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GRADUATION THESIS.

ON THE

SANITARY CONDITION

OF THE

FENS OF LINCOLNSHIRE

IN REFERENCE TO THE ORIGIN AND MITIGATION

OF CERTAIN

ZYMOTIC DISEASES.



BY

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1.

On the Sanitary Condition
of the Fens of Lincolnshire, in Reference
to the origin and mitigation of certain
Zymotic Diseases.

During the past two years I have devoted much time and attention to the origin and propagation of Typhoid Fever and other Zymotic diseases, having had privileges associated with the subject which happen to few, who, like myself, are commencing their professional career in a rural district.

One great advantage being that, the Medical Officer of Health in whose possession the reports on the sanitary condition and health of the district are, is my Grandfather, who commenced practice in this locality in 1826. He still holds the appointment, and it has fallen to my lot to materially assist him in the discharge of his duties, in which the water supply of the district has formed a very prominent part.

The result has shown that, water of the very worst possible quality may

be drunk for years without generating Typhoid Fever.

I am aware some eminent Physicians have maintained that Enteric fever has a spontaneous origin. I do not presume to make this essay controversial, but simply to state facts derived from my own limited experience aided by the note books in the possession of my Father and Grandfather.

The rural sanitary district in which I have acted as assistant to the Medical Officer of Health comprises the town of Donington with the villages of Quadring, Gosberton, Surfleet and Pinchbeck, forming the greater part of the Spalding Union, having together an area of 34150 acres with a population of 8756.

The district is at the southern extremity of the Lincolnshire fen, comprises a portion of the flat alluvial area of Fenland. The soil is for the most part silt, or sandy loam, overlying clay, but in some places the latter is at the surface. It is protected from the inroads of the sea by a series of embankments, and is intersected by a network of canals and dykes, part of an elaborate system of drainage,

affording protection to the country from the upland waters by their means discharged into the rivers Witham and Welland.

The market town of Dornington so frequently referred to in the following pages has a population of 2,665 wholly engaged in agriculture. It consists of six principal streets converging on the market place, from which branch off one or two cross streets and yards.

Regarding the sanitary arrangements of the town, the water supply is obtained partly from underground cisterns, or other less perfect means of storing rain water, caught on the roof, and partly from wells. The latter are shallow, exposed to contamination by surface soakage, which penetrates for remarkable distances through the soil, but are not commonly resorted to for drinking purposes.

The only two public pumps, one of which was sunk so recently as 1876, are also from the same cause now polluted and unfit for use. In one locality a pit forms the source of supply for a number of households.

There is no system of sewage; slops are got rid of either upon gardens when available, or into porous cesspools in the

back yards, formerly open drains, wide and offensive, traversed the main street of the town, but were replaced several years since by 18 inch brick culverts.

The privy in common use is provided with a vault beneath the seat, some four feet in depth, allowing a large accumulation of excrement, which is removed, perhaps once a year.

A large weekly market for cattle, sheep, and pigs is held in the market place, and in the absence of any system of scavenging, and of a properly paved surface, is a perpetual source of nuisance to the neighbourhood.

The dwelling houses of the labouring classes are mostly four-roomed, well built and ventilated, and not overcrowded.

For the rest, although the town, as a whole, presents an appearance of neatness and good order, a result of the frequent supervision of the sanitary officers, and the abatement of ordinary nuisances of an obtrusive kind, yet, the sanitary condition of Dornington cannot be pronounced satisfactory, owing mainly to the need for a proper system of sewage disposal.

To establish the fact, that, the most impure water will not cause an outbreak of Typhoid Fever I will make some extracts from the report-books at my disposal, all the facts having come under my own personal observation.

In the summer of 1883, the Medical Officer of Health was instructed by the Local Government-Board to take precautions against an outbreak of Cholera, the water supply forming a most vital part of the enquiry.

On former occasions the town of Donington had been reported as very indifferently supplied with water. To meet the requirements of the Local Government-Board a house to house inspection of the district was made, and as a result the following report was made to the Rural Sanitary Authority.

