Scarlet Fever and The Milk Supply with Notes of an Epidemic

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Introduction

The origin and native habitat of Scarlet Fever is unknown, and there is no record of it in ancient times; even at the beginning of the Seventeenth Century it was looked upon as only another form of measles. It was not until Sydenham observing the epidemics of 1661-75, established the nature of Scarlatina as an acute specific disease, separate from Measles, though which conducts that the "oldest notice relating probably to an epidemic of Scarlatina dates from Sicily 1543." In distribution, it was confined, until comparatively recent years, to the Continent of Europe, which still remains the chief centre of the disease. In Asia and Africa it has not obtained much prominence

though it must often have been imported into these countries. This immunity cannot be attributed to the colour of the natives, for it has been shown that negros suffer equally with whites, in the United States where it is prevalent; nor can it be from their tropical position, as it is firmly established in South America. The varying type was early recognised but nothing known of the conditions, causing a mild or severe outbreak; why for a series of years the character of the disease should be so slight, to be followed again by epidemics of the most malignant nature.

A study of Statistics shows that males and females, are nearly equally susceptible. The age at which it is most prevalent is from 5 - 10 years

with a rapid fall after the tenth year; it is not well marked under six months.

Mortality varies greatly, and may be three per cent. in some to thirty per cent in other outbreaks. The maximum is in the third year of life, diminishing slowly for the next few years, but afterwards rapidly, no doubt due to the proportion of the population protected by a former attack, as well as the increased power of withstanding a disease, by increased strength. It becomes dangerous again after thirty years, in proportion to the numbers attacked.

Aetiology

"Concerning the nature of the Scarlet Fever poison, its specific character is beyond question, and it may be with good reason, taken to be an organised body, But all enquiries and experiments have not furnished any certain knowledge about it". This may be taken as the extent of the knowledge of the aetiology up to a very late date, and is met with in different language in all the text books. What was the origin or evolution of the "organised body" may or may not be discussed; is it capable of spontaneous generation or is infection always the result of poison eliminated by a previous Case, are questions that have again and again

*References will be found on Pages 95 and 96

been discussed. While he do not think would, in many cases even at the present day, be the easiest way out of the difficulty, but in this connection Herbert Says the disease never arises but in consequence of the conveyance of a specific poison, and here is the evidence of Tyndall against spontaneous generation.

To trace the cycle of the disease from an antecedent case, is often impossible, and would be so oftener even if not recognised that the infective material is capable of existing in a latent condition for an indefinite time, numerous cases being on record where the disease was traced to a case, months or even years previous;

the cause being stored away in clothes, to become active when these were disturbed and brought into contact with a susceptible person. In those diseases where it has been shown that the virus attacks both man and animals fewer difficulties have presented in tracing the source of infection. That Scarlatina can be so traced from animal to man, is a problem capable of demonstration.

During the Epidemics it was recognised that the virus was capable of contaminating milk, and was thus carried to the consumers. In 1881 Mr Ernest Hart[2] tabulated the results of investigation into epidemics caused by milk, but it was still looked upon as an

accidental contamination from some human source. This advance in the knowledge of how infection might be spread, opened the way for the discovery of 1882, when the contamination from any human source could be reasonably excluded.
On that Great Mr. Power' was called upon to investigate on behalf of the Local Government Board, into the cause of an outbreak of Scarlet fever and throat illness, occurring in various districts of London, and found the origin of the epidemic to the milk supplied by a retailer, receiving his supply from a farm in Surrey. It was proved that the milk was contaminated before reaching the dairy, and enquiries at the farm showed that there had

been no cases at or within several miles of the farm for months. There was therefore no reason to show that it had been contaminated in any of the usual ways from a human source. It was found that one of the cows had calved about a week, and milk from this cow had been added to the supply three or four days, before the outbreak. When this cow was examined, about a month after, it was observed that she had lost portions of her coat, and the udder was stained with vaginal discharge. The question then arose, whether the lochial discharge, mixed with the milk, from this cow, was the cause of the Scarlatina; the matter was then placed in the hands

of D. Klein's investigation. It was then found that this discharge inoculated and given with food to other animals caused no obvious illness. But it found that muco-purulent discharge from the throat of a Scarlet fever patient, inoculated into a healthy cow, as well as given with food, produced general disturbance; that pus, taken from the resulting abscess at the seat of inoculation, in the cow, inoculated into dogs, caused illness in four days. A cow was inoculated, the day after calving, with throat discharge with the result that an abscess formed; the lochial discharge from this cow added to her milk and inoculated into two dogs caused local and general disturbance, one of them having discharge

from the tonsil. The most significant point gained by these experiments was the fact that, a cow inoculated with the discharges from human Scarlatina contracted a general illness and that inoculations from this cow appeared after an incubation period of four days, — inoculations of ordinary pus caused nothing at once. Suspicion has thus aroused that milk might be infected from other than a human agency, and the way opened for further investigation.

Prominence was again given to this subject when in 1885 Dr. Wynter Blyth, Med. Off. of Health for South Marylebone, reported to the Local Gov. Board, that an outbreak of Scarlet Fever was in his district, and that so far he had been unable trace contamination

from any previous case; but at the same time it was beyond doubt that infection had been spread by means of the milk supply. On behalf of the Board, Mr. Power took up the matter and found that the customers of a particular dairy in North Marylebone had developed Scarlet fever to a very marked extent within a limited period. It was proved beyond doubt that the milk was not infected after reaching the dairy, and that the supply was derived, to a large extent, from a farm at Hendon. Enquiries at the farm showed that besides sending milk to North Marylebone, it was also retailed in St Pancras, Hampstead, St Johns Wood, and Hendon. In three of these districts Scarlet

fever had appeared, at the same time, but there were no cases, in the two last named.
At or around the farm, or among the workers no illness had been present.
The Sanitary arrangements as well as the health of the workers, were under the constant observation of the Medical Officer of Health for London, at the investigation of one of the retailers, so that contamination of the milk might be guarded against as far as possible. Human Contamination being thus practically excluded, the alternative of some condition present in the cows, had next to be considered.
The cattle which were all stall fed, were housed in three sheds and a quarantine shed was pro-

sided, for the purpose of isolating newly purchased cows, until found free from disease. About a month before the appearance of the Scarlet fever, three newly calved cows had been bought from Derbyshire and shortly after four others from Oxford; these were placed in the quarantine shed, as customary, for a week or more, the milk meantime being used. The various districts were supplied as follows:-

St. Marylebone from Large Shed, assisted by Middle & Quarantine Sheds
Hampstead & Paddington " Middle " " " Small " "
St. Johns Wood & Hendon " Small "

The cows were reported to be free from illness and milked and fed well. After the quarantine period the cows from Derbyshire were placed in the large shed along with two from

