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Vaccination Eruptions

T. D. POOLE.

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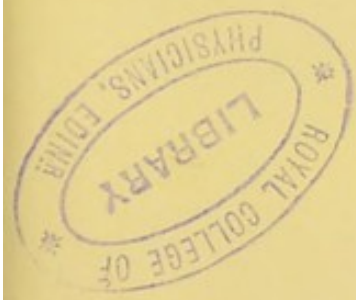
VACCINATION ERUPTIONS

Original Research

BY

THOMAS DOBSON POOLE, M.D.

Master in Surgery, University of Edinburgh; Fellow of The Obstetrical Society.



Truth is truth to the end of the reckoning.

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TO

Mrs Eliza Cardwell

THIS VOLUME

IS

DEDICATED

AS A TOKEN OF PROFOUND RESPECT

BY THE AUTHOR.

CONTENTS.

PREFACE.

IF I were asked to name two of the most important operations I should say, Circumcision and Vaccination; though an attempt to explain to any but the intelligent why I mention these, would require far more space than we have now at our disposal.

An operative procedure whose good results have been tested by time and experience, whose benefit is not confined to the operated upon solely, whose risks are almost infinitesmal, and which is best performed on the healthy subject, cannot but excite the curiosity of those whom it may directly or indirectly concern. The uneasiness generated in the minds of the parents who bring their offspring to be operated upon need not then be wondered at. To some of us who are not parents this feeling is foreign; but it can easily be imagined.

The method that most readily suggests itself of mitigating this condition of "mental unrest" in our patients is for us to be thoroughly conversant with the inconveniences and dangers (however slight they may be) of the operation, so as to be able, if occasion arose, to cope with them in a reasonably skilful manner.

I was first prompted to undertake a description of "Vaccination Eruptions" through having met with several

cases of rash following the operation, an account of which, in ordinary books on vaccination, was barely mentioned; and it was Dr J. W. Ballantyne (to whom I have to gratefully acknowledge my thanks) who assisted me in putting my idea into practical form. I hope that this little work will be of service to medical practitioners in general.

My thanks are also due: To Dr J. B. Buist who not only favoured me with vaccine material for experimental purposes, but also with many valuable hints concerning the literature of vaccination; to Dr Nöel Paton for the characteristic kindness he showed me in the Laboratory of the Royal College of Physicians, Edinburgh; to Dr Sims Woodhead for a tube of potent tubercle culture; and to Drs Carr and Stuart, Residents at the Edinburgh Fever Hospital and Royal Edinburgh Infirmary (respectively), for their valuable assistance in procuring erysipelatous and other morbific poisons.

T. D. P.

INTRODUCTION.

AS Political Economy is to the politician, so is Vaccination to the investigator. After reading more or less extensively the subject of vaccination, one cannot avoid the conclusion that authors have discovered more words than matter. "For the wit and mind of man, which is the contemplation of the creatures of God, worketh according to the stuff, and is limited thereby; but if it work upon itself, as the spider worketh his web, then it is endless, and brings indeed cobwebs of learning, admirable for the fineness of thread and work, but of no substance or profit" (Bacon).

Nor is the difficulty simplified by a few anti-vaccinists, who, grovelling in their own inventions and conceits, have concocted a panorama, in which we see a war between the anti-vaccinists and the vaccinists, the former being represented as using the instruments of the present day, while the latter are represented as using those of the time of Jenner. This has diverted the attention of the thoughtful and polluted the minds of those not educated to think. Our present inconsistent law on vivisection is another cause that still further tends to postpone the day when vaccination is to be revealed.

Does vaccination minimise the small-pox mortality? is what the statesman, in particular, asks. Although I do not intend dealing with this question at present, it may here be pointed out that (to borrow the idea from Mr Newman) a true statesman who has a *liberal* education (as distinguished from a *scientific* education), and who is endowed with what is termed *capacity*, will, in making a law, use the skill and opinions of others. Therefore, in making a law regarding a scientific subject he will use the skill and opinions of scientific men.

Assuming that vaccination minimises the small-pox mortality, it is plain that the small number who die from vaccination cannot be weighed against the thousands that are saved thereby. It is mere sentiment to say that the Compulsory Vaccination Acts should be unconditionally repealed because a few infants die from vaccination, or because other diseases may come with it. Taking cow-pox to avoid small-pox is simply running a small risk in order to avoid a great danger. Life is a game of skill, not of chance.

Since the public, who are indirectly the law makers, are so influenced by sentiment, it is evident that if sentiment has not to rule, the minds of the public must be kept as far as possible neutral, and that any publication whose tone is calculated to generate sentiment is inadmissible. A time may come when sentiment will be out of the pale in the making of a law on cremation.

It is argued—as we are led to believe from the tone of some anti-vaccination literature—that the public have a right to know the details of vaccination. If so, then the

public have a right to know the details of some points in obstetrics or in toxicology, about each of which there is a law.

Considerable ingenuity is shown by the anti-vaccinists in their arguments to prove that compulsory vaccination is inconsistent with freedom, and they recommend isolation to take its place. But no legislature can give to an individual that freedom whereby he becomes a source of danger to himself and his fellow-creatures; or otherwise, the laws on suicide and murder ought to be repealed. The law simply requires that an infant be vaccinated in order that its chances of contracting small-pox are diminished; or if it do catch the disease, the probability is that recovery ensues (whereas small-pox is very fatal in unvaccinated children); at all events, the small-pox virus, after passing through the system of a vaccinated person, becomes so attenuated or modified, or, in other words, is disarmed to a great extent of its virulence, that it either fails to give the disease to a second vaccinated person or becomes more weakened still, and in this way an epidemic of the disease tends to become extinct; and surely there is nothing inconsistent, immoral, or unjust about such a law. And it is difficult to see how compulsory isolation could be more consistent with "freedom," provided hospital accommodation were sufficient to enable such a law to be carried out. Fortunately, the present system answers the purpose. The Registrar-General's report showed that the deaths from small-pox in 1890 were *sixteen;* but it may be safely predicted that, if the people in some parts of England persist in remaining misguided in regard to the vaccination question, the record of 1890 will not so soon be broken.

Parliament has just as much right to compel a healthy child to be vaccinated for the public benefit as it has to expose a healthy soldier to the enemy's bullets or to the diseases and drudgery of an unhealthy climate. Nor has a physician a right to treat a patient as his own judgment dictates; for there are conditions of worry and anxiety (and in some instances amounting to melancholia) that might be relieved by a procedure, which, if permitted, would act disastrously on the public morals—although perhaps beneficial to an isolated patient. Thus, one individual is allowed to suffer an inconvenience for the good of the community.

Again, there are others who scoff at the scientific opinion of vaccination by saying that science is now in its infancy. The type-writer and the phonograph are not the productions of anything comparable to infancy, whose helpless imbecility is characteristic. If any such comparison be needed, Science would be more aptly compared to a daughter of Eve on the verge of womanhood—who is, as we wish to make her, true or false. The time may not be far distant when she will be comparable to a sensible matron.

In the meantime when we consider, how that previously to compulsory vaccination in six months there died of small-pox in Glasgow alone 800 persons, how that at one time the contraction of small-pox was almost inevitable to every one, how that at present the number of cases in a small-pox epidemic is counted by the teens and not by the thousands, and how that there are hundreds of practitioners who, while in a practice of many years, have seen neither a small-pox patient nor a case in which vaccination has been followed by an untoward effect, we cannot help thinking that to

repeal the Vaccination Acts is a risky experiment for Parliament to undertake.

The literature of vaccination eruptions is so meagre—thus differing from the literature of vaccination with which, however, it is blended—and no one can boast of a large experience in the complications of vaccination, that no attempt whatever can be made to give the frequency of the various accidents that may attend the inoculation with vaccine lymph.

"The extreme paucity," says Malcolm Morris (*Brit. Med. Jour.*, 1890, ii., p. 1229), "of the literature of this country may be ascribed, on the one hand, to the fear that any full account of unusual appearances may be detrimental to vaccination as a system, and, on the other hand, to the fact that eruptions are fortunately rare. In answer I would urge that it is one's duty to record, as far as possible, any deviation from what may be considered the normal course." And Dr Lee says (*Brit. Med. Jour.*, 1884, i., p. 1179) that we "should recognise that vaccination may cause certain eruptions which we ought not to disregard but rather to explain. Thus the prejudices which have of late been increasing against vaccination will be diminished and the cause for them prevented."

CLASSIFICATION.

Undoubtedly the best method of classifying disease is based, as modern pathology teaches, on the etiological factor. Mr Malcolm Morris (*Brit. Med. Jour.*, 1890, ii., p. 1230), appreciating this, suggests two principal groups for the classification of vaccination eruptions—

1. Eruptions due to pure vaccine inoculation.
2. Eruptions due to mixed infections, that is to say, to vaccine together with an additional virus.

Dr Colcott Fox (*ibid*), however, prefers a classification more in accordance with the one so ably put forward by Morrow, and arranges all departures from a normal vaccination in one of five groups. The classification of vaccination eruptions presents no ordinary difficulty, and must of necessity be faulty, since it is a classification of a variety of diseases *relative* to another disease. It is necessary, in order to describe them in anything like an orderly manner, that some arrangement be made, and I purpose using the admirable classifications of Malcolm Morris and Colcott Fox.

PROPOSED CLASSIFICATION.

(Malcolm Morris).

GROUP I.—ERUPTIONS DUE TO PURE VACCINE INOCULATION.

Division **A**—Secondary local inoculation of vaccine.

Division **B**—Eruptions following within the first three days before the development of the vesicles.

Urticaria.
Erythema multiforme.
Vesicular and bullous eruptions.

Division **C**—Eruptions following after the development of the vesicles due to absorption of virus.

1. Roseola—like measles.
   Erythema—like scarlet fever.
   Purpura.
2. Generalised vaccinia ("vaccine généralisée").

Division **D**—Eruptions appearing as sequelæ of vaccination; eczema, psoriasis, urticaria, etc.

GROUP II.—ERUPTIONS DUE TO MIXED INOCULATION.

Division **A**—Introduced at the time of vaccination.

Subdivision (*a*) Producing local skin disease.
Contagious impetigo.
Erythema.

Subdivision (*b*) Producing constitutional disease.
Syphilis.
Leprosy (?).
Tuberculosis (?).

Division **B**—Introduced, not at the time of vaccination, but subsequently through the wound.

1. Erysipelas.
2. Cellulitis.
3. Furunculosis.
4. Gangrene.
5. Pyæmia.

CLASSIFICATION.

(Colcott Fox.)

I. Local abnormalities or irregularities in the development of the vaccine vesicles.

II. Incidental exanthematic eruptions.

III. Diseases inoculated with vaccinia at the time of the operation.

IV. Diseases (chiefly of a septic nature) which find a nidus in the wounds subsequent to the operation.

V. Diseases excited in subjects specially predisposed to the same.

LOCAL ABNORMALITIES OR IRREGULARITIES IN THE DEVELOPMENT OF THE VACCINE VESICLES.

Lymph.—It is difficult, with ordinary care, to deviate from even a branch of such an extensive subject as vaccination, and a brief notice of some of the more salient features of vaccine lymph will not be a needless digression. Weak antiseptics appear to exert little influence over vaccine, and Dr R. Pott (*Brit. Med. Jour.*, 1882, i., p. 592) says that salicylic acid (1–300), boracic acid (3·5%), and carbolic acid (1–5%) solutions do not destroy its activity, but over 5% of carbolic acid solution does so. And Dr W. Husband, in his essay on vaccine, is said (*ibid*) to have stated that vaccine, properly secured in his tubes, retains its activity for seven years. There are two principal kinds of vaccine lymph, the translucent and the opaque. The translucent variety, the one to be recommended for vaccination purposes, is alkaline in reaction and shows under the microscope micrococci, varying in size from ·1 to ·5μ, which are stained with comparative ease by analine methyl violet. These micrococci are supposed to be the active principle of lymph. Besides these micrococci there may be seen according to M. Ferré (*Brit. Med. Jour.*, 1884, i., p. 695) different structural elements, such as

lymphatic cells, blood corpuscles, and more or less misshapen granular carbonate of ammonia. These must be regarded as accidental ingredients and not as true products of vaccine. The clearest lymph is obtained at, or just before, the time when the vesicle is mature, for these cellular bodies make their appearance daily in increasing numbers after the 7th day. The opaque lymph is acid in reaction. It owes its capacity according to Buist (*Vaccinia and Variola*) to the "germ" of vaccinia itself and to a slight extent to the germinal matter found in commercial vaccine tubes, which assists in the production of the opacity. A cover glass preparation of opaque lymph, stained with analine methyl violet, shows chains of micrococci, diplococci and tetrads, the micrococci being twice the size of those seen in a similar preparation of clear lymph. These micro-organisms bear a resemblance to those seen in Dr Buist's artificial cultivations of lymph.

The attempts to cultivate lymph artificially have been, up to the present time, practically a failure, although much light has thereby been thrown into the dark corners of pathology. Among the names of those who have worked at this difficult subject we may mention those of Buist, Cohn, Neil Carmichael, and Quist. Buist's cultivations were carried on in solid media and his experiments led him to conclude that he had attenuated his lymph. On the other hand, Neil Carmichael (*Proc. Philos. Glas.*, 1886–7, p. 369) who, using a fluid medium, claims to have succeeded in cultivating lymph artificially, but not in sufficient quantities for general inoculation. Dr Carmichael's cultivations succeeded in 10% only of the children inoculated, who were susceptible in a special degree. "It is not, I think," says Dr Carmichael, "a truly attenuated lymph, for when it does succeed its success is perfect." In this way it differs from Dr Buist's cultivations. Quist (*Brit. Med. Jour.*, 1884, i., p. 380) concludes that the micrococci to which lymph owes its

activity can be made to multiply without losing its activity. His medium is blood serum and glycerine to which he adds a small quantity of carbonate of potash.

We cannot, however, avoid associating the idea of mixture with fluid media and lymph, for the latter is well known to tolerate considerable dilution with such fluids as glycerine and water without losing its effect.

The discovery of a method of cultivating lymph artificially, in quantities sufficient for practical use, would place vaccination on such a firm basis, that no apology need be offered for suggesting a method; and since the vast field of bacteriology is in such an uncultivated condition a straggling gleaner may hope by chance to obtain as ripe a sheaf as a professional reaper. The causes of failure in the cultivation are not known. It must be due either to the want of a suitable medium under proper conditions of time and temperature, or to the micrococci giving rise to a product which prevents their natural proliferation. Nearly every known medium has been tried, and under various conditions, without success. If the speculation that lymph generates a "ptomaine" that interferes with its growth be at all feasible, then the cultivation of lymph in a test-tube would be the last thing to expect, for the medium in the test-tube on the introduction of the lymph would be vaccinated and thus protected. The comparison between this imagined process of lymph and the behaviour of yeast assists in making the theory more tenable. The growth of the yeast fungus is checked by its product, alcohol, when the latter is in sufficient quantity. I would therefore suggest to any one desirous of making another attempt to cultivate lymph artificially, that it be cultivated in a receptacle made of some material, as bladder or sausage skins (or earthenware pots), which would permit the product of lymph, if dialysable, to escape, care being taken to add salts to the fluid outside the dialyser in sufficient quantities to prevent those escaping from within.

It would appear that all those organisms which cause diseases that give partial or complete immunity from subsequent attacks, present the greatest difficulty in cultivation and therefore in detection. If we believe, as there are reasons for so doing, that cow-pox is small-pox modified, we can easily understand the importance of taking special care in the natural (the only practical) cultivation of vaccine, in order that it may not undergo still further attenuation. The lymph should be cultivated in healthy children whose vaccination pursues a normal course.

It is a question whether it would not be advisable to postpone the using of humanised lymph until after a lapse of time necessary to prove that no ill effects had happened to the vaccinifer from whom it was taken. This would of course do away with arm-to-arm vaccination; but by this means specific disease, which might have been incubating in the vaccinifer, could, in most cases, be avoided.

Normal Vaccination.—When vaccine lymph is rubbed into a small area of scarified skin, nothing occurs until the second or third day, when a papule is seen at the seat of inoculation. This increases in size, and on the fourth or fifth day a vesicle is formed. On the eighth day the vesicle is plump, rounded, and pearl coloured, has an elevated margin, a depressed centre, and contains translucent potent lymph. It is surrounded by a zone of inflammation (areola) which continues to increase for several days and the contents of the vesicle begin to be purulent. A scab then takes the place of the vesicle. The scab becomes harder, drier, and firmer during the third week, when it drops off, leaving a depressed, circular, or ovoid scar. Any departure from this simple and beautiful process may be considered an abnormality.

Extra Vesicles.—It sometimes happens that on inspecting a case of vaccination there are found more pocks

than was the apparent number of insertions, or the pocks may be irregular or dumb-bell shaped. In the great majority of cases these extra vesicles are to be explained by the restlessness of the infant, together with the discomposure of the person who brings it to be vaccinated, This causes the operator to "lose his place," as it were, when making the necessary scarifications, and the result is that he makes more insertions than he intended. The shape of the pock depends much on the shape of the area of skin scarified, but it tends to assume a rounded outline.

Supernumerary Vesicles.—There is another condition not unlike the preceding which has received the name of "supernumerary vesicles." A whole group of vesicles, some confluent, some isolated, develop on the areola of the vaccinated arm, and are commonly accompanied with vesicles in other regions of the body. The explanation generally offered is that they are due to auto-inoculation, but I shall attempt to show, under the head of *vaccine généralisée*, that they are probably due, in most cases, to absorption of vaccine lymph into the system, and the areola on the arm is simply a weak point in the cutaneous system, most favourable for their development. As an illustration, we may mention a case by Dr Hugh Thompson (*Brit. Med. Jour.*, 1890, ii., p. 1232), which is interesting to compare with the one that came under my notice (case of H. S.). "The great difference," says Dr Thompson, "between vaccine and variolous virus, is, in my opinion—as I have pointed out in a pamphlet,—'a certain fixedness or non-diffusibility in the former, so that it remains germinating where it has been planted, having little or no tendency to spread except by contiguity of tissue, being pre-eminently aërobic. As an illustration of this, I may mention the details of a case of so-called supernumerary vesicles of a very marked character. . . . . It seems a case half and between a local and a

general eruption—a sort of connecting link. I note that when the supernumerary vesicles are extensive with an early developed areola (which, indeed, is only a local extension of the virus into the skin, and always more or less vesicular at the margin of the parent vesicles), the vesicles are 'dry,' yielding very little lymph on puncturing them, thus showing that the virus has been either absorbed into the blood, or diffused through the surrounding skin."

CASE OF VACCINATION, ILLUSTRATIVE OF SUPERNUMERARY VESICLES.

M. M., 17 Abington Street, aged four months, vaccinated 11th October 1886, at the Hall of the Faculty of Physicians and Surgeons, Glasgow. 18th.—All four insertions successful, and areola considerably developed with numerous supernumerary vesicles. 22nd.—Since the 18th, supernumerary vesicles have greatly increased in size and number, three or four being of the size of a small pustule with a central depression, in the immediate vicinity of the primary vesicles and many smaller ones of different sizes scattered over the whole of the area; those at its outer border being in general the smallest and the last come, some of the latter within the last twenty-four hours. The number of vesicles, counting small and large together, might be about fifty or sixty. Nevertheless the constitutional disturbance has been very slight. The primary vesicles have meanwhile increased in diameter, the three depressions corresponding to the three punctures made for each insertion have, by the gradual extension of necrotic action, coalesced, forming one large depression in the centre, whilst on the outer margin a vesicular border is observed, from which, as well as from the supernumerary vesicles, lymph could still be obtained. 23rd.—Still more minute vesicles coming out, one or two even beyond the areola which has never exhibited a distinct

line of demarcation. A small pimple or vesicle was also seen on the chin. 25th.—The vaccination now markedly on the decline; many of the supernumerary vesicles have dried up and fallen, leaving no cicatrix. The four primary vesicles have quite dried up, and the areola become dusky and faded.

24th December.—Vaccination all healed well; cicatrices measure, each, half-an-inch by a quarter-of-an-inch square.

