An inaugural dissertation on the nature and origin of vacinna, or cow-pock : submitted to the public examination of the Faculty of Physic under the authority of the Trustees of Columbia College, in the State of New-York, The Right Rev. Benjamin Moore ... : for the degree of Doctor of Physic, on the 8th day of November, 1803 / by Samuel Scofield.

AN

INAUGURAL DISSERTATION

ON THE

NATURE AND ORIGIN

OF

VACCINA, or COW-POCK.

SUBMITTED TO THE PUBLIC EXAMINATION OF THE

FACULTY OF PHYSIC

UNDER THE AUTHORITY OF THE TRUSTEES OF COLUMBIA COLLEGE, IN THE STATE OF NEW-YORK,

The Right Rev. BENJAMIN MOORE, D.D. President;

FOR THE DEGREE OF

DOCTOR OF PHYSIC,

On the 8th Day of November, 1803.

BY SAMUEL SCOFIELD,
Citizen of the State of New-York.

"A specific is discovered for that disease which has been the scourge of Europe for a thousand years, and committed the most dreadful ravages in every quarter of the world."

Ring on Cow-Pox.

NEW-YORK:

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1803.

Charles Buxton M.P.

from his friend

The Author

TO

VALENTINE SEAMAN, *M. D. &c.*

WHOSE HUMANE AND PHILANTHROPIC EXERTIONS,

SO CONSPICUOUSLY DISPLAYED

IN INTRODUCING AND CULTIVATING A FAMILIAR KNOWLEDGE OF VACCINE INOCULATION IN THIS CITY,

HAVE JUSTLY ENTITLED HIM TO

THE GRATEFUL THANKS AND ESTEEM

OF HIS FELLOW CITIZENS;

AND

TO WHOSE ATTENTIVE AND INSTRUCTIVE INFORMATION THE AUTHOR IS INDEBTED FOR THE GREATER PART OF HIS MEDICAL EDUCATION,

THIS DISSERTATION

IS RESPECTFULLY INSCRIBED.

TO

JAMES WATSON, Esq. *President;*
GILBERT ASPINWALL, *Vice-President;*
THOMAS FRANKLIN, *Treasurer;*
ADRIAN HEGEMAN, *Secretary;*

AND TO

ROBERT BOWNE,
JOHN KEESE,
SAMUEL L. MITCHILL,
ANDREW COCK,
WILLIAM MOORE,
WILLET SEAMAN,
SAMUEL MILLER,
JAMES ROBERTSON,
THOMAS BUCKLEY, *and*
ISAAC HICKS, *Directors;*

AND ALSO TO

VALENTINE SEAMAN,
EDWARD MILLER,
WRIGHT POST, *and*
SAMUEL BORROWE,

Medical Board of the

New-York Institution for the Inoculation of the Kine-Pock:

Gentlemen,

PERMIT me to tender you my grateful and sincere acknowledgments for the polite attention shown, and for the many services rendered me, during my official capacity as Resident Surgeon to that Benevolent Institution: And, with wishing that you may long continue your wise and judicious Guardianship over this Beneficent Establishment, in which you have so transcendently signalized yourselves in the glorious cause of Humanity, and more particularly as respects that of the poor and needy of your own city, I subscribe myself your much obliged and humble servant,

SAMUEL SCOFIELD.

INTRODUCTORY OBSERVATIONS.

THE subject to which I have devoted the following pages is, I conceive, one of the most important that can engage the attention of the medical practitioner or of the public. It is not only intimately connected with the interests and policy of States and Empires, but involves in its consequences the health and happiness of all posterity.

Not more than five years have elapsed since the astonishing effects of this inestimable blessing were made known to the world, by its first great inoculator, Dr. Jenner, in a work, entitled, "*An Inquiry into the Causes and Effects of the Variolæ Vaccinæ, a Disease discovered in some of the Western Counties of England, particularly Gloucestershire, and known by the Name of the Cow-Pox.*"

Notwithstanding the era of this great and ever memorable improvement in the science of medicine is fixed at so advanced a period as the latter end of the eighteenth century, its existence in the cow, and its capability of being communicated from the cow to the human subject, have been known, in some of the dairy countries of Europe, from time immemorial. In such of the European countries, those persons to whom were committed the affairs of the dairy were known frequently to contract

very disagreeable and troublesome sores, from milking such cows as happened to be labouring under this complaint; generally manifesting themselves in the part exposed to the infection, as the hands and wrists. Persons so infected were, in the course of their complaint, most generally affected with a slight ephemeral fever, after the subsidence of which, the ulcers in a short time cicatrized; and they were left in a state *for ever* after unsusceptible of the small-pox, either by inoculation or contagion. The truth of this is confirmed by the experience of ages. But this knowledge, unfortunately for humanity, was principally confined to the *proprietors* and *domestics* of the dairy; it being well known by them, that the existence of such a disease among their cows, if public, greatly depreciated the value of their produce. At length, however, the immortal Jenner, by finding it frequently impracticable to communicate the small-pox to such as were said to have previously undergone cow-pock, turned his attention towards it, and, by a long series of accurate and impartial experiments, in transmitting the matter from the cow to the human subject, by means of inoculation, evinced, beyond all possibility of doubt, that the disease thus induced was equally effectual in securing a person from the variolous complaint, as that communicated immediately from the cow by milking; and that the matter was not in the least deprived of its prophylactic virtue from having passed the ordeal of the human system. Experience now fully warrants the assertion, that through this medium the infection may be handed down to posterity in an undegenerated state, and, contrary to the opinion which Dr. Jenner first advanced, will supersede the necessity of having frequent recourse to the original stock, in order to keep up a constant supply of the genuine matter.

