of Medicine, Vol. II. p. 75.

Treatment of pertussis in its third stage.

There is no doubt that the duration of this stage can be shortened. It is a comparatively easy matter now to moderate the cough, diminish the catarrh and hasten the recovery of the patients strength; and these are the objects we should set before us now. Precautions must still for obvious reasons be taken against exposure to cold and damp. As regards drugs so many and so different are the remedies proposed that we cannot help believing of many of them that when a patient gets better it is a case of "post quod sed non propter quod." When the patient is going on well the best medicine is change of air.

Specifics have been recommended. Dr. John Lowe of King's Lynn thought that good was derived in this stage from the use of benzole.

The stimulating antispasmodics have been largely prescribed — asafoetida, castor, musk, oil of amber, cantharides and camphor especially the two last. Asafoetida has been recommended to be given in emulsion, to a child of two years one or two grains three or four times a day or even as often as every two or three hours. Asafoetida is a valuable drug, but to give it in any form to a child would be a difficult disagreeable task; and I fear the nurse if she did not "throw physic to the dogs," causing

them to depart quickly, would on her own responsibility place it on the mantelpiece and finally remove it to some distant cupboard. Few are the adults who can be got to take it except in the form of pills. } Third stage.

For the cough, narcotic and expectorant remedies of various kinds may be administered. Dr. Aitken recommends small doses of laudenum or belladonna combined with ipecacuan every two three or four hours; and this is not a bad prescription at all especially if there be gastro-intestinal catarrh, though the preparations of morphia are preferable to those of opium. I have found Chloral hydrate answer very well, and butyl chloral perfectly satisfactory. I think the same medicine used during the second stage may with benefit be continued during the third; the parents too will be better satisfied, they are suspicious of changes in the mixtures. } Relieve the cough.

If the expectoration be too profuse, tonics and counter-irritants will be useful. Meigs says the patient sometimes becomes pale and weak in the course of the disease from anorexia vomiting and violent paroxysms; in such cases, when there is no fever or only a little evening pyrexia, he employed tonics, as the tinct. Cinchonae flav. or the syrup. ferri iodidi, with much advantage. He } Diminish the catarrh.

Treatment of uncomplicated pertussis.

Third stage. } Restore the strength } adds that "when the Apetite has been very feeble quinine in doses of a grain three a four times a day at the age of three a four years has restored it more rapidly than any other remedy we have used." (1) Cullen says Cinchona is the most certain way of curing the disease.

Oxide of zinc, Arsenic, tannin (Speigel) alum (Bodanus) and the preparations of iron are among the other tonics that have been used at this stage. Sir. Thomas Watson says that alum in doses of three a four grains every four or six hours has been given with apparent benefit, when there has been much bronchial catarrh and no fever and the expectoration is attended with difficulty a vomiting. Under these circumstances West also recommends it even during the preceding stage, asserting that it will diminish the secretion, arrest the vomiting, and render the cough much less frequent. He suggests three a four grains every four a six hours to a child under two years (p. 490). In other cases where there is pertussal catarrh with anorexia and vomiting he says hydrochloric acid is of much service and also zinc sulphate and extract of belladonna in gradually increasing doses. Mr. Dolan says that in this stage the syrups of the phosphate and of the iodide of iron and cod liver oil may be given

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(1) Meigs and Pepper, Diseases of Children, p. 247.

Treatment of uncomplicated pertussis.

with benefit[1]. Among other ferruginous preparations the citrate of iron and ammonia, the compound syrup of the phosphates are fairly well taken by children. So too is the citrate of iron and quinine made palatable by the addition of syrup of oranges. They are useful in the absence of pyrexia for removing catarrh and the cough to which it gives rise, and for generally improving the patient. While speaking of tonics we must not forget Change of air, which is said to be of great value, not only from the town to the country, but even from the country to the town; and distance is not of much importance so the child be removed from an infected atmosphere and from the society of affected children. Sir Thomas Watson says that "when the child is well in other respects, but seems to cough as if by habit, change of air will often remove the cough as if by magic, and the shower bath and iron will sometimes succeed if change of air be not practicable." Dr. West says that "of all means which promote recovery from whooping Cough, and the feeble health it often leaves behind, none is to be compared with Change of air especially to the sea-side, and if opportunity offers and the season be favourable it should never be neglected." The warm bath has been advocated at this stage. The rule of my practice

{ Third stage.

{ Restore the strength.

{ Change of air.