Tardy Vesicles, etc.—The evolution of one or more vesicles may be tardy, or too rapid, or they may be ill-formed Such abnormalities are more rarely found in infants than in adults. Dr Samuel Prall (*Brit. Med. Jour.*, 1878, ii., p. 127) is of opinion that no true vesicle can be obtained in an infant suffering from congenital syphilis. In re-vaccinated adults more commonly than in infants, some of the vesicles from the same vaccination may be in an early stage of development. while others are fully formed. In other cases, and especially when attenuated lymph is used, little more than a scab is produced. From a typical Jennerian vesicle on the arm of an adult sister (vaccinated with calf lymph), I re-vaccinated an adult brother, and produced a vesicle much less typical. From the vesicle on the arm of the brother I re-vaccinated another adult brother, and there resulted a small "mark" which was more a scab than a vesicle. The progress of the pock was rapid, and the scab dropped off early. Undoubtedly the lymph underwent attenuation as it passed through the systems of the re-vaccinated adults. Lymph taken from subjects who have already been vaccinated is not to be recommended, and M. Bucquoy (*Brit. Med. Jour.*, 1885, i., p. 713) maintains that such lymph is useless. In France, a ministerial decree of 1883 sanctions "the use of vaccine lymph from adults who have been vaccinated, only when no other can be obtained."

In cases of tardy vesicles, especially those associated with an eczematous condition, Mr Enoch Snell (*Brit.*

Med. Jour., 1885, i., p. 109) highly recommends the following ointment :—

℞. Ung. Hydrargyri. Ammon., ℥i.,
Ung. Plumbi Carbonatis, ℥i.,
Fiat. Ung.

Late Appearance of Vesicles.—Instead of the vesicles making signs of appearing on the second or third day, they may be delayed for several days, and in rare instances for months or years. This delayed appearance is said to be more common when calf lymph is used. Mr Bryerly (*Med. Times*, 1862, p. 442) cited an instance in his own practice, in which the vesicles appeared just two months after a child, then suffering from whooping-cough, had been vaccinated; and Dr George Harley (*Med. Times*, 1881, ii., p. 572) mentions a case where the vesicles did not develop till one year after vaccination. A case quoted by Sir Thomas Watson (*Med. Times*, 1877, ii., p. 621), in which the vesicles did not appear till fourteen years after vaccination, is more surprising still. It was a case of a girl, aged fourteen, who, when attacked with influenza, began to complain of pain in each arm at the spots where, when an infant, she had been vaccinated; and in these places vaccine vesicles now became perfectly developed. An elder sister was re-vaccinated with lymph thence obtained, and beautiful vesicles resulted.

Revivifying.—Closely allied to the late appearance of vesicles is the revivifying of vaccination, by which is meant the appearance, after some subsequent inoculation, of vesicles at the site of a previous and apparently unsuccessful vaccination. Dr H. J. Ilott (*Brit. Med. Jour.*, 1885, ii., p. 1017), relates a case of a child who was vaccinated on 27th October, and when inspected on 2nd November, no signs of any vesicles were found. It was therefore again vaccinated on 2nd November, and on the third day following, three out of

the four vesicles commenced to develop at the site of the first vaccination. They were all well marked on 9th November, and pocks developed at the site of the second vaccination also. Mr T. A. J. Sheperd (*Lancet,* 1881, i., p. 978) records a case illustrative of vaccination being revived after four years. Mr Sheperd vaccinated, on the left arm, a nurse who had been vaccinated on the right arm four years previously: one of the four insertions on the left arm was successful, and the vesicle was accompanied by the usual inflammation. The four places on the right arm, where she had been vaccinated four years previously, became distinctly vesicular, exuded an appreciable amount of lymph, and in fact became tolerably characteristic of secondary vaccination. The most feasible explanation of these phenomena appears to be that the active principle of lymph, lying dormant in the skin at the site of a previous vaccination, receives an impetus from a later inoculation and is kindled into activity.

Running Vesicles.—Vaccine vesicles sometimes "run," and the lymph forms a crust on the arm, which is to be distinguished from impetigo contagiosa. The vesicles may have been ruptured by their being too distended with lymph, and this is apt to occur in infants with delicate skins, or by accident, or intentionally. The accidental rupture of a vesicle is attended with more risk of septic contamination, than when the vesicle is opened with an instrument. Such complications demand treatment, and there is no reason why a wounded vesicle should not be treated antiseptically like any other wound. Dr Radcliffe Crocker (*Brit. Med. Jour.*, 1890, ii., p. 1232) agreed with Mr Malcolm Morris as to the necessity for antiseptic treatment of vaccine vesicles, and thought it could be simply and efficiently carried out by keeping them constantly covered with corrosive sublimate wool now in general use. When the vesicles "run" the application of powdered oxide of zinc, or starch, or flour is

useful. Moist applications as oil or cream are inadmissible, and they fail to prevent the parts sticking to the clothes. For the spontaneous rupture of the vesicles, or the wound from the lancet, Dr Alex. A. Sinclair (*Brit. Med. Jour.*, 1884, ii., p. 127), recommends the firm application of clean blotting-paper. The wound is thereby closed, the lymph prevented from forming a crust on the arm, and the natural drying of the vesicle and the formation of a scab thereby attained. When the vesicles are inflamed, Dr Illingworth (*Brit. Med. Jour.*, 1885, ii., p. 264) recommends the following to be applied to the vesicles on the eighth day:—

℞. Zinc ointment, ʒvi.,
Glycerine, ʒiss.
Carbolic acid, ʒss.

"If there should be any inflammation around them it should be gently rubbed in with the finger nail, and then applied on linen twice a day."

In the case of infants the utility of vaccination shields is generally admitted to be more than doubtful. The vaccinator should vaccinate the child's arm that is away, during nursing, from the nurse's body. Protection by shields is rarely wanted in the case of an infant, for the arm can easily be altogether taken out of the clothing, care being taken to wrap the child up warmly in some loose shawl or similar article which is free from irritative dye. Absorbent antiseptic pads, for once using only, do pretty well. (See Erysipelas).

Vaccination Ulcer.—The vaccine vesicles may ulcerate and all of them are affected as a rule. The ulcers are deeply excavated, and there is much suppuration and inflammation. The margin of the ulcer is irregular, and the floor uneven. The induration is inflammatory and the inflammatory areola assumes an erysipelatous aspect. If there be any gland

swelling it is inflammatory, and complications as sloughing and erysipelas are liable to occur. A vaccination ulcer is to be distinguished from a syphilitic ulcer (see Vaccino-syphilis). Ulcers are liable to complicate vaccination in individuals whose tissues are broken down from any cause, constitutional or acquired, the weak, the fat, and flabby children, and particularly the strumous-eczematous type. The introduction of septic germs, as our experiments have shown, either at the time of, or subsequent to, the operation, such as after the scabs have been prematurely knocked off, is often the exciting cause of an ulcer. The treatment is like that of any other ulcer, cleanliness and antiseptics—*e.g.*, boracic acid (the weak ointment useful), dusting powder for the inflammation—and the avoidance of all applications that may induce a more unwelcome complication, as shields, quack nostrums, cream, etc., are the points to be attended to. The constitutional treatment must not be overlooked.

Accidental Vaccination.—Accidental vaccination may be described here. From the number of cases recorded, it does not appear to be very uncommon. A vaccine vesicle occuring in an unusual situation is very liable to lead to an erroneous diagnosis unless one's mind is on the alert; but there is nothing specially to distinguish an accidental pock from one following ordinary vaccination, except by its unusual situation and the fact that it is accompanied with greater inflammatory action. The sites where the accidental pocks are mostly found are the exposed parts of the body, the face being the most common locality, but the mucous membrane of the mouth, nose and tongue, the conjunctiva, and the vagina are not exempt.

When occurring in the latter situations they are to be distinguished from chancres. If vaccine lymph come in contact with any abrasion of the skin, such as a scratch, or a flea-bite, or a skin disease, a vesicle may develop. That

there probably is some abrasion in each case is shown by Dr Buist (*Ed. Obstet. Trans.*, vol. xvi., p. 109), who failed to produce a vesicle by rubbing lymph mixed with blood on the unbroken skin. Using a pocket handkerchief that has come into contact with vaccine vesicles, the vaccinated arm of the infant touching the breasts or the face while in bed, using some application that has been contaminated with lymph from vaccine vesicles, and scratches from a vaccinated child, are mentioned among the causes of accidental vaccination. Another possible cause of accidental vaccination is the using of a vaccine lancet for a different purpose, as is shown by Dr Buist's experiment (*ibid*) of inoculating a monkey with common yeast, which apparently produced a typical vaccine vesicle; but Dr Buist admits that the lancet was probably charged with dry vaccine. This shows, as Dr Buist points out, how necessary it is not to employ a vaccine lancet for any other purpose.

The symptoms vary according to the site affected, but there is more or less inflammation, with its symptoms, accompanying the process, and in some cases closely resembling erysipelas. And this is a point of difference between an accidental pock and one due to *vaccine généralisée* (from blood infection).

The lymph in its transit from the vaccinifer becomes tainted with septic germs, which are the cause of the inflammation. Dr R. W. Felkin (*Ed. Obstet. Trans.*, vol. xvi., p. 107) records nine cases of accidental vaccination that have come under his notice. Two were inoculated in the corner of the eye, two on the mouth and cheek, one on the labium, one on the lip, one on the cheek, one on the breast, and one on the buttocks. The last mentioned case was curious. The patient, aged 28, had chafed himself in riding, and had used some vaseline from a pot from which his wife was dressing the vaccinated arm of the child. When Dr Felkin saw the patient there was a large area

on the buttocks presenting well marked vaccine vesicles. Another of Dr Felkin's cases—a girl aged 20—was vaccinated accidentally at the outer angle of the eye, which she subsequently lost.

The following account by Mr George A. Berry (*Brit. Med. Jour.*, 1890, i., p. 1483) explains the symptoms and peculiarities of accidental vaccination on the eyelids. He mentions that he has seen five cases, four in women and one in a man. "In all, the pocks were found on the lower lid, but there were also to be found one or more ulcerated patches on the margin of the upper lid. Swelling was great, and involved not only the lids but also the cheeks. The base of the ulcer was decidedly harder than the surrounding swelling, but not so distinctly indurated as in the case of a chancre of the lid, and the glands were not indurated. There was comparatively speaking very little pain. In no case was the eye affected. The affection never led to any alteration in the position of the lid, and even the cicatrix left was slight, barely perceptible, owing no doubt to the laxity of the skin in this situation. The main interest in these cases consists in the possibility of the inoculation taking place at all, and the differential diagnosis between vaccinia and a primary syphilitic sore. As to the manner of inoculation: in three of my cases this could not be ascertained; in one there was little doubt that a direct transference of lymph took place owing to the child's arms often being in contact with the mother's face. In another the handkerchief used for wiping the vaccinated arm was admittedly used by the mother also. A syphilitic sore is always more or less a distinctly cut, eaten out ulcer, which has taken a considerable time to develop from its first appearance as a pimple on the lid margin. The opposite lid is not ulcerated as a rule. The base of the ulcer is greatly indurated, and the pre-auricular as well as the submaxillary glands are often swollen. There

is no history which can connect the case with vaccination, and usually one which renders a syphilitic contagion possible."

It was very curious that in none of Dr Berry's cases was the eye affected. That the eye is sometimes affected is seen by the following case, communicated by Mr Swanzy, for Dr Knaggs, of Newcastle, New South Wales, before the Ophthalmological Society of the United Kingdom. Such cases have received the name of "vaccinal ophthalmia." An unvaccinated woman was inoculated in the left conjunctiva oculi and on the side of the nose by the finger nail of her infant. On the nose she had a normal vaccine vesicle. Ocular symptoms consisted in very severe swelling of the lids with muco-purulent discharge and finally keratitis with hypopyon. Mr Anderson Critchett (*ibid*) referred to an interesting case he had published, of a medical man who was very myopic, and whose elbow was jogged while vaccinating a child. The lancet entered the eye and a well marked vaccine vesicle appeared at the corneo-sclerotic margin. On the ninth day there was hypopyon, which became re-absorbed. Finally, an artificial pupil resulted.

A case of a vaccine vesicle developing on the tongue is recorded by Mr Q. R. Buckell (*Brit. Med. Jour.*, 1889, i., p. 1405). The mother injured her tongue with a fish bone, and kissed the vaccinated arm of her infant. No bad results followed. And Dr Melville (*Brit. Med. Jour.*, 1887, i., p. 160) related a case of accidental vaccination occurring in a child aged 8 months, suffering from eczema of the face and scalp, and who was accidentally vaccinated from the arm of an elder child with whom it slept. The child at first did well, but refused food on the fourteenth day and died. The eruption on the child was almost entirely limited to the parts affected with the eczema, but there were a few isolated vesicles on the forehead, nose, eyelids, and chest.

We have seen the points of difference between a vaccine vesicle and an indurated chancre occurring on the eyelids;

and so characteristic is a typical vesicle on a plain skin surface that to mistake it for a chancre is hardly possible. The differential diagnosis is not, however, so easy when the pock occurs in a locality where, by mechanical and other irritation it becomes disfigured. A hard chancre commences as a small, red, itching papule, and is of slow development. A vaccine vesicle develops rapidly, and there may be a history of exposure to vaccine lymph. A hard chancre has a base more indurated than that of a vaccine pock, is always accompanied by a bubo, and is followed by secondary symptoms.

Mercury, etc., would not much influence a vaccine vesicle, and the glandular swelling, if any, would be inflammatory. It must be remembered that the ulceration caused by a vesicle, occurring in a syphilitic subject, would be still more confusing, and would be influenced by anti-specific remedies. Moreover, accidental vaccination of a syphilitic subject might be the cause of some specific phenomena, rash, etc. (See Vaccino-syphilis.)

ERUPTIONS
DUE TO PURE VACCINE INOCULATION.

THERE is a stage in the study of vaccination when one is inclined to become anti-vaccinist, to join the rabble, and to share their bubble glory; and while seeking a cause for these weak tendencies, there is found, not a hope of adducing any startling evidence of the ill effects of vaccination, much less of denying its utility, but rather a feeling that if vaccination were stamped out, then some of the theoretical difficulties with which it is associated would suffer the same fate. To allow such a sentiment to remain unbalanced by reason is to acknowledge a weakness, of which, in calmer moments, we would be ashamed. The necessity then of exposing the facts already demonstrated and of pointing out what is unexplained will be evident. No subject is more fascinating, none more subtle, and none that is involved in so many theoretical mysteries but yet crowned with such practical success, as vaccination. We are aware of the impropriety of defending this important system of medicine by the method of argument used by its opponents—argument by ridicule; and our endeavours will be turned rather in the direction of indicating some of the untoward effects of vaccination, leaving what is claimed for it to be a sufficient defence.

A physician who disbelieves that vaccination is occasionally followed by rashes could not, on being called to a case, exercise his skill with the same advantage as if he were

acquainted with these sequelæ. No surgeon could be said to be conversant in the treatment of fracture of the femur if he were ignorant of the hypostatic congestion of the lungs which may follow it.

At the onset of describing vaccination eruptions there arises a fear, partly of exaggeration, and partly that their exposition may be thought detrimental to vaccination. Out of a few evanescent rashes, however, the anti-vaccinists will, it is thought, be able to make little capital—some, no doubt, since by this time they must be weary of attacking the staunch foundations on which vaccination is built. If vaccination is to be condemned because it is known to be the occasional indirect cause of skin eruptions, or of momentous accidents, then the drugs which give rise to the same eruptions, and indeed all surgical operations, must, for a similar reason, be discontinued. But denying or hiding facts is simply flinching from the enemy and thus allowing them to gain headway. When science was in her infancy philosophers turned the universe into a vast theatre for their amusement and entertainment; but now that day is past, and whilst yet retaining some of her infantile properties she affords us *authoritative direction* in addition, and if we are by reason to follow her, we are bound to listen to what she dictates. Science is our captain, we are the soldiers, obedience is our first duty.

On grounds *a priori* nothing is easier to imagine than the possibility that vaccinia may be accompanied with a rash. For what do we occasionally see in small-pox? Morbilliform and scarlatiniform rashes preceding the true exanthematic manifestation, as also a purpuric rash distributed in a triangular form at the lower part of the abdomen. The same rashes may occur in cow-pox. The specific rash —the pustular—of small-pox contains the poison that causes the disease, and in this way differs from the occasional rashes. The same is true in regard to cow-pox.

What is the explanation of these non-specific rashes? The most feasible one is that the skin tends to eliminate a poison (whatever may be its nature and wherever formed) generated by the disease, just in the same way as the skin tends to eliminate the poison of small-pox, scarlet fever, etc. The same rashes are caused by such drugs as chloral, copaiba, etc., and are met with in various diseases, *e.g.*, Bright's disease. Thus one poison has a greater affinity for the skin, another for the intestines, and another for the kidneys or lungs.

But how comes it to pass that vaccinal rashes are seen in some subjects and not in others who are inoculated with lymph from the same source? There is no other means of explaining this fact than by the old term idiosyncrasy. A constitutional predisposition is required, perhaps a faulty chemistry of the body, whereby a foreign agent acting on the vaso-motor system induces a skin eruption. There is, as it were, stored up in the system, a potential energy, which is now and again liberated by vaccination, and the kinetic effect shows itself in the form of a skin affection. The predisposition in many cases is quite strong enough to require no other liberator of energy than time, as is shown by children whose vaccination has been postponed or neglected, and who develop eczema at what would have been the vaccinal period. It is in virtue of this peculiarity that certain people suffer after partaking of such food as shell-fish. I know a practitioner who is attacked with urticaria after eating oatmeal porridge, by which means he can bring on an attack of the disease which he used to demonstrate to his fellow-students. Another practitioner with whom I am acquainted suffers from urticaria when excited. I witnessed on one occasion, when he had been worried by the calling of two or three patients at an unprescribed hour, that his hands and face, about an hour afterwards, were covered with an eruption of urticaria.

The type of the eruption not uncommonly gives a hint as to the constitution of the patient. The French aphorism, always true in medicine, "il n'y a pas de maladies, il n'y a que des malades," is illustrated by the nature of the skin affection differing in different individuals while the same cause is at work. Thus in a hæmophilic the eruption will show itself in the form of purpura, and in a syphilitic in the form of an eruption characteristic of that disease, and if there be much cachexia, perhaps in the form of pemphigus. It must not, however, be concluded that if pemphigus happened to follow vaccination the vaccinée is syphilitic. Dr Gustav Behrend (*Brit. Med. Jour.*, 1882, ii., p. 551), is of opinion that vaccination eruptions are not caused by any specific action of the vaccine lymph, as precisely similar ones are noticed after the administration of certain drugs and articles of diet. Dr Behrend says that blood change might give rise to skin eruptions (pyæmia, septicæmia, operation wounds), but that a certain predisposition is a necessary factor in their production. There are, says this author, two distinct phases in the course of vaccinia: (*a*) in the early ones (first three days) the vaccination wound itself might be a factor; while (*b*) the later ones (beginning from the eighth day) are due to absorption of certain materials from the developed pustule. Analogous eruptions occur in variola.

The great factor in the cause of vaccination eruptions is, as we have said, a constitutional predisposition; but it has generally been noticed that vaccination with calf lymph has been followed not as infrequently with eruptions as vaccination with humanised lymph. In regard to this question, M. Depaul (*Brit. Med. Jour.*, 1880, ii., p. 22) distinguishes three kinds of virus as causing vaccinal eruptions: (*a*) humanised vaccine virus which rarely gives rise to secondary eruptions; (*b*) calf lymph, of which the inoculation is more frequently followed by these eruptions; (*c*) finally, variolous lymph, if it may be so called, that is to say, attenuated

variolous virus; for instance, that of discrete varioloid pustules, which often gives rise to a generalised benign eruption. Opaque lymph is said by Buist to cause eruptions. We purpose here giving a separate description of each of the eruptions mentioned in Mr Malcolm Morris's classification (Group I).

ROSEOLA.