Although the discovery of vaccine inoculation is of so very recent a date, and notwithstanding the vast torrent of opposition directed against it from almost every quarter, its salutary influence has already extended into every civilized nation of the world, and its beneficial effects are now experienced even by the savage. Indeed, there is not at present a single well-informed physician, either in Europe or America, that pretends in the least to doubt of its efficacy in protecting the system against that loathsome complaint the small-pox. It is computed that not less than two millions of persons have already experienced the happy effects resulting from this great and ever-memorable improvement. A great proportion of the better informed part of the community have already become sensible of the vast benefits that would accrue to society in substituting the vaccine for variolous inoculation, and are now very generally adopting the practice.

From the growing reputation of this invaluable discovery, we are warranted in asserting that it promises fair, at no very distant period, to exterminate from the face of the earth one of the most formidable and destructive maladies to which mortality is heir; and that, in time, the small-pox will only be known from the devastations and ravages which it has committed—circumstances which the human mind will ever contemplate with horror.

This dreadful scourge of humanity is not only to be dreaded in regard to its fatality, but also in consequence of the many incurable diseases which it not unfrequently produces; some of the most prominent of which I shall take an opportunity of noticing in the following dissertation.

The important discovery of vaccine inoculation I conceive to stand unparalleled in the history of medicine. What remuneration, what gratitude, then, is due to him who put mankind in possession of this inestimable blessing! His signal and transcendent services will be handed down, in the annals of time, to the latest ages, and posterity will recognize the name of their great benefactor with gratitude and esteem.

AN

INAUGURAL DISSERTATION

ON

VACCINA, or COW-POCK.

THE Cow-pock is supposed, by Dr. Jenner, to derive its origin from the horse. This singular opinion will, no doubt, appear very surprising to many. In order, therefore, that the reader may clearly understand upon what his belief is predicated, I shall, previously to entering into an investigation of the subject myself, give the opinion entertained of it by our author in his own words, in the following quotation from his works. (See his *Inquiry into the Causes and Effects of the Variolæ Vaccinæ*, &c. p. 2—6.)

" There is a disease," says Dr. Jenner, " to which the horse, from his state of domestication, is frequently subject. The farriers have termed it the *grease*. It is an inflammation and swelling of the heel, accompanied, at its commencement, with small cracks or fissures, from which issues a limpid fluid, possessing properties of a very peculiar kind. This fluid seems capable of generating a disease in the human body (after it has

undergone the modification I shall presently speak of,) which bears so strong a resemblance to the small-pox, that I think it highly probable it may be the source of that disease.

" In this dairy country a great number of cows are kept, and the office of milking is performed indiscriminately by men and maid servants. One of the former having been appointed to apply dressings to the heels of a horse affected with the malady I have mentioned, and not paying due attention to cleanliness, incautiously bears his part in milking the cows, with some of the particles of the infectious matter adhering to his fingers. When this is the case, it frequently happens that a disease is communicated to the cows, and from the cows to the dairy maids, which spreads through the farm till most of the cattle and domestics feel its unpleasant consequences. This disease has obtained the name of *Cow-Pox*. It appears on the nipples of the cows, in the form of irregular pustules. At their first appearance they are commonly of a palish blue, or rather of a colour somewhat approaching to livid, and are surrounded by an inflammation. These pustules, unless a timely remedy be applied, frequently degenerate into phagedenic ulcers, which prove extremely troublesome. The animals become indisposed, and the secretion of milk is much lessened. Inflamed spots now begin to appear on different parts of the hands of

the domestics employed in milking, and sometimes on the wrists, which run on to suppuration, first assuming the appearance of small vesications produced by a burn. Most commonly they appear about the joints of the fingers, and at their extremities; but whatever parts are affected, if the situation will admit, these superficial suppurations put on a circular form, with their edges more elevated than their center, and of a colour distantly approaching to blue. Absorption takes place, and tumours appear in each axilla. The system becomes affected; the pulse is quickened: shiverings, succeeded by heat, general lassitude, and pains about the loins and limbs, with vomiting, come on. The head is painful, and the patient is now and then even affected with delirium.* These symptoms, varying in their degrees of violence, generally continue from one day to three or four, leaving ulcerated sores about the hands, which, from the sensibility of the parts, are very troublesome, and commonly heal slowly, frequently becoming phagedenic, like those from whence they sprung. During the progress of the disease, the lips, nostrils, eye-lids, and other parts of the body, are sometimes affected with sores; but these evidently arise from their being heedlessly rubbed or scratched with the patient's in-

* "It will appear in the sequel that these symptoms arise principally from the irritation of the sores, and not from the primary action of the vaccine virus upon the constitution."

Note of Dr. Jenner.

fected fingers. No eruptions on the skin have followed the decline of the feverish symptoms in any instance that has come under my inspection, one only excepted, and in this case a very few appeared on the arms: they were very minute, of a vivid red colour, and soon died away without advancing to maturation; so that I cannot determine whether they had any connection with the preceding symptoms.

" Thus the disease makes its progress from the horse (as I conceive) to the nipple of the cow, and from the cow to the human subject."

In regard to this interesting subject, I shall take the liberty of deviating from its worthy author. Sorry I am, however, to contest the opinion of so eminent and learned a character; but candour, and a firm persuasion of a contrary belief, compel me to the disagreeable task.

