

## ON THE TREATMENT OF ERUPTIVE FEVERS.

SUMMARY.—The Eruptive Fevers—Variola—Its Prophylactic Treatment—Variolic Inoculation—History of Variolization—Vaccine—Importance of Vaccine—Its Results—Origin of Vaccine—Cow-pox and Horse-pox—Attenuated Virus—The Microbe of Vaccine—Animal Vaccine and Humanized Vaccine—Vaccination—Dangers of Vaccination—Vaccinal Syphilis—Vaccinal Tuberculosis—Activity of Preservation by Vaccine—Conservation of the Vaccine—Importance of Vaccination—Treatment of Small-pox—Period of Invasion—The Rachialgia and the Constipation—Treatment of the Eruption—Abortive Mask—Period of Suppuration—Disinfectant Lotions and Baths—Cardiac Complications—Ether—Opium Medication—Period of Desiccation—Treatment of Complications—Hygienic Cures—Prophylactic Treatment of Scarlet Fever—Treatment of Measles—Treatment of the Eruption—Treatment of the Complications.

GENTLEMEN: By their symptomatic aggregate the eruptive fevers constitute a natural group in the class of fevers, and the therapeutic indications which pertain to them deserve to arrest our attention for a short time. Of these so-called zymotic fevers, small-pox possesses especial interest on account of the prophylactic treatment peculiar to this disease, and on this subject I have a good deal to say.

In consequence of the hideous aspect which the face presents when covered with pustules, the repulsive odor that comes from the patient, the unsightly cicatrices which the malady leaves behind it, and its extreme contagiousness, small-pox deserves to be regarded as one of the most terrible of epidemics, and it is an important duty, on the first appearance of this formidable scourge, to endeavor by every means to limit its ravages.<sup>1</sup>

Do not persuade yourselves, gentlemen, that this word "ravages" is a figure of speech; it is, on the contrary, the rigorous expression of the truth. When in fact small-pox smites populations which have had no protection or immunity from the disease, as is sometimes seen in certain races that inhabit the interior of Africa, or the Polynesian Islands, whole communities have been swept away by the lethal epidemic, and you can judge of the fatality

<sup>1</sup> It is unknown at what epoch the first epidemics of small-pox appeared. It is said that in the books of Brahmins, dating back three thousand years, descriptions of small-pox have been given. It has been stated that this disease also reigned endemically in China, and some even affirm that variola was one of the seven plagues of Egypt; others claim that it was contemporaneous with the birth of Mahomet in 573. What is certain is that the Arabs and Rhazes in particular were acquainted with small-pox, and that the latter taught the treatment of the disease by cold baths. The Arabs passed over the disease to the Spaniards, and the latter introduced it into America.

In France, in the sixteenth century, Gregory, of Tours, designated small-pox under the name of *morbis varius*, from whence came the name of variola; Marius, bishop of Avranches, gave it the name of *varus*, whence it derived the name *verole* (pox) and to which a diminutive has been added to distinguish it from the disease which Voltaire called its elder sister (a)

(a) Barthelemy, Researches on Small-pox. Thèses de Paris, 1880.  
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of these epidemics, in recalling what happened only five years ago (in 1880), at the time of the arrival in Paris of a tribe of Esquimaux, which contracted small-pox during its peregrinations in Europe. All were attacked, and all succumbed. The observation of facts furnished a first means of preservation; it was remarked that persons who had once had the disease were ever after protected from its invasion, and either as the result of accident, or by a process of experimentation, inoculation for the prevention of small-pox came into vogue.

This inoculation or variolation has been, for many centuries, practiced by the Chinese, who make use of pock-scabs, which they introduce into the nasal fossa.<sup>1</sup> Then it was put in use in Circassia to protect young girls

<sup>1</sup> Variolization, or inoculation for small-pox as a prophylactic means, dates from the most remote antiquity. Practised in Georgia, in Circassia, in China, in India and in Persia, it was introduced later, in 1673, into Turkey by Timoni and Pitarino; thence it was imported into England, into most of the states of Europe, and finally into France. The operation was performed at all ages and in all seasons; pregnancy, menstruation, epidemic diseases and acute phlegmasias alone contra-indicating it. Variolization was practised by causing the dried scabs in fine powder to be aspirated by the nose (as in China), or the patient was inoculated with it by applying the matter to the skin denuded by a blister or otherwise broken by a seton, an incision or a prick. In England and in France the pock matter was pricked into the skin, the inner part of the arm being chosen for this purpose.