Erythème Vaccinal, Roséole Vaccinale, Rash Vaccinal, are terms used by French authors in describing this affection. Its existence has long been recognised, and it is perhaps the most frequent of vaccinal rashes. It appears, as a rule, about the time of the maturation of the vaccine pustules, usually from the eighth to the eleventh day; exceptionally is it seen at the third day, and some authors pretend to have observed it about the eighteenth day (*Roger, quoted by Dauchez, Vaccinides*, p. 86). It is a rosy macular rash like that of measles, for which it has more than once been mistaken. It disappears on pressure. Not uncommonly it first makes its appearance in the locality of the vaccine pustules, and from thence spreads to other parts of the body, where it may attack the face, and thus be easily detected. Sometimes the macules are isolated, but they may become confluent, and even exhibit these two characters on the same subject and at the same time. It is a benign eruption. According to Dauchez (p. 142) roseola is apyretic, but Professor Fournier (see *Vaccino-syphilis*) says that vaccinal rashes are accompanied with fever. From recorded cases it would appear that the opinion of Dr Dauchez was more correct. There is little constitutional disturbance. It may be quite evanescent, but it usually dies away after two or three days, without desquamation or itching.

Diagnosis.—There are several diseases with which it might be confused, and the one it resembles most is measles.

The absence of quick fever, coryza, catarrh of the conjunctivæ, etc., and the existence of vaccination marks, would assist in avoiding the error. Roseola generally attacks the limbs, trunk, and afterwards the face, and may appear and disappear in the course of twenty-four hours. There may be the possibility of contagion in the case of measles. According to Bousquet (*quoted by Dauchez*, p. 93), the spots of roseola are larger than those of measles. Professor Thomas expresses himself in the following terms:—"The spots of roseola are rounder and less angular than those of measles. They are rather macules than papules, and never in the beginning of these eruptions has there been found that projecting which is so frequently observed in the beginning of measles. There exist, however, cases where the analogy is so striking, that confusion is possible" (*ibid*). It must be distinguished from rötheln; and also from roseola which precedes the characteristic eruption of small-pox. As an example of the latter, we may state a striking case mentioned by Dauchez (p. 82), of a child aged ten years, in the practice of M. Labric. The child had been ill for four days, and was brought to the Hospital for Diseases of Children on 1st January 1883.

"The entire surface of the body was covered with a rosy morbilliform eruption, constituted by red macules, describing on the face and neck crescents of a remarkable neatness. In the evening of the same day the child was taken to the small-pox patients, and its hands, face, and feet, were quickly covered with a vesiculo-papular eruption, which was the prelude of a grave variola attack to which the child succumbed." Had this child been vaccinated after the small-pox poison had stolen a march on the vaccination, that is to say, too late for the vaccine to check the action of the variola, the roseola from which the patient suffered might have easily been mistaken for that following cow-pox. The evidence of recent vaccination, the absence of fever, pains in the back, vomiting, etc., together with a consideration

of possible contagion, are the means of avoiding any confusion. Roseola vaccinale is to be distinguished from skin affections caused by certain drugs as chloral, belladonna, etc., and that following diphtheria or cholera. A question, in the case of an infant, in regard to cutting of the teeth, would not be out of place in making a diagnosis.

Cases.—The following is an illustrative case of vaccinal roseola (*Dauchez*, p. 91). On 15th July 1882, Dr G. vaccinated at Rue de Madame, Paris, a child aged two years, Marguerite N. Three punctures were made on the right arm, and calf lymph was used. On 18th July a red spot appeared on the inoculated arm, and was soon followed by a papule which developed into a pustule on 22nd July. About the eighth day following the operation, a slight febrile action declared itself, the child lost its appetite and complained of its arm. The mother undressed it and beheld, to her great astonishment, a multitude of rosy spots which covered the nape of the neck, the neck, shoulders, trunk, and limbs. On the following day the eruption reached the cheeks and alæ nasi, and simulated the exanthem of measles. In fact, the invaded surfaces were set with perfectly flat, rosy spots, separated one from another by intervals of healthy skin. But differing from what passes in measles, the little patient is apyretic, there is no coryza or pain, no conjunctival injection, nor can any sonorous rale be detected by auscultation; in short there exists on the surface of the body a confluent roseola without fever and without mucous catarrh. Three days after its appearance the exanthem completely went away in one night without leaving any colouring, etc. At the same time the vaccination marks faded, the roseola spontaneously died away and the patient was quite well, without passing, as in measles, into a stage of desquamation. We have found, in the antecedents of Marguerite N., no peculiarity which allows us (outside the vaccination) to explain

the appearance of the red rash described. Its mother was a young woman, strong and vigorous, and who has always felt well, although she had in her infancy suffered on several occasions from acute herpes of the lips. Its father is an old soldier, who has never had any affection of the skin except a very intense boil. Our little patient has cut all its teeth with the exception of the four last molars.

Another case not quite so typical as the above, and which is given by the same author (p. 101), illustrates roseola appearing on the eighth day after vaccination and showing successive areas attacked. It was a child aged nineteen months, who was brought to the Hospital for Diseases of Children on 13th July 1883. The father and mother were healthy and never had had any eruption; nor was there any history of rheumatism. The patient was vigorous, well developed for its age, and had not suffered from measles or scarlet fever. During the previous June it was attacked with convulsions of short duration, without any known cause, ten days before its vaccination (treatment, purgative and emetic).

The dentition was actually in an advanced state. The diet of the child was not varied, which consisted of bread soup, soups, milk, eggs, and vegetables. In fact, the child took no medicine which would explain the eruption for which it was brought. The eruption appeared eight days after its vaccination.

On 3rd July the little patient was inoculated at the *Académie de Médecine* by eight punctures (four on each arm). 10th July.—Eight large vesicles appeared at the points of inoculation. Each of them is flat, umbilicated, and surrounded by a ring of inflammation quite extended. 11th July.—The febrile action is a little marked (no digestive troubles). In the evening the mother observed two large rosy "plaques" symmetrically placed in the front of each ear. On 12th July these "plaques" disappeared in order to give

place to rosy, irregular spots (which disappear on pressure), appearing on the back of the hands, back and front of the arms, and which died away in about twenty-four hours. 13th July.—We see the colouring nearly effaced in the upper limbs. Complete apyrexia. After having encouraged the mother we prescribed some bran baths. The infant has not returned.

ERYTHEMA: URTICARIA.

Much confusion has arisen through the term erythema, as the disease which is indicated by this name occasionally assumes different characters. In the meagre literature of vaccination eruptions we find little more than the names of the skin affections which may follow vaccination. All, however, are agreed that they do occur, but in many instances disappear so soon, and are of such benignity, that only in some cases has a thorough clinical note of them been made. In the classification by Mr Malcolm Morris we observe that erythema multiforme and urticaria may make their appearance before the development of the vesicles, and that urticaria may also occur as a sequela of vaccination. The scarlatiniform erythema may appear after the development of the vesicles; but Dr Gustav Behrend, who has had much experience as a public vaccinator, has been frequently informed by mothers that evanescent erythema frequently appears in the first twenty-four hours, rapidly subsiding, so that it was no longer visible on the day of inspection (seventh day). Urticaria due to vaccination is very rare. Dr Austin Martin (*Medical Record*, April 1882), speaking of vaccination eruptions, says: "There are certain rashes like the eruption of roseola (or *die rötheln*, or German measles, to use the modern nomenclature), and sometimes like that of measles or scarlatina, and now and then, quite rarely, like that of urticaria, and occasionally of large splashes or blotches covering part or whole of the body,

The eruptions are very fugacious, very evanescent, and of very little consequence to anybody except the ardent anti-vaccinator. They always appear when the areola is in its acme of development, and are not without analogues in instances where any very intense inflammatory congestion occupies a limited portion of the cutaneous system." A case of urticaria is recorded by Dauchez (p. 120) of a child suffering from a vesicular eruption, and whose vaccine pustules were drying up and covered with black crusts, and who was attacked with an urticarial eruption covering different parts of the body. The back of the hands, the back of the thumb, middle of the left hand, and the sternal region were adorned with spots of papular pruriginous urticaria, each measuring from one to two centimetres in diameter. Mr Q. R. Darling (*Brit. Med. Jour.*, 1890, ii., p. 1366) mentions a case of a girl, aged 17, who had been inoculated through milking cows suffering from vaccinia, and who developed urticaria on the back of the arms and on the left side of the face. This urticaria supervened when the pocks were nearly all healed up.

Sometimes erythema assumes characters which may lead to an erroneous diagnosis. A case by Dr Hugh Thompson (*Brit. Med. Jour.*, 1890, ii., p. 1232) illustrates that the diagnosis of these rashes is sometimes difficult. "The following case," says Dr Thompson, "although perhaps not one of post vaccinal rash, I may give as presenting points interesting and allied to the present discussion: E. B., aged six months, vaccinated in Glasgow Royal Infirmary, 16th June 1890; a weakly child, having syphilitic eruptions (mucous patches) on nates, fontanelles open, and some snuffling, had undergone treatment for congenital syphilis. 23rd June—All four insertions had 'taken'; vesicles somewhat retarded, with no areola. 24th June—The child was seen by a medical man who, finding a rash which he considered scarlatinal, notified it as such to the sanitary officer, who next day sent it to the

Fever Hospital, Belvidere. Dr Gemmel, under whose charge the child was placed at Belvidere, informed me that when the child was admitted, on 25th June, the rash was already declining and the temperature 98·6; the mouth red, but no swelling of the tonsils. On 28th June, with Dr Gemmel's permission, I saw the child when the rash had entirely disappeared; the vaccine vesicles had developed into four compound vesicles; the areola still considerable and without a line of demarcation. The mucous patches on the nates had meanwhile almost healed, and the child was looking well and cheerful. 14th July—Dr Gemmel informed me that since 6th July free desquamation had been going on. That this rash, if scarlatinal, did not arise from anything in the lymph used in vaccination is evident from the fact that the vaccinifer had no symptoms of scarlatina either before or after being vaccinated; as also none of the other children vaccinated with the same lymph, so far as I have been able to ascertain—and I have seen two of them—have shown any symptoms of scarlatina." The invasion, fever, sore throat, and possible contagion are points to be considered in making a differential diagnosis between vaccinal erythema and scarlet fever.

Résumé.—We may then say that erythema associated with vaccination, is related to roseola, is usually evanescent, accompanied with little or no constitutional disturbance, and presents itself in two principal varieties, erythema multiforme, and the scarlatiniform erythema; and that urticaria, a rare manifestation, may appear within the first three days after, or as a sequela of vaccination.

MILIARIA.

"We give the name vaccinal miliaria to a satellite eruption of the vaccinal fever, appearing from the eighth to the twelfth day (very rarely later) after vaccination. It is

constituted by ittle vesicles of the size of a grain of millet, accumulated in great numbers over large surfaces, containing a transparent liquid at first, then opaque, followed by slight furfuration and never leaving cicatrice safter it." (*Dauchez*, p. 110). Miliaria after vaccination is a very rare affection and cannot be distinguished by its anatomical characters from miliaria due to other causes. There is nothing that signalises its onset unless it is a slight febrile action. Like most of the vaccination eruptions it makes its appearance usually at the time when the vaccine areola is at its full development, but Mr Malcolm Morris has classified vesicular eruptions as occurring before the development of the vaccine vesicles. In most of the recorded cases it appeared from the eighth to the eleventh day. Its distribution is generally very irregular, the skin of the limbs, neck, face, and back being affected. It commences as little rosy spots which are soon covered with a multitude of vesicles the size of a pin's head, and presenting, whether near the site of the inoculation or on other parts of the body, a similar appearance. At first the vesicles contain a clear fluid, but they may pass in the course of twenty-four hours into a purulent, milky stage, and then dry up after thirty-six or forty-eight hours. There is usually little or no constitutional disturbance, nor is there any itching of the skin. The vesicles are too small to be umbilicated, or at least to appear so to the naked eye. If the disease be complicated with some other eruption it may be prolonged six or eight days. A vesicular eruption is sometimes seen in the neighbourhood of the vaccine vesicles. "Now and then," says Dr Martin (*Med. Record*, April 1882). "Very rarely, when the areola is most vivid, in plethoric infants and children with very vascular skins, are seen, within it, little globular vesicles not at all umbilicated, and containing a fluid which on inoculation induces no effect whatever. These are nothing more than effusions beneath the epidermis without any specific character, and mere results

of intense congestion of the vessels in the corium. The very minute miliary eruption is composed of vesicles, which, on examination with the aid of a good lens, reveals decided umbilication."

Dr Martin had failed to produce vaccinia by the inoculation with the contents of these miliary vesicles. Dr Colcott Fox (*Brit. Med. Jour.*, 1890, ii., p. 1400) says: "The different phases represent probably stages of the same inflammatory process, just as we see in eczema. The most intense phase is the vesicular. The following case which came under my notice a few days ago, is a good illustration. The vaccination of a child, age six months, had been postponed from time to time owing to the strong repugnance of the mother to the operation. On 8th November it was vaccinated in three places with calf lymph, and the vesicles ran a perfectly normal course. On the tenth day an itching, rosy, miliary, papular eruption appeared, and eventually covered the cheeks and extensor aspects of the forearms. On the cheeks many of the lesions vesiculated slightly and on the arms they threatened to do so but just stopped short of that stage. The eruption then declined and the child was but very slightly disturbed in health. The vesicles were small, conical, and never umbilicated, and the affection was quite distinct from lichen urticatus." As an illustration of miliaria we may cite a case, recorded by Dauchez (p. 114), of an infant in the practice of M. Labric:—L. Gallot, aged 22 months, admitted into the Hospital for Diseases of Children on 16th February, quite well and vigorous, is usually in good health; a little lymphatic (blonde, fine rosy tinted skin). There is evidence of a suppressed pustular impetigo. No rachitis. The child is weaned. We find quite easily in the father of this child traces of an herpetic diathesis. The mother appears well. The following is the history which she gives us. On 6th February she had the child vaccinated at the Hospital Laënnec. Five punctures were made on

the arms (three on the right and two on the left). 12th February.—In spite of a slight febrile action the child remains out of bed. No diarrhœa or sickness. The five inoculations resulted in a very white pustular eruption. The inflammatory areola which circumscribed each pustule extended about two centimetres and without affecting the glands of the axilla. 14th February.—The arms, wrists, backs of the hands, the neck, and the face were covered with redness which rapidly disappeared and give place to a multitude of little vesicles, at most the size of a pin's head. On the face the rosy spots assumed, on the 15th, a deeper red tint. In the evening they enlarged at their bases and became slightly papular. Struck by the character of this eruption, and entertaining doubts about the development of a slight varioloid attack, a doctor in the city recommended this woman to bring her child to the hospital for consultation. On 16th February, the day of admission, the macules which covered the face became vesicular. On undressing the child we find in the regions already mentioned, that on the external aspect of the limbs the rosy vesicles, as large as a pin's head, furnished on pricking them a drop of clear fluid. Scattered over the limbs, they described in one place a linear series, and in another, groups of eight, ten, and fifteen isolated vesicles. The eruption is more abundant on the front of the left arm, it covers the back of the hand, and it is found even between the fingers. The child is neither feverish nor sick, nor is there any diarrhœa or sore throat. The five vaccine vesicles have actually dried up and are covered with thick crusts. 17th February. — Temperature normal. Some of the vesicles transparent yesterday have become turbid during the day. Some are dried up and hooded with little black crusts. On each spot there exists no trace of scratching. 18th February.—The examination of the mouth discloses the spots where two canines are commencing to pierce the gums. In the evening, we see

again some of the pearly vesicles already described. None of the vesicles have increased in size; none umbilicated; temperature normal. 19th February.—Little diarrhœa in the evening, temperature elevated three degrees; no functional trouble. 20th February.—General state, excellent. 21st February.—Apyrexia in the morning; evening, temperature elevated three degrees; examination of all the organs shows nothing; eruption disappeared. Child left on the 25th February.

The above case may be looked upon as more or less typical, but the eruption may be confluent in some localities, discrete in others, and fresh areas may be attacked after the vesicles in other parts are developed; in other instances the patients have presented macules, papules, and vesicles simultaneously.

The prognosis is good, but the diagnosis is not always easy. It must not be confused with a similar eruption due to dentition, nor with one associated with a slight varioloid attack.

PEMPHIGUS.

Little mention is made in English and French literature of this affection as following vaccination, but like psoriasis cases of it have been recorded. In Vienna, however, Hebra, Kaposi, and the greater number of German dermatologists have described it as occurring in feeble, rachitic, and anæmic infants. (*Hebra, Traité des Maladies de la Peau,* p. 279, *de la trad. franc., par le Dr Doyon*). G. Behrend (*quoted by Dauchez,* p. 125) says the bullæ vary in size from a pea to a strawberry, and are filled with a clear fluid, which, on drying up, gives place to little crusts covering red ulcerations. According as one bulla disappears, new ones spring up on other parts of the body. A pemphigoid eruption appearing during the vaccinal period is usually followed by recovery, but that due to cachexia may result in death of the infant.

It is most liable to occur in very young infants, particularly in those whose health is undermined by rachitis, anæmia, or cachexia from any cause. It has no characters that distinguish it from pemphigus unassociated with vaccination. The prognosis should be guarded, but unless some complication, such as a gangrenous condition supervene, recovery is the rule.

Treatment.—The treatment would be according to the constitution of the patient, and a suitable nourishing diet, cod-liver oil, Parish's syrup, iron, etc., would be indicated; and locally, simple or boracic ointment, calamine lotion, dusting powders, etc. Following vaccination, pemphigus is, however, all but unknown.

A case is mentioned by Dauchez (p. 127).

GENERAL PEMPHIGOID ERUPTION.

Hospital for Sick Children; practice of M. Labric: Note communicated by Dr Tisné.

In 1879, M. Labric received into his charge a child, aged four years, with a puny appearance and suffering from whooping-cough. On account of the fever and incessant cough which contra-indicated vaccination, the latter was put off. Nevertheless, some hours after its entry, this child was subjected to vaccination, calf lymph being used. This regulating measure is necessary in the Children's Hospital, on account of its vicinity to the small-pox patients. On the fifth day of inoculation two vaccine pustules appeared on the left arm, and on the seventh day they had acquired their complete development. On the following days the aspect of the pustules completely changed, and each of them was transformed into a large bulla which contained a sero-sanguineous liquid. On the ninth day, at the morning visit, the child was broken down in health, and suffering; the fever declared itself during the night. On undressing the child, we find on the surface of the body a confluent eruption of pemphigoid bullæ, on the arms, trunk, neck, and lower limbs.

Each bulla encloses a sero-sanguineous liquid. The cicatrisation of the ulcerations was produced little by little, and was complete about the 8th day. Two months later the child died of broncho-pneumonia.

PURPURA.

In subjects with hæmorrhagic tendencies, a purpuric rash, like that occurring in small-pox, may show itself after vaccination. It is extremely rare, generally makes its appearance after the seventh day, and lasts about a week. It may be accompanied by other hæmorrhagic symptoms, and the vaccine vesicles themselves may be implicated. Purpura is liable to cause some constitutional disturbance, but from what is known of it its prognosis is good. Several cases have been recorded. A little girl, aged four years, was vaccinated on 19th March 1842. Five punctures were made on the left arm, the lymph used having been taken from a perfect vesicle of the eighth day. An elder brother and a younger sister were vaccinated with lymph from the same source. On the 23rd the arm was more inflamed than usual, and some spots were observed on the face. The child according to all reports enjoyed perfect health. On the 26th, the eighth day after inoculation, the pustules were black as if filled with blood. Numerous petechiæ were dispersed over the body, but more especially over the face, neck, and arms. A slight contusion on the temple gave rise to an ecchymosis. A little blood escaped from the left ear and nose, but there was no blood in the excrementary materials. The general health appeared good and the petechiæ scattered over the body disappeared at the same time as the vaccine pustules, and on the sixteenth day all evidence of hæmorrhages had gone, two crusts having dropped off, but the three others, as black as jet, remained. In the brother and sister the vaccination followed a most normal course (*Gregory, Med. Chir. Trans.*, vol. vii., 1842).