"From the Station at Donington to the market place, a distance of about half a mile, I found 67 Houses, seven having good wells, five with wells more or less out of order. The result is that 26 families are supplied with good water, while 34 families are using water of the very worst description, obtained from the Town Pump, Carrington's Pit and private

wells, the important question arises; are those places proper sources of water supply? Certainly not.

With regard to the Town Pump I have caused the following notice to be placed on it - "This water must not be used for drinking purposes without filtering and boiling"

"Carrington's pit - cannot be relied upon, consequently 34 families are daily drinking impure water, and it must not be lost sight of that Cholera rapidly spread in London from drinking water drawn from the pumps in Aldgate, Broad Street and St-James."

The Medical Officer recommended that a new well should be sunk between the station and market-place. This, however, the Board did not consider necessary and left the matter in the hands of the Donington Guardians, who expressed a wish to know the cause of the impurity of the water. I accompanied the Medical Officer to Donington, taking the necessary reagents and tested the water of the Town Pump, as well as that derived from other sources, fully satisfying the Guardians present that the impurity was due to sewage contamination,

and, moreover, that owing to the presence of free Ammonia in most of the Samples the source of contamination was in immediate proximity to the water supply, and also of recent origin, but, in spite of this, no means were adopted to improve the water supply.

The Medical Officer finding five families were compelled to drink the water from the town pump, twelve from Carrington's pit - and other families from private wells, the water from which was highly polluted with sewage, reported to the Board that "the Town was so badly supplied with water that, it would be a dereliction of duty on his part, as well as a gross injustice to the Inhabitants if he failed to draw the attention of the Rural Sanitary Authority to the risk which was daily incurred through drinking such unwholesome water. Given an outbreak of Typhoid Fever, it might spread with fatal rapidity."

As a result of this report - the Sanitary Inspector was instructed to dig for water in Matting Lane, a street near the centre of the town, the soil of which is honey-combed with privy vaults. The Inspector was prevented

in accomplishing this through the intervention of a leading parishioner, who was opposed to any alteration being made in the existing water supply.

The Dorington Guardians attended a subsequent meeting of the Board and denied the justness of the Medical Officers reports, asserting the town was well supplied with water & that there was no need of a new well and that the whole parish was against the proposal.

The Medical Officer was so confident of the accuracy of the qualitative analysis of the water in which I had lent my aid, that he forwarded a sample from the Town Pump in question to the Analytical Sanitary Institution, Holborn Viaduct, and received the following reply

Report on Sample of water from Dorington Town Pump received from W. Stiles, Spalding.

Free Ammonia	2.50 parts in 100,000
Albuminoid Ammonia	.07 " "
Nitric Acid	.37 " "
Chlorine	35.30 " "
Sulphuric Acid	34.42 " "
Total Solids	239.65 " "

The above figures are sufficient to prove beyond the slightest possible doubt

That This sample of water is of the very worst quality, and highly polluted with organic matter of animal origin; it is, in fact, simply diluted sewage, and is absolutely unfit for use by any human being. In the interests, not only of those who have been using this water, but (especially at a time like the present) of the community at large, we would urge most emphatically that this pump be closed without an hour's delay.

Signed Arthur Hill Hassall M.D.
E. Godwin Clayton F.C.S

D. Hassall's report was read to the Board and instructions were given to the Inspector to close the pump at once. He was also instructed again to proceed with digging for water in Hattling Lane, but was again prevented, in consequence of which a special meeting of the Board was held.

The Donington Guardians expressed dissatisfaction with D. Hassall's report and forwarded a sample to W. Miller F.C.S. who also reported it: "perfectly unfit for domestic use and likely to be prejudicial to Health."

The Medical Officer still persisting in his efforts to obtain good water, the

Donington Guardians undertook to provide a new well. In the mean time communications had been made to the Local Government Board, Dr Page an inspector, Ettles Scholar, and a distinguished graduate of Edinburgh University was sent down in order to report to the Board on the Sanitary condition of the town of Donington.

He reported that, "whilst in regard to the question of water supply the action of the Sanitary Authority has, all but, been confined to the consideration of sinking a new well; I found one of the sources of water supply Carrington's Pit-resorted to by upwards of twenty families. The water was stagnant, turbid and partly covered with a green scum of Combrooid vegetation, nevertheless, during the time I was examining it several persons came to fill their pichers for domestic purposes.

