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by

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SMALLPOX, INOCULATION  
AND V VACCINATION.

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A HISTORICAL SKETCH, DATING FROM THE RECORDS OF  
THE EARLIEST DATES TO THOSE OF  
JENNER'S TIME.

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Envious and foul disease,  
Could there not be  
One beauty in an age  
And free from thee?

In this way, at as early a date as 1600, Ben Jonson wrote of the most dread, loathsome and fatal disease of his day. At about the same time another writer calls it, "an inevitable accident of human life." Few diseases have been so destructive to human life as smallpox and thus it has ever been regarded with horror, from its fatality, its disgusting accompaniments and disfiguring effects as well as from the fact that no nation, no rank, no constitution, neither age, nor sex escaped it; all trembled in mentioning its name. Those who survived their illness came out pocked and maimed for life. Nor was this the worst, many were left as mere wrecks; consumptive, scrofulous, asthmatic, lame and in numerous cases even deaf and blind.

As with many others of our most prevalent diseases, little is known of where smallpox originated. The earliest records we have of such a disease are ~~found~~ among the writings of the Chinese

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Croniqlers. Sometime during the nine centuries of the Tschu-n dynasty, which lasted from the twelfth to the third century before Christ, a disease closely simulating, or identical with smallpox was referred to. Several hundred years previous to the Christian era the Brahmins of the Hindoostan had a special deity which they worshipped when smallpox plagues were prevalent. The ceremonies used on these occasions are found in their sacred book, the Artharva Veda. In neither of these early Chinese and Hindoostanee references can much be learned about the disease. They are simply the first records that have come down to the present time and are only of interest as they show the great antiquity of the disease and the probable nidus from which the worlds greatest scourge has sprung.

In Europe, at so early a date, the disease evidently was unknown. Hippocrates, the great Greek physician and the "Father of Medicine" makes no mention, in any of his eighty odd treatises, of a disease that could be taken as smallpox. The same may be said about the "Paradoxopoeus" of Rome, Claudius Galenus, who practised and wrote about six hundred years later than Hippocrates. The first evidence of the disease in the west is probably to be found in the report of a pestilential plague, that ravaged Syria about the middle of the fourth century before Christ. A Roman army returning from a tour of conquest in Asia Minor carried this plague to Europe. Many writers deny that smallpox was introduced into Europe at such an early date, but it seems indisputable that a plague was carried west at this time and the description of it, though vague, leads as many others to think that this was smallpox. Another fact that seems to show that the disease

was at least known to the early Greeks is, that, during Alexander's invasion of the Indus Valley his army is said to have suffered more from death due to thirst and <sup>to certain</sup> a disease, than it did from its battles, and this disease is not described by his historians as a strange or new malady. From the accounts given of this disease we are led to believe that it was smallpox. Hence, from these considerations, it seems more than probable that the disease was prevalent on the shores of the Mediterranean Sea long before any definite account of it was given by the early medical writers.

Leaving now the vague and indefinite evidence of the early ages let us see what can be found in the more certain and available works of modern writers. The Arabs are responsible for the spread of the disease from Asia Minor to Egypt and it is to the Arabian practitioners in Alexandria, that we must look for the first descriptions of the disease as it existed in Alexandria in the first half of the seventh century. Two centuries later Messue gave his account of it and a hundred years later (923-930), Rhazes, a doctor of the Bagdad Hospital wrote, "why hardly anyone escapes attack."

Our knowledge of the disease is obtained more from the chronicles of the monasteries and the writings of the historians than from those of the medical men, hence it is impossible to procure connected or detailed information. It seems to be quite evident that the Arabs are responsible for the spread westward around the Mediterranean shores, but, the exact course and date of this spread are questionable. What we do know is, that the disease was quite generally distributed in Southern and Central Europe previous to the time of the

Crusades, but, it is to these pilgrimages of the eleventh and twelfth centuries that the rapid dissemination and consequent mortality is entirely due.