A case of *vaccine ecchymotique* appearing on the eighth day is mentioned by Dr Bergeron (*Dauchez*, p. 138). An infant was vaccinated three months after its birth. On the seventh day after inoculation, at the time when the pustules were fully developed, the infant was seized with a slight febrile attack and was ill. The same evening all the surface of the body was covered with a confluent eruption of very fine purpuric spots, simulating those made with a puncture of a needle, or those of flea-bites. The most minute examination did not discover any parasite. The eruption remained stationary during the first three or four days, and then progressively faded on the following days. On the ninth day it had almost disappeared, and on the tenth day there was hardly any fever. The hereditary antecedents showed nothing.

ECZEMA.

Eczema associated with vaccination presents several points of interest. Vaccination often cures eczema, now and then aggravates it, but rarely is it the cause of the disease. Eczema is the most common skin lesion in auto-inoculation. Dr Colcott Fox (*Brit. Med. Jour.*, 1890, ii., p. 1235) is of opinion that eczema is of great frequency in early infancy and that vaccination has no specific influence in producing it, though it does occasionally excite it. The little understood nature of eczema of necessity makes it a study, in relation to vaccination, a very difficult one.

Eczema is well known to occur in the gouty, rheumatic, and scrofulous constitutions, and it is under these conditions that it occurs after vaccination. Like other vaccination eruptions a constitutional predisposition is required in its production, and instances are known where all the children of the same family have suffered from eczema after their

vaccination. In many such children with hereditary tendencies, if the vaccination be postponed, the eruption shows itself at what would have been the vaccinal period.

It is well known that vaccination often cures, and is in fact recommended as the treatment of eczema; but it should not be resorted to until other means have failed, as there is a risk of auto-inoculation. Acute eczema should never be thus treated. Dr C. D. Hill Drury (*Brit. Med. Jour.*, 1880, ii., p. 414) mentions the cases of three children whom he vaccinated and the eczema soon disappeared; and Drs Carrick Murray, Thomas Wilson, and R. P. Tyler (*Brit. Med. Jour.*, 1880, ii., p. 497) relate cases in which eczema made its speedy disappearance after vaccination. Mr D. M. Williams (*Brit. Med. Jour.*, 1880, ii., p. 690) records three cases which he vaccinated with success. The eczema on the buttocks of a child I vaccinated had almost disappeared on the day of inspection.

The treatment of eczema by vaccination has been tried with varied success in the case of adults. Dr E. Haughton (*Brit. Med. Jour.*, 1886, i., p. 725) mentions a case of eczema in an adult whose condition was at first aggravated by vaccination but afterwards improved. Dr Haughton also records the case of a lady who was similarly treated for eczema which was cured. In both of these cases an asthmatic condition supervened after the improvement of the eczema. There are analogous cases where the sudden disappearance of a patch of eczema is followed by cardiac irregularity, etc., which rapidly subsides on the eczema again breaking out.

Like eczema occurring at other times, that following vaccination is due either to some hereditary predisposition, as gout, rheumatism, struma, etc., or to errors of diet, or teething, or injury, or the effects of an illness—vaccination merely adding, as it were, the last straw to the camel's back. It generally commences late in the vaccinal period. It may show itself in the region of the vaccine vesicles (which in

scrofulous subjects are liable to become ulcerated) and from thence extend to other regions of the body, where successive patches may appear, showing the disease in its various stages. The eczema may be of the impetiginous kind but this is rare. The onset of the disease is occasionally sudden, and the constitutional symptoms are slight. Itching is a symptom and the *acarus scabei* should be kept in mind in making a diagnosis.

The following is a brief account of a case of generalised eczema, appearing on the tenth day after vaccination (*Dauchez*, p. 123). Marie L., born 17th October, was vaccinated on 4th November by Dr G. The vaccinifer was a vigorous child aged two years, and chosen among several at the *Académie de Medècine*. 11th November—The vaccine pustules are well developed. There are two on each arm and the infant shows no trouble; no diarrhœa or fever. It takes the breast well and sleeps quietly a part of the day. However, on undressing it on 14th November, in order to give it a bath, there is discovered a very intense eruption, that has appeared during the night, over the whole surface of the body; the arms, the neck, and the face, are red and inflamed. The buttocks and lower limbs are also affected. 15th—The eruption has given place to a second vesicular swelling, very fugacious, which leaves bare, red and inflamed surfaces. 16th—The inflammatory action, very pronounced, during the night is less; the eruption pursues its course; on the arms it is less; it persists on the shoulders, face, forehead, and cheeks; the patches over the eye-brows and temples show perfect symmetry; it is also formed behind the ears, on the nape of the neck, and in front of the arm-pit. 18th to 30th—The eruption lost its acute characters, but the eczema on the face lasted till the end of January 1883. The parents of this child have never had eczema, the father is rheumatic, and the mother is subject to acne eruptions, especially at the menstrual epochs.

Treatment.—The treatment of eczema following vaccination does not differ from that occurring at other times. The treatment should be commenced *early*, and a careful inquiry about the diet should be made, the child put on a judicious dietary, and the alimentary canal regulated by calomel, etc. For the treatment of eczema in the locality of the vaccine vesicles, see "Tardy Vesicles." The washing of the infant should be performed only when absolutely necessary, bran or gruel water taking the place of soap and water. When struma or debility exist Parish's syrup, and in elder children Easton's syrup or Fellow's syrup, are indicated. There is a difference of opinion as to the utility of arsenic in eczema, and no lines can be laid down for the guidance in its employment.

Without mentioning all the applications used in the treatment of eczema, liq. carbonis detergens, ℥i ad Oi, or weaker, would perhaps be the most useful to begin with. If the *acarus scabei* be suspected, a modification of the treatment would be required, and the tender skin of an infant taken into consideration. The vaccination of infants suffering from eczema ought to be postponed till the patient is well, except in times of small-pox epidemics, when the danger of variola is far greater than the risk of auto-inoculation which is usually a mild illness.

VACCINE GÉNÉRALISÉE.

THE term *vaccine généralisée* does not appear to have conveyed the same meaning to the minds of the various medical men who have drawn attention to it. Thus Mr Q. R. Darling (*Brit. Med. Jour.*, 1890, ii., p. 1362) after describing a case of a girl, aged 17, who was inoculated on the hands from the teats of a cow and who developed pocks on the face, asks: "Were the pocks on the face auto-inoculation, or were they *vaccine généralisée?*" Dr G. B. Longstaff, kindly writing to me concerning an interesting case which he published (and which I shall mention further on), says: "My own opinion was that some of the vesicles were due to auto-infection of the eczema—some were 'generalised vaccinia.'" And we see in the classification by Mr Malcolm Morris that secondary local inoculation is not mentioned under the same heading as *vaccine généralisée.*

At the British Medical Association, in the discussion on Vaccination Eruptions (*Journal*, 1890, ii., p. 1231), the following question was submitted for further elucidation: "Is there such a disease as *vaccine généralisée*, due to blood infection, or are the secondary vesicles following vaccination produced by external inoculation?" Dr Colcott Fox (*ibid*) says: "But there is another very interesting eruption, quite distinct from the other vesicular and bullous

eruptions, which has occasioned much dispute, and some who believe it to be the specific vaccine eruption have called it 'vaccinola.' I refer to the cases in which a more or less widespread evolution of vaccine vesicles occurs. After a careful study of the records, I am strongly inclined to the opinion that they are, certainly most are, cases of auto-inoculation. . . . . That they are vaccine vesicles is proved by inoculation; but the doubtful cases are very rare and the eruption does not involve the mouth." From this it can readily be seen that the disease called *vaccine généralisée* is little understood. When we refer to the French literature on the subject we find that the term does not appear to have caused such confusion. Dauchez (p. 11) divides *vaccine généralisée* into two heads—(*a*) appearing spontaneously, and (*b*) developing by auto-inoculation from the 8th to the 18th day (Besnier). After the 9th day, says the same author, auto-inoculation is very rare.

We wish therefore to be understood, in the following pages, that the term *vaccine généralisée* is to signify a generalised eruption of vaccinia, whether due to blood infection, or to auto-inoculation, or to both.

After studying the recorded cases and those produced experimentally, we are inclined to favour the opinion that the pocks containing the poison are the specific eruption of vaccinia, just as those in small-pox are the specific eruption of that disease; although, as we have seen, the great feature in vaccine is, as Dr Hugh Thompson points out, a certain "fixedness or non-diffusibility," thus differing from small-pox. But this "fixedness" is sometimes seen in variola also—for example, when the poison is taken from the discrete variety of the disease. The several monkeys which Dr Buist (*Vaccinia and Variola*) variolated showed pocks at the sites of the punctures only, and there was no secondary eruption.

It is a curious fact that small-pox is very mild when introduced through the skin; in fact, many maintain that there is little risk in variolation, especially when the poison is taken from discrete small-pox. Whether vaccinia is an exanthematic disease or not, we shall be better able to judge after discussing *vaccine généralisée*; which we now hasten to do. And, in order to give as brief and concise a description as possible, it would be best perhaps to discuss—firstly, the eruption produced experimentally; secondly, to mention a case or two illustrative of what we think to be due to the absorption of the virus into the system, and to discuss one of these cases (the one that came under my notice and which presents unusual characters); thirdly, to briefly describe the disease when due to auto-inoculation; and finally, to give a *resumé* of the subject, with the diagnosis.

Cow and Horse Pox.—There are some striking points of difference between horse-pox and cow-pox. The poison of the former is more active than that of the latter, and is often accompanied by a generalised eruption. Moreover, the pocks from the poison of the horse are larger than those due to vaccinia. A case of generalised eruption from horse-pox is mentioned by Dr Warlomont (*Traité de la Vaccine*, p. 70, 1883), of one of Prof. Bouley's pupils, who, having injured his finger, and after dressing the leg of a horse suffering from grease, was taken the day after with pain, and the next day with a feeling of malaise and weakness. On the following days pustules showed themselves on the fingers of the left hand, on the face and on the bridge of the nose between the eye-brows, and which were followed by adenitis of the cervical and axillary glands. The contents of the pustules were inoculated with success into a young bull which furnished vaccine for an infant in whom the pocks were of a beautiful appearance.

The differences between cow and horse pox are given by M. Chauveau (*Dauchez*, p. 17):—

(*a*) The eruption which results from an inoculation remains absolutely local in the cow, whilst in the horse there occurs occasionally, if the animal is *young*, a primitive local eruption which is accompanied with a secondary exanthem more or less isolated.

(*b*) When one introduces the vaccine virus into the system, without its coming in contact with the skin, it is easy to obtain in the horse a generalised vaccinal exanthem with all the characters it presents in natural cases. Never has this natural exanthem been thus produced in the cow.

(*c*) When the subcutaneous connective tissue is chosen by which to introduce the virus, there happens in animals of the bovine species, as in the horse, a local tumour, and, as in the horse also, the generalised influence over the system transfers immunity from vaccine.

(*d*) If the injection be made directly into the lymphatic vessels or veins, it does not appear to exercise, over the bovine species, the least general influence.

Much light has been thrown on this subject by the admirable experiments of Professor Chauveau (*Warlomont*, p. 80). M. Chauveau produced a generalised vaccine eruption in a horse by injecting vaccine into a lymphatic vessel of the animal. Eleven days afterwards the vaccinal exanthem appeared on the nose and lips, and on the fourteenth day, on the hind legs. The liquid from the eruption inoculated into four animals of the bovine species, caused in all a beautiful vaccinal eruption, which remained absolutely local. Inoculated by four punctures into a child, only one very small vesicle resulted, whose evolution was extremely slow, but whose virus, transmitted to a second child, caused

on each arm three pustules, of which the evolution was equally prolonged, and which ended by acquiring extraordinary dimensions. In another experiment, the eruption was produced by injecting the virus into the cellular tissue, through a small wound made in the side of a young colt, aged eighteen months. On the tenth day after the inoculation, the animal presented a very characteristic vaccinal eruption in the naso-labial region. M. Chauveau obtained very similar results by administering to colts lymph mixed with their drinks.

The following case, by Dr G. B. Longstaff (*Brit. Med. Jour.*, 1883. i., p. 454) is not unlike the one that came under my notice:—On 18th January I vaccinated my fourth child, a boy aged three months, with lymph obtained through the Association for the Supply of Pure Vaccine Lymph. Vaccination was effected in four places by the superficial scratching with a new needle. There was no bleeding. The child had been strong and healthy from its birth. It had slight nasal catarrh some weeks before, and had been subject to repeated attacks of "red gum;" but no vesicles or pustules were observed up to the time of vaccination, when there was an appearance on the left cheek that was taken for another incipient crop of "red gum." On the second and third days the papules on the cheek became surmounted by vesicles, which soon began to weep, and presented all the characters of eczema. On the fifth day there were four vesicles at the points of inoculation, fairly well developed, and with clear lymph oozing from them. On the seventh day, or possibly late on the sixth, a crop of papules appeared round the points of inoculation, and also a few scattered over the body. On the eighth day, the primary vesicles were large and well formed, oozing a good deal. There was very little areola. On the ninth day, vesicles appeared on what may be called secondary papules. On the tenth day, the primary

vesicles, still discharging copiously, were surrounded by at leasty fifty discrete circular, well-formed vaccine vesicles, several of which were discharging lymph. There were also similar vesicles distributed as follows :—One on the opposite elbow, one on the top of the head, one on the neck, one on the ear, and a few on the body. The child's back, scalp, and back of its forearms, were now covered with a scaly erythematous rash. The arm was swollen and brawny, but not more so than is frequently observed in ordinary cases. Eleventh day—a disturbed night, but yet the child slept a good deal. About seventy secondary vesicles were counted on the left arm, five on the ear, one on the back, and one on the right elbow. Twelfth and thirteenth days—the vesicles on the arm became confluent; indeed, the upper portion of the limb presented exactly the appearance of confluent small-pox. Swelling and constitutional disturbance were still inconsiderable; scabs beginning to form on the primary vesicles. Fifteenth day—all the vesicles, secondary as well as primary, dried up; eczema on the cheek quite dried up; the rash on the back of the scalp subsiding.

26th February.—Scalp and back well; eczema still on left cheek; a small abscess on the nipple; a few erythematous patches on neck and chest. The child appeared very well, and the scabs separated in the usual course. Dr Warlomont informed Dr Longstaff that he considered the case one of *vaccine généralisée* which is said to be less rare with calf lymph than with humanised lymph. Dr Warlomont attributed the "anomalies much rather to the ground than to the seed." Dr Longstaff further asks: Ought I to have delayed vaccination? To what extent was the generalised eruption due to auto-inoculation?

In the *Medical Record*, April 1882, Dr H. Austin Martin records *a most rare, possibly unique, case of general eruption of vaccinia* :—"The case was a most perfect and

undoubted one of general vaccinal eruption. What any competent and careful observer would call a general *spontaneous* eruption of vaccinia has always been a very rare anomaly, a very large proportion of cases so heralded and recorded having most clearly been either eruptions of varicella, or from auto-inoculation, or contact with another *vaccinée*. I find no case in all the literature of vaccination which I have toiled through in this special research, in which the re-vaccinated nursing mother communicated undoubted vaccinia to the nursling through the medium of lactation, and such, without doubt, was the case I now put on record." The case is as follows:—"A lady of Boston, aged thirty-six, was re-vaccinated on the 13th day of February 1882, with bovine vaccine virus. On the same day one of her two children, a boy aged three, was also vaccinated, but the other, a seven months' infant at the breast, was not submitted to the operation. The reason for this omission was that the latter was suffering from eczema capitis (crustea lactea), and the physician in charge feared an aggravation of the eczematous eruption from vaccination, and a consequent considerable and very undesirable burden to the mother in case her own secondary vaccination should be at all troublesome. The vaccination of the mother was effected, but only a slight vaccinal effect was noticed—itching, slight efflorescence, and a faint approach to a vesicular eruption and areola; but on the 1st of March (Wednesday) the slight scab which had followed it had fallen. On that day, the sixteenth after the mother's re-vaccination, it was observed that the infant was somewhat fretful and feverish, and a number of red pimples were seen on the arms about and below the elbow. On the third day after this (Saturday) these had so increased in size, changed in character, and multiplied in number, and so many others had appeared on other parts of the body, that the attending physician was called. It was very noticeable that the portions of the

surface on which the eruption of eczema had been most marked were the seats of the most abundant eruption of this new visitation. The physician in attendance on the case most kindly allowed me repeated opportunities of seeing it, and, on the first occasion, visited it with me, desiring my opinion as to its character, for it had appeared to him so very much like small-pox that, as a measure of prudence, he had reported it as such to the local Board of Health. I first saw it on Monday, 5th March, the fourth day after the commencement of the eruption had been noticed on the arms, and the twentieth day after the mother's re-vaccination. I found the infant very fretful, and continually trying to scratch the parts most covered with the eruption. When, however, the mistaken application of vaseline on rags was removed, the most irritable parts of the skin bathed, and then dusted freely with finely powdered starch, this symptom subsided considerably. The temperature was slightly elevated, not more than two degrees above normal. On examining the entire surface of the body, at least 400 clearly defined, perfectly circular, invariably umbilicated vesicles were apparent. The two forearms chiefly on their lower surfaces, the ankles and legs below the knees, and left cheek were the sites of certainly all but about one hundred of these. The remainder were scattered about on other parts of the surface, singly and in groups of two, three, or more. The surfaces of the abdomen and back were almost free from them. On the upper part of the chest, the upper arms, the thighs, the neck, forehead, and right cheek were very nearly all the vesicles not found on the two forearms, the legs, and the left cheek. On these five places, when I first saw the case, the eruption was nearly confluent, the vesicles being closely *coherent*. The eruption had wonderfully the appearance of that of variola on the fifth or sixth day. The vesicles were, however, more perfectly and invariably absolutely circular. No matter how near to each other, not one vesicle varied in the slightest

degree from a perfect round. On the arms—on one particularly—a considerable number of vesicles had been torn open by the patient, exhibiting very clearly the peculiar cellular structure of the vaccine vesicle, and from these exuded a considerable amount of perfectly colourless pellucid lymph. Around each separate vesicle, and groups of them, was a bright areola of limited extent, and of more symmetrical approach to a circular outline than observed, at a certain stage, around the pustules of variola, varioloid, or varicella. . . . . My diagnosis was of a general eruption of vaccinia, and, if I was right, dessication would soon follow. . . . . On visiting it in the forenoon of next day (Tuesday) I found the beautiful, clear definition of every vesicle had almost entirely disappeared, or been much modified. Dessiccation had not only commenced but was very considerably advanced, and already there was a confluent scab covering a large portion of the surface, on which the eruption had been most abundant. . . . . I visited the case again on the 9th (Thursday). Many scabs had been rubbed off, but over each of the confluent patches, they remained adherent, except when somewhat broken of at edges. . . . . There was no indication of loss of substance below the epidermis, or, of course, of subsequent pitting."

Dr Martin further gives the translation of an account of a case (as being analogous to his) found in the *Rapport du Comité Central de Vaccine sur les Vaccinations practiquées en France pendant l'année* 1810, *à Paris de l'imprimerie Imperiale,* 1812:—"A girl, aged four years, had been vaccinated in vain several times in 1809. She was again vaccinated without effect in 1810. This persistent refractoriness of the system to control vaccine, induced M. Cazals, a physician at Agde, to adopt the following method: —He was in the habit of using the vaccine crust; he thought this had proved too feeble as an external appliance,

and to accomplish the desired end he induced the parents to give the child, as a pretended vermifuge, a pinch of powdered vaccine crust. This was done in a tablespoonful of soup. The child suffered no inconvenience till the fourth day, at which time the places previously vaccinated, exhibited a slight appearance of effect. She suffered from evident languor, nausea, and even vomiting, as in variola. There was very smart fever, with faintness, nervous restlessness, and extreme prostration. This condition continued during six days, and at the end of that time there appeared a general eruption of 180 vesicles all of clearly vaccinal type; each followed its natural course, the inflammation of the circle or areola extending to several millimetres around each vesicle: in many places all the areola combined so as to make one single large area of cutaneous congestion. From the eleventh to the twelth day the areola declined. There remained some slight, hardly perceptible efflorescence, and fever ceased at the beginning of the thirteenth day. On the fourteenth day, the scabs became black, but did not fall off till the twenty-first day."