In company with the Medical Officer I examined the sites of many private wells, in every instance the surroundings were such a character as to indicate danger of sewage pollution.

W. Phils had brought with him some Nessler's reagent for the detection of Ammonia, the result of its addition

11.
to sample after sample of water taken from the spot - was the immediate production of a deep yellow discoloration, conclusive proof that these samples were strongly impregnated with sewage matter. This was the case also with the public pumps in the Market-Place.

The wells in other parts of the town gave, it is true, no such indications of pollution on the application of the same ready test, save in one instance, but the same liability to be fouled from privy vaults and cesspools exists, and I have no doubt that this condition is, in a large number of instances, only one of less intensity of sewage contamination".

D. Page included in his report the analysis of water taken from Town Pump which I have given on page 8.

Notwithstanding the order issued by the Sanitary Authority to close the said pump it yet continues in daily use by a large number of families.

D. Page adds, "It is perfectly clear that, the present source of water supply in Donington, all consisting of shallow wells sunk in the same more

or less polluted surface, beds of silt, are unfit for household purposes."

The same judgment, must in my opinion, be pronounced in the case of the new well, not yet opened for use, which has been sunk under the direction of the Donington Guardians. The site is enough to condemn it; being upon the road side, within 15 yards of marshy ground, occupied by a stagnant pool.

Soon after D. Page's visit I assisted in making a qualitative analysis of the water from the new well, the result was the Medical Officer presented the following report to the Sanitary Authority.

"The water from the new well is extremely salt, polluted with sewage and quite unfit for drinking purposes"

The competency of the Medical Officer being again questioned, he suggested a sample should be sent to the County Analyst Professor Graham, University College, who forwarded the following analysis

Free Ammonia	0.041	in 100,000
Albuminoid Ammonia	0.156	"
Nitric Acid	0.53	"
Chlorine	107.50	"
Sulphuric Acid	39.24	"
Total Solids	346.50	"

It is evident from the foregoing figures that, this water is very greatly contaminated with animal organic matter; it is indeed nothing more than a mixture of water and sewage matter, and is quite unfit for drinking, or any other household purpose.

Notwithstanding all the efforts on the part of the Medical Officer and the addition of considerable pressure on the part of the Local Government Board, the Local Sanitary Authority still persists in the determination to take no additional measures to supply this community with a purer water. In this course they are to a great extent supported by the prejudices of the parishioners who contend that, they have now for a number of years used the condemned water without any very apparent bad result, and are prepared to continue in the same course until some severe epidemic brings them to a sense of their folly.

It will be manifest that the Sanitary Act requires some amendment, as, upon enquiry, I have reason to believe that, it still remains a dead letter in

many rural districts.

Although in the case of Donington, water, which may be described as diluted sewage, has not generated Typhoid Fever, may not its continued consumption have so impaired the general health as to have shortened the duration of life amongst that community?

I am in a position in a great measure to solve the enquiry. On comparing Donington, with the adjoining Gosberton district, which it resembles in every respect except that Gosberton is exceptionally well supplied with good water.

I find in Gosberton during the last six years the deaths of 121 persons registered over sixty years affording an average of $77\frac{1}{4}$ years each.

In Donington during a corresponding period of six years, 95 deaths were registered of persons over sixty, giving an average of only 71 years each, comparing very badly with the average $77\frac{1}{4}$ years recorded in the Gosberton district. The same result holds good upon comparing Donington with the towns and villages in the neighbourhood.

Again, referring to diseases of the Zymotic class, - those which the Local Government Board deems preventable.

During the last six years 11 deaths have occurred in Gosberton (pop 3046) from Zymotic diseases, while in Donington (pop 2565) 24 deaths have been recorded from Zymotic causes during the same period.

These facts, I submit, conclusively prove that there is something radically wrong in the sanitary condition of Donington, due to the very impure water supply.

I agree with the Medical Officer that there is but one remedy, viz - an artesian well. Several are already at work in the locality, one affording 6,000 gallons of good water in 24 hours.

Having shown that this community has now for a number of years drunk water of the very worst possible quality, with a complete immunity from Typhoid Fever during the last six years, with the exception of one imported case, I am forced to the conclusion that when an outbreak of Typhoid is traced to drinking water it must have become charged with a specific poison yielded

by patients suffering from Enteric Fever.