Oxfordshire, the remaining two going to the middle shed.
When the supply to North Marylebone was stopped, the farmer ordered the milk to be given to pigs and what over to be poured into pits. Poor people at Hendon, learning this persuaded the cowmen to let them have the milk, with the result that scarlet fever appeared among a number of those families.
Examination of the cows, revealed the fact that in the large shed several of the cows had ulcers and vesicles on the teats and udders, one of the Oxfordshire cows being worst of all. Two of the Derbyshire cows had scars on the vessels, evidently the result of healed ulcers. In

the middle Shed, several recent cases of the same thing were seen, while in the small shed, the early stage of the same condition was found. It was then advised that the sale of all the milk, should be stopped, and as it proved the advice was taken only just in time as Scarlatina appeared in St Johnswood for the first time. The late D. Cameron, Med. Off. of Health for Hendon, in a paper, read before the Epidemiological Society London, on this subject, says that there is a specific contagious and infectious disease, attacking in the first instance newly calved cows, and communicated to healthy cows by inoculation from the hands of the milker. The result is a

general disturbance, slight fever, dry cough with quick breathing; in week cases sore throat, discharge from nostrils and eyes; eruption round eyes, and hind quarters, from which the cuticle peels leaving bare patches. One or more of the teats become swollen and oedematous; vesicles form on teats between the teats and udder; these scab when broken and the scab lasts for about five or six weeks. The quality of the milk is altered becoming "ropy" or standing.

Experimenting with scrapings from an ulcer, Klein found[6], that calves inoculated with this suffered from ulcers at the seat of inoculation four days afterwards lasted for about three weeks.

From the ulcer, cultures were made, and a micro-organism isolated, the same result being got when milk from an ulcerated cat was used. With this micro-organism calves were inoculated with the same result as when scrapings from an ulcer were used; from the heart's blood of one of the calves killed, the micro-organism was recovered.

Continuing his observations Klein found that this micro-organism, which he named Streptococcus Scarlatinae, could be isolated from the blood of patients suffering from Scarlet fever, as well as those dying of the disease.

Out of seven cultivations, made from the blood which the patients

were alive, four were successful, and from four cultivations made from the blood after death, the Streptococcus Scarlatinae was isolated in two cases. The cultivations from the living subjects were made when the temperature was about its highest point. The Streptococcus was only found in very small numbers in the cultivations, and in some cases other Micro-cocci were also found, from which the former were isolated.

From these Cultures calves were inoculated, and a Culture was mixed with milk given to a calf, followed in both cases by the characteristic illness. Added to Milk kept at a temperature of 35°C, this Streptococcus

turns the Milk solid in about two days.

Further experimenting on newly Calved cows, with cultivations obtained either from human Scarlet fever, or after passing through the Calf, it was found that inoculation from either source caused ulceration of the teats in from four to nine days; this was one of the earliest symptoms and manifested itself whether the cow was being suckled or milked by hand. Afterwards there was a general febrile disturbance Milk drawn from a wound teat, during the febrile attack, was found to contain the Streptococcus The ulcers were with difficulty transmitted to man by direct-

inoculation.
Animals the subject of experiments when killed, were found to have post mortem conditions very similar to that met with in patients dying from Scarlatina, and so constant as to be taken as characteristic of a specific disease.
A condition similar to that described above was found in connection with an outbreak of Scarlatina, in the Camberwell district of London; ulceration of the teats and udder being found in a cow at the dairy to which the epidemic was traced.
An outbreak of febrile disease with sore throat, but without rash, was traced to a particular dairy in Edinburgh and the cows supplying the milk were found

to have disease of the teats and udders. In this case Klein found that the condition was not exactly similar to the Hendon disease, though there were certain phenomena leading up to, but not giving the characteristic results. A Streptococcus was isolated, which was slightly different from the Streptococcus scarlatinae.

Following on these epidemics, here is that occurring in the North side of Glasgow, traced to the milk supply from a farm in Renfrewshire? Here again disease of the teats and udders of the cows was found, complicated with sores transferred to the hands of the milkers. Here there can be no reasonable doubt that the milk

was the cause of the Scarlet Fever. In this case the virus must have been present in the milk for at least twenty days, for sixteen days after the milk was first stopped, the sale was again resumed, in another part of the City; the result was carefully watched and it was found that two days after the sale was commenced, cases of Scarlet fever were reported. The sale was continued for seven days and nineteen cases were noticed among the consumers. The cows presented no disguaranteeing condition of the skin and there was no evidence of a constitutional affection. Crusts and lymph from the sores were used to

Klein who found "that an Organism was present with properties similar to that obtained from the Hendon outbreak ... in addition the Virus of vaccinia was present"

From these investigations the following Conclusions may be drawn:

1 outbreaks of Scarlet fever may result from a particular Milk Supply, from which human contamination may be reasonably excluded

2 Cows suffer from a specific fever or teat and udder, with Constitution disturbance in some instances

3 From the blood of Scarlet fever patients, teat sores, and the milk from cows, with this disease

a micro-organism has been isolated, the Streptococcus Scarlatinae (Klein)

4 Calves and newly calved cows inoculated with this Streptococcus suffer from the specific disease and the streptococcus can be recovered.

5 Calves fed on milk containing this streptococcus acquire the disease

6 Children fed on the same milk suffer from Scarlet Fever

7 That the post mortem appearances in all are closely related

Crookshank takes exception to the conclusions drawn by Klein and holds that the Streptococcus Scarlatinae is the same as the

Streptococcus pyogenes. This is denied by Klein in an article on the Morphology and Biology of the Streptococcus.
Crookshank's personal observations seem to be similar to the Wiltshire cow disease, which was evidently true vaccinia, the difference between it and the Hendon disease being pointed out by Klein.
The fact that continental observers have failed to isolate this organism in connection, may be due to milk epidemics being little known on the continent. Kaskin does not altogether deny the existence of S. scarlatinae, but states that one isolates chain cocci, which may be regarded as a variety of

of Streptococcus Pyogenes. He does not however consider these to be the cause of Scarlet Fever but acting on the inflamed throat give rise to complications.
Rokenham and Fenwick investigating into the action of certain substances which were derived from organs of patients who had died from Scarlet fever, found that they could isolate a morbid product, which even after boiling, was capable of producing acute parenchymatous inflammation when injected into animals.
While a connection between the udder disease and Scarlatina has been established, much still remains to be done before the chain of evidence is

complete. Why the Edinburgh disease was limited to a febrile sore throat; was the organism here in a process of evolution, which might in due time have developed true Scarlet fever? There is no record of inoculation in the human subject, which must frequently have happened, among the millions, causing Scarlet fever. A case recorded by Cameron throws no suspicion of Scarlet fever, the local irritation being sufficient to account for the general disturbance. Nor is the condition such as is observed in those inoculated for the purpose of generating a mild form of the disease, for in these cases the

generated disease is said to have been as violent as from ordinary infection. Nor is it comparable with Surgical Scarlet Fever. Of course in neither of these instances was the virus passed through the calf; but Klein reports the same results before and after passing through the calf, and there is no evidence of inoculation from a calf in the history of the Hendon disease.