Turn now to the countries on the western extremity of Europe. From historical references in accounts of the Arab<sup>6</sup> tour of conquest across the north of Africa, we find a disease evidently smallpox continuously harassing the ranks of their armies. The Moorish towns were more or less devastated by recurring epidemics. Their commercial intercourse with Spain and France soon offered a medium for contagious invasion of these countries. From the coast it was not long in working its way northward and in the course of a couple of hundred years was the most prevalent and fatal disease of the continent.

About the year 570 A. D. the Bishop of Avenche described a plague of Central Europe which, from the variegated or spotted condition of the skin during the illness, he was led to call "Variola". This is the first record of a specific name for the disease and this name exists to the present day as a synonymous term for smallpox. Ten years subsequent to this, in the reign of King Childebert, Gregory, the great historian of Tours describes an epidemic which began in the neighborhood of Auvergne and a few years later another that seemed to centre in Tourraine. The symptoms as described by him indicate that the two epidemics were of the nature of smallpox. In describing the sickness of the Lady of Count Eborin, who was attacked during one of these epidemics, Gregory wrote somewhat as follows; She was very sick, entirely covered with vesicles, even to her hands and in her feet. Her eyes were closed by the swelling. She was

washed with and drank of the water with which the tomb of the blessed saint had been washed at the Lord's Passover. The fever abated, the discharge of the vesicles was painless and she recovered. Other interesting historical examples are, the death of the son of the Earl of Flanders 961, and a cure of a bishop of St. Gall in Switzerland.

The first records of the malady in England are to be found in prescriptions dated in the tenth century. The Anglo-Saxons, of this and the subsequent century, had prayers in their church services to protect them from the "lathan poccas" (loathed pocks) and one special prayer for the consecration of amulets to be worn as preventatives against the disease. Gilbert Anglicus and John of Goddesden, physicians of Edward the First's time, wrote about smallpox founding their works on the writings of the early Arabs. Both these men used the same treatment for the disease, which treatment is essentially similar to that of the present day. When the King's son was ill Goddesden prescribed his famous "red treatment." His royal patient was put in a red room with red bed furnishings and was nourished with red food and red wine. This was the founding of a practice which remains in the care of a smallpox patient of the present day, viz; avoidance of exposure to light, and stimulation. It seems peculiar that we find the disease reported at an earlier date in Ireland than its alleged appearance in Spain(675). Whether this is due to the incorrectness of the historical data, or these reports being accurate, to the close commercial connection of these western islands with the Mediterranean ports, is not known. The latter seems the more probable.

To follow closely the progress of the disease from this

time on would be impossible in the limited scope of this paper but references to the most severe epidemics in different countries of the old as well as the new hemisphere will show how great and persistent this spread was. From the tenth up to the eighteenth century smallpox harassed the whole of Europe. The death-rate was enormous and ever increasing. Figures from the mortality rolls appal us by their immensity: for example:-

Speaking of Europe as a whole Lettsome said the average annual mortality from smallpox was 210000 but Pissen almost doubled this and placed his average at 400000. Bohn estimated 500000. Osterln stated that  $1/12-1/10$  of the whole population <sup>and</sup> ~~or~~  $1/2-3/5$  of the child population died of smallpox. Duvillard claimed that  $2/3$  of all the children born in his day took smallpox and that  $1/8-1/3$  of them died from its resulting effects.

In the England of James the First it was very prevalent but it did not reach the height of its destructiveness till the eighteenth century. In every thousand deaths smallpox was accountable for eighty nine. Many of our royalty and nobility were carried off by the disease.

De la Condamine said that smallpox was responsible for  $1/10$  of all the deaths in France in his time. In one year alone there was an epidemic with a mortality of 150000. The Dauphin died in 1711 and Louis XV in 1774 from his second attack.

It is impossible for people of an age like ours to imagine such mortalities as occurred among the poor and almost destitute inhabitants of the Russian Empire. Our present hygienic surroundings are mostly a result of the development

of sanitary science during the past hundred years. No such conditions for the maintenance of public health as we now enjoy existed among the crowded cities and towns of the middle ages. Who can correctly picture or describe an epidemic that killed so quickly and so many that those who remained could not bury their dead? Who can imagine an outbreak of a disease that annihilated town after town in its course? Such was the condition in Russia in the years 1630 and 1691 respectively. In one year 2000000 deaths are reported to have occurred.