The facts which I conceive greatly to militate against Dr. Jenner's hypothesis are,

1. That the Cow-pock has been discovered in the teats of American cows, and also in those of several parts of Europe, where, it is known, the cows and horses are never attended by the same person.

It appears that Dr. Jenner has an opinion that the disease is particularly confined to some few counties *in England*, where there is, as he says, a direct communication between the heels of the horse and the teats of the cow, through

the medium of the male domestics, who, after having been employed in applying dressings to the heels of a horse affected with *grease*, without proper attention to cleanliness, incautiously bear their part in milking the cows; and in this manner, from some of the particles of the infectious matter having adhered to their fingers, they communicate the disease to the cows; and that from the cows it is communicated to the maid-servants, and in this way spreads through the farm. From this it seems that Dr. Jenner lays his chief stress on the circumstance, as he supposes, of the disease not existing in any country where this communication is wanting. Now, that the genuine Cow-pock has been discovered on the teats of American cows, in several of the different States, is an undeniable fact; and experience has proved that the matter affords effectual security against the small-pox. And that the office of milking is never performed by men that are employed in applying dressings to the *greasy* heels of a horse is equally certain. It is also well known, that the Cow-pock has existed in Ireland from time immemorial, where it is even deemed a disgrace for a man to engage in milking. In proof of which I shall relate the following anecdote, which Mr. Ring, in his treatise on the Cow-pock, informs us was related to him by Dr. Jenner himself. "Two peasants, who lived on a nobleman's estate in Ireland, having

been compelled to milk the cows in the park, were considered, by their neighbours and fellow servants, as utterly unfit for all society. Had they committed murder, they might have found some kind friend to speak to them and associate with them; but they had been guilty of a much greater crime, that of *milking cows*."

One of Dr. Jenner's principal arguments in support of his opinion, concerning the origin of the Cow-pock, as advanced in his 'Further Observations on the Variolæ Vaccinæ,' is drawn from the supposed "total absence of the disease in Ireland and Scotland, where," he says, "the men-servants are not employed in the dairy." It appears from Mr. Ring, that the preceding narrative was related by Dr. Jenner previous to his knowledge of the existence of the disease in these countries. Since this, however, we have been informed, by men of the first respectability in the medical profession, that the Cow-pock has existed in Ireland for an undeterminate length of time; and that it has been long known, among the common people of that country, to prove effectual, when taken from the cow by milking, in preventing the small-pox; instances of which are related of thirty or forty years standing: and there are not wanting instances of persons voluntarily giving themselves the disease, from a conviction that it would prevent the small-pox.

Doctor Lewis Sacco, of Milan, in his treatise on Cow-pock, informs us that he has discovered the real disease in the cows of Lombardy, where the horses and the affairs of the dairy are never attended to by the same person. And it has also been discovered in the Dutchy of Holstein.

Now, the existence of the disease in places where it is certain there is not the necessary medium of conveyance, amounts to a direct proof, as I conceive, that the Vaccina is not in any way connected with or dependent on the *grease.*

2. It does not appear that Dr. Jenner, or any of the advocates for his opinion, have, after numerous and repeated experiments, succeeded in securing the system against the effects of the variolous virus, either with matter taken immediately from the horse, or after it had undergone that peculiar modification in the system of the cow which, by Dr. Jenner, is deemed so essentially requisite, in order that it should possess the property of completely securing the constitution against the effects of small-pox.

It is said, indeed, by Dr. Jenner, that a veterinary surgeon has, at last, actually succeeded in producing the disease artificially in a cow, by removing a scab from the teat, and applying the recent blackish matter of *grease* to the denuded surface. This is the only case he relates that appears to carry with it the least degree of proof that the Cow-pock derives its origin

from the matter of *grease;* and even here it seems very singular that we have not a more full history of the case given us, as it would certainly be of the utmost consequence to have an accurate description of the appearances of the disease, and also what use was made of the matter it afforded, and whether it imparted to the human system the same security as the casual Cow-pock. I apprehend, however, there were never any trials instituted with this artificial virus; or, if there were, they must, no doubt, have proved abortive, otherwise so important a circumstance in support of the doctrine would doubtless not have passed unobserved.

There are, it is true, several experiments related by Dr. Jenner, which, in some measure, seem to favour his hypothesis. He informs us, in one of these, that he found it impracticable to induce the small-pox in a person who, six years previous to his inoculating him with variolous matter, had been pretty severely indisposed, owing to some sores, occasioned, at that time, by the matter of *grease*. This person, it is said, was inoculated repeatedly, and also exposed to variolous contagion, but wthout producing any effect. To this case is annexed a note, stating, as a remarkable fact, well known to many, the frequent failure of attempts to communicate the small-pox, by inoculation, to blacksmiths, who in the country are farriers.

Another case is adduced by Dr. Jenner, to prove the obscure appearance of small-pox after the disease produced by the *grease*, at least in some instances.

In another he tells us that this cannot be *entirely* relied on, until a disease has been generated, by morbid matter from the horse, on the udder of the cow, and passed through this medium to the human subject; for the person who was the subject of this case, he informs us, took the small-pox upwards of twenty years afterwards.

In all these cases we see there is but one in which the person was rendered unsusceptible of the small-pox, and this, it seems, was only of six years standing: whereas there is one of them, who, after twenty years had elapsed, was seized with the variolous disease. Is it not, therefore, probable, that the person who continued to resist the small-pox only for the short space of six years, might have become again subject to it, after a lapse of thirty or forty? Certainly it is; and the more so, I think, as there is but this one person, among the many adduced, who remained unsusceptible of variolous action.

