

Original Articles.

THE PREVENTION OF THE SPREAD OF TYPHOID FEVER.¹

BY THOMAS H. GAGE, M. D., OF WORCESTER.

MR. PRESIDENT, AND FELLOWS OF THE MASSACHUSETTS MEDICAL SOCIETY, — The subject to which I invite your attention this morning is taken from the new and attractive field of preventive medicine. It relates to a disease of almost or quite universal prevalence, and to a feature of that disease which is constant and familiar. What I have the honor to offer for your consideration will be upon the possibility and the practicability of preventing, or at least of diminishing, the spread of typhoid fever, as it occurs among us, by processes of disinfection applied to the intestinal discharges of the typhoid patient.

I do not bring this subject to your notice in the expectation that what I have to offer will possess the merit of novelty, or add much, if anything, to the great mass of knowledge and information upon it which is already accessible to the profession. I have nothing that is new or original to present, and there will be little of originality, I fear, in the presentation of that which is not new. The views to which I call your attention have been for many years before the medical public, and have been supported with great zeal and ability. Some of the most thoughtful and intelligent members of the profession among us have adopted them, and have given to the preventive measures they propose a full and unprejudiced trial. But their adoption has been by no means universal; and I have observed that precisely the class of occurrences they aim to prevent are constantly reported from various parts of the State, without allusion either to the preventive measures suggested or to the vital theory upon which those measures are founded.

I have chosen the subject, therefore, as the theme of my remarks under the influence of a strong impression, derived from all the evidence I have at my command, that the proposed methods of prevention have not yet received among us that general attention and experimental trial to which, by their reasonableness and the great weight of testimony in their favor, they would appear to be entitled. And I will add that I have selected it also out of a confident belief that their universal adoption would not only redound to the honor of the medical profession, but, what is of far greater importance, contribute something of substantial and permanent value to the welfare and happiness of our people. I am aware that great differences of opinion exist upon the questions which will be raised by the topic I have selected. It is a matter upon which observers and students are greatly divided. It would be strange if the views to be presented here did not provoke discussion. I only wish that they might do so. The general effect of such a discussion could not be other than beneficial.

At a recent meeting of the Obstetrical Society of London, Dr. Robert Barnes opened a discussion upon the important practical subject of "the use of forceps and its alternatives in lingering labor" by an address, in which occurred the following passage: "The true function of a society is to gather together and then, to diffuse knowledge; to encourage independ-

ent inquiry; to survey from time to time, by the light of mutual reflection, the positions attained; and thus to seek sound guidance in the application of our knowledge to our practical duties." The whole address from which this paragraph is taken is replete with that practical wisdom which comes only from correct observation and great experience. It brought on a debate, which was continued by repeated adjournments through several successive meetings. In it the most eminent obstetricians of the kingdom participated, and upon every phase of the important question reflected the light of individual study and experience. The whole discussion, accurately reported, and presented to the medical public through the appropriate channels, completed a circle of operations which illustrate in typical form the action of a society engaged in the exercise of its "true function to gather together and then to diffuse knowledge."

The subject that I bring to your notice to-day is one of at least equal practical importance with that introduced by Dr. Barnes to the society over which he presided. It is brought before an audience as familiar by long experience with the disease to which it relates as was that audience with the obstetric art. It is as interesting and important to every medical practitioner as that, and it is as important in its relations to humanity as that. I wish it might receive at the hands of the members of this society an equally general and continued discussion.

What I have to say relates to the spreading of typhoid fever *as it occurs among us*.

I do not limit the subject in this way under a belief that this familiar feature of the disease, as we see it, differs in any essential respect from the same thing as observed elsewhere. The laws that determine and govern the spreading of typhoid fever in one part of the world have the same determining and governing influence in any other part. The specific poison by which the disease originates and spreads is the same everywhere, and, without doubt, the media of its transmission are the same everywhere. It is one of its essential characteristics to spread. Wherever it appears it shows an invariable tendency to enlarge the sphere of its operations, and extend beyond the limits of its first invasion.