Outbreak of Scarlet Fever at Dunellan during the Summer, 1896

The importance of being able to record a freedom from infectious disease, which at all times desirable, is especially so, during the Spring and Summer months, owing to the fact that the majority of the resident population, are largely dependent on the popularity of the district as a holiday resort; visitors naturally avoiding any place likely to be a source of danger to themselves or families. Situated on the north bank of the Clyde, Dunellan, extends along the river for about three miles, the sanitary district increasing this distance by

nearly seven miles. The houses are arranged in parallel rows, the first, and only one involved in the outbreak, being the County Road from Dunoon to Loch Striven. These houses except those occupied by the working classes, are either self-contained, or two flatted, villas, standing in from a half to two acres of ground. Many of these are unoccupied during the winter months, except occasionally at the week ends. At Easter a number of householders and visitors arrive, and the population will have increased by nearly one thousand. During June the great influx of visitors takes place, remaining till

about the end of September; the total population being now about 4000.

The Water Supply is stored in three reservoirs, the collecting pond being on the moor about two miles behind the Village. Analysis report shows the quality to be good, but it has a slight Yellow tinge from the peat soil.

The Drainage while not by any means perfect, is very fair, and being improved every Year.

The Milk Supply is obtained from four farms in Dinellan and four at Toward, three of the also retailing milk in Dunoon, only supplying the

towers on the County road, as they pass through.

The sanitary administration of the district is under the control of the Local Public Health Committee of the Argyll County Council, and has as its official, a County Medical Officer and Sanitary Inspector, as well as a local Medical Officer, the Water, and Sanitary Inspector. The Notification Act is in force, all notifications being sent, in the first instance to the local Medical Officer, who instructs the local Sanitary Inspector, at the same time notifying the County Officials.

There is practically no Hospital for Infectious Diseases available. There is an arrangement with the Burgh of Dunoon, to receive patients

into this hospital, provided there is accommodation; as only four patients of each sex can be isolated, at a time, and even then they must all suffer from the same disease, this hospital is practically useless. A Joint hospital is in the process of erection, and will be ready early in 1897.

Isolated Cases of Infectious disease are met with in the spring and Summer months, especially the former, introduced by visitors very rarely do these spread among the resident population

The first cases of Scarlet Fever notified in 1896, were in my own practice, and seen on the afternoon of July 1st; one case in the family of a resident, another

si that of a visitor. Neither child had been out of the district during the previous fortnight, nor had they met, their residences being fully a mile apart. On the 8th one more case was seen, and another on the 9th. Three of these families were known to get milk from the same farm, the other was uncertain, though it was afterwards found that they did. Suspicion was thus thrown on the milk as the cause of the illness, and no other cause being discovered an inspection of the farm was determined on. It was with hesitation that this course was adopted, owing to the fact that, even suspicion of such a cause, though unfounded, might prove disastrous to the farmer.

This fear, of consequences, was removed and the matter simplified, by my receiving a message, while on the way thither, to visit the farm professionally. There a daughter of the farmer was found to be ill from similar fear, the first symptoms having felt the previous evening. The household, consisting of the farmer, his wife, two sons, two daughters a boarder, [illegible] male & one female servants, were seen, with the exception of the boarder who was out, examined. When it was found that one of the female servants, M. L. was showing signs of desquamation. The following is the history furnished by M. L. She served at a farm near Dumbarton until the May term (28th); she then went home

to Bailieston, where she remained till June 4th, when she went into the service of a dairy keeper in Edinburgh. On the following day she felt ill of colds, but continued at her work, suffering from "sore back and swollen glands in the neck". Not improving and fearing fever she should be confined to bed, her mistress sent her home again on June 8th. Medical advice was not sought, but she improved sufficiently to again seek a situation, and on the 18th was engaged and went to Lowood, where she remained until observed on 3rd July. She was apparently quite honest in her belief that there had been very little wrong,

and unaware, that she was a source of danger to others. Subsequent enquiries at the various Public Health Department of the districts in which she had resided, elicited the fact that Scarlet Fever was prevalent at Ballycotton during May and June.
The cattle were next examined, but nothing was indicating illness was found; careful observation of the cows and udders revealed nothing abnormal.
Tracing the Milk from the Cows to the Consumer it was found that fifteen fifty and sixty cows were milked by six women at 6. am and 2. pm. At each milking a different set of cows is taken by the milkers

who thus go round the byre, — this is to prevent harm to the cows from a bad milker, any danger that might arise being counteracted by the woman following at the next milking. Two tins, one for each side of the byre, receive the milk from each cow; when these are full, the contents is strained direct into the barrels of the milk cart, from which it is retailed morning and evening by a son of the farmer. It was pointed out that the sale of all dairy produce, must in the mean time be stopped, and the cart having gone out with the evening milk, the farmer sent a mounted messenger after the cart, to prevent, as soon as possible

the spread of infection.

From list of families residing in the Innellan district, it was found that fifty were regularly supplied with milk, besides others who occasionally came to the Cart, but could not be identified. It was also retained in Dunoon causing an outbreak there at the same time.

The following cases traced directly to the Milk Supply were notified:

July 1st	2	Cases in	2 families
" 2nd	1	"	1 "
" 3rd	6*	"	5 "
" 4th	3	"	2 "
" 6th	2	"	1 "
" 7th	2	"	1 "

*This includes M.L. the farmers daughter. Three others after the origin was known

Two of the above cases were in the farm household, besides the servant M.L., and may have been injected by direct contact or from using the milk. A third case at the farm, seen on the 18th was in all probability due to direct contact, as all milk used in the house was boiled from date of recognition.

Secondary Cases

15th July	1 case		
16 "	1 "		
18 "	2 "	in 1 family	
23 "	1 "	" 1 "	"
13 August	1 "	" 1 "	"
16 "	1 "	" 1 "	"
3 September	1 "	" 1 "	"
14 October	1 "		

In two of these cases, that of 16th Aug.

and 8th Sept. the injection could not be traced; in the former case is a doubt if the disease was not contracted elsewhere, the patient having visited a district where Scarlet fever was prevalent the day before being attacked. That of 14 days was injected from clothes returned from hospital.