Thus, not only in many large towns, but, also, in country villages, outbreaks of the disease have been traced to the water of wells into which there has been percolation from a privy or cess-pool contaminated with the evacuations of patients suffering from Enteric Fever. In like manner it has been proved that the disease may be imparted by drinking milk to which infected water has been added.

With regard to the spontaneous origin of Typhoid Fever, it may not be ill-timed, or irrelevant, to add that, my Father who has been 30 years, and my Grandfather 60 years engaged in the profession, still assent to the doctrine so warmly advocated by Murchison and other eminent Physicians that Typhoid Fever may have a spontaneous origin.

My Father, when only five years of age, was prostrated by an attack of Typhoid, became greatly emaciated, and continued for eight weeks in a very critical condition. This was an isolated case, the cause being attributed, and no doubt justly, to a large cess-pool

in a rather confined yard covered only by an iron grating.

He was constantly attended by a faithful female servant, who, after the recovery of her charge, was herself stricken with the same form of fever, accompanied by diarrhoea, she continued in a very emaciated condition for ten weeks, convalescence being extremely slow.

Three years elapsed, then another servant was attacked with Typhoid. Her case was more severe and protracted than the former, three months elapsed before she was able to resume her duties.

The cess. pool was thoroughly filled up with fresh earth and lime, and although the house has since been divided into tenements, several families, now having access to the same yard, not any Typhoid has broken out amongst them for the last fifty years.

The treatment adopted in these cases, now some fifty years ago, I find was that so much approved by Dr. Elliotson, consisting in administering small & repeated doses of Hydrargyrum cum Creta, combined if necessary with Dover's powder to subdue any inordinate action of the bowels. As

soon as the tongue began to clean and moisten, Quinine in small doses was given, and Port wine in moderate quantity allowed.

In looking through my Grandfather's note-book I find the following interesting letter addressed to him by the curate of the parish.

7th Dec, 1839.

"My dear Sir,

Will you have the kindness to prescribe for me? My malady is a shivering - chilliness, as if someone were pouring, or rather trickling, cold water down my back between the shoulders blades; it first came on yesterday after I had walked to Mill Green.

I tried something to eat, and a few glasses of Port wine, which relieved me until the evening, when it drove me to a well warmed bed, and sundry cups of tea.

I was extremely feverish all night but towards morning I had a profuse perspiration. My head, though I cannot say it has any positive pain, feels wooden - as filled with wool."

The patient's history of his sufferings

Shows that the invasion was sudden and severe, resembling Typhus, indeed, on examining the Register, I found the cause of death "Typhus", but, it must be remembered that, this occurred before Dr Jenner had pointed out the distinction between Typhus & Typhoid!

The progress of the fever as described by the short notes of the case, was rapid, symptoms particularly characteristic of Enteric Fever set in - profuse diarrhoea, evacuations pale, great prostration, head-ache, dry brown tongue, - a severe attack of intestinal haemorrhage supervened towards the close of the third week, causing Syncope, from which the patient never rallied.

No other case occurred in the village, the only probable cause of the fever being a stinking Puck near the back door of the house.

In 1876 a well marked case of Typhoid occurred in the practice of my Father. A healthy youth, son of a respectable farmer, living in a good house, standing alone, was prostrated five weeks by an attack

of fever. The water supply was good, the Medical Officer failing to discover a cause for the outbreak, unless it arose from sewer gas emanating from the mouth of a small tunnel near the house, made for the purpose of carrying off superfluous water and slops of all kinds.

I am indebted to W. Jollye, surgeon, of Dorington, who has been in practice in that place over a quarter of a century for the following facts.

Two youths, aged 12 & 14 years, sons of a gentleman in very good position, residing in an excellent house, standing alone, its surroundings in first-rate sanitary condition. The water used for drinking purposes pure, drainage good.

Previously to W. Jollye being called in, the youths had complained of feeling languid, listless & indisposed to take part in their ordinary occupations or amusements, no appetite, sleep disturbed. These premonitory symptoms lasted several days, then the characteristic symptoms of enteric fever commenced; after confinement in bed for four weeks, and great debility for a longer time, both ultimately recovered.