The following case, which came under my observation, presents several points of interest, and will, I think, throw much light on this very little understood subject:—

16th April 1891.—H. S., an apparently healthy child, aged five weeks, having a good family history, and living at a farm in a country district, was vaccinated by me in four places. None of the insertions took. There was no skin affection.

23rd April.—I again vaccinated the child in four places on the same arm (left). The lymph used was taken directly from a healthy child, who had four large typical Jennerian vesicles, from which, when opened, a great quantity of clear

lymph exuded, and which, though the dropping off of the scabs was retarded, progressed favourably.

6th May.—I inspected the case (H. S.), which the mother said had done well, and found that there was one small "mark" with a blackish surface, the surrounding skin being inflamed to no alarming extent.

11th May.—The mother brought the child to me and I found it fretful and feverish. On the arm (left) there was a collection of vesicles varying in size from a threepenny piece to a small pea, and covering an area about the size of a crown piece. In the centre of these vesicles was a black patch representing the original vesicle. The vesicles in the centre of this collection were confluent, while those at the periphery were more or less isolated. The whole of this area was surrounded by a ring of inflamed skin in which were dotted, irregularly, papular-like elevations, evidently developing into vesicles. I found also a vesicle about the size of the finger nail in the lumbar region. There were several small vesicles (or bullæ) on the fingers and toes. The mother informed me that the mischief began the day after I last vaccinated the child—*i.e.*, on 7th May. From her story it would appear that on 7th May (the fourteenth day after successful vaccination), papular-like elevations began to arise in the inflamed skin around the original "mark" and developed into vesicles; and that about two days after she first noticed signs of these extra vesicles on the arm, there were some coming on the fingers and toes and in the lumbar region.

12th May.—I found the child more fretful, and the inflammation on the arm had extended about a quarter of an inch. Some of the vesicles on the arm, originally isolated had become confluent, and it was noticed that the vesicle in the lumbar region had grown. There were several "shotty" points on the buttocks.

13th May.—More vesicles were discovered and the area on the arm had extended. There were about eight vesicles on the buttocks, one on the bridge of the nose, and some coming on the soles of the feet. That in the lumbar region looked inflamed around. Lead lotion was applied to the collection of vesicles on the arm.

14th May.—The mother said the child had been vomiting. The vesicles on the arm had extended so as to almost surround the arm, though the inflammation was to a slight extent less.

15th May.—The general state of the child was about the same. One vesicle was found on the wrist, and a little pus exuding from the umbilicus, and believed to have been due to a vesicle having formed there. Lead lotion continued.

16th May.—The vesicles had a less tendency to develop. Child was ill.

18th May.—Condition, if anything, improved.

20th May.—One vesicle was seen on the lower lip, and one on the forehead.

21st May.—The vesicles seemed to have ceased developing on the arm. The *tops* of the vesicles in the centre of the cluster on the arm had come off, leaving an irregular-shaped weeping surface about the size of a florin piece. The tops of one or two vesicles on the back had come off (probably mechanically). The vesicles on the face (eight in number) and on other parts of the body were growing laterally.

22nd May.—Lymph taken from a vesicle (or bulla) *on the toe.*

23rd May.—One vesicle on the back was noticed to have grown laterally, and there were three or four smaller ones surrounding it.

[My observations of the case were temporarily interrupted.]

8th June.—It was noticed that no more vesicles had developed since 23rd May, and that the vesicles on the arm had disappeared, leaving an ash-coloured surface, in the centre of which was, situated in a depression, a black scab (original vesicle). The vesicles generally were drying up, and (for example, one on the ala nasi and one on the upper lip) had been replaced by scabs, but the majority were in pretty much the same condition as they were on 23rd May. A pock on the ali nasi appeared to be eating it away.

10th June.—Child died.

Remarks.—The child was vaccinated in the usual way, an instrument specially adapted for vaccination being used, and which was cleansed with a clean napkin and water before and after performing the vaccination. Besides H. S., two other children (Foster and M'Leod) were vaccinated with lymph from the same source—one child in four places and the other in two places. In either of these children (as in the child H. S.) only one vesicle resulted. As these two children presented only one vesicle each, they, like H. S., were again vaccinated, in one place, on the other arm, about eight days after their first vaccination. In one of these children only, was this second vaccination successful. About the same time I vaccinated upwards of fifty other children, concerning whom I had no complaints, nor did I hear of any complaints to the other medical men in the district. I daily visited a fever hospital about that time, but the usual precautions to avoid carrying infection were taken. There was no infectious disease (unless "influenza" be considered so) in the immediate vicinity where the child H. S. lived, and the only diseases of an infectious nature I had to deal with were typhoid, scarlet fever, rötheln and measles. There was no small-pox or chicken-pox. Besides myself three well-informed medical practitioners saw the case, and were of opinion that it was not one of a well

recognised skin eruption. The vesicles (or bullæ) on the fingers, hands, toes, and feet were circular and *not* umbilicated. The vesicles on the other parts of the body were circular, broad, and umbilicated, free from a ring of inflammation (except one large vesicle on the back and those on the arm), contained a clear fluid, and, in short, could not be distinguished from vesicles following ordinary vaccination, except by their unusual position. They were distributed on the fingers, toes, hands, feet, back, buttocks, thighs, face, the nape of the neck, and left arm. There was also one on the vulva and one near the anus. There were no vesicles on the chin, but one on the lower lip, one on the wrist, and, with the exception of one on the umbilicus, there was none on the abdomen. If any symmetry was shown the most marked was on the extremities where the eruption attacked the flexor surfaces. No connection could be traced between any horses or cattle and the case, neither was there any similar disease prevailing in the district. The child was not isolated, and none of its brothers, or sisters (four in number) or adults in the house, suffered in any way referable to the case. The child lived at a farm in a country district and was nourished by the breast previously to and during its illness.

This case is interesting for many reasons. The late appearance of the secondary vesicles—*i.e.*, on the thirteenth or fourteenth day after successful vaccination; the *almost simultaneous* appearance of the vesicles on the arm, and those on other parts of the body; the presence of vesicles (or bullæ), on the fingers and toes; and the prolonged duration of the illness resulting in death of the patient.

Was it a case of Varicella?—The large size of the pocks, their duration, the absence of chicken-pox in the district, the other children coming in contact with the patient escaping the disease, are reasons sufficient for not attributing the infant's illness to chicken-pox.

Was it natural Small-pox?—Against this, the patient was not isolated, and none in the house suffered from contagion. It is only proper to mention, however, that the children, at all events, were vaccinated. Besides, there was no small-pox in the district, and the pocks (most of them at least) had not dried up after twenty-eight days; and its evolution had other points to distinguish it from natural small-pox.

Was it a case of Variolation?—The patient was vaccinated arm to arm from a child (vaccinated with humanised lymph) who served as vaccinifer for two other children, and in these latter, as well as in the vaccinifer, no ill effect was noticed. It is curious to note that in each of the three children (one of whom was the patient), vaccinated from the same source, only one vesicle resulted; and each of these was again vaccinated, as they showed only one vesicle each, and in only one was this re-vaccination successful. It would appear to resemble the secondary vesicles following variolation, for Kaposi (*quoted by Dauchez*, p. 42), in referring to inoculated variola, says:—The specific eruption of variola, usually little confluent, simulating varioloid, appears from the eleventh to the thirteenth day; and Rayer (*Traité des maladies de la Peau*) states that the local eruption of inoculated variola is complete on the seventh day. It is after this time that the general eruption commences to appear, and is complete only after the thirteenth or fourteenth day. The symptoms, however, shown in the case in question have other points to distinguish it from variola.

We are thus compelled to conclude that we have here a case of *vaccine généralisée*. Our experiments confirm this conclusion. On 22nd May, as already stated, the mother kindly allowed me to procure some lymph from a vesicle (or bulla) *on the toe*. Several punctures were made with a clean needle into a distended bulla on the great toe, allowing

several drops of clear lymph to exude. The cuticle was quite hard, and on the following days the bulla showed no signs of injury, or that lymph had been taken from it, thus proving that the cuticle had some reparative power. From this bulla I was enabled to partially fill three vaccine tubes which I placed in a ℥ii. dispensing bottle. Some days previously, I had pricked with a needle some of the vesicles on other parts of the body, and a small quantity of lymph exuded, but the mother objected to my collecting lymph from them. The lymph thus collected from the toe was used for the following experiments :—

EXPER. 1.—*13th January.*—Several cover glass preparations were made from the lymph of one of the tubes. The lymph stained with aniline methyl violet, showed under the microscope forms of micrococci seen in a similar preparation of ordinary clear lymph (vaccine). In fact, the preparations could not be distinguished from those of clear vaccine similarly treated.

EXPER. 2.—*13th January.*—Guinea-pig A was vaccinated in two places, after the skin had been shaved, and washed in the process of lathering. The lymph was blown from the vaccine tube on to the skin, and several scratches were made with a common needle. The following day the wounds looked a little inflamed. Fourth day—distinctly elevated scabs, but no areola. Fifth day—scabs drying up. Sixth day—scabs dropped off, leaving two oval scars.

EXPER. 3.—*18th January.*—It was noticed that the end of the remaining tube was broken, allowing the air to come in contact with the lymph, which had acquired a reddish tinge, thus differing from the lymph in the other two tubes, whose contents were perfectly transparent. This lymph with the reddish tinge was, however, used in the vaccination of guinea-pig B, which was vaccinated in two

places. The operation did not take, and nothing remained to be seen except the scratches caused by the needle.

We notice that it is is difficult or impossible to produce a typical Jennerian vesicle in the guinea-pig, and it may be concluded that the scabs in guinea-pig A were due to vaccine and not to blood serum.

It is to be remembered that the lymph used in the vaccination had been in the body over sixteen days, and would, in consequence, undergo attenuation not unlike Dr Buist's artificial cultivations.

In regard to guinea-pig B, the failure of the vaccination may be ascribed to the fact that air was allowed to come in contact with the lymph while in the tube. The facts that the microscope showed micrococci like those seen in ordinary vaccine lymph, and the scabs followed by scars after the inoculation of guinea-pig A, are sufficient evidence, after excluding varicella and variola, that the case was one of vaccinia.

After being satisfied of its being a case of vaccinia, the next question is: Was it totally or partially due to auto-inoculation, or to blood infection (spontaneous "vaccine généralisée")?

Was it due to auto-inoculation?—The idea that it might be due to this is supported by the statement of Besnier, as we have already pointed out, that auto-inoculation may occur from the eighth to the eighteenth day. The opinion of Dr Dauchez is that auto-inoculation has chances of success from the sixth to the ninth day, and the spontaneous eruption is contemporary with the local vaccinal pustules (p. 52). We shall, however, see that auto-inoculation may occur as early as the third day. Against auto-inoculation there are several interesting facts. The primary vaccine vesicle was not opened either intentionally or accidentally. There was no

evidence of the child's scratching the vaccinated arm. There was no skin disease or appreciable skin lesion, in which to plant the virus; and we have previously seen that Dr Buist failed to produce a vesicle on the unbroken skin. If there were any skin lesion, although unappreciable, in some parts of the body, the remarkable symmetry as shown by the eruption on the fingers and toes, could not be attributed to an accidental mechanical breach of the skin; and *it is difficult to imagine how lymph could penetrate the hard cuticle of the fingers and toes*, which, as already stated, had some reparative power after being pricked with a needle.

If due to auto-inoculation, it can be readily conceived that the lymph, in its transit from one part of the skin to another, and coming in contact with the soiled linen, would run a great risk of being contaminated with such organisms as would cause an inflammation in relation to each vesicle; but there was, almost without exception, no areola around the secondary vesicles. Under the heading of accidental vaccination, I have shown that inflammation around the pock is very common, and which would be best explained by the mixture of organisms with the lymph. The risk of vaccinating with septic matter is explained elsewhere. Another piece of evidence against auto-infection is that the third vaccination, performed the day before the onset of the generalised eruption, was unsuccessful; and if the child's clothing were impregnated with lymph, it would be expected that at the site of the scarifications there would have developed a pock, or that if the patient's own lymph could produce a pock, then any other lymph might do likewise.

Were the secondary vesicles on the arm due to auto-inoculation, and those on the rest of the body due to infection from them? The facts—that the mother *noticed* that vesicles were coming on the rest of the body *two days* after she observed signs of those appearing on the arm, and

that when I first saw the child with this illness, I found a vesicle in the lumbar region quite as developed as any on the arm—thus showing that the vesicles on the arm and some in the other regions probably arose simultaneously —do not appear to make this supposition tenable.

Was it a case of blood infection (spontaneous vaccine généralisée)? In a discussion on Vaccination Eruptions (*Brit. Med. Jour.*, 1890, ii., p. 1229) Dr Colcott Fox expressed his opinion that most, if not all, cases of *vaccine généralisée* were due to auto-inoculation; and Radcliffe Crocker believed that the same disease was due to auto-inoculation at the early stage of development of the original vesicle.

We have stated the evidence against blood infection, that is, the appearance, in the case of H. S., of secondary vesicles on the thirteenth or fourteenth day after vaccination; but at the same time adduced facts that go far to prove that it was not a case of auto-infection. Let us for a moment recall to mind Dr Martin's case of an infant developing a spontaneous generalised eruption, due to its being suckled by the re-vaccinated mother; and the one of the girl aged four years who took the powdered vaccine crusts, and four days afterwards exhibited alarming constitutional symptoms, which were followed after a lapse of six days (*i.e.*, ten days after taking the powder) by a general eruption of one hundred and eighty vesicles.

Two such cases mentioned by Dr Dauchez (p. 45) are interesting.

One is by Dr Etienne. It was a child, aged four years, who had undergone a very regular vaccination. On the ninth day it sucked the vesicles which it had injured. Six days afterwards there arose malaise, nausea, delirium, and all the symptoms of variola. Soon the body was covered with vesicles, each of which followed a most regular course

and of which the material inserted into another child gave rise to local vesicles without a general eruption.

The other case by Dr Richard was a girl, aged eight who, four days after sucking the vaccine vesicles of her younger brother, developed a score of vesicles having every appearance of those at the point of insertion.

From these cases and the experiments of M. Chauveau it may be justly inferred that the incubation of cow-pox, when introduced into the system by the mouth, or by injecting it into the sub-cutaneous tissue, is on an average *eight* days. Dr Martin's case—the infant affected through lactation—tends to show that lymph may be absorbed into the system without producing any tangible result; and M. Ferré has (*Brit. Med. Jour.*, 1884, i., p. 695) found the micrococci of lymph in the blood of different animals after vaccination.

We have seen that the various rashes following vaccination are due to the absorption of some material from the vaccination wound, that they may occur at any reasonable time after vaccination, and that they require a constitutional predisposition in their production. Now, remembering that the symptoms show themselves about eight days after the vaccine has been introduced into the system, it is easy to imagine that if, in the case of H. S., lymph were absorbed on the fifth or sixth day, the general eruption would appear on the thirteenth or fourteenth day. The day of the appearance of the eruption would date from the day of *absorption* and not from the day of vaccination. The fact that M. Chauveau failed to produce a generalised eruption in the cow shows that it is the host, and not the poison, that is peculiar. In variolation the secondary eruption appears on the thirteenth or fourteenth day and *is* due to absorption. Why small-pox introduced in this way is very mild is not known. Perhaps it may be explained by the partial protection given by the absorption of some material from the

primary vesicles—that is, before the micrococci of the disease have had time to develop. The absorption of the cow-pox virus would seem quite as likely as that of small-pox, or as the products from the vaccination wound. The absorption of the virus, however, is not as difficult to understand as the manner in which it develops afterwards.

But why do the secondary vesicles predominate in the region of the primary vesicles? Have we not seen that miliaria, purpura, eczema, etc., diseases occasionally brought out by vaccination, not uncommonly first show themselves in the locality of the vaccine "mark." Nay, the pocks in small-pox are well known to be more abundant on a piece of skin whose vitality has been lowered, say by a blister. Moreover, Dr Thos. Dutton (*Brit. Med. Jour.*, 1883, i., p. 356) records a case of a child whose vaccination was progressing favourably, when, on the third day the arm inflamed and there were scabs "all over" the child. When Dr Dutton saw the case he found it one of varicella. He noticed that the varicella vesicles clustered round the weak part in the arm near the remains of the vaccine vesicles.

I venture to hold that the inflammatory areola is a *weak point* in the skin, and is thus a most suitable locality for the development of the secondary vesicles. *We may then conclude that the case of H. S. was one of vaccine généralisée (spontaneous), due to the virus being absorbed into the system, and the numerous confluent vesicles on the vaccinated arm were not due to auto-infection, but developed there on account of its presenting the weakest spot in the cutaneous system.*

Why the eruption on the hands and feet was not umbilicated is difficult to say. The explanation might be that it was owing partly to the special structure of the skin in these regions, and partly because the "bullæ" were very distended with lymph. A vesicle in the region where the

tendo Achillis is inserted, just at the spot where the thick epidermis joins the ordinary cuticle, was slightly umbilicated. The eruption in these localities was confined entirely to the flexor surfaces. A case recorded by Dauchez (p. 53) of a child suffering from generalised vaccinia showed on the plantar aspect of the foot a pustule which was a little umbilicated.

In regard to the third vaccination which was unsuccessful the cause of the eruption could not be ascribed to it, for the eruption appeared the day after this vaccination was performed. The first vaccination, performed a week before the second, the successful one, might have had some influence over the disease, as it is possible to imagine that the lymph in its scarifications might have been to some extent revivified (see Revivifying of Vesicles). The lymph was not to blame, and the only explanation that appears to be correct is that the disease was due to some constitutional peculiarity of the patient—whatever that might mean.

Vaccine Généralisée due to Auto-inoculation.—*Vaccine généralisée* from this cause is recognised, and is comparatively frequent. There is generally an accompanying skin disease, the most common being eczema. Lymph coming in contact with diseased skin is very liable to produce a pock. A recruit having abundant acne on the neck, shoulders, and back, was vaccinated without effect on the healthy skin of the arm. As no result followed, the operation was repeated six days after on the other arm, as also on the papillæ of the acne on the shoulder and back. In these last localities a few pustules were developed, while in the healthy skin on the arm no change occurred. In another case, several punctures made in the eruption of psoriasis were followed by development of vesicles, while vaccination on the healthy skin was twice performed without success. (*Dr Hieler, Medical Times,* 76, i., p. 261).

Dr Radcliffe Crocker, as has already been indicated, believes *vaccine généralisée* to be produced by auto-inoculation at the early stages of development of the original vesicles. Dauchez says auto-inoculation rarely takes place after the ninth day; while Besnier maintains that it is possible as far as the eighteenth day. Thus it will be seen that a reliable diagnosis as to the kind of vaccine généralisée cannot be made from the date of the secondary vesicles.

The following case of auto-inoculation illustrates that the secondary vesicles may appear on the third day. It is of an eczematous child (*Dauchez*, p. 64). Jules B., aged six months, has not been vaccinated on account of eczema of the forehead, hairy part of the neck and face, and the front of both arms. The eruption commenced to improve and it was decided to vaccinate the child on account of there being an epidemic of small-pox. *18th February.*—A single puncture was made on each arm, and the vaccine used was taken directly from the cow *21st February.*—On the third day, elevations commenced to show themselves at the seat of puncture, but already there are four supernumerary pustules on the eczema of the front of the right arm. *23rd February*, fifth day.—Several neat vesicles are recognised scattered over the two arms—five or six on the left, seven or eight on the right—some isolated on parts of sound skin, others in groups of three or four on the patches of eczema. An eczematous patch about the size of a five-franc piece is covered with pustules encroaching one on the other. After the ninth day the eruption appeared to have attained its height. There were swelling of the axillary glands, fever, insomnia, tension of the right arm, and the isolated pustules followed the ordinary course of vaccination, dessicating on the thirteenth day. *22nd February.*—Swelling of the axillary glands disappeared; and the pustules did not leave a depressed cicatrix.