The total number of cases, both primary and secondary, arising on a period of the injected milk is seen to be twenty five, and involving Seventeen households: the death occurred in a child under 1 year, the Scarlet fever being superimposed on an attack of Chicken pox and Bronchitis, being equal to a death rate of 4 per cent. Cases in Devon are not included it being a separate Sanitary Authority

The ages of those attacked were,

Under 5 Years	10	Cases
between 5 . and 10 Years	8	"
. 10 . . 15 "	1	.
. 15 . . 20 "	1	.
Over 20 "	8	"

The total number of Cases under observation is too small to draw any conclusion, but the number of adults attacked is perhaps greater than usual. Of course statistics on number of Cases can only be brought out since the Notification Act was adopted, the former ones death statistics may have given a wrong impression of ages attacked.

Incubation

In a few of the cases, this period was within definite limits, the following cases being examples of this:-

I. R. aged 7 years. arrived at Innellan for his holidays on 1st July. On the following morning milk was purchased from the infected supply, on the only time that by mistake. Fifteen hours after using the milk he turned ill, and the disease diagnosed on the 3rd.

P. M. landed from a yachting Cruise on the evening of the 29th. Had milk on the morning of the 30th June, before going to Glasgow. Scarlet fever was diagnosed that night; he being too ill did not return to Innellan.

M.M. a brother was treated in temporary hospital; clothes were returned on October 20th. In 24 hours M.M. complained of illness which was only definitely diagnosed when desquamation appeared.

In these cases the probability of exposure to an infection other than stated, may be reasonably ignored, so that we have here an incubation period, of 12, 16, and 24 hours.

No milk was distributed from the infected farm on the 4th July. The last cases traced directly to the milk supply, were two notified on the 7th; here the incubation period was at least three days and may of course have been longer

M.L. the Servant who brought the disease, was in all probability suffering from Scarlet fever on June 8th She came to Lowara 13 days later, but it was only after other 13 days, that the disease was observed; it is probable therefore that she did not communicate the infection /8 at least 26 days, after her illness commenced - There is no reason to suppose that she caused Scarlet fever in anyone in this district other than those mentioned. When examined on the 3rd July there was slight evidence of desquamation, on arms, legs, and trunk, - the hands were rough and hard. She admitted that there had been peeling of the face and neck, caused as she thought by the soap used

in Washing; seen again on the 6th
the hands were desquamating freely,
and the feet showed signs of the
same thing. From this there is
reason to believe that the milk
was free from infection until the
3rd June, or about three weeks after
the first turned ill, so that
the first cases would have from
12 to 21 days incubation. Of
course this is only theory but
it has the support of the cases
quoted above.
These observations beat out the
opinions of several recent writers,
who are of opinion that the in-
cubation period given by the older
authorities is too long and too wide.
Moore considers that the incubation
period is short, probably never more

than a week; average 3 to 5 days.
From an analysis of 592 cases, Cooper
found the average period was 8 days.[16]
Whitelegge[17] lays stress on a 9 day
period, from the fact that 75%
of the cases occurring in houses
where there had been a previous
case, were on the 8th day. An
epidemic at Berkeley Hill due to
milk contagion showed a 2 day
period.[18] Definite periods are also
shown at [19]Dublin Barracks 3 cases in
8 to 10 days; eight cases in 4 days
at Burringham[20] (one in 2 days another
in 4 days and another in 6 days.
[21]Murchison observed 75 cases, bearing
on the question, in 20 years, and
found 0 exceeding 6 days

73	not	"	5 "
54	"	"	4 "
29	"	"	3 "
16	"	"	2 "
3	"	"	24 hours

these all show cases arising from what was in all probability a definite source of infection; still error is very apt to be overlooked. While it is safe to say that the incubation period may be from a few hours[32] with a probable average of 2 days, it would be well not to pronounce anyone who had been exposed to infection, as free from danger for at least ten days, if this extended period would be the means of preventing the spread of the disease.

Onset and appearance of the Rash.

A few of the cases had a very sudden and definite beginning.

M.P. 9 years; was quite well on going to bed on 1st July. At 3 am of the 2nd she complained of sickness and vomited; got very feverish, and by 8 am complained of sore throat. Seen at 11 am the temp was 100.2°; tonsils red and swollen; rash appearing on chest.

F.R. 6 years: Refused breakfast on the morning of the 2nd July though seemed in her usual health an hour before. About 11 she vomited, soon becoming flushed and delirious. Seen

at 1 pm the temp was 102·2°, tongue covered with fur, tonsils inflamed. Rash on chest, back, arms and slight on the legs. In this case the rash in the first instance was not typical, partaking somewhat of the character of a measles eruption.

J. K., aged 17 years, was not quite well on going to bed on 2nd July; in the morning had sickness and vomiting, and afterwards slight sore throat, which got much worse during the day. When seen at 6 pm the temp. was 103·2°, tonsils very much swollen. Chest, back and abdomen covered with rash.

J. D. age 11 years, was observed to be very hot and delirious at 1 am; the

delirium increased and at times he was restrained with difficulty. Vomiting and purging commenced at 7 am; Seen at noon later then a slight redness over the chest; in two hours, after a hot pack there was the typical rash.

I.M. ætat 29, observed his chest covered with the rash, when dressing; When seen there was slight redness of tonsils temp 99°

M.M. 8 years, complained of sickness but did not vomit, tongue coated with whitish fur, no sore throat, slight redness on wrists, desquamated on the 11th day.

In the first five cases, which may be taken as examples of the others, the rash appeared within twelve hours, commencing in all of them

on the chest, and with the same exception, in no case was it first observed on any other part of the body. In the last case, the [illegible] of the disease, would in all probability have been overlooked, but for the fact that another case was in the same house.

In all the cases the pain was quite typical of Cerebral fever; even in the case of F.R. where the face and arms gave the impression of measles, that had on the trunk was characteristic in most of the cases, it was also observed, that the early symptoms were very similar, especially in the children, dizziness and vomiting with more or less delirium being the most constant.

Course

As is usual in milk epidemics of Scarlet Fever, the majority of the cases were of a mild type. For the first three or four days the temperature was moderately high, with head symptoms, constant and marked; as the temperature went down the delirium disappeared by day, but persisted at night in several cases for more than a fortnight. With an early crisis, appetite returned, and the convalescence was uninterrupted by serious sequelæ. Nine of the patients were adults, and they, with one exception, suffered so little, that it was with difficulty they were made to take the precautions necessary

to safeguard themselves from complications and others from infection
In two of the cases the type was severe, one of them being very ill, the other severe but of short duration.
J. K. age 27 years, daughter of and living with the farmer, at the infected farm; she was constantly in contact with M. R. using the milk, both in its natural state and cooked with food. Personal and family history, good
On the night of the 2nd July, under the impression that she had caught cold, she had a hot bath, and a hot drink, but did not get rid of the chilled feeling. Eventually sleeping she passed a fair night, but in

the morning was sick, and vomited; there was slight sore throat, general depression, and shivering. She tried to go about her duties, but had to return to bed almost immediately. During the day the throat got worse so that swallowing was was nearly impossible.
When seen at 4 p.m. (on the 3rd) she had the appearance of being very ill, the face was flushed and anxious looking; prostration was shown by sinking in the bed, and difficulty in moving the arms; the breathing was short and quick. Conversation was painful and attempts at swallowing having to be made between each word, and even then she was understood with difficulty. Tongue was thickly coated and swollen;

tonsils inflamed and meeting in the middle line, examination of the throat was imperfect owing to the pain it caused. There was pain in the lower half of the back and the legs were stiff and sore. Over the whole trunk and limbs there was the typical scarlet fever rash, but more markedly developed on chest. The bowels had moved in the morning, the result of an aperient, when a little urine was passed but there has been none since.