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1) T. M. Dolan, Whooping-Cough, p. 90.

Treatment of uncomplicated pertussis.

Third stage. In this stage is — get rid of the cough and the weakness that is left behind by tonics, preferring that which is the most pleasant and effective of all viz. change of air especially to the country: where that cannot be had, and in the great majority of cases it cannot, I prescribe the citrate of iron and quiniae as in the following for a child under two years — R Ferri et quiniae cit. gr. xij Syrup. aurantii floris ʒi, aq. ad ℥ij. Sig. ʒi quater in die post cibum.

Summary of the therapeutics of pertussis. To sum up what has been said on the subject of drugs — We have no specifics, and are therefore compelled to adopt palliative treatment, than which if pushed vigorously nothing can be better. Of course our treatment should vary according to the case, but the number of drugs necessary for even the severest attack is small. In my own experience the sedatives have proved the most useful. The preparations of belladonna, morphia and hydrocyanic acid or combinations of these have no doubt their value; but what I myself have found by a long way the most satisfactory are as before mentioned butyl-chloral hydrate and chloral hydrate: and I am firmly persuaded that the proportion of cases treated by them that will escape complications and recover "tuto cito et jucunde" will be larger than in the case of those treated by any other method.

Treatment of Complicated Pertussis.

Whenever a child is ill between the paroxisms complications should be searched for. They are easy of detection. Generally speaking these require the same treatment as in their idiopathic form, the complication being the primary care the pertussis, though not lost sight of, occupying only a secondary place in our consideration. Meigs judiciously remarks that means of too powerful or exhausting a nature should not be used, for after the complication is cured the patient has still the original disease to go through and therefore requires all his strength. If we take them in the order of their frequency we have to consider

I Complications Connected with the respiratory System.

Of these bronchitis is the most common, so common that it is the practitioners duty to be on the watch for its occurrence. Should it arise the treatment of the case will require modification. {Bronchitis.

If the large tubes only be affected then we have simply whooping-cough plus bronchitis to deal with. The patient should be put to bed, the diet regulated, ~~and~~ the bowels gently opened with say a dose of syrup of Rhubarb and Castor oil, and poultices with or without mustard applied to the chest. The {(a) of the larger tubes.

(1) Complications of the respiratory organs. Bronchitis

narcotic or sedative already in use may be continued or paregoric substituted with the addition of ipecacuan wine and spirits of nitrous aether in small doses, care being taken that it is administered at frequent and regular intervals possibly every three hours.

(b) Of the capillary tubes.

If on the other hand the capillaries be affected, and the secretion be very profuse, with difficulty in removing it indicated by dyspnoea and frequent cough, sedatives and all depleting and depressing remedies such as antimony must be discontinued, lest we increase the gravity of the symptoms and induce fatal results. The chief object is to keep the tubes clear, and this is done by administering stimulating expectorants and by sustaining the patients strength, placing him in a large warmed and ventilated room, and giving him nourishing and proper diet, milk beeftea, chicken broth, brandy and water if necessary. The mixture may advantageously contain senega with ipecacuan or squills, and an alkali such as the carbonate of ammonia or the nitrate citrate or bicarbonate of potash; and possibly an occasional emetic may be given. ~~In pyrexia warm baths are beneficial and ferruginous tonics and astringents generally are counter indicated. The bowels should be attended~~

Treatment of complicated pertussis.

Much benefit will be got from counter irritation to the front and back of the chest by mustard poultices. Warm baths are grateful to the patient. Ferruginous tonics and astringents are injurious so long as there is pyrexia present. The bowels should be attended to, Constipation being relieved by Castor oil, and diarrhoea checked by such remedies as the Chalk mixture and Catechu without resorting to opiates. After convalescence commences then iron wine or syrup of the phosphate of iron, with cod-liver oil Emulsion and change of air (if the season be suitable) will quicken and complete the re-

{(a) Lung Complications.
(b) Capillary bronchitis.

establishment of strength.

In Collapse lowering remedies must not be given. If the patient be strong a mild Emetic of Ipecacuan or Sulphate of Copper may be administered; but most reliance is to be placed on nourishing diet such as milk, Eggs and Liebig's Extract separately, or combined, on Stimulants, such as the Aromatic Spirits of Ammonia, the Brandy, and Egg mixture or simple Brandy and water; and on Rubefaciants to the Chest, Among which mustard poultices are good, but what has generally answered better in my experience is the applying with

{Pulmonary Collapse.

Treatment of Complicated pertussis.