The variolization having been performed, certain peculiar phenomena follow. In spontaneous variola, there is only one eruption, which spreads indiscriminately over the whole body. In inoculated variola there are two eruptions. For seven or eight days the patient is without fever, and there are only local symptoms; a gradual development from the point of inoculation of a pustule which about the eleventh or twelfth day dries up and leaves a cicatrix. About the eighth day, to the local disease succeeds a general constitutional disturbance with a heavy feeling in the head, malaise, chills, fever, nausea, vomiting and three days after, the appearance of a secondary eruption which begins on the face to extend to the neck, thorax and limbs. These pimples, which are in greater or less number according to the individual, enter into suppuration at the end of three days and follow to the end the habitual march of the pustules of small-pox of the most mild form, without leaving any cicatrices.

By the side of the advantages which variolization procures: mildness of the febrile phenomena, diminution of the number of pustules, abbreviation of the duration of the disease, and especially attenuation of its gravity, must be reckoned special inconveniences to the subject and to his family. The disease engendered by the inoculation may sometimes be of a very grave character, and always by these inoculations made on several persons, foci of the disease are created which may cause it to spread.

It was in the height of the popularity of inoculation that Jenner came upon the stage, and revealed to the world his marvelous discovery of vaccine. (a)

(a) Timoni, Historia variorum quæ per incisionem excitantur, Constance, 1715.—Maitland, Account of inoculating the small-pox, London, 1722.—De La Condamine, Mémoire sur l'inoculation de la petite vérole, Paris, 1754. Histoire de l'inoculation de la petite vérole, Paris, 1776. Montucla, Recueil de pièces concernant l'inoculation de la petite vérole, Paris, 1757.—Tissot, l'Inoculation justifiée, Lausanne, 1754.—Gatti, Eclaircissements sur l'inoculation de la petite vérole, 1764. Réflexions sur les préjugés qui s'opposent aux progrès et aux perfectionnements de l'inoculation, Bruxelles, 1766. Nouvelles réflexions sur la pratique de l'inoculation, 1766.—Wrisberg, De inoculatione variolarum, Gottingue, 1765.—Petit (Ant.), Premier rapport en faveur de l'inoculation, 1766.—Gaudoyer de Poigny, Traité pratique de l'inoculation, Nancy, 1768.—Dunsdale, the present method of inoculation and small-pox, London, 1766, 1767, 1772. Tracts on inoculation, 1782.—Noel, Traité pratique de l'inoculation, Reims, 1789.—Satinade, Traité pratique de l'inoculation, Paris, an VII.—Desotens et Valentin, Traité historique et pratique de l'inoculation, Paris, 1800.



who were to be sold in the markets of Constantinople, and it is from this source that the wife of the English Ambassador, Lady Mary Wortley Montague, in 1721, obtained her knowledge of inoculation, which she communicated to the people of her country; whereupon this practice speedily spread over all Europe. But, notwithstanding all the precautions that were taken, this variolation was not without danger, for inoculation from a mild case of the disease may engender small-pox in its most serious form, and although a real progress was made by inoculation, there was, nevertheless, a mortality of at least one in three hundred. Jenner, who was, as you know, a physician-inoculator in England, by his immortal discovery, substituted vaccination for inoculation, and from henceforth civilized man was in possession of a perfect prophylactic treatment for small-pox.<sup>1</sup>

<sup>1</sup> Known and practised, as it is said, for ages in India, Persia, and even by the aborigines of South America, vaccination had not yet been introduced into Europe, and at the moment when Jenner made his first trials with animal vaccine in England, variolization was greatly in vogue. Certain physicians had remarked that some persons remained refractory to the inoculation of small-pox virus, and that these were generally persons who had before presented a pustular eruption on the hands contracted from milking cows affected with cow pox, but these observations passed unperceived and unappreciated. It was reserved to Jenner to derive profit from these observations, and after long researches, to bring into general usage the practice of vaccination.