Temperature 103·2°; pulse 130 per minute.

During the night there was constant muttering delirium, and at no time did she recognise her mother who was in attendance; when roused occasionally it was with difficulty,

and a little milk and whisky put into the mouth, tickled on again.
On the morning of the 4th the temp. was 104·8° pulse over 130 per Minute and very weak. Throat much the same as on the previous afternoon; rash fully out; no urine.
At 3:30 pm, the trained nurse, who had by this time arrived, found the temperature had risen to 105·6°, when 40 ℥ Antipyrine were given.
During the next two days the temp. varied between 103·4° and 104·6° in spite of frequent doses of Antipyrine. Urine was passed unconsciously, in quantity hardly sufficient to wet the napkin. On the 6th a specimen was got and found to contain a small quantity of albumen.

DISEASE.

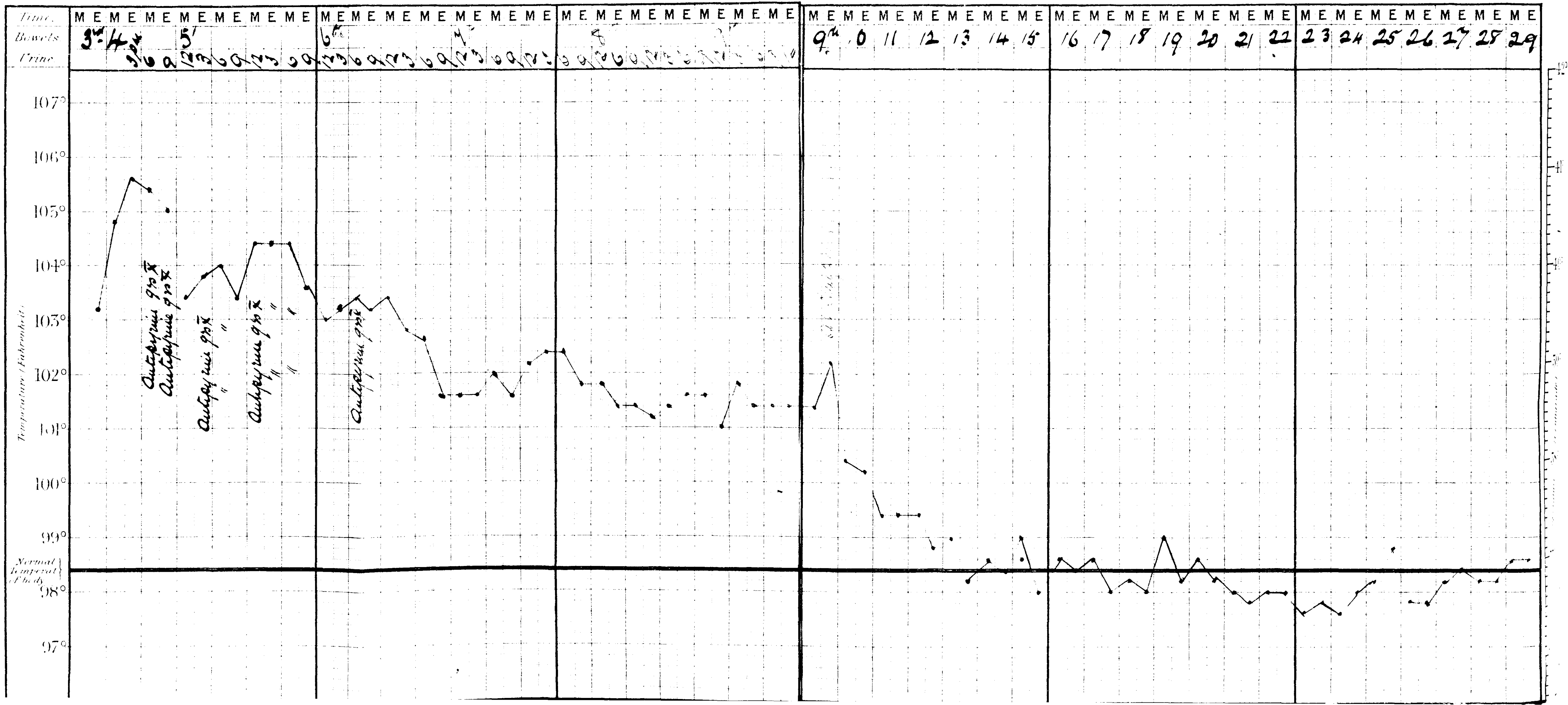
Notes of Case.

Name {

Age

Diet

Case Book No.



On the 9th the throat condition had improved sufficiently to allow of a fair amount of liquid nourishment being taken, though it still caused pain in swallowing.
Delirium was now less and chiefly confined to the night; weakness was extreme; pulse still rapid though a little stronger; urine increased in quantity, with increased albumen.
On the 10th the improvement was so marked, that, though still very weak, permission was given for removal to temporary hospital, two miles distant. The day being very fine, this was effected without bad result, beyond a slight temporary rise in temperature.
On the 14th the temperature was normal

and remained practically so, for the remainder of the time she was under observation, See accompanying Chart.

On July 23rd. Albumen was absent from the urine, and at the end of October, when the last examination was made, had not reappeared. She was allowed out of bed on 20th July and out of doors on five days, ten days later.

No Sequelae.

No special method of treatment was adopted, to counteract the effects of the poison. The throat was brushed with Glycerum, ac. Carbolici for two days, when Glyc. ac. Tannici was substituted; a mouth wash of Permanganate of Potash was frequently used. Antipyrin, see Chart.

Stimulants, in the form of Whisky or Gin, were given freely while the prostration was extreme. Nourishment in the form of Milk, bread jelly, soups farinaceous foods, in as large quantities as could be borne.

J.D. age 11 years. Family history not satisfactory.
Personal history, had peritonitis; suppurating gland removed; Enteric fever the previous winter. On July 2nd he seemed to be in his usual health, when going to bed at 9 p.m. About 1 a.m, before retiring, his father observed that the boy was very restless, and hot to touch. As the night wore on the restlessness got much worse, so that, at times, he was

Kept in bed with difficulty; he cried out occasionally and did not recognise those about him, and there was constant muttering. At 9 am vomiting and purging commenced, and delirium being still present everything was passed in bed.