(1) Lung Complications. Collapse. A camel's hair-brush of a single very thin coat of glacial acetic acid. It has answered better in this way — when a mustard poultice ordered to be is applied to a child, a row is set up, and the poultice is generally removed almost immediately; whereas if the medical attendant apply a thin coat of glacial acetic acid and then depart the uproar occurs but the cause is not taken away, and decided redness of the skin is produced. The means above mentioned will often speedily and thoroughly remove this Complication, which, if it had been treated with an opium preparation and antimonial wine, might have killed the patient.

Pneumonia. If pneumonia set in what is to be done & left undone? Sir Thomas Watson advises leeches to the surface, warm baths, blistering, with a mixture containing tartrate of antimony, nitre, and possibly small doses of hyoscyamus. Meigs says that bleeding at the arm or leeches to the chest might be had recourse to, but not unless urgently called for; and that possibly small doses of antimonial wine, Spirits of nitrous ether, and Dover's powders do best. Steffen on the

Treatment of complicated pertussis.

Lung complications—

Pneumonia.

other hand asserts of blood-letting that it is positively injurious, and that we should confine ourselves to digitalis, quinine, &c. and later on expectorants and emetics if necessary. Here is conflicting advice.[1] It is to be hoped that the days of heroic blood-letting in pneumonia are past, as the mortality from that practice was very great. At the same time there is no doubt that leeches to the seat of pain give relief to the pain (Dr. W. Aitken, Vol. I, p. 731) and if few in number possibly have no injurious effect on the after-course of the case. Dry cupping may be employed without hesitation. Relief is also given by mustard or other rubefacients between the shoulders (Aitken, loc. cit.) But in the treatment of pneumonia whether secondary or primary antiphlogistics, if employed at all, should be employed very sparingly so as not to lower the patient's strength. The tendency with infants and children with this disease is almost invariably to recover if they be allowed, so that in their case the less treatment the better, with the exception of placing the patient in a warm and well ventilated room, relieving pain with an opiate, and thirst

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[1] Dr. Steffen, Ziemssen's Cyclopaedia, Vol. VI. p. 730

Treatment of complicated pertussis.

(Lung Complications.) Pneumonia. } with some fruit-drink, attending to the bowels, and sustaining the strength by good beef-tea and milk, adding wine or brandy if necessary. On referring to my prescription-book I find that a little girl just under four years with inflammation of the lower lobe of the left lung was treated as follows — To begin with the bowels were cleared out by a draught consisting of ℥j of Castor oil and grs x of magnesia beaten up in about an ounce of milk. Then the following mixture was given — Liq. morphiae hydrochl. ℥ß, Vini Ipecac. ℥j, Liq. Ammon. Acet. ℥ij, Syr. Simpl. ℥j, Aq. Camphorae ad ℥iij: Liq. ℥ij 3tis horis. After the child had ceased to complain of pain the morphia was left out of the mixture, tinct. aconit. mXX being substituted, a dose to be administered every four hours; and the bowels were again moved with a two grain calomel lozenge. When the temperature had subsided the mixture was changed for one consisting of Spirit. Ammon. ar. mXLV, Spir. aether. nit. ℥ij, decoct. senegae ℥ij, Aq. Chloroformi ad ℥iij: Liq. ℥ij 4tis horis. If at this stage the cough be troublesome I give as follows to a child under four years —

tinct. hyoscyam. ℥ij, Vin. Ipecac. ℥j, Spir. aether. nit. ℥j, Syr. aurantiff. ℥j, Aq. ad ℥iij: Liq. ℥ij 3tis vel 4tis horis. I find this

Treatment of Complicated pertussis.

treatment works very satisfactorily. { Lung Complications.

In regard to pleuro pneumonia or pneumo-pleuritis (there is generally some pleurisy with pneumonia) the same { Pleurisy.
treatment is necessary as for pneumonia, beginning with paregoric or some opiate to relieve pain. If the complication be of considerable extent, and the child strong and healthy, a few leeches might be applied to the seat of pain; but the cases are few in which such a course is necessary. ~~Of twelve cases treated by Dr. Meigs five proved fatal~~. When the patient is convalescent we must guard against a relapse by keeping the patient warm adding flannel underclothing and confining to the house till it is safe to go out.