Edward Jenner, born at Berkley, Gloucester county, England, in May, 1749, had for twenty years for his first teacher Ludlow, a surgeon of Sodsberg, and it is from him they say, that he learned accidentally that the cow disease preserves from small-pox.

His second master was John Hunter with whom he was always on the most intimate terms. Charged with the performance of variolic inoculations in the county in which he practised, Jenner noted that certain persons were refractory to inoculation, and thus escaped the contagion of small-pox. He observed, moreover, that these same individuals employed on farms had previously been affected with pustular eruptions on the hands, which they seemed to have contracted by milking cows, which had like eruptions on their teats.

Struck by these facts, he undertook various experiments and attempted to substitute for the variolizations properly so-called, inoculation with the virus contained in the pustules developed primarily in the animal or secondarily on the human subject.

He considered, moreover, cow pox and small-pox as having for first origin one sole and same disease, an affection of the horse called *grease*, and which in France is called *eaux aux jambes*. According to him, *cow pox* comes from *horse pox*, and is communicated by the stable-boys charged with the care of horses and the milking the cows. Jenner made his first experiment on his own son in 1789; he inoculated him with *swine pox*, then a little while after he variolized him; the disease did not take.

In 1796 he took from the hands of a farm girl, Sarah Holmes, the virus contained in some pustules, acquired from milking cows, and he inoculated a child by the name of Phipps; the eruption appeared at the points of inoculation, and four months after he variolized the child, the infection did not take, the child seeming to be fully protected. The vaccine discovery was made, but it was not till two years later, in 1798, that Jenner published the results of his experiments in a little book of sixty pages.

Physicians rallied around Jenner, and among them Pearson was the first to repeat the experiments, and with the same results. But like Simmons, Coleman, and other experimenters, they did not believe with Jenner that *cow pox* was derived from the *grease* of horses. Woodville, physician to the hospital for inoculations in London, having found a case of spontaneous cow-pox, made experiments with it; he noticed that the eruptions were not all

I shall not here discuss the value of vaccination. I am aware that there exists a small and uninfluential group of physicians who, under the name of anti-vaccinators, pretend that not only is the discovery of Jenner inefficacious, but that it is even dangerous; but their specious arguments have not lessened the preservative value of vaccine,<sup>2</sup> a value to-day indisputable, and which all the countries of Europe and of the world make haste to recognize, by favoring the promotion of vaccination, and by making it a legal obligation. France has not yet enforced this obligation by legislative enactment, although it has done so in a round-about way, by making attendance at schools and military service obligatory, and in requiring a certificate of vaccination and of revaccination as a condition of admission to the public schools and the army.

I shall not examine here all the questions which the origin of vaccine has

alike, and that there was in some cases a real variolic rash. Woodville concluded from this that pustular eruptions were a part of the vaccine disease, and that cow-pox was but a variety of small-pox. But later he abandoned this view; his last experiments were made with more care and he obtained the results announced by Jenner. His first experiments were defective; in fact he confessed that sometimes he inoculated with small-pox matter at the same time as the vaccine, or several days later. He also made these operations in a hospital where small-pox was prevailing.

The works of Jenner and his partisans rapidly spread the knowledge of vaccine to Hanover, Germany, Austria, France, Italy and even America. It was everywhere practised, despite the obstacles which were put in its way by numerous adversaries (Mosely, Vaunie, Herz, etc.)

The disparagers of vaccine have accused Jenner of not having faith in his own discovery, because in 1799, after having vaccinated without success his son Robert, who was living in a district infected with small pox, and not being able to procure genuine cow-pox matter, he variolized the child.

As in the case of all discoveries, the claim of Jenner to the discovery of vaccine was contested, and in France even, it was said that Jenner had been anticipated by a protestant minister of Montpellier. Whether this be true or not, it is none the less indisputable that if the idea did not first originate with Jenner, to him alone belongs the glory and the merit of having propagated the practice of vaccination.

Besides questions pertaining to medicine Jenner occupied himself much with natural history and published various works on this subject. He died loaded with honors at the age of 64 years; he had a first attack of apoplexy in 1820; he recovered, but in January, 1823, a second attack carried him off. (a)

<sup>2</sup> To judge of the relative mortality of small-pox before and after the discovery of vaccine, we need only consult the tables of Lotz, of Bale. The latter affirms that in the last century a twelfth of the population of Europe succumbed to variola.