But it does not show this tendency to the same degree in all parts of the world. It is not manifested here, for example, as it is occasionally in England and on the continent of Europe. We here in Massachusetts have never yet, so far as I know, been visited by any of those wide-spread outbreaks so often described by English and German authors, where hundreds of persons have been almost simultaneously attacked, as in the recently reported disaster at Caterham and Redhill, in England, where, according to the report of the local government health officer, the common water supply of these populous towns became polluted at its source by the excrement of a single typhoid patient. We have never yet experienced anything like the famous epidemic at Over-Darwen, where, as stated in an official report of the same description, within three weeks after the arrival of a lady suffering with typhoid fever, fifteen hundred persons were seized, through the accidental soakage into the common water-pipes of the town of the sewage which contained her intestinal discharges. No village or town of Massachusetts has ever yet, to my knowledge, been overtaken by such a calamity as that which befell, in 1872, the little Swiss village of Lausen, where in a single sum-

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mer, out of a population of eight hundred and nineteen persons, one hundred and thirty were attacked, through contamination of the water of the public fountains, by the irrigation of meadows, miles away among the mountains, with the water of a stream that contained the alvine evacuations of a family ill with typhoid fever. The spreading of the disease among us has never attained to such epidemic proportions as these. Our experience has been with more circumscribed and limited forms. It has been chiefly as an endemic, restricted and confined to households and neighborhoods, that it has been familiar to the people of New England. We have seen typhoid fever spread among us in families, from member to member, until several, or all, were prostrated; and we have seen it spread from house to house and family to family, in clustering groups of houses, as in the typical country village. We have seen it spread from point to point, wide distances apart, by means of clearly established personal communication, and we have seen it cling to certain houses or localities, and reappear in or near them year after year.

With the spreading of the disease in all these forms the physicians and the people of Massachusetts, and especially the dwellers in our quiet agricultural towns, have been familiar for many generations. Not a year passes without reports of its occurrence among us. It is mentioned on almost every page of our health reports, where "health of towns" is made from year to year the subject of medical correspondence. It is true that some of these reports are brief and incomplete, and that they suggest rather than describe the momentous events to which they refer. But this would not apply to all. Many of them are given with that degree of fullness and accuracy which make them valuable acquisitions to our statistical knowledge. Some of them are interesting and instructive, not only from the faithfulness of the narrative, but from the importance of the comments which are made upon the event described. And not a few acquire still additional interest from an intelligent and original discussion of the causes of such occurrences and the means by which they may be prevented. No one can refer to these reports without finding much and various information upon the subject to which they relate; and no one can attentively consider them without discovering that many of the reporters have made the events to which they allude the subject of serious thought and study.

I have examined them all with considerable care, and have found among them descriptions, more or less complete, of more than a hundred and forty instances of the spreading of the disease. Of this number about one half have been examples of endemics, confined to households, in which from two to eleven members of a family have suffered. In sixty instances the disease has spread from house to house in circumscribed localities, as in a village, or street, or block of tenements. In at least a dozen well-marked examples, it has returned, year after year, in the same house or locality, sometimes for many successive years. And there is repeated mention of its transmission from the scene of some local outbreak to new fields of operation, at a distance, in the person of an individual who had left the focus of infection after having received the poison, and while the disease was still latent and undeveloped. To the facts and information obtained from these instances I have added such as I have been able to

gather from a considerable number not hitherto reported, and also such as I have derived from a personal observation of my own during a period of twenty-five years. And through the whole experience so gathered there have been constantly forced upon my observation one or two practical points of an interesting nature, to which I wish to call your attention. The observation of them is not new or original with me. Their importance here is in the bearing they appear to have on the ætiology of the events we have been considering.