The vesicles from auto-inoculation may follow the course of ordinary vaccine vesicles, but their progress is usually slower. Constitutional symptoms, fever, etc., are also present and vary according to the severity of the disease. The pocks are usually confined to the areas attacked by the skin disease, but apparently healthy skin is not uncommonly affected, and fresh portions of the skin may be invaded in succession. The lymph may be conveyed by the child's nails, or the hands of the mother, from the site of the original vesicle to other parts of the cutaneous system. When the secondary vesicles appear in the region of the vulva or anus, they may be disfigured or modified, and are to be distinguished from syphilides.

RESUMÉ.

We may then say that spontaneous *vaccine généralisée*, that is, due to blood infection, can no longer be doubted, and that there are in consequence two varieties of the generalised eruption of cow-pox; one, the spontaneous, due to blood infection, and the other caused by auto-inoculation.

Spontaneous Vaccine Généralisée is a very rare disease, due to the absorption of the active principle of vaccine lymph into the system. The vaccine loses its "fixedness," probably owing to the primary vesicles having failed to give protection against a further development of the micrococci in the system. It has been most frequently noticed in infants or young children, but cases have been recorded in which adults were affected. The disease may show itself after vaccination, either at the same time as the vesicles at the seat of puncture (thus resembling injection), or later. When vaccine has been taken internally, such as by sucking a vaccinated arm, the symptoms manifest

themselves in the course of four to eight days, and simulate those of an attack of variola. In some cases the secondary vesicles appear at the same time as those on the vaccinated arm and follow the same course of development. In others the symptoms arise suddenly, and consist at first of fever and irritability of the patient; about the same time the vaccine areola shows papular points, which in the course of two or three days develop into vesicles, the ones more centrally situated being confluent and more developed than those at the periphery, which shows isolated vesicles, other papular points, and is surrounded by inflamed skin. At the same time, or soon afterwards, a similar growth of isolated, irregularly scattered vesicles takes place in other parts of the body, presenting in their early stages a decided "shotty" character as in small-pox. The vaccine areola around the secondary vesicles is never exaggerated and may be absent. The vesicles may be distributed in any region of the body, but they have a special affinity for a weak point in the skin as is shown by their developing in greater numbers near the original "mark." There is some symmetry shown in their distribution, especially when the eruption attacks the extremities, and in this latter situation the flexor surfaces are mostly affected. Constitutional symptoms, usually slight, vary according to the severity of the disease. The pocks generally scab after a fortnight, and the resulting scars do not exhibit that depression ordinarily seen; but in severe cases the scabbing may be delayed more than three weeks. No case has been recorded in which the eruption affected the mouth. The prognosis ought to be guarded but recovery has been the rule.

Vaccine généralisée due to auto-inoculation.—This kind of the disease is the less rare of the two and is generally accompanied with some skin disease, as eczema, erythema,

papulo-vesicular eruption, etc., or other cutaneous lesion. It may occur from the third to the eighteenth day after vaccination. The infant, by scratching, conveys the vaccine from the arm to other parts of the body, or this may be done by some other person. Sometimes there is much swelling in the region of the secondary vesicles, especially if the lymph in its transit from one part of the body to another be contaminated with septic germs. The secondary vesicles predominate in the region of the skin lesion, where they may be confluent; but apparently healthy skin is occasionally affected. The pocks dry up, as a rule, about the fourteenth day, but they may in very rare cases ulcerate and thus prolong the illness, which, unless complications arise, usually terminates favourably, and the resulting scars do not exhibit that depression characteristic of an intentional vaccination scar.

Diagnosis.—*Vaccine généralisée* must be distinguished from *varicella*, which may occur at the same time as cow-pox. The large size of the pocks in vaccinia (varicella pocks measuring from $\frac{1}{8}$ to $\frac{1}{4}$ inch), together with the evidence of vaccination, and the possibility of contagion in the case of chicken-pox, would assist in avoiding the error. Fresh crops of vesicles arise in varicella, but rapidly pass into scabs. It is to be distinguished from *varioloid* by the general symptoms (vomiting, pain in the back, pyrexia, etc.), together with a consideration of possible contagion. When the eruption is complete the pocks are equal in variola, which does not show the fresh crops, as are seen in generalised vaccinia. Vaccine pocks are larger, more isolated, and very irregularly scattered. Small-pox may affect the mouth. The disease would, however, in some cases be difficult to diagnose, if it occurred during an epidemic of small-pox. The fact of vaccine lymph being used for inoculation would distinguish it from *variolation*.

I venture to give in a tabulated form the points of difference between the two varieties of *vaccine généralisée*:—

SPONTANEOUS.	AUTO-INOCULATION.
1. No skin disease.	1. Skin disease.
2. No evidence of scratching.	2. May be evidence of scratching.
3. Very irregular distribution of secondary vesicles.	3. Secondary vesicles confined chiefly to skin lesion.
4. Vaccine areola, if any, normal.	4. Areola may be inflammatory, and there may be much swelling.
5. Eruption shows some symmetry.	5. Symmetry, if any, depends on the symmetry of the skin disease.

Treatment.—As regards treatment so little is known of the spontaneous variety of the disease that no special method of treatment can be suggested. The vaccination of infants suffering from skin disease should be postponed till the patient is well, except in times of small-pox epidemics, when the risk of small-pox is far greater than that of a benign eruption due to auto-inoculation. The strength of the patient should be supported, and the pocks, if inflamed or causing itching, dusted with some powder, as oxide of zinc or starch, after bathing them with warm boracic acid solution.

VACCINO-SYPHILIS.

When the anti-vaccinists attribute the spread of syphilis to vaccination they weaken their cause, for cases of vaccination syphilis are so rare as almost deserve the designation of pathological curiosities. So pronounced are the manifestations of syphilis when due to vaccination, that, had it been of common occurrence, there would not have been so few cases recorded in medical literature. As a matter of fact many public vaccinators of large experience have never seen a case; and some even doubt its existence. Nevertheless, the possibility of transmitting syphilis by vaccination has long been suspected, and now sufficient evidence has accumulated as to amount to positive proof; and indeed there are few medical men who would vaccinate themselves with lymph from an obviously syphilitic person. Yet there are others, and of equal eminence and experience, who doubt its possibility, their apparent reasons being that by self-inoculation they have failed to produce syphilis, and the extreme rarity as contrasted with the hereditary and otherwise acquired forms, of undoubted cases seen or reported. It is true that the bulk of alleged vaccino-syphilis cases are either cases in which vaccination has been the cause of bringing out hereditary syphilitic phenomena, or those of ill-cared for, injudiciously fed, and puny children in whom are occasionally seen, concomitant with vaccination, skin disease, oral and anal thrush, nasal catarrh, etc., all of which

are symptoms of syphilis but which may not be due to that disease.

Our faith in the words of a man of Mr Hutchinson's experience, eminence and reputation is so firm that an attempt to shake it by reason would certainly be futile; and there are few, I think, who would act as if the following words of Mr Hutchinson (*Brit. Med. Jour.*, 1890. ii., p. 1234) had no weight whatever: "In reference to the possibility of conveying syphilis from a vaccinifer who does not reveal the taint by any visible symptoms, I feel bound in honesty to say that I feel sure of it. No surgeon in his senses would ever vaccinate from a child which showed obvious symptoms. The fact is that a certain number of syphilitic infants look perfectly healthy whilst very efficiently contagious. There is no use and much danger in denying this important clinical fact."

When a child with hereditary syphilis is vaccinated, syphilitic manifestions not uncommonly first make their appearance, and in some instances simulate very closely those of true vaccino-syphilis. The hereditary signs may be merely concomitant with vaccination, or their appearance may be manifested by the constitutional disturbance caused by the vaccination; for it is well known in Lock Hospitals that any irregularity such as drinking, is a great factor in bringing out a syphilitic rash.

For a syphilitic parent to say that his child's symptoms are due to vaccino-syphilis is an excuse so admirable, that few practitioners would openly contradict such a statement. Again, if through the vaccination of the infant, a practitioner discovers that a parent had unwittingly suffered from syphilis, such a train of events would inevitably follow on her knowing this, that he is not justified in undeceiving her, but rather in allowing vaccination to bear the blame.

These are among the reasons why vaccino-syphilis is apparently better known to the laity than to the profession.

The extreme rarity of vaccination syphilis may be ascribed to the facts that vaccinators are careful to avoid taking lymph from a syphilitic child, or from one about whom they have doubts, and that provided lymph were taken by misadventure from a syphilitic child, and inoculated into a healthy one it does not follow that syphilis would result. When syphilis has been inoculated along with vaccine virus, says Professor Fournier (*Journal de Mèdecine*, April 1889), three alternatives may present themselves. Either the syphilis is not transmitted, and fortunately this is the most frequent result, or the vaccination does not take, but syphilis is produced, and the symptoms and course are identical with those when the syphilitic virus alone is introduced into the body, or finally both forms of virus give a positive result, some points of insertion being followed by pure vaccine lesions, while the chancre appears only at the points where the vaccine has failed. How long after the primary lesion, a person may act as a syphilis producing vaccinifer, is not definitely known, but the time would appear to vary, as in the transmitting of syphilis by other ways, according to the strength of the poison, health of its host, and above all, the treatment received. It is however, maintained by Professor Fournier (*ibid*), that the syphilis may be latent, or even in the course of incubation, as proved by cases seen in epidemics.

A healthy child, says the syphilologist, is inoculated and on the seventh or eighth day serves as vaccinifer and the virus he furnishes may inoculate syphilis, and this before the chancre has appeared in his own person.

Before a case of syphilis can be said to be caused by vaccination the following conditions are essential:—The person must have been free from syphilis previously to being vaccinated; the vaccinifer must have had syphilis in one of its stages; and the syphilitic symptoms must first manifest themselves, after a lapse of time needed for the incubation, at the seat of puncture which would be the

locality of the primary lesion, the other stages following in order.

It is now generally admitted that the blood of a syphilitic person, in the early stages, is capable of conveying syphilis; Mr Hutchinson (*Lancet*, 1873, p. 170) saw an old woman in the Munich Hospital who had been inoculated on the back, between the shoulders with blood taken from a patient just recovering from secondary symptoms. A chancre developed in the back of the woman. Since the blood of a syphilitic person can produce a chancre, it can easily be understood that syphilis may be conveyed from one patient to another by means of the lancet used in vaccination. The same risk is run when lymph is taken from a bleeding vesicle. Such lymph should invariably be rejected. The opinion that it was necessary to allow serum to ooze out of the vesicle after the first drops of lymph—the true product of vaccination—had been exhausted, is now modified; and it is at present believed that clear lymph is sufficient to produce syphilis. In referring to this question Mr Hutchinson (*Brit. Med. Jour.*, 1886, i., p. 59) says, "A question which was a few years ago in dispute, but which has, I may say, unfortunately, been finally settled at rest, is the possibility of conveying syphilis by translucent vaccine lymph. The belief that it was necessary to draw blood, or at any rate to allow the vesicle to drain after emptying it, and thus permit the escape of fresh leucocytes, can no longer be entertained."

The symptoms of vaccino-syphilis do not differ much from those of other forms of syphilis, and to enumerate them would be a needless repetition; suffice it to bring to notice a few cases illustrative of syphilitic symptoms being revealed by vaccination, and a few cases of true vaccino-syphilis. The two following cases recorded by Dr Edmund Robinson (*Lancet*, 1873, i., p. 321) will make clear some peculiarities presented by a patient whose syphilitic

symptoms are brought out by vaccination. The first case was that of a lady who had been vaccinated during an epidemic of small-pox. The lymph was being preserved on a quill and taken from an infant from whom two other children had already been vaccinated. The lady and two of her daughters (aged fourteen and ten years respectively) were vaccinated from the points at the same time. Two months after the mother suffered from two hard edged ulcers where the vaccine vesicles had formed, and her body was covered with a scaly coppery coloured rash. The vaccinifer was then looked up and was found perfectly well, as also were the two other children who were vaccinated with lymph from the same source. All symptoms of syphilis were denied, but it was found out that soon after marriage something similar appeared but not so bad, and there was loss of hair on the head. Mercury and iodide of potash, and afterwards liq. arsenicalis were prescribed, and she got rapidly well. The second case was that of an infant, one of four, vaccinated by Dr Robinson from the same source, neither the first nor the fourth but the third. On the eighth day all had good vesicles. On the twenty-fourth day after vaccination the one in question had coppery coloured patches over the body, a sore bottom, and where the vesicles had been there were deep excavated sores. One of the elder children of the same parent was undergoing treatment for iritis at the same time. There were two other children apparently healthy.

The following cases by Mr Hutchinson (*Lancet*, 1873, i., p. 169) show characteristics that can leave little doubt as to diagnosis. A respectable tradesman, aged forty-six, came to Moorfield's Opthalmic Hospital with iritis, which was at once detected as syphilitic as it was accompanied with secondary rash, etc. Examination disclosed coppery dusky rash and symmetrical ulcers of the tonsils. Ordinary questions as to syphilis were denied and the genitals showed

nothing. On the arm, however, two or three scabbed ulcers were found, as large as shillings, with dusky indurated borders; and there was an indolent bubo in the corresponding armpit. He said that the sore of the arm had broken out at the seat of the vaccination punctures. He had been vaccinated three months previously, the punctures took and behaved as usual; but when just healed over, a month after the operation, they inflamed and broke out into sores. The vaccinifer was a baby who, when seen by Mr Hutchinson (at eight months old) looked healthy and showed no signs of syphilis except a sunken bridge of the nose. It was the third child, the first two having died in infancy. It was a remarkable fact of the twelve persons vaccinated from the same baby, only the man above mentioned suffered any harm.

The other case was that of a lady who applied to Mr Hutchinson on account of a vascular growth of the urethra, but was discovered to be suffering from a syphilitic rash. On inquiry it appeared that she was vaccinated, in May 1871, by four punctures, that some of the punctures took, but a month later one of them inflamed and became a hard edged ulcer, lasting three months. Two or three weeks later (about a month after the vaccination) the rash appeared copiously and she fell into ill health. From the vaccination in May to the early part of September she had no specific treatment, which probably accounted for the severity of the rash. After this she took iodide of potash and mercury and then went to the sea-side. At the end of this the left eye inflamed (iritis), and the rash, which had been nearly well, relapsed. She was vaccinated from a baby's arm, and at the same time as her two grown up daughters. The baby was said by the vaccinator and its mother to have looked well at the time. As soon as dentition began it had some troublesome sores about the anus (? condylomata) for which it was under treatment for three

months at a dispensary. It was the third child, all living. The eldest boy showed no signs of inherited taint, but the second child had a large forehead and had had sores about the anus like the vaccinifer.

The following series of cases, by Mr Henry Lee, (*Lancet*, 1873, i., p. 817) of a number of children vaccinated in November 1856, at Lupara, by Dr Marone, are more affirmative still. The vaccine lymph was sent in glass tubes, and it was observed that it was mixed with a little blood. There were twenty-three children. They nearly all displayed the same symptoms. The disease with which these children were affected showed itself subsequently among the nurses and mothers, and even among the servants and others who were brought in contact with them. They came of parents who never had at any time previously shown any symptoms of syphilis. The children likewise had never shown any symptoms of syphilis, either congenital or acquired, previously to the vaccination in question. In some of the children, the vaccine vesicles died slowly away, but afterwards ulcers appeared on the spots, surrounded by hard edges and accompanied by multiple enlargement and induration of the axillary glands. In other cases the vaccine vesicles became covered with crusts which remained an unusual length of time. These never became firmly cicatrised, and sooner or later re-opened, assumed an ulcerated appearance, and were accompanied by the usual axillary symptoms.

In all the children above-named, sooner or later, but towards the middle of January, some form of constitutional syphilis developed itself. The symptoms consisted chiefly in eruptions of roseola, crops of papular, impetiginoid, and in a few instances pemphigoid eruptions. At a later period, mucous tubercles appeared on the angles of the mouth, on the mucous membrane of the mouth, around the anus, and on the vulva; the post-cervical and inguinal glands were

affected; and the children were emaciated generally in proportion to the extent and severity of the syphilitic symptoms. The breasts of the mothers who suckled those children became affected with ulcers, varying in appearance but always indurated. Some of these mothers presented a muco-purulent discharge from the vagina. Subsequently, many of the children had, in addition to the symptoms already mentioned, fresh eruptions of roseola, impetigo, psoriasis of the palms of the hands and soles of the feet, and ulcerations between the toes. These women were also affected with chronic enlargement of the post-cervical and axillary glands, which became the size of hazel nuts but never passed into suppuration. After the appearance of the above symptoms, the husbands of some of these unfortunate women became affected with the same disease. Anti-syphilitic treatment greatly modified the disease, but in the majority of cases the syphilitic symptoms recurred. Many of the women who had been affected by their children, when they subsequently became pregnant, miscarried; others were prematurely confined with children who subsequently became syphilitic.

No account of vaccination syphilis would be anything like complete, if mention were not made of the well-known experiment of Dr Cory, who like Hunter, displaying that self-sacrificing enthusiasm in the cause of science, inoculated himself with lymph from syphilitic children (*Brit. Med. Jour.*, 1884, i., p. 1053). The children from whom Dr Cory took lymph for his personal vaccination were in all cases but one, which was unsuccessful, not suffering from hereditary disease in a latent form, but were infants in whom active symptoms were unmistakably present, as shown by cutaneous eruptions, snuffles, mucous tubercles, and ulcerations. Out of the four children in question, only one was proved to have been capable of imparting syphilis by the lymph taken from its vaccine vesicle.

Diagnosis.—The diagnosis of vaccino-syphilis, as in making any other diagnosis, requires judgment united with discernment. A disease cannot be diagnosed from the number of symptoms, for one symptom among many having more weight than the rest may point in an altogether different direction to the others; and a single symptom appearing at a certain time and under certain conditions may be sufficient evidence of a disease. The diagnosis in question is rendered more difficult when symptoms of syphilis present themselves in an infant vaccinated in very early life. The infant might have contracted syphilis at birth. Let us imagine a case. A syphilitic man marries and his wife becomes pregnant. Escaping syphilis the gestation tends to pursue a normal course, when she contracts syphilis at a late stage of pregnancy through a preputial herpetic eruption of the husband; or a husband by an extra-conjugal adventure, contracts syphilis, which he gives to his wife in the latter part of pregnancy; and in this way the infant may be inoculated with syphilis at birth. It need hardly be pointed out that it does not necessarily follow because a man has syphilis the children he begets are syphilitic. Thus it will be seen that the history of syphilis in other members of the family may possibly be misleading; for under the above-mentioned condition of cutaneous lesion, an elder child of a syphilitic man may have escaped the disease and a younger one may be syphilitic. However, the differential diagnosis between vaccino-syphilis and other diseases with which it is apt to be confused, is ably given by Dr P. Portalier (*Brit. Med. Jour.*, 1889, ii., p. 1115) who reproduces a summary of Professor Fournier's clinical lectures on the subject. The lines of difference between vaccino-syphilis and other appearances are drawn with equal clearness and elegance by the French syphilologist.

I. Differential Diagnosis between Vaccinal Ulcers and Primary Chancres.—The latter never develop before the fifteenth day after vaccination, the time required being mostly three weeks; twenty days after inoculation it is still in its earliest development. A "vaccination ulcer" is present, if ever, twelve or fifteenth days after vaccination; after twenty days it is fully developed. The clinical differences are as follows.

In the case of *vaccination ulcer* :—

1. All the pustules are affected as a rule.
2. Much inflammation and ulceration.
3. Deeply excavated ulcer.
4. Much suppuration.
5. Irregular margin as in soft chancre.
6. Floor of the ulcer uneven; suppuration.
7. Inflammatory induration.
8. Inflammatory erysipelatous areola.
9. Gland swelling none, or else inflammatory.
10. Complications often present, sloughing, erysipelas, etc.

Syphilitic Ulcer :—

1. Is restricted to one or few pustules; often those do not develop.
2. Inflammation is slight.
3. The loss of substance is superficial.
4. Suppuration is absent, or scanty; crusts form.
5. Border not notched, slightly elevated, gradually lost in floor.
6. Surface of floor smooth.
7. The "parchment" induration is specific, not merely inflammatory.