The following table will be of interest at the present day amid the scepticism provoked by the wide spread literature of anti-vaccinationists:

(a) Jenner (Edw.), An inquiry into the cause and effects of the variolic vacc., London, 1798, trad. franç. par de la Roque, Lyon, 1800. Further observations on the variolic vaccine or cow-pox, 1799. Appendix to the treatise on cow-pox, 1800. A comparative statement of tracts and observations relative to the cow-pox, 1800. On the origin of the vaccine inoculation, 1801. On the varieties and modifications of the vaccine pustule occasioned by an imperfect state of the skin, 1819.—Woodville, reports of a series of inoculation of variolic vaccine or cow-pox, Londres, 1799.—Pearsey, Recherches historiques sur la vaccine, Londres, 1798.—Vaunie, Réflexions sur la nouvelle méthode d'inoculation.—Herz (Marcus), in Journ. de Hufel., vol. XII, 1801.—Baron, the life of Edw. Jenner, with illustrations of his doctrines, London, 1838.



raised,<sup>3</sup> viz., whether it comes exclusively from the cow or in the first instance from the horse. Whether cow-pox and horse-pox are anything but real small-pox developed in animals? Whether there is identity between human variola and animal variola? These are problems of experimental physiology which are far from being solved, despite numerous laborious investigations, in particular those of the veterinary school of Lyons and its chief Chauveau. Yes, it seems demonstrated that horse-pox and cow-pox are the small-pox of the horse and cow, but when you come to inoculate these animals with the human pock you

Names of Countries.	Period Before and After the Introduction of Vaccine, to which Belong the Figures Pertaining to the Mortality from Small pox.	Annual Average of Mortality in Each Million of Inhabitants.	
		Before the Introduction of Vaccine.	After the Introduction of Vaccine.
Lower Austria.....	1777 — 1806 and 1807 — 1850	2484	340
Upper Austria.....	1777 — 1806 and 1807 — 1850	1421	501
Styria.....	1777 — 1806 and 1807 — 1850	1052	446
Illyria.....	1777 — 1806 and 1807 — 1850	518	244
Trieste.....	1777 — 1806 and 1807 — 1850	14036	182
Tyrol and Voralberg...	1777 — 1806 and 1807 — 1850	911	170
Bohemia.....	1777 — 1806 and 1807 — 1850	2174	251
Moravia.....	1777 — 1806 and 1807 — 1850	5402	255
Austrian Silesia.....	1777 — 1806 and 1807 — 1850	5812	198
Galicia.....	1777 — 1806 and 1807 — 1850	1194	676
Bucovina.....	1777 — 1806 and 1807 — 1850	3527	516
Berlin.....	1781 — 1805 and 1810 — 1850	3422	176
Sweden.....	1774 — 1801 and 1801 — 1850	2050	158
Copenhagen.....	1751 — 1800 and 1801 — 1850	3128	286 (a)

<sup>3</sup> Jenner admitted as the origin of vaccine a disease of horses' heels, which being transmitted to the cow by the dirty hands of milk men employed in treating the sick horses, is transformed into cow-pox. He at first called this disease *the grease*, and later he gave it the name of *sore heels*; a name which is the equivalent of *caux aux jambes*; which our veterinary surgeons apply to the same disease. It is to-day known that this horse disease is not the true origin of cow-pox and does not preserve the animal from small-pox; but that there exists another disease which Bouley calls *natural horse pox*.

This natural horse-pox was observed in France, in 1860, at Rieumes, near Toulouse, by Laforge, and in 1863, by Bouley, at the veterinary school of Alfort.

This horse pox is an eruptive vesiculo-pustular disease which is seated especially on

(a) Lotz, Variola and Vaccine. Report made in the name of the Sanitary Federal Commission. Bâle. 1881.

obtain a product which gives you for the human subject not kine-pox but small pox. The identity of vaccine virus and variola virus is only a hypothesis, but which will, it is hoped, shortly become a scientific reality, thanks to the brilliant discovery of attenuated virus by our illustrious colleague Pasteur.

I cannot here resist the desire to say a few words concerning this doctrine, which, originating only a few years ago, occupies so great a place in the prophylactic treatment of diseases, and which has thrown so much light on the history of virulent and infectious maladies.