Searching for the cause of the outbreak I discovered that a short time previously the deposit of a pit which had been the receptacle of the drainings from a brewery had been carted and spread in a paddock near the house, which, for a long time, emitted most offensive exhalations which I believe to have been the cause of the fever.

Until about the year 1830 the mortality from Typhus in this town (Spalding) with a population of about 70,000 was exceedingly great, originating no doubt from a foul drain called the Westbode, which ran through part of the town, and was the receptacle of all forms of nuisances, consisting of dead cats, dogs, stale fish, butchers offals &c. I am informed by old residents that it was impossible to conceive anything more odious either to sight or smell. This drain was filled up in 1830, from that date the mortality from Typhus greatly diminished, to such an extent that, my Father who has been in practice in the town thirty years has never met with a case. The closure of this drain resulting in the eradication of the disease from the district.

A foul drain also ran through

The town of Donington similar in every respect to the one mentioned above. Dr. Brown now of Hammer-smith, but who for many years practiced in Donington, informs me that after cleaning this offensive drain the income of his practice fell off 30 per cent.

In 1855 the said drain was entirely filled in with the result that since that date Donington has like Spalding been free from Typhus Fever.

Dr. Brown in answer to my enquiry whether he could inform me of the distinguishing characteristics between Typhus and Typhoid so definitely pointed out by Dr. Jenner could be traced in the fever which had proved so fatal in Donington? replied; - "I believe at that time 1838 Jenner's distinction was not much if at all noticed; the only Jenner at that time known to the Profession was Vaccine Jenner. All the distinction recognised was - "Typhus Meticus" and "Typhus Gravior" even the word Typhoid was only used to describe a set of symptoms, as after Pneumonia and other acute diseases."

Dr. Brown adds "when I was called in, or saw cases early and found the secretions foul I began by clearing out the bowels by Calomel and Castor Oil

many cases were arrested others ran on to the "Gravio", with black tongue,ordes, delirium, extreme prostration, subsultus, picking at the bed clothes, coma, death. All such cases were designated - "Typhus"..

Thus it is apparent that medical men in general had paid little attention to the distinction between Typhus and Typhoid as arising from a distinct poison and distinguished by an eruption until about 1840.

Previously, however, Professor Goodser of our University added another to his many laurels when he pointed out that in certain kinds of continued fever, far different sets of appearances were visible on the body of those dying under such conditions.

Goodser discovered that in the body of a Typhoid patient the intestinal glands were always diseased whereas in Typhus cases this phenomenon was not observable, this giving a powerful stimulus to pathological research into both kinds of fevers.

Professor Goodser's observations had but little appreciable influence until about 1856 when Sir William, then Dr. Jenner became convinced of the soundness of Goodser's views, and worked out with masterly thoroughness the line of investigation indicated

by that great-master. Thus, Sir W^m Jenner if not the original discoverer of the essential difference between Typhus and Typhoid, (the credit of which belongs to the Edinburgh School) most certainly deserves great credit for having by a brilliant series of clinical and pathological observations demonstrated beyond a shadow of doubt the soundness of the views announced by Professor Goodser.

To Sir William Jenner we are also indebted for placing the treatment on a sensible and rational basis. In an address delivered at a meeting of the Midland Medical Society at Birmingham (1879) he says - "in a very large proportion of cases, no other treatment is really required from beginning to end than rest - in bed, quietude, fresh air, pure water, regulated diet, with a little wine in the third or fourth week."

Is Typhoid Fever Contagious? with my limited experience I do not presume to solve the enquiry which has evoked discussion among the most eminent men of the medical profession. I confine myself to facts which have come under my special knowledge.

A young man, aged 23, whose parents reside in Quadring, was sent home from London in a state of convalescence after

an attack of Typhoid Fever. His sister aged 17, caught the fever, and died. The greatest possible precautions were taken, with this result, there was no further extension of the fever. The water supply of the house after a careful examination proved itself to be of the most wholesome character, the possibility of sewage contamination being quite out of the question; the house is isolated, the surroundings are in a satisfactory sanitary condition; indeed, I was unable to discover any cause from which the second case could have arisen except by contagion.