Greenland isolated though it was from the rest of the world lost two-thirds of its entire population in a single year (1733). Nor was Iceland missed. In the space of less than five hundred years it was devastated by more than twenty epidemics with mortalities such as 6000, 8000 and particularly in the season 1241 & 2, 20000. In 1707 its small population of 50000 was reduced to 32000 by a <sup>single</sup> smallpox epidemic.

Asia was ravaged by a similar destruction. Nations were decimated and towns depopulated. Eastern Siberia and Kamchatka suffered from repeated devastating epidemics in the latter half of the eighteenth century. Hindoostan and China the home of smallpox have always figured prominently for this most terrific of pandemics.

The history of smallpox in America has to do only with the last four hundred years. It would be hard to realize how any country having any commercial intercourse with a plague-stricken land could possibly escape an invasion by that plague. At the time of the discovery of America, Europe was suffering from one of its worst epidemics, hence within fourteen years from the first landing of Columbus on San Salvador



the disease was strongly rooted in the New Hemisphere. Previous to this time the disease did not exist among the American aborigines. The influx of merchants and colonists consequent on the conquest of these new lands was the only source by which the disease could have been introduced. In 1507 whole tribes of San Dominigo Indians were exterminated and historians tell us that among the native inhabitants of Mexico it was more destructive than the swords of Cortez and his followers, sweeping to a horrible death over 3500000 people and leaving none to bury them. From Central America it spread north and south infecting both continents. Sir John Simon states, "In Brazil 1563 it extirpated whole races of men and about the same time in the single province of Tuito it destroyed more than 100000 Indians."

A few countries such as Australia, Tasmania, New Zealand and the Fijis, which were isolated, escaped infection even to as late a date as 1898. The Sandwich and Marquesas Islands, on the contrary, have suffered greatly losing as many as 8-25% of their entire populations in different epidemics.

With more space, this subject of smallpox might be indefinitely expanded, but, enough has been said to serve my purpose so I will proceed to the second part of the subject, inoculation.

Considering a mor<sup>l</sup>ality such as smallpox occasioned for centuries, it is no wonder that men tried to find a means of preventing, or in some way ameliorating, its accompanying conditions or subsequent results. It was, doubtless, at an early period in the history of mankind that the idea was conceived of producing mild attacks of certain diseases in order that severe attacks might be forestalled and baffled.

Elementary conclusions must have preceded such a conception, viz.,

1. All, or nearly all members of the infected environment were susceptible to the prevalent disease.
2. One attack conferred immunity, partial or complete, transient or permanent.
3. In such cases a mild attack had prophylactic qualities.
4. A mild type, once started, would probably (if spread by contagion or infection) induce similar mild types.

Smallpox, a disease corresponding in most respects to the class mentioned above, was early learned to render immune any persons who had recovered from it. Reasoning like this, men devised the plan of inducing a light attack of smallpox to prevent the contracting of the disease when more fatal epidemics were scourging the country. The variolous exudate, in some form, was inserted, or inoculated as it was termed, into the system of the person who wished protection.

Some writers date the introduction of inoculation as a prophylactic measure many centuries before Christ, while others place it at 590 A. D. It was first practised in the east, in China, and by the early Brahmins in India. We have on record descriptions of services used on the occasions, as well as the methods followed during inoculations. In China the rude custom of "sowing the seed" prevailed. The crusts, taken from variolous subjects, were perfumed with musk, rolled in cotton and inserted in the nostrils. The germs of the disease were soon absorbed by the delicate mucous membrane lining of this organ and the usual course of the disease resulted. This method had a very disfiguring effect upon the faces of those who recovered. The Brahmins made a

practice of storing matter from inoculated cases each season, to be used the following year. During their cold months (generally about February) they collected their patients and held the prescribed religious ceremonies. The arms of the subjects were then rubbed to a glow and several scratches were made on the outer side of each. Over these, small pledgets of cotton previously soaked in the variolous matter, were bandaged for about six hours. The treatment during the subsequent eruptive period was similar to that of the present day.