Suppose, for a minute, it be admitted, merely for argument sake, that the equine virus possesses the power of giving to the system complete security against the small-pox. Would such a fact go any length to prove its similarity to Cow

pock? Certainly not. For it must be known to every inoculator of experience, that it is frequently impracticable to excite the small-pox in the systems of those who, at the time of inoculation, happen to be labouring under some peculiar morbid affection, as eruptive complaints, &c. And have we not reason to suppose that there are other morbid poisons, which future experience may prove capable of warding off the effects of this terrible hydra the small-pox, and perhaps of some more disagreeable malady? The Small-pox and Vaccina, we well know, are capable, in a great measure, if not entirely, of mutually destroying the effects of each other, at least their constitutional effect: but no one, I presume, will from this contend for the identity of the two diseases. It is also rendered pretty certain, from experience, that the action of Vaccina has the effect of rendering sheep unsusceptible of a very fatal complaint, which prevails and is contagious among them, called the *rot;* and also of inducing a disease in the canine species, which is succeeded by an unsusceptibility of the *hydrophobia;* yet no one, I am fully persuaded, will imagine the least analogy between these complaints.

Another very potent argument in favour of the one complaint not being produced by the other, is their perfect dissimilarity, as existing in these two different species of animals. The truth of

this assertion, I am convinced, will appear at once evident to every person who has had an opportunity of examining them in their different stages. It is said by those who are conversant with the complaint, that the *grease* is produced from horses standing a great length of time in foul stables; moreover, it seems to be confined principally to the heels of the animal, evidencing itself in the form of small fissures or cracks: whereas the distemper to which the cow is subject manifests itself on the udder, assuming a vesicular or pustulous form. Is it not probable that, if these diseases were of an analogous nature, there would be an identity of their appearance, when affecting only different species of the same common class of animals? And more than this, the permanency of their very different situations in these animals certainly evince a very decided difference in the nature of them.

The validity of Dr. Jenner's opinion relative to the origin of Vaccina is supposed, by many, to be completely confirmed by some experiments lately made by a Dr. Loy, who tells us that, in order to ascertain the truth of Dr. Jenner's assertion, he had recourse to experiments; and he informs us that he has been successful, in some few of the great number he has made with the matter of *grease*, in exciting a disease in the human constitution which very much resembled Vaccina, and which, in some instances, served

as a complete security against the variolous complaint by inoculation. But in every case in which it appears to have been successful in preventing variolous inoculation from having effect, the person was subjected to inoculation with small-pox before the disease excited with the matter of *grease* had, by any means, completed its progress. Some of them, it seems, were inoculated with small-pox on the sixth day of the disease, others on the tenth, &c. I am fully convinced that experiments like these are not to be depended on, more especially when Dr. Jenner tells us, that he has witnessed a case, where a person, after having received the influence of *grease*, remained for twenty years unsusceptible of the small-pox, and was then seized with this complaint: and it must be apparent, I think, to every person at all acquainted with the physiological laws of the animal œconomy, that a morbid disposition would not so soon become extinct from the system. Further, Dr. Jenner states that a cold and wet spring is favourable to the production of both Cow-pock and *grease;* which is to say, that the former is not dependent upon the latter, but that they are both the common effect of *certain physical causes*.

From what has been above adduced, I think we may with propriety, and with every appearance of truth, conclude, that the two diseases

are not only unlike in their nature and appearance, but also in their effects: the one affording a temporary and ineffectual security against the small-pox, the other a permanent and effectual; the one peculiar to the cow, the other to the horse.

Of the principal discriminating and characteristic Symptoms and Marks of the inoculated Vaccina, together with its incidental Varieties; and a Description of the spurious Complaint.

THIS disease, as communicated by inoculation, much resembles, in its commencement, the small-pox. At the end of the second or beginning of the third day, if the operation proves successful, (*i. e.* forty-eight or sixty hours from the time of inserting the virus) a small speck of inflammation generally manifests itself at the place of inoculation; this, gradually and uniformly increasing, for the most part in the course of the third day, becomes much more conspicuous, and most generally by the commencement of the fourth, we may discover, by the feel, a minute pimple, elevating itself somewhat above the common surface of the skin, with a slight inflammation circumscribing its base. From this time it gradually increases in magnitude, and by

the termination of the fifth or beginning of the sixth day, begins to assume that characteristic and specific appearance which, to the experienced eye, so obviously and so happily distinguishes it from that direful malady the small-pox. These criteria, however, cannot, in every case, as early as the fifth or sixth day, be so clearly discerned by the naked eye. Hence the necessity of using magnifying glasses in examining the early stages of this complaint. The peculiar visible features of Vaccina consist, principally, in the perfectly regular margin and beautifully circumscribed form of the vesicle; having its surface much flattened, with an evident and remarkable depression in its center, of a darker colour, giving it the appearance of elevated edges; which is occasioned by the cuticle still adhering in that spot to the true skin underneath. Contrary to this, the small-pox pustule, by the fifth or sixth day, begins to assume an irregular angulated margin, and is altogether destitute of that flattened surface and central depression which so peculiarly characterise the genuine Cow-pock vesicle. What more certainly, if possible, distinguishes the vaccine from the variolous pock, is, that the former appears to be an entire congeries of small vesiculæ or cells, so that in puncturing the common vesicle or membrane surrounding them, it requires some time for the virus to ooze out; and when we have exhausted

it of all its contents, its magnitude appears very little diminished: whereas the latter consists merely of one common cavity, and upon making a single puncture into it, its contents are immediately and entirely evacuated, leaving no trace of its existence behind, except the flaccid and relaxed cuticle which had previously served to contain the matter. It is peculiarly deserving of notice, that the circumscribed appearance and perfectly regular margin of the Cow-pock vesicle are evident in all the latter stages of the disease, even in the process of scabbing: while the small-pox, in contra-distinction, becomes daily more and more irregular, in consequence of the confluence of the circumjacent pustules.