8. Hardly any inflammatory areola.
9. Gland swelling constant, indolent.
10. Complications rare.

II. Differential Diagnosis between Vaccinal Rash and Secondary Syphilitic Eruptions.—Under the former are comprised *roseola vaccinalis*, miliaria vaccinalis, *vaccina bullosa* and *hæmorrhagica*, also accidental rashes, rubeola, scarlatina, lichen, urticaria, etc.

A True Vaccinal Rash.

1. Appears between the ninth and fifteenth day after vaccination.
2. Absence of inoculation chancre.
3. Eruption has not syphilitic characters.
4. Is attended with fever.
5. Is evanescent.

A Secondary Syphilitic Eruption :—

1. Appears at the earliest nine or ten weeks after vaccination.
2. Requires the pre-existence, in every case, of a specific ulcer at the site of vaccination, this to constitute the rash due to vaccination.
3. Shows the characters of true specific eruption.
4. Is not attended with fever.
5. Lasts a long time.
6. Is accompanied as a rule with specific appearances on the mucous membrane.

III. Differential diagnosis between vaccino-syphilis and hereditary syphilis which may show itself about the time of vaccination.

Vaccination Syphilis:

1. Begins with a local affection, chancre and indolent bubo.
2. Has a typical development in four stages, incubation, chancre, secondary incubation, generalisation (secondary rashes, etc.).
3. (*Syphilides*) never appear earlier than the ninth or tenth weeks after vaccination.

Hereditary Syphilis:—

1. Has no chancre, but begins with general phenomena.
2. Has no typical development after vaccination.
3. Is wholly independent of the latter as to time.
4. Is attended by habitus syphiliticus, or syphilitic bodily aspect.
5. Other manifestations of hereditary syphilitic lues may be present.
6. The history may indicate syphilis.

The only point in the above admirable summary, requiring correction, is the statement that a secondary syphilitic rash is not attended with fever.

Treatment.—Unfortunately nothing new can be suggested in the way of prophylaxis; and although the risks of giving syphilis by vaccination are almost infinitesmal, it need be no excuse for a careless choosing of the vaccinifer. No one would vaccinate from a child obviously syphilitic, nor yet from one about whom he had doubts. When we recall to mind the opinion of Mr Hutchinson, that translucent lymph may convey syphilis, and that many syphilitic infants look perfectly well whilst yet very efficiently contagious; and the opinion of Professor Fournier, that syphilis may be transmitted from a vaccinifer in the latent stages of

syphilis, or even during the period or incubation, we are bound to come to the conclusion that the only sure prophylactic method of avoiding vaccino-syphilis, is the using of calf lymph only. But, on the other hand, when our attention is turned away from the theoretical to the practical side of the question, when we consider how often vaccination syphilis does actually occur among the millions that are vaccinated with lymph from children, we are equally forced to conclude that the rejection of humanised lymph is riding the hobby too far; and that by a careful selection of the vaccinifer, avoiding in some instances first born children, by taking lymph, and the first few drops of clear lymph only from vesicles not later than the seventh or eighth days, by rejecting all sanguineous or otherwise coloured lymph, the chances of transmitting syphilis by humanised lymph are thus practically reduced to *nil*, as time and experience have shown. (See Lymph).

TUBERCULOSIS.

It is difficult to imagine when and how the notion that tuberculosis may be transmitted by vaccination originated. On both practical and theoretical grounds the idea is opposed. No instance has been known of the conveyance of tubercle by vaccination, nor one of infection at autopsies of tubercular subjects. The tubercle bacillus of Koch is universally admitted to be the cause of tuberculosis, and again and again has it been proved that tubercle is inoculable. And Koch, Cheyne, and others have shown that pure cultivations of a hundreth generation have invariably induced tuberculosis, when inoculated into the anterior chamber of the eye, a place where primary tubercle never makes its appearance, and in animals, as dogs, which are almost exempt from the natural disease. The tubercle bacillus is then a *sine qua non* in the production of the disease. The bacillus is not found in the blood of tubercular animals, except in some cases of acute miliary tuberculosis; much less therefore can we expect to find it in vaccine lymph. Lother Mayer (*Medical Times*, 1885, i., p. 255), failed to find any tubercle bacilli in the lymph of eighteen re-vaccinated phthisical patients; and Dr Acker (*ibid.*), at the suggestion of Dr Wolfberg, undertook a series of carefully conducted experiments on the lymph, and the examination of the blood of a large number of tubercular patients. Five patients advanced in tubercular phthisis whose sputum contained plenty of bacilli were

vaccinated with antiseptic precautions. Bearing in mind Koch's observations on the part played by the white blood cells as bearers of bacilli, it was not thought necessary to take lymph earlier than the seventh day, when these leucocytes first make their appearance. Samples were taken on most days from that to the thirteenth, when the vesicles dried up. In all, forty-eight preparations were made and stained with methyl blue, gentian violet, and, latterly with fuchsin. In no single instance could a bacillus be detected. Dr Acker next made two hundred and fourteen preparations of blood taken from eighty-seven patients in various stages of phthisis. He employed the slower methods of staining, keeping the preparations in the colouring fluid twelve to twenty-four hours; but the search for bacilli was fruitless, though in all these the physical signs were well marked, and bacilli had been demonstrated in the sputum in large quantities. Prior, of Berlin, and Gessler, of Munich, found the same negative results, but Wechselbaum, of Vienna, discovered bacilli in the blood in three cases of acute miliary tuberculosis examined by him. Provided the bacillus did exist in vaccine lymph taken from patients or animals suffering from tuberculosis, experimental evidence would tend to show that the disease cannot be transmitted by the inoculation of such lymph into *superficial* scratches of the skin; for, as pointed out by Dr Warlomont (*Medical Times*, 1883, i., p. 554), if an animal is to be rendered tuberculous, the bacillus must be carried deep into the tissues; and this is why infection is never produced at autopsies of tubercular subjects. Besides, the temperature of the epidermis is too low for the growth of the tubercle bacillus. The disease, when inoculated in experiments, spreads slowly and gradually from the point of insertion. Among the millions that have been vaccinated during more than eighty years, not a single one has presented at the point of vaccination any resemblance of tubercle.

Dr Schmidt (*Medical Times*, 1885, i., p. 255), at the request of Dr Bollinger, performed some experiments with the purpose of ascertaining, whether even under the most favourable circumstances it were possible to effect tubercular inoculation epidermically. The extreme susceptibility of guinea-pigs is well known. Into the skin of a number of the animals and of rabbits tubercular matter of various kinds was carefully worked in as in vaccination, but in all with a negative result; while the control animals into whose peritoneal cavities, or subcutaneous tissues the same matter was introduced, were found, *post mortem*, to have been deeply infected.

Guinea-pigs are animals peculiarly suitable on which to conduct experiments with tubercle and vaccinia, as they are susceptible to both diseases, and to tuberculosis in a special degree. The special susceptibility of the animals to tuberculosis, might be thought a disadvantage, for the animals might be tubercular at the time of inoculation, or develop tubercle subsequently and from other causes. But if the animal be rendered tubercular by means of cutaneous inoculation there is first a *local*, and afterwards, a general manifestation of tuberculosis. We performed two series of experiments; one by simply working tuberculous matter into the scarified skin, the other by vaccinating the animals with lymph mixed with tubercle. Our first experiment was to vaccinate a guinea-pig in three places, with lymph mixed with fresh purulent sputum, from a case of tubercular phthisis that died. The sputum, kindly given me by Dr Stuart, resident at the Edinburgh Royal Infirmary, showed the bacilli in large numbers. The vaccination of this guinea-pig behaved so irregularly, and caused such constitutional disturbance, owing no doubt to the pathogenic organisms in the pus, that we decided in subsequent experiments, to vaccinate by one puncture only, and to employ the tubercle bacillus

as free as possible from such organisms. Consequently Mr Drurie, of the Slaughter House, Edinburgh, was good enough to supply me with some tuberculous glands from a cow which had suffered from well marked tuberculosis; and Dr Sims Woodhead kindly favoured me with a tube of tubercle culture.

EXPER. 4.—*13th January.*—Guinea-pig vaccinated by three punctures on side. Material—humanised lymph *plus* purulent sputum, from case of tubercular phthisis. Second and third days—all insertions look red but the redness confined to areas of skin scarified. Fourth day—where the skin has been scarified it presents circular, movable, indurated patches. Seventh day—three scabs are seen surrounded by a little vesicular structure. There is no areola. Animal is ill. Eighth day—one of the scabs dropped off, leaving sore. Guinea-pig ill. Tenth day—part of another scab dropped off. Animal seems better. Fourteenth day—animal looking very ill. Scabs formed again where others had dropped off. No inflammation. Eighteenth day—all scabs fallen, leaving three full-sized typical cicatrices. Guinea-pig in good health.

EXPER. 5.—*2nd March.*—Guinea-pig. Fresh potent tuberculous matter from cow, worked into scarified skin as in vaccination. One insertion. Second day—scarifications well marked. Third day—crust of dry tuberculous matter adhering to skin. Eighth day—nothing to see except loss of hair on site on inoculation.

EXPER. 6.—*2nd March.*—Guinea-pig inoculated as in Exper. 5, and with same material. Second day—scratches only seen. Fifth day—crust of tuberculous matter on inoculation spot. Eighth day—nothing to see except loss of hair.

EXPER. 7.—*4th March.*—Guinea-pig. Potent tubercle culture worked in as in vaccination. One insertion. Third

day—scarifications red. Fifth day—crust. Seventh day—small scabbed ulcer. Fourteenth day—scar.

EXPER. 8.—*2nd March.*—Guinea-pig vaccinated by one puncture. Material—humanised lymph *plus* fresh potent tuberculous matter from cow. Second day—scarifications very red. Third day—elevation at inoculation spot. Fourth day—scab. Eighth day—scab very large. Twelfth day—scab fallen leaving scar.

EXPER. 9.—*2nd March.*—Old guinea-pig vaccinated by one puncture. Material—humanised lymph *plus* fresh potent tuberculous matter from cow. Second day—scarifications well marked. Fifth day—scab. Seventh day—dumb-bell shaped ulcer. Eighth day—scabbed ulcer. Animal looks ill. Tenth day—animal died.

EXPER. 10.—*4th March.*—Guinea-pig vaccinated by one puncture. Material—humanised lymph *plus* potent tubercle culture. Third day—operation appears to have failed. Fifth day—doubtful if going to take. Seventh day—large flat scab. Tenth day—large irregular shaped ulcer about the size of a sixpence. Eleventh day—ulcer healing. Thirteenth day—large triangular glassy looking scabbed ulcer. Seventeenth day—scar.

EXPER. 11.—*4th March.*—Guinea-pig vaccinated by one puncture. Material—humanised lymph *plus* potent tubercle culture. Fifth to seventh days—scab. Tenth day—scab very large. Thirteenth day—scab dropped off leaving scar.

That the death of one of these animals (Exper. 9) was not due to tuberculosis from inoculation is evidenced from the fact that it died ten days after its vaccination; and curiously enough the most minute examination failed to disclose any tubercle bacilli in the internal organs, thus proving that the animal did not die from natural tuberculosis. The only pathological sign of any note that could be detected *post*

mortem was a very distended gall-bladder (to four times its natural size) filled with muco-purulent matter. The animal was old and its death was probably merely coincident with the vaccination, the ulcer caused by which might have had, however, some influence in turning the scale against it. At all events there was not a particle of evidence to show that the animal died of tuberculosis; neither was there anything to show that the ulcer had induced pyæmia.

When active tuberculous matter is injected into the peritoneal cavity of a guinea-pig, or introduced deep into the cutaneous tissues — either method sufficing as a control experiment to guarantee the potency of the material—the animal invariably begins to exhibit symptoms of malaise at the end of three weeks and usually dies of tuberculosis about five or six weeks after inoculation. It is customary to kill the control animals after the lapse of four weeks. It was not thought necessary therefore to delay examining these animals for tubercle later than seven weeks. Out of the remaining seven animals inoculated, as above described, only one (Exper. 4) was found tubercular *post mortem*. It was inoculated with tuberculous sputum on 13th January, some weeks before the others, and fourteen weeks after inoculation the abdominal and thoracic viscera were found to be in an advanced state of tuberculosis; but there was no evidence of tubercle in the skin in the neighbourhood of the inoculation spots, thus showing, together with the fact that the animal was alive fourteen weeks after inoculation, that in all probability it did not acquire tuberculosis through the vaccination in question. The other six animals were perfectly healthy and showed, *post mortem*, at the end of seven weeks not the slightest trace of tuberculosis.

We may justly conclude that the transmissibility of tubercle by means of official vaccination is beyond the

limits of possibility; and for the following reasons:—The tubercle bacillus is essential in the production of the disease; the bacillus has never been found in vaccine lymph; animals have not been rendered tubercular by simply rubbing tuberculous material into *superficial* scratches of the skin; the temperature of the epidermis is too low for the growth of the bacillus; no instance has been known of the conveyance of tubercle by vaccination, nor one of infection produced at autopsies of tubercular subjects.

LEPROSY.

We shall allude only briefly to this subject; not because it may appear unworthy of a more elaborate notice (on the contrary we think it deserving of due consideration), but, because the paucity of material upon which to work forbids a lengthy discussion.

There is abundant evidence to show that leprosy is contagious, and there are no doubt other factors at work in its production, as heredity, insanitation, climatic influences, unwholesome and putrid food, malaria, and inoculation. That leprosy is inoculable is now generally admitted, but whether it is so in the same way as tuberculosis does not appear to have been definitely made out; that is to say, whether the leprous bacillus requires to be carried deep into the tissues in order that it may produce the disease, or whether it is sufficient to implant the virus into a mere superficial scratch such as that in vaccination. There can be no doubt that the tubercle bacillus is less virulent than the leprous, but there are some striking analogies between the two; for example Koch's tuberculin acts on both tuberculosis and leprosy in a very similar manner. If leprosy be transmissible by vaccination, then here is a difference between it and tuberculosis. The long incubation of leprosy, as contrasted with that of tuberculosis, renders its study in connection with vaccination by no means easy; whereas if some potent tuberculous matter be introduced into a small

incision (not a superficial scratch) the tubercle bacillus can be demonstrated, about a month after the operation, in great abundance in various internal organs.

Unfortunately no valuable deductions can be made from the writings on this subject by the anti-vaccinists, as it would appear that their argument to associate the spread of leprosy with vaccination was merely an ingenious route whereby to arrive at a more momentous goal. The truth of their statements is too meagre to act as an antiseptic on the falsehoods, and the consequence is that the whole goes bad.

Probably the clearest evidence to show that leprosy may be propagated by vaccination is that referred to by Mr Malcolm Morris (*Brit. Med. Jour.*, 1890, ii., p. 1230), as related by Dr Daubler.

A woman, aged thirty-six, was vaccinated with lymph taken from a leprous person, who subsequently died of the disease. She was vaccinated in three places on each arm, and fourteen days after the vaccination the skin around each spot was raised and discoloured. After five weeks these yellowish-brown spots, which in the meantime had become slowly larger, began to flatten, and, ten weeks after the operation, the skin of the upper arm and the upper third of the forearm was of a brownish colour and wrinkled. The brownish spots continued to increase until they began to diminish after feverish attacks, but the skin never regained its normal colour. In the fourteenth week after vaccination she had two severe rigors, after which characteristic tubercular leprosy developed on the cheeks and brow. The second case, a girl of fifteen, was a half-caste from the same place as the first patient. She was said to have been perfectly well until re-vaccinated. During the first two months after the operation her symptoms resembled those of the other case. At the end of that time dark prominent patches

appeared upon the forehead and cheeks, and three months later leprosy was fully developed on the forehead.

Professor W. T. Gairdner (*Brit. Med. Jour.*, 1887, ii., p. 799), mentions a case where Dr X. vaccinated his own child from a leprous family, though probably not from an actual or apparent leper; and then vaccinated a sea captain's child from his own son. It is all but certain that Dr X. and his wife were of unmixed European blood, and it is certain that the sea captain and his wife were. Professor Gairdner does not say, however, where the children were born.

Dr Beaven Rake, Medical Superintendent of the Trinidad Leprosy Asylum, expresses his opinion (*Brit. Med. Jour.*, 1887, ii., p. 433) that he has not yet seen sufficient proof to convince him of leprosy being caused by vaccination. It is well known that Europeans, born in Europe, do sometimes die from leprosy after living some time in the tropics. He thinks that the single chain of facts adduced sometimes to explain the connection between leprosy and vaccination, can be explained by the theory of coincidence, *i.e.*, in a tropical island where leprosy is endemic. He says:—"If vaccine lymph be taken from a healthy child in a locality where leprosy is endemic, and such lymph be sent to a country free from leprosy, and a healthy child in such a country and who has never quitted the country be vaccinated with the lymph, and if this child after vaccination, and without leaving the country develop leprosy, then it may be taken as proved that leprosy is communicable by vaccination. The experiment has, I suppose, never been tried, for residents in Great Britain would not be likely to send to the tropics for lymph." Dr Rake had failed to find the *bacillus leprœ* in twenty-seven examinations of pure and impure lymph from lepers; and animals vaccinated with lymph from lepers have not,

so far, developed leprosy. But Dr Arning (*Report on Leprosy in Hawaii*, 1886, p. 45) says that in one case he found bacilli in the lymph and crust from a vaccine vesicle on a tuberculated leper. Such then is the evidence that leprosy is communicable by vaccination, but it can hardly be deemed direct and irrefragable proof; and although no one will deny that the increase of leprosy in some countries demands the serious attention of the profession, yet when we consider that in Norway, leprosy is on the decline, and vaccination on the increase, we conclude *ipso facto* that investigators are liable to err in concentrating their attention too much on vaccination, in ascertaining the causation of the spread of the disease.

ERYTHEMA, ERYSIPELAS, Etc.

Through the term erythema we can trace a generic development from the blush of emotion, or the rosiness which borders a healthy wound, to the tense and suppurative hardness which we name and treat as erysipelas. This variation of type depends on a variety in causation and the force and kinds of resulting change reflect the character of its stimulant. It will be admitted by all medical authorities that two chief groups of causes exist—that in which the mechanical irritation is a prevailing feature, and that in which septic forces are at work. In aid of these there is often a peculiar habit of body in the person attacked. The under-fed or improperly fed, the overworked, the relaxed and flabby type, in short, any in whom health means less than vigour, possess this constitutional proneness; the child may be unhealthy, the house may be unwholesome, the parents may be uncleanly. There is abundant evidence that any degree of erysipelas may proceed from any surface injury. The pin scratch has no immunity which the amputated stump has not. In either case dirt, friction, bad ventilation, overcrowding, and other such conditions may introduce an unwelcome complication. But in order that true erysipelas may be produced the poison, contagion, or seed of the disease must be implanted in the scarifications or wound thus induced. The rupture of a vesicle is insufficient to cause erysipelas, otherwise the intentional opening of vesicles

would be followed by a similar result. The poison may be conveyed by the lancet from one vesicle to another in the process of opening them.

In regard to erythema which may be the starting point of erysipelas, the condition may be caused by the use of a dirty lancet for vaccination or for opening a vesicle, the application, to the vaccine vesicles, of nostrums which are a suitable medium for the culture of septic organisms, for example, "hen's fat," "goose grease," poultices, etc., the use of carelessly selected crusts for vaccination, and shields. The application of cream or milk which are apt to turn sour, and especially when procured from a locality where infectious diseases are prevailing, may be mentioned as causes of erythema. Dr Little (*Brit. Med. Jour.*, 1882, i., p. 398), in his report on vaccination, says that crusts, if not carefully selected, are apt to cause inflammation and ulcerations, and that the arm operated on swells in some cases to twice the natural size; and the spot where the lymph is inserted becomes the centre of a slough of the size of a rupee or larger. Crusts have, however, almost universally fallen into disuse. Dr Buchanan, of the Local Government Board, (*Lancet*, 1885, ii., p. 1060) cautioned against the use of vaccination shields, and their doubtful utility is now generally admitted. The portion of flannel work which rests on the arm, as also the bands, are covered with and consist of porous material, such as lint, etc., and whenever any discharge takes place this material runs almost certain risk of being soiled. Any subsequent use of the shield practically amounts to a dirty surgical dressing, and it is well known how serious a danger this is even to the most trivial surgical wound. Shields moreover are liable to interfere with the circulation of the arm. Our experiments in this part of the research do not prove anything beyond the already well known fact of the risk of vaccinating with septic lymph. In the experiments with tubercle we find that any addition of foreign

matter to the lymph is very prone to give rise to a very irregular vaccination, and often to vaccination ulcers.