Carrying out the fruitful line of inquiry suggested by vaccination, Pasteur has shown that it is possible by special cultures of microbes,<sup>4</sup> the supposed

the skin and on the buccal and nasal mucous membranes, and exceptionally on the conjunctiva. On the skin, the eruption has for seat of predilection the lower portion of the limbs and the head. This eruption is accompanied by a slight febrile movement which comes on three or four days before the appearance of the vesico-pustules. The confluence of the eruption on the legs produces congestion, swelling and ulceration, and it is easy to understand the confusion which has been made between the *caux aux jambes* (leg waters) and horse-pox.

Chauveau, Viennois and Meynert have studied artificial horse-pox, that is to say, that which results from the inoculation of humanized vaccine on the horse, and have shown the differences which exist when inoculations or injections are made in the veins or in the cellular tissue, or when the product is introduced by the respiratory passages.

In the cow there exists also a vesiculo-pustular eruptive fever which has been described under the name of cow-pox, and which may be produced as in the horse by the inoculation of vaccine matter.

Attempts have been made to ascertain if cow-pox, horse-pox and small-pox are the same disease, and this opinion of the unity of the three diseases has been maintained by Jenner, by Thiele, and by Ceely; and it has been the subject of numerous discussions before the Academy of Medicine, especially in 1863 and 1864. Depaul has been the most ardent defender of this unity, which has been combated by Bousquet, and this view may be summed up in these words: "There is no special vaccine virus. The latter is nothing but small-pox virus in its action on the cow and the horse."

Unfortunately experiments which have been made down to the present time have not solved this question, and the researches of the Commission of Lyons show that when you inoculate with human small-pox the horse and the cow, you give them a different eruption from horse-pox and cow-pox; and that if you take the product of this eruption and inoculate man with it you do not produce the vaccine disease but genuine small-pox. (a)

<sup>4</sup> Thus far inoculation by attenuated virus has been practiced in three affections: chicken cholera, anthrax and swine plague.

The virus of chicken cholera is one of the most active. It owes this activity to certain bacilli which develop in the blood and in the entire organism of the fowl. By the culture of this bacillus, one may succeed in attenuating its virulence and creating a variety of microbe which always reproducing its kind is capable of preserving chickens without determining in them cholera. As for anthrax (charbon), the first attempt at attenuation was made by Toussaint, of Toulouse, who raised to the temperature of 50° C. defibrinated blood of an

(a) Jenner, An inquiry into the causes and effects of the variolic vaccine, a disease discovered in some of the western counties of England, particularly Gloucestershire, and known by the name of cow-pox, London, 1798.—Lay, Account of some experiments on the origin of cow-pox, 1802 et Bibl. brit., t. XXI, p. 377.—Bouley, Leçons de pathologie comparée, Paris, p. 175, 1882.—Bousput, De l'origine de la vaccine chez le cheval, rapport sur le mémoire de M. Laforge (de Toulouse) (Acad. de méd., 27 mai 1862).—Chauveau, Viennois et Meynet, Vaccine et variole, nouvelle étude sur l'identité de ces deux affections (Acad. de méd., 30 mai 1865, et Gaz. hebdomadaire de méd. et de chir., 1865, p. 354).—Warlomont, Traité de la vaccine, 1883, p. 55.



agents of contagion in virulent diseases, to change the character of the bacilli, or, to use the happy expression of Bouley, to domesticate them, and thereby create new varieties, which, while maintaining a protective power on the animal in which they have been inoculated, develop only a mild form of the original disease. This is what he has accomplished for chicken cholera, for swine plague, and especially for anthrax, or splenic fever, and to-day it is by tens of thousands that we count the flocks and herds that he has saved from this deadly anthrax by his experimental vaccination. It ought to be the same for small-pox and vaccine, but we have not yet found methods of culture for developing the variola virus, and it is necessary that small-pox should undergo attenuation in the organisms of certain animals, such as the horse and cow, before the resulting virus can be truly protective.