Very early in the Christian era the "Circassian operation" or "Buying the Smallpox" was described as it existed in Asia Minor. The subject to be inoculated was pricked in five places by three needles tied together. The matter, usually taken from the vesicles of some child, was then rubbed in. The name originated from the custom of presenting the child in each case with some appropriate gift. We next find the practice of inoculation appearing in Africa. Here the infection was carried by passing a needle and thread first through a variolous vesicle and then, through the flesh between the thumb and first finger of the person who wished to have the disease. The custom was then introduced farther west but did not, as far as history tells us, pass north of the Mediterranean.

History gives us very little concerning inoculation between the earliest dates and the beginning of the eighteenth century. About this latter date certain cases are reported and it is at this time that men commenced thinking along the line that led to one of the greatest discoveries of the medical sciences. The practice of inducing mild attacks of

smallpox as a prophylactic measure was first reported in Europe about the year 1700. Lady Mary Montagu, the wife of the English ambassador at Constantinople, wrote to a friend somewhat as follows. The smallpox, so fatal and so general amongst us, is here entirely harmless by the invention of ingrafting, which is the term they give it. There is a set of old women who make it their business to perform the operation every autumn, in the month of September, when the great heat is abated. People send to one another to know if any of their family has a mind to have the smallpox; they make parties for this purpose, and when they are met the old woman comes with a nut-shell full of the matter of the best sort of smallpox, and asks which vein you prefer to have opened. She immediately rips open that you offer her with a large needle, and puts into the vein as much matter as can lie upon the head of her needle, and after that binds up the little wound with a hollow shell, and in this manner opens four or five veins. To show what full faith Lady Montagu had in the protective qualities of inoculation, she had her only son operated on in Turkey and in 1721, after her return to England, her daughter was successfully inoculated. This was the first subject operated on in England. The little girl had a mild attack of smallpox and made a rapid recovery. The medical profession strongly opposed Lady Montagu and the initiation of such a custom. The general public were incredulous. The clergy vituperated her for the impiety of trying to control the designs of Providence. In 1722 the Rev. Edward Massey preached, that Job's distemper was smallpox and the devil was his inoculator. The same year the Prince of Wales

commissioned Mead to experiment by inoculating some criminals. The experiment was very successful and the prisoners were set free. The Prince then offered his own family for operation. In 1723 Dr. Willan reported the Circassian operation being practised in South Wales. Two methods are described as existing in the Highlands of Scotland about this same date. In the one case children were put into the bed of a patient with a mild attack of the disease and in the other threads soaked in the variolous matter were tied around the children's wrists. Daniel Sutton of Essex brought smallpox inoculation to its perfection. In three years he had operated on 14000 subjects and his assistants 6000 more. Previous to 1796 he had had over 100000 cases. He performed with a great deal of mysticism and more or less quackery. He prescribed secret powders and remedies for the subsequent illness, but in all it was almost identical with the practice of the early Brahmins. He was particularly successful, using the clear fresh virus, applied directly from subject to subject by a lancet and avoiding all kinds of dressings.

It seems strange, that after the introduction of the practice of inoculation into England, where it lingered, it became obsolete in eastern countries. This might possibly be explained by lack of historical detail.

According to Rohe, the date of the introduction of ~~the~~ ~~practice~~ inoculation into America was 1721. In this, and the following year Dr. Bolyston, in his inoculating hospital in Boston, had two hundred and eighty six cases, with six deaths. A mortality so great necessarily caused great unpopularity and about the end of its second year the institution was closed by an order of Legislature. About the end of the century

another inoculating hospital was opened in Boston and remained until inoculation was superseded by more modern practice. Dr. Thompson practised with better success in Maryland, but even his results were viewed with great disfavor. Doctors Nettleton and Jurin of Halifax had many cases but their death rate was too high to impress the public with its advisability. In the first eight hundred and ninety seven cases reported in America, there were seventeen deaths. The method followed was the same as that being used in England. Variolous lint was inserted in two incisions on the arm. The wounds were poulticed and the very severe treatment for fever that was used at that time was prescribed, viz;- emetics, bleeding and blistering. Concerning the drying up of the vesicles, the prevalent opinion was, the later the better. Under an improved method there was a revival of the practice in 1740 and the mortality was reduced to .33-.16 per cent.