EXPER. 12.—*26th January.*—Guinea-pig vaccinated in two places on side. Vaccine material—humanised lymph mixed with scales from case of scarlet fever which had not been treated with any lubricant. Scales taken from arm and allowed to stand in drop of water for twenty-four hours. Second and third days—two inflamed-looking papules. Fifth day—one of the scabs had fallen leaving an abraded surface rather than a scar. At site of the other puncture was a small elevated scab. No areola. Guinea-pig well. Seventh day—scabs dropped off leaving two small scars.

EXPER. 13 and 14.—*5th February.*—An old and a young guinea-pig vaccinated by two punctures each, one puncture on side and other on ear. Material—humanised lymph mixed with serum from bleb of erysipelas of face. Fourth day—there is a button-like induration of the skin on the side of each animal extending beyond the area scarified. No areola. In the old guinea-pig ear shows nothing. Sixth day—on side of old guinea-pig well marked scab about which is seen a little vesicular structure. In the younger animal part of the scab on side dropping off, and the ear feels slightly thickened where it was inoculated. In neither animal was there any areola or constitutional symptom. On the ninth day scabs had dropped off leaving scars.

EXPER. 15.—*23rd February.*—Young guinea-pig vaccinated by two punctures, one puncture on side and other on ear. Material—humanised lymph mixed with pus from an erysipelatous wound. Second and third days—papule at site of puncture on side looks inflamed. No areola. No obvious constitutional disturbance. Puncture on ear shows nothing. Eighth day—a deep, punched out, irregular ulcer about the size of a threepenny piece at site of puncture on side.

Twelfth day—scab covers the ulcer, the margins of the latter projecting further than the scab. Fourteenth day—scar.

Symptoms.—Erythema is a frequent symptom of vaccination ulcers. The skin in the vicinity of the vaccine vesicles is red, hot, and tense, and covers a larger area than the natural inflammation to which the name vaccine areola is given; and in aggravated cases the vaccinated arm itself becomes swollen and there is corresponding constitutional disturbance in addition.

Erysipelas *from* vaccination is very rare. It shows itself about twenty-four hours after the operation which itself may be unsuccessful. The disease *after* vaccination is not so rare, and is due to the erysipelatous poison being introduced through the vaccination wound. In either variety the onset of the disease is sudden, and there is swelling, tension of the skin, a characteristic margin limiting the inflammation, high fever, constitutional symptoms, and a tendency for the disease to spread rapidly.

Treatment.—The treatment of these affections should be commenced *early* and the causes as far as possible removed, such as the use of a dirty vaccine shield, or dirty or ill-fitting clothing. The parts, if uncleanly, should be washed with some antiseptic, say warm boracic acid solution, dried, and then dusted with some powder, as oxide of zinc or starch. If there are ulcers they must be treated like ulcers from other causes, and antiseptics are indicated; weak boracic ointment is useful, and the arm ought to be protected by some material, as corrosive sublimate wool, frequently changed. When true erysipelas supervenes more active measures are required. Perchloride of iron both internally and externally is useful. Some simply apply dusting powder and wrap the parts in wool. The experiments of Dr Julius

Fessler (*Lancet*, 1891, i., p. 101) have shown that ichthyol has a potent deterrent influence on the multiplication of the organisms (streptococci) that cause erysipelas. The following is usually the method of employing ichthyol :—

℞. Ichthyol ʒvi.
Cretæ Prep.
Adipis āā ʒii.

To be smeared on the part. In cold weather olive or almond oil may be added.

Koch's formula for erysipelas is one part of Creolin, four parts of Iodoform, and ten parts of Lanoline, spread well over the affected area and covered with gutta-percha tissue (*Medical Annual*, 1891). In regard to prophylaxis, special precautions are needed if erysipelas is prevailing in the neighbourhood of the recently vaccinated, or if the dwelling or its vicinity be very insanitary. No judicious vaccinator would take lymph from an arm in which there was any excessive redness or swelling, nor would he use a vaccine point a second time.

Cases.—The following account by Dr Flamank Marshall (*Laucet* 1886, ii., p. 95) illustrates the rare disease—erysipelas *from* vaccination. "On 21st January I vaccinated two infants, three and four months old respectively, from a healthy child of four months with four typical vesicles with little or no areola. Two days afterwards the mother of one brought the child to show me its arm which was in a state of erysipelatous inflammation from shoulder to elbow; and the same evening the father of the other infant came to me to say that it was so ill from inflammation of the arm, that it could not be brought, and he knew that there was something wrong. I called next morning and found the child suffering from acute erysipelas from shoulder to wrist. Immediately I called and saw the vaccinifer and found the

infant in perfect health. Both recovered in a week or ten days. There was not the least attempt at the formation of any vesicles and at the end of a week just a few marks of scarification could be seen. Homes mile apart and nothing to be detected with the sanitary arrangements. Lancet clean and was used to vaccinate other children. In a record of over 6000 there are only two in which I have seen erysipelas immediately follow vaccination. Ziessman vol. ii., p. 426, mentions a case of transmission of erysipelas but the disease appeared in the vaccinifer the day after lymph was taken."

A rather curious case came under my notice, of an infant whose vaccinated arm commenced to show erysipelas about twenty-five days after its vaccination. The inflammation started at the site of the vaccine sore, caused by the scab being knocked off, rapidly spread so as to cover the entire surface of the body and terminated, as the mother expressed it, by "peeling like scarlet fever." The patient's sister had had scarlet fever some weeks prior to the vaccination in question, but Dr John Taylor, under whose care the patient was placed, attributed the disease to a very foul, open, undrained, ashpit which was connected with the house. The child recovered of the erysipelas after nine or ten days.

VACCINIA GANGRENOSA.

By the term vaccinia gangrenosa we understand a local or generalised gangrenous affection of the skin, caused by vaccination. Its causes seem to be of a two-fold nature; the introduction, generally through the vaccination wound of septic organisms into a body whose tissues have been rendered vulnerable from any cause, such as cachexia.

The symptoms commence at the early part of the maturation of the vaccine vesicles, or they may be delayed till three weeks after the vaccination has been performed. In some cases, the affection is preceded by a general skin eruption, a part or whole of which takes on a gangrenous action, but in others the skin disease is entirely local, and limited to the vicinity of the vaccine pustules. The constitutional disturbance is great, there is much asthenia, and the disease may pursue a long course.

Cases.—M. Balzer (*La France Medicale*, 15th April 1890), describes a case of a strumous female, aged twenty-three, who was the subject of early malignant syphilis, in whom a few days after vaccination, there appeared at the site of the vaccinal pustule, a slough which eventually attained the size of a five-franc piece. It was fifteen weeks before the slough became finally detached, and this under large doses of iodide of potash, leaving an ulcer that took two

weeks to heal. M. Balzer could not attribute the complication solely to syphilis, nor to the quality of the vaccine, since it was the only case amongst several vaccinated at the same time. But he thought it was due to the accidental introduction of septic organisms at the vaccination, the soil being most favourable for their development.

A very interesting account of a case where the gangrene was limited to the locality of the vaccine vesicles is given by Mr Clement Lucas (*Braithwaite's Retrospect*, 1885, vol. xvi., p. 308). The case was a child, aged five months. The mother was a delicate-looking woman, but the father was strong and well built. The parents had been married six years, the father's age being twenty-seven. There had been three children as the result of the marriage, none of whom had been suckled by the mother. The first child was born thirteen weeks after the marriage. This child had a rash over its buttocks when six weeks old, and thrush in its mouth, but the mother was doubtful as to snuffles. The mother had never suffered from an eruption of any kind, either during pregnancy or after the birth of the child. This child was brought up on the bottle, and had rickets when a year old, but is now strong and well. The second child was born about two years ago. It likewise had a rash over the buttocks when six weeks old, and the mother thinks it had snuffles. It recovered without medical treatment, and, though bottle fed, escaped rickets. The mother had never a miscarriage. The third child, who is the patient, was born on the 10th August 1882. It had snuffles at birth and a rash over its buttocks when three weeks old. Had thrush in the mouth. It was treated by a medical man who gave it grey powders, etc., and the rash disappeared. Was thin and weak when taken to be vaccinated. It had been fed on condensed milk, Ridge's food, Robb's biscuits, etc. When three months old it was vaccinated. The first time it did

not "take"; accordingly a week later it was vaccinated in the same place again, but again the vaccine failed to produce vesicles. The child was not vaccinated again until it was five months old. It was then vaccinated for the third time in the same site, and the following week five vesicles had developed.

No child was vaccinated from this infant, nor was any lymph taken from its arm. Between the second and third vaccinations the mother had noticed that the child had grown thinner. The last operation was performed in January 1883, and about three weeks later the skin at the site of the operation turned brown and sloughed. She took the child to a private medical man who treated for a short time, and then advised her to take it to the Evelina Hospital. When I first saw the child it presented the following appearance:— It was extremely emaciated, with sunken cheeks and eyes, and wasted limbs. The abdomen was tympanitic, and there was no enlargement of the liver or spleen. There was no cranio-tabes, or enlargement of any epiphysis, and the ribs were not beaded. The buttocks and pudenda were in a state of intertriginous eczema, but there were no disseminated shiny spots and no eruptions on any other part of the body. The mucous membrane of the mouth and lips was sound. The left arm was slightly swollen and at its upper part presented a somewhat remarkable appearance. A sore commencing at the point of the shoulder extending down below the middle of the arm, and was occupied in the centre by a large thick black slough. The sore was $2\frac{1}{8}$ inches in length by $1\frac{1}{2}$ inches in breadth. It presented a sharply defined edge of ulceration which dipped through the skin into the cellular tissue beneath, and a red blush of injected vessels extended for about a $\frac{1}{2}$ inch around. Between the slough and the ulcerated edge there was a yellow line coated with pus. The slough which was hard, black, and dry, was divided into two portions, the upper of which was oblong in shape, $1\frac{1}{2}$ inches in

vertical measure, 1 inch across, and a ¼ of an inch in thickness. The smaller portion of the slough was situated below and in front of that already described, and was about ¾ of an inch in diameter. There was no glandular enlargement in the axilla. The child was ordered cod oil and steel wine, and carbolic oil was applied to the wound. It died on 4th March without any convulsion or special symptom of note. The father of the child most emphatically denied ever having had any venereal disease of any kind either before or after marriage.

Post-mortem.—Head not examined. Heart healthy. Lungs collapsed at the lower part behind. Intestines empty and the stomach small. Liver and spleen healthy but latter contracted. Kidneys healthy.

Four other children had been vaccinated from same source and no ill effect followed in these cases.

The child had an eczematous eruption over the buttocks, but this made its appearance some months before the vaccination and could not therefore be attributed to any poison introduced at the time.

Mr Lucas, taking all into consideration, was lead to doubt the existence of syphilis either from vaccination or hereditary. He thought the rashes were due to artificial diet and neglect of cleanliness.

In other cases, described by Mr Hutchinson, a more or less symmetrical eruption follows vaccination, and the vaccine vesicles are unaffected. One such case is described by him (*Lancet*, 1879, ii., p. 878) of a child who was vaccinated three months before its death. Three other children vaccinated from the same source took no hurt. On the eighth day after vaccination a papular and vesicular rash appeared over the trunk, which rapidly assumed a sloughing character. The eruption was at first taken for small-pox, and when death took place, a fortnight later, an inquest was held on the case, for it was thought to be

syphilitic. But Mr Hutchinson pointed out that its evolution, as well as its characters, were not those of a syphilitic affection, and he considered it to be a case of true vaccinia passing on to a gangrenous condition—a condition which he had sometimes observed to take place in varicella.

The following case by Mr William Stokes (*Medical Times*, 1880, i., p. 586) shows the difficulty in the diagnosis of vaccinia gangrenosa. Mr Stokes' patient had been previous to her illness, a healthy, strong, well-nourished girl of nine months. She was admitted to the Richmond Surgical Hospital on 17th February 1880. According to the mother's account she had been vaccinated ten days previously, and within forty-eight hours after the operation a number of purple and black spots appeared, first on the buttocks, next on the face, and afterwards all over the body. On admission the child presented the following appearance:—The body and face were sparsely sprinkled with spots, each of these covered with a yellow scab, and exactly resembling the crusts to be seen in a mild case of variola that is convalescing. There were large sloughing surfaces on both buttocks, on the back of the right thigh, on the calf of one leg, and on both arms. The largest of these was on the right buttock and back of the right thigh; it was 8 inches long and $2\frac{1}{2}$ inches wide at its widest part; in the middle of it was a large black slough separating; it was dry and looked like leather. The slough implicated not only the skin but also the subcutaneous tissues. The other sloughs were smaller and those on the calf of the leg and on the arm had not yet begun to separate. There was no inflammation around these latter. There were three distinct well marked vaccination vesicles on the left arm, one of which had been ruptured. They presented the appearance usually seen on the ninth or tenth day. They were healthy looking, but there were large

sloughs in the immediate vicinity. Under a suitable treatment and nourishing dietary the child happily made an excellent recovery.

Mr Stokes admitted that difficulties existed as to the diagnosis of vaccinia gangrenosa in the case reported by him. In the first place, three other children had been vaccinated with lymph from the same source without injury. Secondly, the great rapidity which the pemphigoid rash manifested itself raised a doubt as to connexion between the vaccination and the development of the rash. A third difficulty was the fact that the vaccine vesicles themselves did not either primarily or secondarily participate in the grangrenous action.

Diagnosis.—Vaccinia gangrenosa is to be distinguished from varicella gangrenosa.

Treatment.—The treatment would be to support the strength by a proper dietary, the use of local antiseptic measures, and in some instances the internal administration of iodide of potash, Parish's syrup, and the like. It is a disease little known.

CONTAGIOUS IMPETIGO.

This disease needs mere mention. It may be inoculated at the time when the vaccination is performed, or subsequently develope in the vicinity of the vaccine vesicles. When thus associated with vaccination, heaped-up scabs appear on the skin near the vaccine marks, and the disease may be conveyed by the child's nails to other parts of the body, particularly the face, head, and neck, but not necessarily to these regions only. It is apt to occur in children whose health is below the normal standard, and there may be some constitutional disturbance. When recognised it is easily cured. The strength should be supported by suitable food and medication, and the parts treated with antiseptics, as boracic starch poultices, or ammonio-chloride of mercury (gr. v to ℥i). Pediculi and otorrhœa if present should also be attended to.

MISCELLANIES.

THERE are other odd diseases which have been known to complicate vaccination and which may be mentioned together. **Frambœsia** (yaws), an inoculable epidemic disease peculiar to the African race both in their native country and in the West Indies, consists of an eruption of yellowish or reddish-yellow tubercles which gradually develope a moist exuding fungus, with constitutional symptoms. It attacks the face, limbs, feet, and organs of generation, has a period of incubation ranging from three to ten weeks, and, except in rare instances, the disease occurs only once in a lifetime. The treatment is cleanliness, antiseptics (carbolic acid), generous diet and tonics.

M. Paul Diday (*Medical Times* 1885, i., p. 491) relates a curious case—**piliferous vaccine virus**—of a healthy girl, aged eleven and a half months, who was vaccinated with animal vaccine virus which had been forwarded in glasses by the agency of the Lyons municipality. The inoculation by two punctures made in the anterior part of the thigh produced fine pustules which ran their usual course and no lymph was taken from them. Sixty days afterwards it was observed around the cicatrices, then recently formed, that a coronet of hairs had sprung up, which, at first were thin and downy, soon after increased in length, substance and colour. On examining the plates between which the lymph had arrived, three or four small hairs were discovered adhering to them.

Dr Edmund Robinson (*Brit. Med Jour.* 1890, ii., p. 1233) says that he has seen several cases of **diphtheritic membrane** form on children's arms after the application of cream from small shops where scarlet fever had been treated during the sale of milk. Boracic acid would be useful in the treatment of such a complication.

Pyæmia has been noticed after vaccination. A case is mentioned in the *Lancet*, (1884, i., p. 857), a child, aged six months, vaccinated with two other children from same source, showed on the ninth day, appearances of successful vaccination with no unusual symptoms; but on the sixteenth day the sores were ulcerated and freely discharging pus. There was also bronchitis. Child died on the twenty-fifth day after vaccination. At the *post-mortem* examination the body was found to be well nourished. There was slight ulceration beyond the site of the vaccine pustules, three of which had become confluent. Associated lymphatic glands enlarged, veins not thrombosed. Both tempero-maxillary articulations, right sterno-clavicular joint, and left ankle were full of pus. Two small patches of purulent infiltration beneath the scalp. Bursa over right olecranon had suppurated and recently burst. Lungs presented numerous wedge-shaped infarctions, some red, some firm, others decolourised in the process of disintegration. Several patches of collapse. There was in the house a man with an abscess of the foot, and occasionally the mother had washed some linen in the water which had been used for cleansing his foot.

Psoriasis is also said to occasionally follow vaccination, as also is **furunculosis.**

GEENRAL CONCLUSIONS.

1. Compulsory vaccination, in the interest of the whole community, is not inconsistent with freedom. Vaccination may be followed by certain skin eruptions and other complications, some of which demand treatment.

2. The artificial cultivation of vaccine lymph in quantities sufficient for general purposes is a desideratum. It is possible to imagine that the failure in the cultivation of lymph may be due to the micrococci giving rise to a product which interferes with their natural proliferation. Lymph should be cultivated on healthy children whose vaccination pursues a normal course. Many of the cases of so-called supernumerary vesicles are probably cases of "vaccine généralisée." Lymph taken from re-vaccinated adults is too attenuated, and not to be recommended for vaccination purposes. The vaccine vesicles may be delayed in their appearance, or they may be revivified by a subsequent vaccination. The antiseptic treatment of vaccine vesicles is admitted. Vaccination ulcers may be the starting point of erysipelas, and our experiments would tend to show that the admixture of septic matter with the lymph was a great factor, though not the only one, in their production. The inflammation and swelling caused by accidental vaccination would be best explained by the lymph being contaminated with septic germs in its transit from the vaccinifer to the *vaccinée*. The pocks due to accidental vaccination when occuring in some localities are to be distinguished from primary sores.

3. The inoculation with pure vaccine may cause, in predisposed subjects, skin rashes, many of which are interesting only from a diagnostic point of view, as they are very evanescent.

4. The existence of "vaccine généralisée" (spontanteous), due to blood infection, can no longer be doubted, and there are in consequence two varieties of the disease, one due to blood infection, and the other due to auto-inoculation. The vaccination of infants suffering from eczema or other skin disease ought to be postponed till the patient is well, except in times of small-pox epidemics, when the danger of small-pox is far greater than the risk of a benign eruption due to auto-inoculation.

5. Many of the alleged cases of vaccino-syphilis are either cases in which syphilitic phenomena have been revealed by vaccination, or those of children whose tissues are specially vulnerable from injudicious feeding, etc., and who exhibit symptoms easily mistaken for those of syphilis. It is possible to transmit syphilis by transparent lymph, but the cases are so rare as not to justify the discontinuance of humanised lymph. The history of syphilis in some members of a family may be misleading, as it is possible that a syphilitic man may have a first child healthy, and a second one syphilitic.

6. The conveyance of tuberculosis by official vaccination is impossible.

7. The transmissibility of leprosy by means of vaccination is a moot point.

8. Erysipelas may occur *from* vaccination or *after* vaccination, the former variety of the disease being all but unknown.

The utility of vaccination shields is now generally admitted to be more than doubtful. Several cases of vaccinia gangrenosa have been described; and impetigo contagiosa may complicate vaccination.