One of these points is that whenever and wherever among us typhoid fever has spread in any of the forms I have mentioned, it has appeared to spread primarily from a single case. This seems to have been an invariable rule. The disease, as we have seen it, has not stricken down suddenly and all at once all the persons in a house who were to suffer by it, nor has it seized simultaneously upon all the houses in a neighborhood that were to be invaded. Its progress has been gradual; it has first established itself, and then it has spread. I do not know of a recorded instance among us of the spreading of the disease otherwise than from a centre first established by a single case. Another point of apparently equal importance and significance is that usually several weeks elapse after the appearance of the first single case before other members of a family suffer, or before the disease extends to neighboring houses. I have been able to learn in twenty-four instances of spreading among us either the exact order in which the cases have occurred, or to fix the order of their succession with so near an approach to accuracy as to leave no doubt upon my mind as to the actual facts; and I find that in these twenty-four instances there was in one a period of eleven days between the occurrence of the first and second cases, in two a period of thirteen days, in one of seventeen, in ten of twenty-one, in two of twenty-three, in one of twenty-six, in two of twenty-eight, in four of thirty, and in one of forty-five, and that the average period was twenty-three days.

Thus, apparently, according to our experience, there must be not only a first case from which spreading may begin, but there must be also a time after the beginning of the first case and before the beginning of the second for the development of some conditions which are requisite for spreading.

Let me now briefly illustrate by one or two cases. They will make what I have been speaking of clearer in your minds than my description of it has done, and will serve to put in their plainest light the kind of occurrences and the order of events in them which it is our object to prevent. They will to some extent illustrate by suggestion the causes of such events. None of the cases are taken from our health reports.

I.

The scene of the first outbreak to which I ask your attention was an isolated farm-house, two miles out from the city where I reside, on one of the great thoroughfares leading to a neighboring town. The house was situated a little back from the road, on high ground, commanding a delightful prospect in every direction. It was built upon a dry, gravelly knoll, which fell rapidly off on three sides, to north, south, and east, and sloped gradually away on the west to a meadow. The drainage was good and the cellar dry. It was a well-built house, neither new nor old, and had all the

appointments and conveniences which usually surround the house of a prosperous New England farmer. The barn and the barn-yard, the pig-sty, the sink-drain, and the privy held about the same relation to each other and to the house and the well that they hold now, and have held for generations, to many another country farm-house all over the State. Moreover, they held the same relation here that had they held for years. Nothing had been recently changed or disturbed.

Altogether, the scene of the sad occurrence was a comfortable and pleasant establishment, and, if not noticeable for its neatness, by no means conspicuous for the want of it, either within or without. It was the home of the most worthy and intelligent people. The farmer and his wife who made it their residence had lived in it for almost a generation, and had reared in it a large family of promising children. No sickness of a serious nature had ever visited them, and certainly no infectious disease, until the great calamity which makes the subject of this sketch.

At the time of the occurrence the family consisted of the farmer and his wife, both past middle age, three grown-up children (two sons and a daughter), a grandchild, three young men employed upon the farm, a maid-servant, and a colored man, — eleven persons in all.

On the 14th of June, 1871, I was called to this house to see the elder son, ill with typhoid fever. He had been drooping for a week. The case was mild, but well marked, and only noticeable by the fact that diarrhœa was persistent and profuse. He recovered. On the 5th of July, precisely three weeks from the date of my first visit to the elder brother, the younger was taken. His case was severe from first to last, and terminated fatally July 31st. August 8th, just eight weeks from the seizure of her elder brother, and five weeks from that of the younger, the daughter was taken. Her sickness was brief and very violent. She died on the 18th, ten days from the attack. During the month of August the father and the grandchild took it, and both recovered. Later on in October the good wife and mother, worn down with grief and watching, also took it. Her sickness was long and severe, and terminated in death on the 18th of November.

Meantime, while these sad events had been transpiring, and chiefly in the month of July, all three of the young men who had been employed upon the farm were taken, and scattered to their several homes. Two went to different towns in Vermont, and one to his home in this State. All were very sick, and one died. The maid-servant was also taken. She went to her home, many miles away, and was not only very sick herself, but communicated the disease to her family, all of whom suffered by it.