In reply to my inquiry, Mr. Jollye, the medical attendant, replies - "If the young man's sister had Typhoid fever independent of infection from her brother it is a very extraordinary coincidence. I certainly think she did catch the fever from him, she had not been nursing him in London, or staying in the same house with him."

Recently a case of Enteric Fever was under my care. The patient a male 25 years of age, resided in a court, not at all overcrowded, in the centre of this court is a drain communicating with the main sewer. The water supply is good, but not far from his door is a

cess. pool which receives the drainage from some stables, it is only very occasionally cleaned out, and imperfectly covered with a slab, consequently sewer gas generated here finding its way into the house was the only probable cause of the fever I was able to discover after a very careful inquiry.

When the patient consulted me he had been indisposed and unable to work for more than a week. He complained of having had chilliness, his pulse was quickened, much headache, furred tongue, thirsty, dry skin, temperature 100, no appetite, pain in left side with cough, countenance heavy, urine scanty and high coloured.

I insisted on his remaining in bed, in a tolerably well ventilated room, his bowels not having been relieved for two or three days I administered ʒj of Calomel, followed by a dose of Castor Oil, which acted very effectively.

I found some friction on the left side below the nipple, together with some fine moist crepitation at the left base. I prescribed the following mixture

Rʒ liq Ammon Accl ʒij

Vin Ipecac ʒi

Aq: Camphor ʒvi

Fiat Mistura ʒvi. ℞.

℞. One ounce every four hours.

At the commencement I applied a mustard Sinapism to the side, and subsequently kept the chest enveloped in a warm linseed meal poultice. The mixture had a very beneficial effect on the skin and kidneys, and the chest affection was much relieved.

During the second week I first discovered rose coloured spots on the abdomen, which were obliterated by pressure, then a new train of symptoms were set up, viz. an increase of fever, evening temperature 103, skin hot and dry, restless and delirious throughout the night, tongue dry and glazed, when conscious he complained of much pain in the head. Diarrhoea became extremely urgent, the evacuations pale, answering to the appearance which has so aptly ^{been} likened to "pea soup", much pain on pressure in the right iliac region, accompanied with gurgling, also an attack of haemorrhage. It is unnecessary to enter into a detail of every days proceedings, suffice to add, I conducted the case to a satisfactory issue, acting on the principles and mode of treatment inculcated in the valuable lectures I was privileged to attend whilst pursuing my studies at my Alma Mater.

I think it worthy of observation

That soon after the haemorrhage the condition of the patient was decidedly favourable, the fever abated, the pulse slower, temperature lower, rest more composed during the night, and what I considered a most favourable symptom the tongue began to clean round its margin, the surface to become moist, the evacuations were more healthy, he took his milk and beef tea with greater avidity. Recovery was somewhat slow, the patient remaining under treatment twelve weeks.

I have, I trust, shown that Typhus Fever in this locality has been totally extinguished through the medium of judicious sanitation. I have carefully examined the Registers since 1850; and am unable to find Typhus assigned as a cause of death in a single instance. At the same time I found that only five cases of Typhoid have terminated fatally during the last ten years in this sanitary district with a population of 8756.

It may not be deemed irrelevant to the subject to show that, Aque once the terrible scourge of the Fens of Lincolnshire has entirely disappeared.

What was the cause of the general prevalence of Aque in this district during

The first half of the present century? The Fens formerly consisted of low-lying marshy ground, large areas being covered with shallow, stagnant sheets of water, in which a rank aquatic vegetation flourished in great abundance, from which emanated what is known as 'Marsh Miasma', effluvia from a soil of a porous character saturated with moisture. Ague was the result of this miasma, occurring principally in Autumn, more especially after a wet season, now thanks to the very elaborate system of drainage in operation throughout the fens, the disease is rarely if ever encountered in the district. I have now taken an interest in such matters for this last ten years, and have never yet met with a well marked example of the disease.

As late as the year 1830. Ague so largely prevailed that after the introduction of the Poor Law, the Guardians of the Spalding Union supplied all the medical officers with Quinine grates, so that, in spite of its high price and great demand, it might be administered when required.