After the introduction into ~~the~~ England of the practice of inoculation, at the instance of Lady Montagu in 1720, it undoubtedly had the effect of reducing the virulence of the disease and where universally practised, lessened the number and severity of epidemics, but, the great drawback to its use was, that it was just as or even more contagious than the more severe cases when it happened to infect an uninoculated district.

As closely as can be ascertained, from the data supplied by Mortality Bills in the great European cities, and also the meagre writings of medical men of that century, it was quite evident that the type of the disease caused by inoculation was, as a general rule, mild, and the type caused among others by contagion and atmospheric infection was also mild, and



further, that the death rate was reduced to about sixty per cent of its former figure. Thus, if inoculation was really increasing the number of smallpox out-breaks, as most writers state it did, it originated cases of a more favorable type and was really saving life by preventing the occurrence of more destructive epidemics. In some of his statistical works on Scotland, Sir John Sinclair makes reference to an increase in population during the eighteenth century and gives ample evidence, that to his mind proved, that the increase was due largely to the conserving effects of inoculation as a universal practice.

Many and great as have been the ever progressing steps taken by medical sciences in the last century, none is greater than the discovery of vaccination as a prophylactic measure against smallpox. That smallpox, a disease so fatal and so general at one time, has, through the ingenuity of man, in civilized communities at least, become almost extinct, is one of the greatest triumphs of Medicine. This most hideous and awfully destructive disease had long been a scourge and a terror to all classes in England, and in fact throughout the known world; and after the disappearance of the Plague, became the severest epidemic of the times. Was it any wonder then that men tried to find a means of preventing, or at least checking, its ravages? Smallpox inoculation was a step in the right direction but, as we have seen above, it had its disadvantages.

Vague beliefs were held by the dairy people of the eighteenth century of a certain protective power rendered by a disease obtained from cows. The peasantry believed in this

immunizing effect of the disease, cowpox many years before any medical men investigated it. Early in the century the Duchess of Cleveland, a woman who depended on her beauty for a living, when being joked about her losing her occupation if she were disfigured by smallpox, retorted, "I am not afraid of smallpox. I've had cowpox." Jatsy a Dorsetshire farmer had had cowpox and in 1774 with full faith in its power he inoculated his ~~wife~~ and two sons with the disease. This is the first account of intentional infection by cowpox that history gives us. Again in 1791 it was tried successfully on three children by Plett in Holstein.

But to Edward Jenner is due the immortal glory of having investigated and given to the world the now almost universal practice of cowpox inoculation, or vaccination as it has been called, as a prophylactic measure against smallpox. Edward Jenner, the son of the Vicar of Berkeley, was born in May 1749. He went to school at Wotton-under-Edge and <sup>afterwards</sup> then at Cirencester. At the early age of thirteen he engaged with Mr. D. Ludlow, the surgeon of Sedbury, and a short time later went to St. George's Hospital in London. When twenty one he was taken as house pupil for two years by John Hunter. Here he started a life long friendship which was knit more firmly by the love both men had for certain subjects in natural history. In this respect Jenner proved of great assistance in certain researches of the great anatomist, Hunter. In 1772 he retired to the country to practise, carrying with him the motto of his master, "Do not think but try, be patient, be accurate." He had heard an assertion, made by a woman at Sedbury, which had clung to him and remained before his mind for years. She had said concerning



smallpox, "I can never take it I have had cowpox". He questioned Hunter on the point but this man was very busy at the time with some dissections and soon dismissed the subject from his thoughts. But to the ravages of smallpox, and the possibility of finding some preventative, Jenner gave his whole attention. He had been inoculated with smallpox and he vividly remembered his six weeks of suffering. He had been bled purged and put on low diet until he was reduced to a skeleton. He was then exposed to smallpox but was not immune, he took the disease.