Does the vaccine virus, you may ask, contain a microbe? Undoubtedly; and Klebs considers it as absolutely identical with that of small-pox. Chauveau, moreover, showed us in 1868 that vaccinal lymph deprived of its solid corpuscles, becomes inert.<sup>5</sup>

animal affected with charbon, and it was with this blood that he prepared his vaccinal liquid. Pasteur, Roux and Chamberland succeeded in cultivating the bacteria in obtaining a variety of these micro-organisms which reproduced themselves only by scission and without spores. This kind of bacterium was obtained by cultivating the anthrax bacillus in a culture liquid at the temperature of 42° to 43° C. These bacteria, deprived thus of spores, lost their virulence and served for attenuated virus.

One may, with these varieties of attenuated bacteria of chicken cholera and of charbon reproduce the virulent species, and for this purpose it suffices to inoculate these bacteria in certain species of animals of small size, the guinea pig for charbon, the sparrow for chicken cholera; then to take the microbe which develops in these organisms and subject it to another culture, and thus by successive cultures we succeed in reconstituting the original virulence of these bacteria. To-day these preventive inoculations for charbon are an accomplished fact of immense practical importance, and it is by the thousands that such inoculations are practiced among sheep in all the countries of Europe.

Detmers, of Chicago, afterwards Thuillier, of France, have discovered a microbe in the blood of hogs infested with swine plague. Pasteur and Thuillier have attenuated the virus and modified the microbe in causing it successively to pass through the pigeon and the hare, and this attenuated microbe inoculated in hogs, preserves them at least a year from swine plague. (a)

<sup>5</sup> Gluge, in 1838, was the first to describe in vaccinal lymph certain crystals which he believed to be the essential principle of this lymph. These crystals were nothing but brilliant corpuscles, which have been since described under the name of corpuscles of Gluge. Chauveau, in 1868, pointed out this capital fact, that when we deprive vaccine matter of the corpuscular elements which it contains, the vaccinal lymph becomes inactive. To obtain this complete separation, Chauveau employed the process of diffusion, and to a stratum of virulent liquid he added, carefully and slowly, a stratum of water; intermingling took place, and all the soluble parts of the serum were diffused through the water; the upper part of this mixture, when animals were inoculated with it, did not reproduce the vaccine. According to Hiller, the contagious principle of vaccine resides in certain pale opaque granules, some

(a) Bouley, *Leçons de pathologie comparée, Le progrès en médecine par l'expérimentation*.—Duclaux, *Ferments et maladies*, Paris, 1882.—Dujardin-Beaumetz, *art. Bactérie, Dict. de théor.*—Chamberland, *Revue scientifique*, mai 1882.—Pasteur et Thuillier, *Du virus atténué au rouget des porcs* (Acad. de méd., séance du 27 novembre 1883).

You all know the methods of vaccination, and I need not here give you any rules for this operation, nor any description of the vaccinal eruption,<sup>6</sup> only reminding you that it seems to-day demonstrated that the number of vaccinations, and the intensity of the vaccinal eruption, have a certain part in the protection conferred, and the statistics of Oppert and of Russell seem to me in this

soluble in solution of potassa, others insoluble. Klebs believes that he has found the microbe of vaccine; he claims that it is identical with that of small-pox; it has for dimensions  $\frac{1}{10000}$  of a millimetre; it presents itself often in groups of four, whence the name of *micrococcus quadrigeminus*. (a)

<sup>6</sup> The regular vaccinal eruption is developed in the following manner (Bousquet): The first and the second day one sees nothing unless it be some little hyperæmia in the punctures, but to inexperienced eyes the vaccinated subject is as if nothing had happened; it is the period of incubation common to all contagious diseases and especially to eruptive fevers. From the third to the fourth day, a little sooner in summer, a little later in winter, there is seen on each point of puncture a red point, more sensible to the touch than to the sight; in fact the finger distinguishes very clearly a little engorgement, just commencing, but soon to increase.

The fifth day, counting from that of inoculation, or the second day of the eruption, this pimple has become larger, but still without any particular characteristic.

On the sixth day it is no longer possible to be mistaken. Instead of developing towards a point as it had commenced to do, the pimple enlarges, flattens, becomes slightly cupped in the centre and takes on a silvery white, shading a little into a blue color. At the same time the base is surrounded with a little circle still very circumscribed but which spreads further each day.

The seventh and eighth day the same symptoms a little more marked. The pustule then fully formed, presents itself with its distinctive characters; is one or two lines in breadth, of a slightly azure white color, surrounded by an aureola of considerable extent, depressed in its centre, and terminated by hard swollen borders more elevated than the rest of the surface.