About the fifth or sixth day, and in some instances as early as the fourth, the inoculated part begins to change from the red pimple above mentioned, assuming a vesiculated appearance, containing a fluid, the colour of which, through the cuticle, resembles very much that of whey, being of a perfectly limpid consistence, and very transparent. Its limpid consistency and transparency, however, are apt, from certain causes, to undergo a considerable change, which we shall take occasion hereafter to mention. It is at this period that the virus possesses its greatest share of activity, and, provided it can be obtained in sufficient quantity, is most suitable for the purposes of vaccination; it being at this early stage

of the complaint, for the reason above mentioned, less liable to fail in exciting the disease than if delayed to a later day; though from the sixth day to the tenth is laid down, by Dr. Jenner, as the most proper time for procuring it. During the time that intervenes between these two periods the pustule is greatly augmented, so much so by the tenth day, in the generality of well-marked cases, as to acquire nearly the size of a half-dime; the surface of the pock at the same time becoming much more evidently flattened, in proportion as it increases, so that sometimes, in a pock of the above mentioned magnitude, its elevation above the surface of the surrounding skin will scarcely exceed the one-tenth of an inch: the genuine vaccine vesicle is likewise always destitute of that plump rotundity which is so invariable an attendant on the variolous.

About the eight or ninth day, sometimes a little earlier or later, according to circumstances, the pock having attained to its acme, the constitutional symptoms begin to manifest themselves, first by pain in the inoculated part, extending itself towards the axilla, the glands of which now become swelled and painful, especially on making any exertion with the arm. These symptoms having extended themselves thus far, the whole system begins now to participate in the affection, by association with the local part; as evinced by the succeeding languor, drowsiness,

paleness, chilliness, flushes of heat, head-ache, fulness and pain of the eyes, with redness; pain of the limbs and back, loss of appetite, nausea, and sometimes vomiting; increased fulness and preternatural frequency of the pulse, thirst, white tongue, and, in short, all the general symptoms of fever. It is not, however, to be supposed that these symptoms discover themselves in every case; on the contrary, it frequently happens that we are unable to perceive the least constitutional indisposition: some of these, for the most part, notwithstanding, make their appearance, continuing from a few hours to one, two, or three days, according to the constitution of the patient, together with many collateral circumstances; then subsiding spontaneously without any disagreeable consequence. The slight marginal inflammation which has remained permanent from the first commencement of the vesicle begins, about the *eighth* or *ninth* day, sometimes rather earlier or later, gradually to extend itself, very moderately affecting the surrounding parts, till about the *tenth* or *eleventh*, when its increase becomes much more rapid; diffusing itself, in some instances, to the distance of two or three inches from its source, and sometimes, though rarely, extending itself as high up as the shoulder and as low down as the elbow. This it is that constitutes the *efflorescence* or *areola* so much spoken of by authors, and which is said, by some, to be

indicative of the constitutional affection, and by many is considered as a pathognomonic symptom of the complaint.

From this time the central depression of the vesicle begins to assume a darker appearance, which, extending itself gradually towards the circumference, completes, in the course of four or five days, that dark mahogany-coloured scab which is so peculiarly characteristic of the true disease. This scab, if it be minutely examined in the first stages of its formation, will be found very frequently to put on a stellated appearance, having a number of small lines, like radii, shooting out from the center to the circumference, in a curvilineal direction; with a corresponding number of little sulci or furrows. From the first commencement of the scabbing process to its completion, the scab passes through all the different grades of colour, from a light brown to that of a dark mahogany, assuming, at last, very much the colour and appearance of a tamarind stone; becoming, towards the latter stages of vaccination, very thick and heavy, and daily increasing in the intensity of its colour; and gradually detaching itself, at its circumference, from the surrounding parts, adheres, at length, by nothing but its center; falling off eventually at different periods of time, though generally in three or four weeks from that of inoculation; leaving no trace of its existence behind,

except a superficial pit or depression in the cuticle.

Thus does the Vaccine-pock, as it has occurred to me, complete its regular stages. Some varieties, however, remain yet to be mentioned, which I shall proceed to treat of in the following order.

It sometimes happens, that, either from some peculiar change in the qualities of the matter used for inoculation, or from some specific disposition of habit, the vaccine vesicle shall vary in respect to its progress, and also its appearances, through its different stages. These varieties resolve themselves principally into the three following heads: 1. In regard to the progress and appearances of the vesicle. 2. In regard to the areola or efflorescence: and, 3. As respects the scabbing process.