II. Complications Connected with the nervous system.

If Convulsions should occur great care should { Convulsions.
be taken to prevent the recurrence of this most dangerous complication. With this object the constitutional cause or condition which has given rise to the Convulsions should be sought for and treated, and at the same time some strong antispasmodic as butyl chloral hydrate, chloral hydrate or one of the bromides administered in strong doses. The doses of the bromides usually

Treatment of complicated pertussis.

(2) Complications of the nervous system.

Convulsions.

given are as has been pointed out by other writers almost useless.
For a child under one year five grains of the bromide of potassium, and for older children in proportion to their ages, may be fearlessly and advantageously prescribed. If dentition be proceeding and the gums be red and swollen they may be lanced, warm foot baths ordered, and a dose of calomel and castor oil given. If there be gastro-enteric disturbance it should also put right, confined bowels being opened by rhubarb and soda a rhubarb and calomel, and diarrhoea checked by a Dover's powder or two. If the convulsions be due to severe bronchitis, warm baths and large mustard poultices to the front and back of the chest, mustard foot baths, with appropriate medicine as chloral hydrate in small doses and ipecacuan wine, or if it be preferred a combination of the latter with liquor atropinae and hydrocyanic acid. If it be due to extensive collapse of the lungs, counter-irritants, stimulants, &c. should be resorted to. If to pneumonia, hot baths &c. If to cerebral congestion it is usual to apply cold to the head, and place the body in a warm bath, to put leeches to the temples or behind the ears, to purge freely, and apply mustard leaves

Treatment of Complicated pertussis.

a blister to the nape of the neck. If the onset of convulsions be sudden without headache or any symptom of inflammation the bromids or chloral hydrate if had recourse to in full doses will often save life. As regards the immediate treatment of a child in a fit under these or other circumstances by far the best according to my experience is to inject a dose of chloral dissolved in tepid water into the rectum. This drug if injected hypodermically my experience is that will at once stop convulsions, but it will also almost certainly produce a severe localized cellulitis.

{2 Complications of the nervous system.
{Convulsions.

Simple meningitis may be present with or without convulsions. When this complication occurs there is headache, the head feels hot to the touch, the eyes are suffused, the child is drowsy and lies with its face turned from the light. Squinting is sometimes present, and is a symptom of grave omen. There is considerable fever. The breathing is accelerated. Great care should be taken as West remarks by careful and if necessary repeated auscultation lest we mistake this for some mischief within the Chest, for if free depletion and large doses of tartar emetic

{Simple meningitis

Treatment of complicated pertussis.

(2) Complications of the nervous system.

Simple Meningitis.

be employed we might destroy a life. It is usual to treat slight cases of this very serious complication with warm foot or general baths, evaporating lotions a ice to the head, and by Calomel in purgative doses, with the bromides or chloral to secure sleep: while in the graver cases it is customary to apply two or three leeches to the temple or behind the ears. If leeches be used at all they should be applied few and early, care being taken that the hemorrhage is stopped after it has proceeded a reasonable time. I have seen most good from placing the child in a quiet and darkened chamber, elevating the head and shoulders, applying mustard poultices to the Chest, ~~and~~ administering Calomel in purgative doses, and some sedative as chloral belladonna, hyoscyamus or the bromides.

Tubercular meningitis.

In tubercular meningitis it is necessary to attend to the bowels, to keep up the strength with milk (the food all children take best and longest) and beef or chicken broth: and last but not least to procure quiet and sleep with butyl-chloral hydrate or the bromides.

Spinal irritation evidenced by Opisthotonos contractions and frequent vomiting may

Treatment of complicated pertussis

occur while dentition is proceeding. Frequent vomiting for obvious reasons is apt to increase the mischief. Here chloral is of great value, though usually the bromides have been resorted to. The bowels should be enquired into, and the gums lanced if necessary. {Complications of the nervous system

Sometimes the paroxysms it is said are so violent and prolonged that suffocation or convulsions seem imminent from the spasmodic closure of the glottis. For this condition Dr. Meigs recommends fanning, or sprinkling the face with cold water, or if the weather be warm taking the patient to the open window. {Excessive laryngismus.

M. Bell and Dr. Churchill (Diseases of Childhood, p. 273) speak highly of the inhalation of sulphuric ether at the commencement of the paroxysm, the former directing it to be sprinkled on the clothes of the patient, the latter recommending half a dram to be spilled in the nurses hand and held before the Childs mouth and nose. They say it rarely fails to give relief.(1) This use of ether implies a nurse in constant attendance, and consequently is impracticable among the poor where the severest cases are seen.

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(1) Meigs and Pepper, Diseases of Children, p. 251.