The ninth and tenth day this congeries of symptoms acquires still more intensity, but the most remarkable change takes place in the aureola, whose color, more bright and more red, disappears with greater difficulty on pressure of the finger and extends nine or ten lines in every direction. The subjacent parts are engorged, and this engorgement is proportioned to the extent and intensity of the areola.

From the eleventh day the papule begins to fade; the silvery blue changes and becomes brown; the areola contracts, grows pale, and yellowish; finally from the twelfth to the thirteenth day the pimple dries up and is transformed into a hard black crust, which falls on the twentieth or twenty-fifth day, and leaves in its place an indelible cicatrix, so characteristic that an experienced person can always tell what was its source.

The vaccinal cicatrix is round, deep pitted, traversed with rays and studded with a multitude of little black points which correspond without doubt to the cells which the pimples contained in their interior. It is superfluous to add that the older the cicatrix the more it is confounded with the integument, but it is never entirely effaced.

Such is the pustule obtained by human vaccine; with animal vaccine there are certain slight differences. The pustules are ordinarily more voluminous, more flat, more white; the march of the eruption is slower and its local action more violent, and sometimes accompanied with engorgement of the glands of the axilla.

Kine pox sometimes presents irregularities. The period of incubation which lasts

(a) Gluge, *Anatom. Microscop.*, Winden, 1838. Chauveau, *Nature des Virus*, etc., Acad. des Sc., Feb'y, 1868. Klebs, *Arch. für Experim. Path.*, t. x., p. 2 and 3. Hiller, *Untersuchungen über das Contagium der Kuhpocken*, Centrabl., No. 20 et 21, 1876.



respect to be very conclusive.<sup>7</sup> But one point on which I ought to insist is the necessity of re-vaccination; in fact, vaccine seems to lose its protective properties in about ten years; therefore, all the governments which have made vaccination compulsory have been careful to enjoin revaccination.

Of all the dangers which have been attributed to vaccine, there is but one which deserves your serious consideration: it is the possibility of inoculating syphilis when the matter is taken from a syphilitic subject.<sup>8</sup> To-day it is perfectly demonstrated, and by observations, unhappily too numerous, which amount in our country to more than 120 cases, that vaccinal syphilis exists, and that too much care cannot be taken in the choice of the subject from whom vaccine matter is obtained. This consideration has had a good deal to do with the success which has attended animal vaccine, a kind of vaccination which Lanoix and Chambon imported from Italy in 1856 to our country, and you may see in this hospital the success which has been obtained by this bovine vaccination, to-day adopted by all the countries in Europe as

ordinarily from three to four days may be prolonged even to the fifteenth or twentieth day. In the eruption one sometimes sees the pimples develop not simultaneously but progressively, the one after the other. Sometimes, also, there develop more pustules than there were pricks, and they are met with not only on the parts inoculated, but also over the whole body. These cases are especially seen in children affected with impetigo. This diffused eruption is unfortunate from the reaction which it occasions, and especially from the indelible cicatrices which it leaves behind. So in the case of children affected with rashes it is well to be prudent; if there is no epidemic of small-pox prevailing, one may put off vaccination; if there is fear of contagion, one need not make but one or two punctures.

In certain cases where inoculation is made very deep, no pimple is produced, and yet the individual may be preserved, as the late observation of René Blache has shown.<sup>(a)</sup>

<sup>7</sup> According to Oppert, the greater the number of raised pustules, the more complete the protection. He gives a table of observations which go to confirm this view.

<sup>8</sup> Vaccinal syphilis is to-day admitted without dispute by all observers, and Viennois in 1860 had collected more than sixty-seven observations. In France we may reckon at one hundred and twenty the number of cases of vaccinal syphilis recorded. In Italy the number amounts to three hundred. In England there have been but thirty-six instances. One may, moreover, on this subject consult the interesting statistics of Lotz, of Bâle. As for France, the number of persons infected, which as we have just mentioned amounts to one hundred and twenty, since attention was first called to vaccinal syphilis, might be augmented by more than twenty cases observed in the garrison at Algiers. Many hypotheses have been put forth to explain the introduction of syphilis by vaccine.