The standard or natural appearances of the Cow-pock vesicle are those above related: in some instances, however, notwithstanding every precaution is used in the operation, as well as in taking and preserving the infection, the disease induced will deviate considerably from its natural appearance. The virus, in some cases, after its introduction under the cuticle, does not produce any evident change in the part for some time, lying apparently in a dormant or latent state for ten or fifteen days, when, either from a second inoculation, or some other cause, it be-

comes roused into action, and proceeds on through its regular stages, assuming its natural appearances; though its progress, in such cases, is almost always much more rapid than usual. Several instances of this nature I had an opportunity of witnessing during my residence at the New-York Institution for the Inoculation of the Kine-pock. A case of the like nature also occurred in the practice of a very respectable physician of this city, which, from its singularity, I deem well worth mentioning. The virus, in this case, after its insertion, had lain apparently in an inactive state for several days, when, from an inoculation with variolous matter, near the place where the vaccine virus had been introduced, it was excited into action, and passed regularly through its several stages, entirely superseding the effects of variolous inoculation, although the latter had made some considerable progress. This person, it may be observed, had been repeatedly vaccinated by Dr. Waterhouse, of Cambridge College, and by him was deemed unsusceptible of the complaint. Sometimes the vesicle is very tardy in its progress, and does not arrive at maturity till the twelfth or fifteenth day; it being very obvious, however, that the operation had taken effect immediately after the insertion of the virus. At other times, again, the vesicle is premature, acquiring its acme as early as the sixth or seventh day, with a forma-

tion of its areola proportionably soon. I have obtained matter, which answered every purpose of inoculation, as early as the fourth day. In some cases the pock produced is unusually small. But, notwithstanding all these varieties in respect to its progress and size, the vesicle, if genuine, still preserves its central depression, its circular form, regular margin, and, in short, every characteristic and specific appearance. These anomalies, in all probability, result either from some peculiar change in the matter made use of, or from the system's being under the influence of some morbid action. Some few cases I have seen, in which there were from one to two or three pock made their appearance in the vicinity of the local one, exactly resembling it in every particular circumstance, though generally falling off rather sooner. This, however, is by no means a common occurrence; and when such pock do appear, they are, in all probability, induced by the patient's infecting the part with his nails.

From what has been above said, it will be seen that the vesicle is subject to great variation, especially as regards its progress; and that, therefore, there can be no *specific* time fixed upon for procuring the virus. I have, as before stated, obtained it as early as the *fourth* day, (ninety-six hours from the time of inoculation) and succeeded perfectly well with it in producing the real disease. In other cases, on the con-

trary, it has been impracticable to obtain any till the *twelfth* or *fourteenth* day.

It has been observed, in the foregoing pages, that a slight marginal inflammation was present from the earliest stage of the complaint, and that, in general, this began to diffuse itself to the surrounding parts about the *ninth* or *tenth* day, forming what is called the efflorescence or areola. It commonly happens that this inflammation does not diffuse itself in the form of an areola till the period above-mentioned: cases, however, have occurred, in which it commenced its career as early as the *fifth* or *sixth* day: in others, again, it has not made its appearance till the *twelfth* or *fourteenth;* and sometimes, it is said, not at all.

The efflorescence, after it has commenced, advances very rapidly to its height, from which it begins soon gradually to decline, first at its circumference; and, in the course of one, two, or three days at farthest, is almost entirely gone; being, in general, succeeded by a desquamation of the cuticle. Frequently, however, it begins first to subside from around the base of the vesicle, leaving between its circumference and the pock an interval of uninflamed surface, and, gradually advancing from this towards the confines of the areola, completely disappears in the usual time. Sometimes the areola subsides in such a manner as to leave one circle of inflammation immediately around the base of the pock, and another

externally, so as to constitute a distinct external and internal areola. As the efflorescence differs in respect to its time of appearance and mode of declension, so also does it vary in its appearance when formed. It has before been stated, that it was naturally circumscribed and limited in its extent, and uniform in its colour from the vesicle to its border: these characters, however, in some instances, are varied, for it sometimes happens that the areola, instead of exhibiting this circumscribed and limited extent, assumes a stellated appearance, not having its inflammation uniformly diffused, even within its boundaries; but having alternately a streak of inflamed and uninflamed surface shooting out from the vesicle, like radii from a center, and exhibiting no definite boundary.

The efflorescence varies also in point of duration, its usual time of continuance being from one to three days; though it frequently, either from mechanical irritation, or from the natural tendency of the disease, continues a much longer time.

It also varies as to its intensity of colour, being naturally that of a rose-pink; though in some cases it is of the colour of the pink only, and in others of a vermillion.

Having mentioned the varieties that are occasionally manifested in the vesicle and efflorescence, I shall proceed to notice some of the most

usual that take place in the process of scabbing. The change of colour which is to be observed in the center of the vesicle about the close of the tenth day, indicates the commencement of this process, and extends itself over the surface of the pock in the course of two or three days; and the pock, at the same time, gradually hardening, the scab, for the most part, is completely formed in ten days or two weeks from the time of vaccination: from this time it begins gradually to detach itself from the skin, at its circumference, and shortly falls off, leaving the part in the state before mentioned. It sometimes happens, however, contrary to this natural state of affairs, that the formation of the scab commences at a much earlier period, and sometimes, again, is protracted far beyond its usual time. It has, indeed, been known to commence as early as the sixth or seventh day, and complete itself proportionably soon: in other cases it has not commenced till the seventeenth or eighteenth, though in such it has been observed to advance to a state of maturity much sooner. As to the colour of the scab in the genuine complaint, it seldom varies, assuming almost invariably that dark brown, chesnut, or mahogany-coloured appearance, heretofore mentioned; attended, most commonly, with a smoothly polished and glossy surface. I have observed, however, that in the dark skin of the African the

colour is more intense than in the skin of an European, being influenced, probably, by the colour of the rete-mucosum. The other characters of the disease, as exhibited by the former, are altogether synonymous with those of the latter, except the areola, which must, of course, be invisible: its existence, nevertheless, is fully evinced by that tumid hardness which is so invariable a concomitant of this local inflammation.