Seen at 8·am (July 10th) he was reported to be slightly better, and could be roused sufficiently to put out his tongue which was red, with the tonsils inflamed and slightly swollen. It was quite evident, when spoken to, that he did not recognise those around him. Temperature 102·5° Pulse over 130 per minute. Skin dry and hot with tendency to redness over the Chest. Some urine had been passed in bed.

Two hours later, after a hot pack

DISEASE.

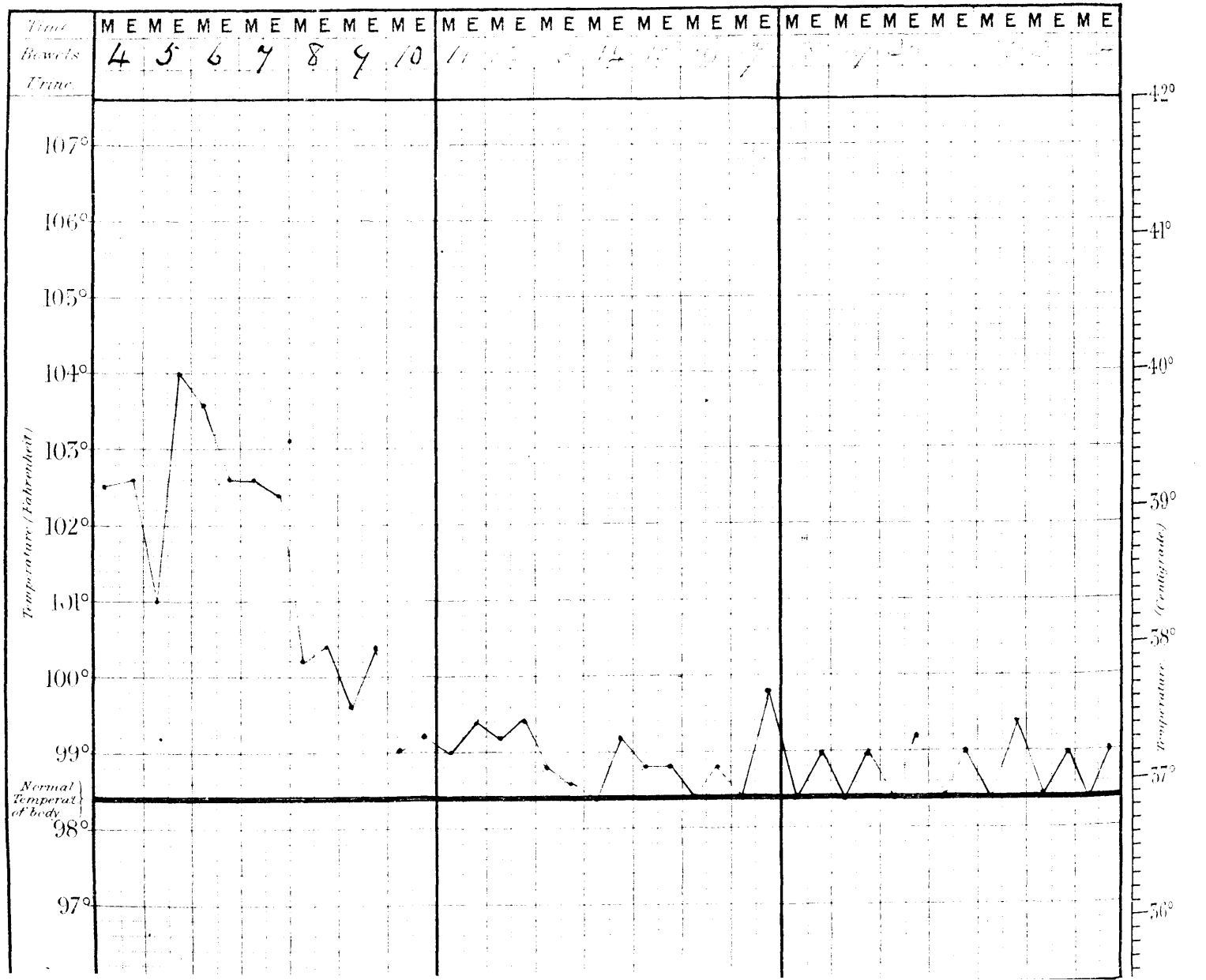
Notes of Case.

Name

Age

Diet

Case Book N°



the Chest and abdomen were covered with the typical rash, temperature 102° pulse 130 per minute. Vomiting and purging stopped. Still drowsy.
During the next four days he was in a condition of stupor, when roused he took what was given to him, but on being left alone, at once returned to the semi-unconscious state; on one occasion during the night the nurse required assistance to control him. Both bowels and bladder were emptied, unconsciously night and day, and at night only for other ten days.
At no time was the throat very bad.
A specimen of urine was obtained on the 10th and when tested was found to be free from albumen.

On the 10th the temperature may be said to have been normal, and from this date convalescence was rapid, though there was slight delirium at night.
No special treatment used.

The effect of Antipyrin in the first of these cases was rather disappointing, for though given frequently and in fair dose, it failed to reduce the temperature to any extent. This was the experience of Reimer[23] who found that in 684 cases, "it had no influence whatever on the disease, and fails to depress the temperature during efflorescence, though it counteracts the injurious process of tissue combustion".
Cold baths were not used to reduce

the temperature, for the simple reason, that the world would not have been allowed, as well as from want of appliances. Numerous methods have been advocated for aborting the attack. The Illustrated claims for the treatment of Bichloride of Mercury, that it lessens the fever, prevents complications and shortens the isolation period. This was discussed by the Leeds and West Riding Medico-Chirurgical Society, when the opinions expressed by those who had used it, was that no advantage was evident over other cases, where no special treatment had been adopted.[25] Thomas[26] thinks the praise given to many remedies, may be due to their being used in mild epidemics when nearly all the cases go well

of themselves.
Eucalyptus oil has been given internally as well as used as an inunction; in the latter form, in my experience, it has nothing to recommend it over Carbolic oil, except that some prefer it as being less disagreeable, while others take the contrary view. Except in those cases treated at home, when an inunction prevents the dry skin from spreading, it is probably better to resort daily baths during desquamation.

Abortive Forms.

During the first two weeks of the outbreak the number of sore throats complained of was very large in proportion to what is usually seen at the same period of the year.