Not a soul escaped of all who were living in the house at the beginning of this dreadful outbreak but the colored man. The endemic lasted from the middle of June to the middle of November. Out of eleven persons, ten had the disease and four died. It spread not only through the entire family where I first saw it, but through the agency of one of its members it entered and spread again through another, many miles away. It began with a single case, characterized by profuse diarrhœa, and did not spread from that for three weeks.

The intestinal discharges, without disinfection, were thrown into the vault of the common privy, which was attached to the rear part of the house.

II.

A man came from some town in New Hampshire to the village of J., in the summer of 1875, and immediately fell ill with typhoid fever, of which he soon died. He was believed to have been sick with the fever when he arrived. The next year, 1876, the disease broke out in the house next to the one where he died, attacking a mother and daughter, both of whom recovered. It also attacked in the same year two young persons in a family on the opposite side of the road, a little distance away. It appeared again in the village in a single case in 1877. In 1878 it again appeared in the house where, in 1876, it had attacked the mother and daughter. This time it took the husband and father, and he died. The place was then sold, and the next year the new proprietor was taken in the early spring, and also died.

There had been no typhoid fever in the village for many years until the advent of the sick man from New Hampshire, in 1875. It has clung to the locality ever since, and broken out every year in houses all of which were within a stone's-throw of the place where he died, and where his alvine evacuations were cast, without disinfection, into the shallow privy vault upon the surface of the ground.

III.

The following case I have taken from an admirable report of it which appeared in the *Popular Science Monthly* for February, 1879. I have taken it from just without the limits of our State, because the accuracy of the report brings out a point in the ætiology which I have been unable to discover in any recorded instance of a similar occurrence among us.

In the city of S., in the State of New York, in a clustering group of thirteen houses on the outskirts of the town, a case of typhoid fever broke out on the 8th of September, 1876. The next occurred in the second house beyond, on the 4th of October, *twenty six days later*. The disease then spread from house to house, until seven of the thirteen had been invaded, with a total result of seventeen cases and three deaths. The reporter distinctly states that on the 20th of September, after a hot and dry time, a tremendous storm of rain occurred, which filled and overflowed the privy vault, into which the excrementitious matter of the first case was thrown, scattering the material which it contained all over the surface of the ground and into the neighborhood of the well from which all the families that suffered took their drinking-water; and, further, that none of the families in the group who did not use this well suffered.

These are typical examples of the spreading of typhoid fever as it has occurred among us. They illustrate the fact, to which I have alluded, that it spreads from a centre first established by a single case. They illustrate also the fact that the establishment of such a centre requires time. They suggest by implication that it is by means of the intestinal discharges that the infective centre is established.

I turn now to the presentation of a theory that such occurrences may be prevented by disinfection of these discharges, and to a brief consideration of some of the testimony supporting it. This testimony comes to us from various sources, and from authorities who differ somewhat among themselves as to the nature of the disease, and still more as to the nature of the morbid agent by which it is propagated, but not at all upon the importance and value of disinfectant methods.

So far as I know, it is to the late Dr. William Budd, of England, that the medical profession and the public are mainly indebted for the theory of the prevention of the spread of typhoid fever by the disinfection of the intestinal discharges, and for the first practical suggestion of methods by which it may be carried out. The idea was, I think, original with him. It was certainly through his earnest advocacy that it was first brought prominently into public notice, almost twenty-five years ago. His occasional contributions to the medical press upon this and kindred topics have made his name familiar, but he is probably best known among us by his elaborate work upon Typhoid Fever: Its Nature, Mode of Spreading, and Prevention, which was given to the public in 1873.

Dr. Budd's attention was first called to the subject in 1839 by a terrible outbreak of typhoid fever in the little village of North Tawton, Devonshire, where he was then residing, and where, as a young practitioner, he was just beginning his professional life. North Tawton was a country town of only eleven or twelve hundred inhabitants, and its people were mostly engaged in agricultural pursuits. Dr. Budd was born there, and had grown up among the people. He knew them all personally. Moreover, he was, medically, the sole possessor of the field. All the cases of the disease passed under his immediate observation and care. The fever broke out in this secluded place in the second week of July, 1839, and before November eighty of the inhabitants had suffered by it. It furnished a typical illustration of the spreading tendency of the disease. Whole families were, one member after another, prostrated. It passed from house to house, and pervaded the place. Persons taken sick there left for their homes in neighboring towns, and carried the disease with them to new localities.