Another cause of Ague arose no doubt from the atmosphere becoming vitiated by the unwholesome effluvia arising from the decomposition of hemp and flax, this

not then confined to any particular spot, but general throughout the district. At the early part of the present century very little wheat was grown in this locality, hemp and flax being the staple commodities. These after they had attained their full growth were pulled and steeped for a long time in ditches covered with sods, in which they underwent decomposition.

If the decomposition of vegetable matter did not give rise to a gas as some authors assert, the state of the drains after the removal of the flax and the unwholesome effluvia arising from them must have very materially affected the production of the disease.

During the French wars our coasts were blockaded and our supplies of foreign wheat cut off, and the drainage being improved, the growth of hemp was discontinued, the land being broken up and utilized for the growth of corn. The unwholesome drains in which the process of steeping was carried on were filled up. This no doubt played an important part in extinguishing a gas.

I find the disease prevailed chiefly in the autumn, and that very few, at some period of their lives, were exempt

My Grandfather had his share of what was called the "Third day ague." In the first stage, so shivering with cold that no artificial heat would relieve, secondly, the hot stage, accompanied by intense headache, relieved only in the third stage by an outbreak of perspiration, followed by a return to health; the third day again to encounter a repetition of the same horrors.

The remedies consisted in the administration of powdered Cinchona and Liguor Arsenicatis. Cases were supposed to be cured by the power of the imagination, charms were actually bought for the purpose, even cobwebs were resorted to as a remedy. After the introduction of Quinine it was looked upon as a specific in the cure of the disease, in doses of three or four grains three times a day.

It was observed that the inhabitants became acclimated, and less liable to an attack than persons newly arrived in the district. Again, an individual who had had an attack was more than ever liable to a subsequent attack, such cases were frequently most obstinate, and yielded only for a limited time to medical remedies. In such cases the disease assumed a chronic form, organic change having taken

place in Liver and more especially in the Spleen, an enlargement of which was called "Aque Cake".

During the first-half of the present century a somewhat anomalous form of fever was very prevalent throughout the district, which may now be said to be quite extinct; known to the older Practitioners as Remittent Bilious Fever. A very severe epidemic occurred during the very hot and dry summer of 1828, following a very wet season, so that, it was probably due to the same influences which are now known to be so productive of Aque. Its chief characteristic was an obstinate vomiting, more or less headache, fever invariably accompanied by a distinct evening exacerbation, but without any complete intermission. Many cases continued in this condition three or four weeks, occasionally assuming a Typhoid character, but rarely proving fatal.

The persistent vomiting was only checked by a large dose of Calomel, the stomach rejecting every other form of medicine. When a thorough action of the bowels had been obtained and the sickness abated Quinine (which was at that time

first introduced to the profession) soon restored the patient to health.

Small Pox the terror of our forefathers, thanks to the immortal Jenner, may with truth be said to be extinct in these extensive parishes. After having made a very careful search I am in a position to state that, not a single death from small pox has been recorded during this last forty years, a fact that bears testimony to the efficient manner vaccination has been performed in this locality, as well as the readiness with which the inhabitants have availed themselves of its inestimable benefits.

Scarlet Fever, - In the districts of Puckbeck and Gosberton with a population of 6192, only 7 deaths have occurred from Scarlet Fever during the last ten years, while in the adjoining parish of Donington with a population of only 2565, - 17 deaths from Scarlet Fever have been recorded during the same period. Another proof of the injurious effect resulting from the consumption of the Donington water, its contaminated condition having been fully discussed in the earlier part of this essay.

Diphtheria broke out in the parish of Pouchbeck in the month of March, 1858, in a few weeks extending through the greater part of the County. During the latter end of May, it became publicly known that an affection of the Throat prevailed in the parish, of so severe a character that, if 48 hours were allowed to elapse before any active treatment was adopted death might be expected to ensue in a large number of instances.

To the Medical Officer, it was a new disease, the routine treatment adopted in any other affection of the Throat proving valueless, if not injurious.

The most remarkable characteristic of this epidemic was, that the constitutional disturbance was not at all in proportion to the local mischief. Indeed, in the majority of cases the patients pursued their usual avocations, complaining only of soreness of the Throat; yet, on inspection, the tonsils, fauces, soft-palate & uvula would probably be found to be covered with an exudation of plastic matter, accompanied with a most offensive odour of the breath.