The apparent indifference of Hunter on the subject did not discourage him in his aim. The medical clubs at Alveston and Radborough, of which he was a member, denounced him and his theme as a nuisance and demanded silence on a threat of expulsion. But ridicule did not daunt him. He proceeded with his investigations and found that a pustular eruption derived from infection communicated from the teats of cows similarly disordered appeared on the hands of milkers. This eruption was considered as a safe-guard against smallpox. About 1790 he wrote to his friend Gardner and took him into his confidence. In closing this letter he stated that it was his hope and prayer that it might be his work in life to extirpate smallpox by the mode of treatment now so familiar under the name of vaccination. With his motto before him he worked ahead and on May 14th, 1796, after twenty-eight years of patient and persistent investigation, he successfully vaccinated a boy James Phipps. In two incisions on the outer side of the left arm he inserted lymph taken from vesicles on the hands of a dairy maid Sarah Holmes. On July 1st, variolous inoculation was tried but failed. The

boy Phipps was immune! He immediately communicated with his friend Gardner, who announced the news to the Medical profession of London.

Gardner and Henry Cline both realized the fact that there was something in this hobby of Jenner's. They worked independently but all towards success. For the two years following Jenner's first vaccination there was a lack of available cowpox and confirmatory experiments were prevented. Then in August 1798 Cline successfully vaccinated his first subject. He immediately wrote to Jenner and gave him the benefit of his researches. Later in the same year Jenner announced to the world his discovery by means of his publication, "An inquiry into the causes and effects of Variolae Vaccinae" and the following year he produced "Further observations on the Variolae Vaccinae, or Cowpox." In 1800, "A continuation of facts and observations relative to the Variolae Vaccinae or Cowpox" was issued. The following is an extract taken from a letter to a friend written about this time, "While the vaccine discovery was progressive the joy at the prospect before me, of being the instrument destined to take away from the world one of its greatest calamities, blinded with the fond hope of enjoying independence and domestic peace and happiness, was often so excessive, that, in pursuing my favorite subject among the meadows, I have sometimes found myself in a kind of reverie."

His writings were soon in great demand and the news of the discovery was in a couple of years, universal throughout the civilized world. The medical profession of Europe put it to the test that has made vaccination a practice that will last until smallpox is an extinct disease. As early as the

year 1800 it had reached the new continent. Dr. Benjamin Waterhouse carried the news and imported the first vaccine. The following year, he and President Jefferson vaccinated their own families as well as two hundred friends. About the same time John Redmond Coxe introduced it into Maryland.

What better proof of the efficiency of vaccination as a ~~great~~ protective proceeding against smallpox could be asked for than that given by a few minutes examination of the London Mortality Bills, of the ten years preceding, and the ten years following the advent of the nineteenth century. Nor were the beneficial results of vaccination confined to London, or even England. Throughout the whole of the civilized world, where ever records have been kept, the incoming of vaccination as a universal practice has been followed by very great diminution of the death-rates due to smallpox. In its early days in the hands of ignorant practitioners casualties occurred and censure was not lacking, but Jenner had foreseen this and indeed had predicted it.

One of the hardest questions that Jenner had to face was the occurrence of deaths from smallpox in persons who had apparently been thoroughly vaccinated. In the greater number of cases the failure was due to imperfect inoculation, but in a few scattered cases it was seen in those who had been undoubtedly and thoroughly vaccinated. Jenner believed that vaccination properly done, had a complete and life lasting immunizing effect. At the present day this is not admitted, but it is held, that after a lapse of several years the protection disappears, and it is on this fact, that the practice of re-vaccination is founded. As was seen when smallpox inoculation was practised, certain persons were insusceptible

and others were repeatedly susceptible, so also with vaccination. In some no local signs can be obtained with one or repeated operations, and others "take" and run a typical course as often as they are operated upon.