Having now, as accurately as I am able, delineated the natural appearances of the genuine Vaccina, and, with as much precision as the extent of my observations would permit, traced it through its different anomalies, I proceed to mention some of the most obvious and discriminating characters of the spurious complaint.

When, from mismanagement in either taking or preserving the genuine vaccine virus, a deterioration of its natural and inherent properties is induced, instead of producing that beautiful symmetry of appearances above described, it gives rise to a disease not only totally unlike it in appearance, but one that is altogether dissimilar in effect; which, instead of affording that permanent and effectual security against the small-pox ever attendant on the real complaint, is entirely destitute of all prophylactic influence; consequently, leaving the constitution in a state still susceptible of the impression of variolous virus.

The effect thus produced not answering the desired expectation, has led many unwary and inattentive physicians to allege, that vaccine inoculation was not succeeded by an unsusceptibility of the constitution to variolous infection. Hence we see the necessity of indefatigable and reiterated experiments, in order to arrive at truth, in conducting such novel and interesting inquiries.

The vesicle, excited by spurious or impure virus, is very readily distinguished, by every experienced eye, from that which results from the real. The effect of the former, when introduced under the cuticle, is frequently to excite premature inflammation, attended, in many instances, with intolerable itching, (this symptom is also a presage of its not having taken effect at all, *i. e.* when genuine matter is used), and many times producing an elevation of the cuticle, and forming a pimple of considerable magnitude in the course of a few hours. This, however, is not always the case: in some instances its effects do not become apparent sooner than those induced by the genuine virus. From this time the disease progresses through its different stages; not, however, with that admirable and beautiful regularity which characterizes the true disease. When, from impure virus having been made use of, the spurious Cow-pock is induced, instead of presenting itself in the form of a regular and cir-

cumscribed vesicle, it has the appearance of an ill-conditioned creeping sore, seldom assuming the pustulous or vesicular form; and instead of producing a scab of the usual kind, is attended with a festering, light coloured, or yellow one, being always less thick and heavy than that succeeding the true disease.

What is still more strikingly different is, that the scab succeeding the genuine vesicle appears to be merely, as it were, laid on, or slightly adhereing to the skin; has its superior surface very level or plane, and its margin, or external circumference, is very considerably and abruptly elevated above the common level of the surrounding parts: whereas the scab of the spurious has considerable rotundity, is thickest in the middle, little elevated above the surface, very light and thin around its margin, gradually though irregularly losing itself in the surrounding skin, and frequently terminates in a disagreeable phagedenic ulcer, difficult of cure. The spurious pock, at the same time, has no regular areola or efflorescence, but merely an inflammation surrounding it, which frequently extends itself to a considerable distance from the place of inoculation, particularly when much irritated, putting on that angry and fiery aspect so peculiarly characteristic of phlegmonic or suppurative inflammation: whereas the real pock is surrounded by an erysipelatous inflammation. This inflammation is

also much more permanent than the efflorescence accompanying the true Vaccina; neither is it so rapid in its accession or declension as the latter naturally is.

The constitutional affection induced by this complaint (especially if the local disease proceeds to any great height) is generally more severe than that which is attendant on the real disease. The slight symptoms of fever that usually occur in true Vaccina are here very much aggravated: the patient, for the most part, is affected with great pain and swelling in the axilla, extreme pain of the head, preternatural heat of the surface, great pain in the bones and back, pulse much more frequent and full than natural, white tongue, nausea and vomiting, great pain and tension in the inoculated part, &c. Besides, these symptoms have no stated or regular time of coming on, but invade the system indiscriminately, as circumstances shall direct.

If the disease succeeding vaccination shall assume the above appearances, no one need for a moment hesitate in pronouncing it to be spurious; and we may, with boldness, assert, that it has not wrought that requisite change in the system which is so indispensibly necessary in order to secure it against the dire effects of variolous poison.

After having thus briefly treated of the origin, general appearances, and varieties of this extra-

ordinary complaint, I deem it necessary to offer some few observations in regard to its method of treatment.

From the foregoing description of this disease I think it will appear very generally to require more attention in nice discernment and discrimination, in order to detect its specific and characteristic marks, than in judging of medicines proper to be prescribed. I believe it will be very readily admitted, by every experienced practitioner in this complaint, that there is scarcely one case in ten in which the patient is so much indisposed that a cooling purgative or two, joined with a little abstinence in diet and regimen, will not relieve him. This, I can say, was the case during my residence at the Kine-Pock Institution of this city, which was one year, in which time there were upwards of a hundred persons who experienced the salutary effects of vaccine inoculation at that benevolent establishment, and not one case in the whole number presented, (notwithstanding they were generally of the more indigent part of the community, consequently very liable to be exposed to all the vicissitudes of weather, and many of them, indeed, to laborious exercises,) that required any thing more than some mild and cooling cathartic.