Opportunity more favorable for the study of such occurrences could not have been presented, and Dr. Budd devoted himself to the task with enthusiasm. He traced the course and relation of events, observed everything in the living and the dead, and kept accurate notes of all. The whole experience evidently made a profound impression upon his mind, and gave a strong direction to his subsequent studies. He passed, with lapse of years, from the little country town to larger spheres of practice and usefulness and to great eminence in the profession, but always maintained to the end of life a continued and increasing interest in the great subject which had so signally attracted his early attention. To use his own expression, he seems to have been from the beginning "possessed with a burning desire to devote the best powers of his mind to a discovery of the means by which such calamities may be prevented."

(To be concluded.)

CAPE COD AS A HEALTH RESORT, AND SOME REMARKS PERTAINING TO SANITARY SCIENCE.

BY PETER PINEO, M. D.

THE inhabitants of cities and towns recognize the importance of a change during the hot season to some salubrious place in the country, where the population is less dense, the air and water uncontaminated, and the opportunities for bathing and recreation are abundant; consequently the subject of health resorts, the

sanitary character of different places, their natural conditions and environments, are becoming matters of much interest.

We are familiar with treatises on health resorts at different and distant places, more especially for the winter season, but I venture to call your attention to conditions and localities within our own commonwealth, offering inducements, during a portion of the year, quite as great, in my opinion, as any other place on this continent.

Cape Cod, where first landed that company of sturdy people who sought freedom and equal rights in the wilderness of America, is by no means the last in importance as a health resort in summer. It is distant from sixty to one hundred and twenty miles southeast from Boston, and extends sixty miles into the Atlantic Ocean, with an average width of a few miles only. From Buzzard's Bay to Chatham, on the south shore of this peninsula, a distance of forty miles in a straight line, but nearly double that if we measure the indentations of harbors and bays, we have natural conditions the most desirable as a sanitary resort during a portion of the year.

The temperature is lower in summer and higher in winter, and less variable than in Boston or elsewhere in New England. This is probably occasioned by its extending further out into the Atlantic Ocean, and feeling a greater influence from the Gulf Stream.

The barometric condition is not very variable, the reading being usually from 29.5° to 30°.

The summers are, as a general rule, exceptionally dry, the showers passing usually to the north or south over the water. Sometimes there is fog, but less than is desirable during the hot season. After continuous sunshine and drought for many days in summer, when the nervous system becomes somewhat irritable and the body surcharged with electricity, the dry sand acting as an insulator, then a foggy day becomes a healing balm, relieving the body and soothing the mind; it softens the skin, improves the complexion, and is hailed with pleasure by ladies as well as gentlemen, notwithstanding its damaging effect upon crimps and starched appendages and ornaments generally.

The prevailing and almost constant wind, in summer, is from the southwest, coming directly from Vineyard Sound, without passing over intervening woods or swamps.

The soil is a light, thin, sandy loam, with a coarse, gravelly sub-soil, absorbing rapidly the rain-fall when it occurs, or any liquid falling upon it; consequently there is no surface moisture, and dry walking is at all times insured except during a rain-storm.

Vegetation, being very scanty, is not sufficient to excite fears of malarial poison from its decomposition.

The bathing is excellent, and on the south shore of the Cape the water is warmer than at most places further south, and no danger need be apprehended from an undertow, as the shallowness of Vineyard Sound gives a warmer temperature, and also prevents the heavy seas found at other places on the coast.

From June until November the climate is as delightful as exists upon the continent, balmy yet invigorating, the nights cool and comfortable, inducing sound and refreshing sleep.

Occasional stormy days are inevitable here as at every other place, when invalids, wherever situated, should be in-doors with an open fire.

The appetite of those coming from inland is greatly