A very interesting series of investigations bearing on vaccination was carried on by Jenner and his contemporaries, as well as by many who worked after his death. They tried to trace some connection between the disease of the lower animals and those of the human race. A resemblance had been noted between grease, a disease of the horse, ~~and smallpox~~ vaccinia or cowpox, a bovine disease, and smallpox, a human ailment. Some claimed that a close relationship existed between these three diseases. These diseases in the cow and horse only occur in the parts of the respective animals most liable to come in contact with the infected hands of men viz; the teats of cows, and the heels of the horse. There seems to be some truth in this for since the suppression of smallpox epidemics, cowpox and grease, as spontaneous diseases, have become almost extinct. It was from observations along this line of thought that Jenner discovered the facts that confirmed his theory, that a person who had been inoculated with cowpox was rendered immune to smallpox germs. Observers such as Badcock, Ceely, Thiele etc. inoculated heifers with variolous lymph and using the lymph from vesicles obtained inoculated other heifers. This was repeated several times and then the resulting lymph was used on human beings. Some reported having obtained nothing more than purely variolous manifestations, while others asserted that they had typical vaccination results. These latter observers also found that lymph taken from their typical vaccination vesicles

always gave vaccine and never variolous effects.

In closing permit me to write a few words on a burning question of the day. Is vaccination, properly carried out, under any circumstances, a dangerous or uncalled for practice? As I have pointed out above, no rational man can look at the tremendous decrease in the annual death-rate that took place about the first of the nineteenth century without feeling that there must be some underlying cause. The only two causes that present themselves are, the introduction of vaccination, or an improved sanitary condition in the large cities of the world. The anti-vaccinationists claim that the latter was the dominant cause. Does history tell us of any great steps in this direction about this time? If so, I have failed to find them. When these agitators can produce evidence enough to account for such a change vaccination must at least share its immortal glory; till then sanitation can claim little. Driven from this, they say that vaccination has been responsible for many deaths, innumerable cases of life long sickness, etc. etc. Jenner foretold all this. He realized that ignorant operators could bring calumny on his theory. The chief objections raised against vaccination as a universal practice are; failure to, produce an immunity to smallpox and spread of various diseases, such as, syphilis, tuberculosis, skin diseases etc. Concerning the former objection little need be said. Jenner thought the immunity conferred by thorough vaccination was complete and lasting, it is now universally believed that it is only good for a few years and that it does not, necessarily prevent the disease, but simply alleviates the symptoms, should the disease occur. True, and sad to relate, vaccination has caused many horrible deaths

and lingering illnesses. We do not need to go back any further than 1901 to find this, e.g. the outbreak of tetanus that took place among some people vaccinated in a certain locality in the Northern States. This was an accident not dependent on vaccination as a practice, but upon contamination of the lymph used. Syphilis as a vaccine borne disease is now a thing of the past. It was generally due to a custom of arm to arm inoculation, i.e. a healthy subject being vaccinated with lymph taken from a vesicle of a syphilitic person. Syphilis as far as our present knowledge goes is a disease of the genus homo sapiens. Hence lymph, as it comes from a calf, can not be syphilitic. Any taint of this kind must be due to contamination during its preparation or application to the subject, and with a reasonable amount of precaution, danger from this source may be eliminated. Concerning tuberculosis little can be said until it is definitely proven that bovine and human tuberculosis are different and that man is not susceptible to the former. Osler states, "It has been urged by the opponents of vaccination that tuberculosis may be thus conveyed but of this there is no evidence. Lymph of re-vaccinated consumptives is non-infective. Lupus has originated at the site of vaccination in a few cases," The precautions taken by all reliable lymph manufacturing establishments reduce danger of vaccine-borne tuberculosis to a minimum. The skin diseases are almost a thing of the past. They were in most cases due to a mixed infection by poor vaccine. But all these deaths and lesser casualties due to vaccination are cases that can be counted by hundreds or even tens. Death due to smallpox ran into the millions per annum previous to vaccination. Each year sees greater

perfection in our samples of lymph, each year shall see fewer accidents from its administration and each year brings us closer to the day when science shall prevail over fanaticism, vaccination become universal, and variola shall dwindle into a thing of the past.