Fourteen cases all occurring in male adults were especially suspicious, one of them in fact being more pronounced than a few of the notified cases of scarlet fever. There was swelling and redness of the tonsils, including the pillars and fauces, the inflammation being in the form of an areola, with a distinct line of demarcation of the normal tissue. There was of course more or less feverishness, with quick pulse, but in none was it

the slightest sign of a rash, and careful observation failed to trace the slightest sign of desquamation. These symptoms were in patients who had used the milk from the infected farm; one of the worst cases however used only butter milk. Four nurses, in charge of cases, also suffered from severe sore throat.

One child had acute nephritis commencing with rigor, followed by increased temperature, rising to 103·6°. The urine was very scanty, loaded with albumen, and showing microscopically, granular and blood casts and blood corpuscles. There was swelling of the face hands and abdomen, and slight [illegible] of the feet and legs. This child [illegible]

also used the milk, but had neither sore throat, rash nor desquamation. There may or may not have been a connection between this illness and the milk supply, no other cause could be attributed; other children living in the same apartment remained perfectly well. The child made a good recovery, and the urine was free from albumen in six weeks.

In none of these cases was there a history of a previous attack, and they may be taken as local manifestations of Scarlet fever poisoning.

Desquamation

In the majority of cases, this commenced early, especially in those that had high temperature and copious rash. In the cases of L. R. and L. D. (see above) where the temperature was as high as 105·6° and 104° respectively, there was desquamation on the fourth day of illness, in the former extensive, in the latter only slight evidence.

In eleven cases with an average of 102·4° as the highest temp. registered, there was peeling on the fifth day.

It was very important in one case, that of an adult, only slight peeling being seen, though extensive

watched for both by the nurse and myself. This patient was kept under observation for 65 days, and when dismissed it was quite certain that only a small part of the skin had been thrown off. Here the highest recorded temp. was 99.6°; the symptoms were slight but typical.

A clergyman boarding at the farm, had a severe attack of Scarlet fever when a boy, again suffered, the diagnosis being confirmed by Dr. McNeil, the Church Medical Officer; in this case there was no visible sign of desquamation in the 45 days she was under observation.

One adult had a severe and complete desquamation, without any

illness being reported to the nurse or myself. There may have been some disturbance viz. it was not sufficient to keep the patient indoors; nor was there any return of albumen, the urine being examined twice weekly while in hospital, and none appeared, before or while this secondary desquamation was going on.

The question naturally arises, at this point, what part does desquamation play in the spread of infection, and how early in their illness are patients a source of danger to others?

To take the latter question first, my own opinion is that Scarlet fever is not nearly so infectious, in the very early stages, as it is in the latter, and while the necessity of caution

in all stages of the disease is enforced, still one frequently sees cases that have been ill for several days, without suspicion as to the nature of the disease, no attempt being made to isolate type without spreading the infection. An excellent example of this is the case quoted on page 44 for another purpose. A boy sickened with scarlet fever on July 2nd and was not removed to hospital before the 9th Meantime the mother attended both the sick child and two others Isolation was out of the question yet it was only in October when the boys clothes returned from hospital that another child turned ill. The chances of infection were greater in the first instance than the last, and the susceptibility

of the patient could not have been greatly altered.

Battles[27] considers that it is quite impossible to say, that it is, or is not infectious in the first stage, but that it should be treated as if it were so: again Scarlet fever is infectious from the onset of the earliest symptoms and quite long after convalescence has been established[28]. Others again hold that it is not infectious in the first stages and use this as an argument for the early removal of patients to hospital, before other members of the household become infected, Ellis Med. Off. of Health for Derbyshire takes this view[29] It is also held to be most infectious when the fever is at its height[30].

In the epidemic under consideration

the dates on which more than one member of a household turned ill, is as follows.

D. M	Notified July 3	
M. M	" " 4	
J. K.	" " 4	On the first two the infection may have been either the milk or contact with returned M.C. at fete
G. W	" " 6	
L. K	" " 13	Probably last infection from first, on two removals to hospital on 10th having had to be carried through a long lobby.
M. J	" " 4	The latter may have been early infection from the first, but a three day milk infection cannot be excluded.
A. J	" " 7	
N. M	" " 7	Not very early infection
M. M	" " 16	may have been from Camp. highest.
D. L	" " 18	
M. L.	" " 18	
D. M	" " 2	Infection from returned
M. M	" " Oct 14	Clothes.

These cases may all be accounted for by either Direct infection or early

dessaumation

The prevalence of Scarlet fever is greatest in autumn, as shown by Greenwell[31] and others, yet in this outbreak which may be said to have occurred at the most favourable time for the disease, there was a remarkable immunity shown. At the farm for example there were twelve individuals unprotected by a previous attack, yet from the servant only two were affected directly and even they may have been infected from the milk. Sleeping in the same room, were other three girls, one of them occupying the same bed, and did not suffer in any way. In those households where more than one member suffered, there were an average of 6 others, and where only one of the family suffered the

average was 6·3 of unprotected persons. Of the 45% and more families who used the milk, in only seventeen was there illness, primary or secondary. A very marked difference to Measles, where the experience of three epidemics showed that it was the exception for an unprotected child to escape.

It has been alleged that too much importance has been given to desquamation in the spread of infection. Among others Bookbyer[32] holds this view and considers that inflammation of the naso-pharynx and elsewhere, with the discharges are the most important factor in spreading disease. While the infection is no doubt given off by breath and secretions, still the desquamating cuticle must be

responsible for a very large percentage of the cases, irrespective of secondary inflammations. The girl M.L. had not the slightest signs of any inflammatory lesion, and yet she was, without doubt, the cause of an outbreak. To give another case, a boy on a visit here, was accidently seen by me, and found desquamating. He had been "out of sorts" a fortnight before, and a very careful Glasgow practitioner, thought there was little wrong. There was no evidence of throat or other lesions but yet this boy carrying a parcel to a dressmaker was the means of conveying the disease to her. That infection is carried by third parties there cannot be any doubt; as well as by letters, clothes, or books. Hamilton at Dublin Barracks[33]

reports a case carried by a cat. In my own experience a family prevented from leaving the house by weather conditions for more than a week, had the disease conveyed by the mother; she visiting town called on a relation, not knowing there was scarlet fever in the house, rendered temporary assistance to the child, but carried the infection home although she remained on deck from Greenock to Innellan.

Preventive Measures.

As already stated no Hospital is provided, by the Public Health Committee, for Infectious Diseases. It was therefore necessary that provision be made for the isolation of the sick, with the least possible delay; especially as at the outset there was no means of knowing to what extent the disease might spread.