Treatment of complicated pertussis.

Complications of the nervous system.

Excessive laryngismus.

Even where there is a nurse it is a troublesome method. But why wait till the paroxysm appears before adopting measures for its relief? Why not keep the child continually under the influence an antispasmodic such as chloral or butyl-chloral? If the child be given full and frequent doses of either of these remedies I confidently assert that prolonged and violent laryngismus will not and cannot occur. Prevention is more scientific and better every way than cure.

III. Complications connected with the digestive system.

Typhoid (infantile remittent) fever, a complication of exceeding gravity, may occur, though happily it is very rarely seen, in the course of pertussis. When it does the diet should be strictly confined to milk and eggs, which should be given every two hours, and the patients strength kept up with dilute nitric acid a dilute sulphuric acid and quinine.

Diptheria.

Diptheria is mentioned by German writers as likely to supervene where it is endemic or epidemic. I have never seen this disease complicating whooping cough. It is said that the exudation is apt to appear on the ulcerated surface beneath the tongue, and on other parts as well.[1] When mild the complication, as when it is idiopathic, is apt to

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[1] J. L. Smith, Diseases of Children.

Treatment of Complicated pertussis.

escape notice. It requires the same treatment as when it is a primary disease

{Complications of the digestive system

Vomiting when unduly frequent requires checking. The treatment by cochineal was introduced by Wachsl. Aitken says this drug gives relief. The usual prescription is Cochineal ℈ß, potass. bicarb. ʒj; sacchar. alb. ʒij; aq. purae ℥iv. Powder & gether and strain. To a child of one year mXV, for a child two years ʒß, and for a child of four years ʒj four times a day. Dr. Wm. Aitken says the vomiting always disappears under the persistent use of this drug.(1) That is an indisputable fact. What is equally certain is that it will disappear with the persistent use of anything even with tartar emetic, and that it will disappear of itself if left alone. Cochineal is perfectly harmless, but in my belief perfectly useless, except that it may take the place of some drug such as laudenum which has been deranging the stomach. The best ingredient in the prescription is the bicarbonate of potassium. If I had to deal with a case of excessive vomiting I would restrict the diet to milk and soda water or milk and lime water in equal parts,

{Excessive vomiting.

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1) Dr. Wm Aitken, Practice of Medicine, Vol. j. p. 769.

Complications of the digestive system. } to be given at regular and frequent intervals and in small quantities at a time, possibly ordering a mustard poultice to the Epigastrium, and prescribe some what as follows for a child under two years — ℞ Butyl-chloral hydrate ℈j, Acid. hydrocyan. (Scheele) m iv, liq. bismuthi et ammoniae cit. ʒiss, aq. chloroformi ʒx, aq. destil. ad ℥j. Sig. ʒj 2ndis horis. Hydrocyanic acid is useful for the vomiting, whatever it may be for the paroxysms.

Diarrhoea. } Intestinal catarrh is a serious and not infrequent complication in infants. The diarrhoea is often preceded by vomiting. It has been stated that generally when diarrhoea begins the pertussis symptoms, as in other complications, abate and rapidly disappear. Sometimes it is said the relax defies all treatment and carries of the patient; but these I fancy would be cases of tabes mesenterica. Dr. R. J. Lees thinks the best results are obtained not by attempting to lock up the discharges by opiates and astringents, but by the administration in full doses of quinine and iron,(1) and by the application to the abdominal surface of stimulating liniments.

(1). Lancet, 7th. May, 1881; p. 730.

Treatment of complicated pertussis.

Complications of the digestive system.

I am bound to admit that I have witnessed good results from a mixture containing solution of the perchloride of iron and tincture of digitalis. { Diarrhoea.

I have also found a mixture of hydrocyanic acid and hypophosphite of lime answer well in the following proportions, in a child under three years — Acid. hydrocyan. (Scheele) m. iv, calcis hypophit. ʒj, Spirit. Chloroformi mxl, aq. ad ʒiij; Sig. ʒij quater in die. I prefer however a combination of hydrocyanic acid and bismuth as, e.g. for a child under one year — Ac. hydrocyan. dil. B.P. m iv, Bismuthi subnit. (vel Carb.) gr. xxv, mucilag. acaciae ʒiij, Aq. Chloroformi ad ʒj; Sig. ʒj 3tis horis.

Should all fail my sheet-anchor is Dovers powders, in doses of one grain for a child under a year old, one to be taken after each liquid motion.

Finis.