1. The hypothesis of direct inoculation by a lancet which has been in contact with chancrous pus, or by the contact of cloths soiled by pus of the same nature, the vaccinal abrasion taking the infection, or by possible inoculation with syphilitic blood.

This last hypothesis has been experimentally verified in Italy by Pellizari who in 1862 inoculated his pupil, Dr. Bargioni, with syphilis by employing blood taken from the cephalic vein of a woman of twenty-five years of age affected with constitutional syphilis.<sup>(b)</sup>

(a) Brusquet, *Traité sur vaccine*.—R. Blache, *Efficacious vaccine without cutaneous manifestations*, (Rev. mens. des malad. de l'enfance, Dec. 1883).

(b) Viennois, *De la transmission de la syphilis par la vaccination* (Arch. gén. de med., 1860, t. 1, p. 640, t. II, p. 32 et 297).—Depaul, *la Syphilis vaccinale* (Acad. de med., decembre 1864 et fevrier 1865).—Lotz (de Bâle), *Variole et vaccine*, Bâle, 1880 p. 107.—Millard, *Sur un cas de syphilis vaccinale* (Union med., decembre 1865, No. 147, p. 466).

well as in America. For my part, I consider animal vaccine just as good as human vaccine, with this advantage, that there is certainty of exemption from the danger of syphilis.

But now that the experiments of Villemin have been strongly confirmed by the discovery of the *bacillus tuberculosis*, one may ask if in this way tuberculosis, so frequent in kine, may not be transmissible by vaccine.<sup>1</sup> So far we have had no proof of this fact, but it deserves to be discussed, and Warlomont, in his interesting work on vaccine, has devoted to the refutation of the possibility of inoculation of tuberculosis by animal vaccine, an interesting chapter, to which I refer you.

Whether it comes from the infant or from the animal, vaccine matter may be preserved a considerable time. At our Academy of Medicine, where the humanized lymph alone is used, the vaccine is kept only in capillary and glass tubes. In countries where they make exclusive use of animal vaccine, which is more difficult of preservation, they employ the scabs, or dried pustules reduced to powder or paste, and my pupil, Dr. Crando, of Nice, has shown the activity and the easy preservation of these vaccinal preparations.<sup>2</sup>

<sup>1</sup> Toussaint has made experiments respecting the possibility of inoculation of tuberculosis by vaccination.

With a vaccine pustule from a child in excellent health and the issue of robust parents, he inoculated a tuberculous cow; with the serum from pustules thus produced in the cow, he inoculated four hares and a hog; two of the hares, killed two months afterwards, showed all the lesions of tuberculosis.

As for the hog, it also became tuberculous. Vulpian in commenting on this communication, observes that it is with great reservation that one should accept Toussaint's results. Moreover, he remarks that it is not till after having produced these experiments a great number of times with positive results that one should admit the possibility of this inoculation. (a)

[Fearing the possibility of syphilitic contamination by using humanized lymph, physicians in America largely rely on animal or bovine matter, of which there are many excellent sources of supply in this country. The danger of communication of tuberculosis by animal vaccine is so slight as to be practically excluded. The bovine lymph is more severe in its effects than the humanized, producing often considerable constitutional reaction and a more or less diffused eruption. I am certain that I have seen septicæmic symptoms developed from impure quality of the lymph, for producers, eager to make the most of the occasion, are not always particular to charge their points only with the pure watery lymph which oozes from the papule of the heifer on the sixth or seventh day, but they by artificial means tease out more vaccine matter and this is often contaminated with blood. It cannot be too much impressed on vaccinators, that whether humanized or animal vaccine be used, only the clear water that at the end of a week oozes from the papule is suitable, and that the admixture of pus or blood (and on this account the dried crusts are reprehensible) engenders danger from septicæmia.—TRANS.]

<sup>2</sup> Animal or human vaccine is preserved in different ways:

*Tubes*.—Here the vaccine is in a liquid form and preserved in capillary tubes. You break the tubes when you wish to use the vaccine.

*Glass Plates*.—You can collect and keep the vaccine between two flat pieces of glass, and it suffices to moisten these plates with saliva to have the vaccine fit for use.

(a) Toussaint, *Tuberculous infection by the liquids of secretion and serosity of vaccine pustules*. Comptes rendus de la séance du 8 Aug. 1881.