The County Medical Officer at Oban, was made aware of the outbreak, and the Convener of the Public Health Committee, at once consulted. The latter agreed to act on his own responsibility and so save the delay consequent on calling a meeting of his Committee

An endeavour was made to rent a
a house suitable for an isolation
hospital but without success, all
the houses being occupied at that
season of the year.
After a days delay, a neighbouring
proprietor on being informed of the
state of matters at once placed
a house at our disposal. The
occupants, workers on the estate, were
accommodated, some in tents and
others quartered on fellow workers.
The house was admirably suited
for the purpose of an isolation
hospital, having seven large
and two small apartments on
two flats. Standing in an acre
of enclosed ground, one mile, through
fields, from the Public road and
six miles from Dromedan, there was

small chance of visitors from the village
It was decided in the first instance
to provide for twelve beds, and a
list of requirements being handed
to a Glasgow firm, the goods were
delivered within 24 hours. Some
necessary repairs having been executed
and the Curriehill place, the house
was ready for patients on the afternoon
of the 8th July.
In charge of two trained nurses
with the assistance of a Retrained
girl, the patients were received
on 9th.
A serious drawback to the early
removal of patients, was the
want of a proper ambulance
That belonging to Dunoon Burgh
was used, but not being a
properly equipped ambulance

but by an old fashioned glass
fronted Landau, it was not
deemed prudent, to remove patients
at any stage of the disease, -
the distance being so great -
least serious consequences arise.
In all 16 cases were treated in
the temporary hospital, 6 adults
and 10 Children, without deaths.
When sufficiently well, the patients
were allowed full liberty in the
grounds on fine days; a large
room being retained as a recreation
room for use during wet weather.
The advantage of the liberty to
go about out of doors, was
most marked; without exception
there was increased weight with
improvement of the general health
The average residence in hospital

was 53.6 days, - the majority of the cases had been ill a few days before removal; the hospital was open 85 days.

Difficulty was met with at first in getting the permission of the guardians for removal to hospital, this being the first time such a method was been adopted in the district. In no case was force used, and opposition broke down when the advantage of removal, against the disadvantage of home isolation was pointed out. No charge was made from the time the patient left home

The cases not removed to hospital were, with one exception isolated in fully contained houses, under the care of nurses.

The schools were closed for the holidays so that no action had to be taken or considered. Here it is a doubtful advantage, the children being together quite as much outside as at the school.

Disinfection.

No mechanical or patent disinfector being available, the usual chemical means was adopted.

In private houses besides sulphur fumigation, all soft goods were steeped in 1-1000 solution of bichloride of mercury. Wherever necessary the paper was removed from the walls.

Besides these precautions at the farm, all the byres and milk houses were washed out

before lime washing. All dairy utensils were thoroughly cleaned and scalded at the hospital, all the beds, and pillows were burned as arranged at the time of purchase. All soft goods were steeped for 24 hours in 1.1000 solution of bichloride of Mercury. The floors walls and ceilings were washed with the same solution, and the latter lime washed. Outside all rubbish was mixed with sulphate of iron and buried. The furnishings having been cleaned were removed for storage until the town hospital is ready, the Board having agreed to take them over at purchase price

All disinfection was undertaken by the Town's and Local Sanitary Inspectors

To the District Committee.
A special meeting of the Public Health Committee was called at the earliest date after the commencement of the outbreak when it was unanimously agreed to sanction all expenses incurred, and gave the Contract and local Medical Officer full power to carry on Hospital, and use any means they might jointly consider necessary to prevent the spread of the disease.
The total expence was as follows:

Nursing	£ 53. 13. 0
Provisions	36. 16. 11
Milk	13. 9. 7
	103. 19. 6

Drugs and Aerated Waters	£	6.	8. 10
Ambulance hire		4.	10. 0
Disinfectants		5.	13. 0
Grass Cutting			5. 6
Repair of house		22.	16. 2
Honoraria & Medical Officer		26.	5. 0
Paints		1.	17. 9
Removing Furniture &c		12.	12. 0
Furnishings		34.	14. 4
Goods destroyed		8.	10. 0
Rent forward		103.	19. 6
	£	230.	12. 4
Deduct for Furnishings returned		34.	5. 10
	£	196.	6. 6

being equal to a total cost of £12. 5. 5 per patient.

General Remarks

The sale of milk from the farm was stopped for eleven days and resumed on the certificate of the Sanitary Inspector and myself. During this time the resources of the neighbouring farms were taxed to the utmost to supply the demand for milk. That being so a careful examination of the cows was made and there being no sign of disease, permission was given to board some of them with a neighbour in order that the milk might be utilised. After washing all over the body, the teats and udders were bathed with

solution of bichloride of mercury and finally with soap and water, the cows were turned out and the milk used without any suspicion of being the cause of new cases. Neither was there any cases from the milk, when the sale from the farm was resumed; that produced a large number of former customers returning to the cart, so that the loss to the farmer must have been very great.

During the first week or ten days, it was impossible to carry out, except in a very imperfect way, any personal disinfection. During the second week however, when the cases were well in hand, I made

I was soon to see all Scarlet
fever Patients in rotation, during
a certain part of the day, and
not to visit other cases at that
time, this after a bath and change
of clothes, made me ready for
general work. No case came to
my knowledge, that could by
the remotest chance have been
infected by me.
Twelve confinement cases were
attended during this time without
harm to the mother or child.
In this connection I may be
mentioned that, in 1888, in
Northumberland, when called
by a midwife to an instrumental
delivery, I found after the case
was completed, that a child,
occupying the same bed as the

mother was suffering from Scarlet fever. For the safety of the woman the child was removed to a village two miles away, where it formed a nucleus of an epidemic, but the mother escaped without the slightest sign of infection.

34 McDonald Liverpool himself attended a lady in her confinement when he felt ill of sore throat, the Scarlet fever rash appearing next morning; still there was no bad effect to mother or child, and frequent examinations were made of a patient who had not previously been protected.

35 Thursfield commenting on this remarks that he has frequently been present at Confinements in Cottages where there was Scarlet

in the same house & in the same room.

That the measures adopted to prevent the spread of the disease, were effectual, there can be no doubt. Sixteen cases in twelve households were originally affected, with secondary infection to the extent of nine cases, in marked contrast to former experience of the disease. In 1891 from one imported case, thirteen others were traced, to take a single example.

Fortunately milk epidemics are not of frequent occurrence in connection with Scarlet fever. They might however be fewer if sellers of milk, would when engaging a servant, procure

a medical certificate that she is free from infectious disease. This might be done free of cost by the Local authority, Medical officers of Health if asked requiring to say if a patient is free from infectious disease, might also certify if servants also are free after going to farms, if a certificate cannot be got from the girls. Farmers might also receive a check for isolating any contagious signs of illness, especially any lesions about the teat, where it might be watched. The expense involved would be little, compared with the loss, where the milk becomes contaminated and the sale stopped, as well as the loss of the reputation of the

dairy.
All workers among milk should be provided with disinfectants and the hands frequently washed and those in charge might see that this is done by each milker, before milking.
By these means the evil effects of Scarlet fever might in some measure be mitigated

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