During six weeks upwards of 350 cases occurred in the parish (population 3,000 - census 1851) varying very much in

severity, resulting in 33 deaths.

A drain called the Hammond Beck, then in a very foul condition, divided that portion of the parish which formerly constituted the Fen from the old enclosed lands; in the vicinity of this drain, and some old offensive pits not far distant from it, the epidemic first made its appearance and also prevailed here with the greatest virulence, extending however with rapidity to all parts of the parish, and eventually throughout the greater portion of the eastern counties; only becoming checked by the cold weather of the approaching winter.

Deaths occurred in rapid succession from what was looked upon as a new disease of the Throat; the medical man in whose practice this epidemic first made its appearance, with a professional experience of 45 years, had never met with any affection of the Throat bearing any analogy to the one under consideration, but on referring to the statistical nosology he did not hesitate to return the deaths as due to Diphtheria.

This disease was not only new to the Medical Officer of the Pockbeck district but to the large assemblage of medical men who attended the meeting of the Midland branch of the British Medical Association

before whom he read a paper on the subject, which was published in the journal of the society. Since the year 1858, a few isolated cases of Diptheria have occurred, but have shown no tendency to extend beyond the household of those affected, some local cause usually being found to account for the outbreak; the removal of the source of the danger checking the spread of the disease. Only two deaths throughout the whole of this Sanitary district have occurred from this cause since the 1858 epidemic.

I trust I have said enough to show that, the so called Fens of Lincolnshire need not now be dreaded as a place of residence on account of their insalubrity. During the late severe winter, when the death rate of so many districts assumed such alarming proportions, the death rate throughout this Sanitary district only reached 14.5 per 1000.

It is indeed an undisputed fact that, the Death rate in this division of the Fens is as low as in almost any part of the United Kingdom.

It remains for me to show, as far as I have been able to ascertain, the cause of the great amelioration in the sanitary condition of this locality. It is unquestionably due to the elaborate system of drainage conducted under the superintendence of that highly distinguished engineer Sir Joseph Banks, aided, of late years, by the efforts of the Sanitary Authority.

This large tract of Fen land was at one time described as a perfect morass. The soil varies in different localities, some being of a peaty nature, while another part consists of sandy loam, or stiff clay, all of which was formerly covered with rank herbage. Now there is perhaps no part of the United Kingdom in a higher state of cultivation, or more prolific in the production of corn.

From the passing of the first acts of Parliament - in 1613, until the introduction of steam, as a reliable agent in the removal of fen water, no real sanitary improvement could have been said to have occurred in the condition of the Fen Country.

Even during the time of Charles II these Fen lands appeared to possess a sufficient value as to warrant

speculative risk for their redemption from a state of absolute waste. Large sums of money were expended, in first-embanking the Fens, in order to protect them from the highland floods. This work when accomplished still left them serious difficulty in knowing how to free the enclosed fens from their own rainfall. The wind-mills of the period formed the only means of raising water in sufficient volume to benefit a large area, the well known uncertainty of this agency remained to daunt the fen-men "who spread their canvases on their water-mills, only to as often see them helplessly flapping in the too gentle breeze". It often happens after heavy rains, a period of calm prevails, but our forefathers laid the strong foundation for the future Fen drainage in making the base-banks they were able, and did that great "something" which has earned our gratitude, and bids us honour their noble efforts made under almost superhuman difficulties. This unreliable system was replaced by the work of Sir Joseph Banks, commenced in 1826, which consisted in cutting large drains conveying the water to a large reservoir in which are three immense water wheels driven by steam, each capable of raising ^{water} to a height of ten feet, 600 tons per minute.

Again the improved methods of agriculture have greatly contributed to improving the sanitary condition of the district. Hollow draining has not only rendered the land more productive, but has freed it from a source of Malaria and Rheumatism. Ditches too have been filled in, and neat hedge rows adopted in their stead, indeed, I am bold enough to add that the system of Agriculture now carried on in the greater part of the Fens of Lincolnshire fairly rivals the far famed farming of the Lothians of Scotland.

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