The Cow-pock has been objected to, by many, from an ill-founded idea that it is frequently productive of very sore arms. Some, indeed, allege

that the ulcer subsequent to vaccination is much more inveterate and difficult of cure than that induced by small-pox. This, however, I have never found to be the case, and I am inclined to believe that if the necessary attention be paid in removing the too great mechanical irritation, a great proportion of which very frequently arises from tight sleeves, and in giving the patient the necessary injunctions not to scratch or irritate the vesicle (which, by the bye, he is very much disposed to do, owing to the intolerable itching which frequently accompanies the areola,) it will be found a very seldom sequela of the true pock. Sometimes, however, from inattention to the above precautions, the scab is rubbed off, or the vesicle very much irritated; in consequence of which, violent inflammation not unfrequently ensues, accompanied with great tumefaction, which, in some instances, extends itself to a considerable distance from the place of vaccination, with great pain in the inoculated part, extending towards the axilla; to which very commonly succeed swelling and inflammation of the axillary glands, restlessness, chills, fever, anxiety, nausea, vomiting, head-ache, pain of the back, &c. These symptoms, in the course of two or three days, will generally disappear; though, now and then, a case of greater violence will protract itself, as alleged by some, to one, two, and even three weeks. It is not common,

however, to find a case so violent as not speedily to yield to a gentle antiphlogistic treatment. Due attention should also be paid to the local affection, which, by this time, has commonly assumed the appearance of a troublesome phagedenic ulcer. When the disease shall have acquired such an augmentation (which, indeed, it appears incapable of, except from great and repeated irritation of the vaccinated part), it is highly requisite that some active means should be resorted to, in order to arrest its progress. This we find very effectually answered by the application of the unguentum citrinum; care being taken, however, never to extend its use beyond the surface of the ulcer, otherwise, if active, it will frequently corrode the skin, and by this means augment the sore. The unguentum hydrarg. and the unguent. precip. rubr. are frequently very serviceable in disposing the ulcer to heal. In milder cases, the aq. lytharg. or Goulard's extract of Saturn, diluted, will generally prove effectual. When the inflammation, pain and swelling shall become greatly aggravated, an emollient poultice will be found beneficial. If the inflammation and swelling, at the same time, extend over the arm, keeping the part wet with lead-water, or even with cold water simply, will be attended with great advantage. These, combined with the exhibition of a smart purgative every day or two, together with abstinence from animal food

and ardent liquors, will generally effect a cure in a short time, or so far alleviate the violence of the symptoms, that any common dressing will suffice.

The efflorescence, as has been observed, is sometimes accompanied with a very disagreeable itching: by bathing the part in *rectified spirits of wine*, or *ardent spirits*, this disagreeable symptom is almost instantaneously relieved.

It has been recommended, and, indeed, practised by some, in order to avoid the bad consequences arising from irritation, &c. to destroy, by means of the sulphuric acid, or some other active caustic, the local pock, or vesicle, so soon as it shall have produced its desired effect on the constitution. But the great difficulty in establishing a specific time when the disease shall have succeeded in completely securing the constitution from the influence of variolous infection, will ever render this practice fallacious and delusive.

Manner of preserving Vaccine Virus, and Method of Vaccination.

THE virus of Vaccina being naturally of a very perishable nature, it is highly requisite that every physician who undertakes to inoculate with it should be acquainted with the most effectual

means of preserving it, for the longest time, in its most active state; and more especially so for those that reside in the country, where a failure might be with difficulty supplied.

Most of the physicians who have practised with vaccine virus have been in the habit of securing it on the point of a lancet, not apprehending that the matter very speedily suffered a decomposition thereby, from the action which it exerts on the metal of the instrument. It is well known, that all fluids containing a portion of oxygen in their composition, on coming in contact with iron or steel, very readily undergo a decomposition, having the oxygen they hold as a constituent part detached, and united to the metal, reducing the latter to the state of an oxyd; which process, at the same time that it proves destructive to the metal, also destroys the qualities of the fluid. It therefore necessarily follows, that, as the virus of Vaccina, in common with all other animal secretions, contains a quantity of oxygen in its composition, on being subjected to the same process, must undergo the same or similar changes of its properties, which renders it altogether unfit for use, being frequently, if used, productive of a disease of a spurious nature, the bad consequences of which have been already sufficiently explained. In such cases the physician is not only foiled in his attempt to produce the genuine complaint, but is, at the

same time, deprived of the use of his instrument; for there are very few lancets, after having had infection preserved on them, that are fit for use till after having passed the hands of the cutler. The consequence of such improper practice is, that the physician is continually labouring under unnecessary expense, and his own reputation, together with that of the disease, are both very materially injured. The many difficulties and embarrassments thus arising, are, I am convinced, sufficient to deter any one, in future, from employing similar means for the preservation of this precious fluid.

Another method, which by many has been had frequent recourse to, is the preservation of it on cotton thread. But this mode, I am of opinion, will be found not sufficiently economical, as it requires a large quantity of the virus properly to imbue a small portion of thread. Besides the foregoing objection, another presents itself of a much more serious nature, which is, that virus so preserved is prone to run into the putrefactive fermentation; which process, it is well known, destroys the chemical combination of all bodies subject to its action; consequently the virus, after having undergone this change, is entirely unfit for use.

Another, and, as appears to me, the most eligible method that has been adopted for the preservation of the virus, is by securing it between

pieces of glass, or upon pieces of quill made pointed at the end on which the matter is to be collected. When it is to be preserved in the former way, common window glass is to be made use of, previously cut into square pieces of about an inch each, so that they shall be smooth, and in exact contact with each other. Having properly taken the above precautions, the vesicle from whence the matter is to be obtained must be repeatedly and gently punctured with a sharp lancet, being cautious, at the same time, not to penetrate too deep, otherwise the serum from the adjacent vessels is apt to be effused, which very frequently deceives us, it being impossible to discriminate this from the real virus; very shortly after which the virus will begin gently to ooze out at each puncture, in form of transparent limpid drops, very much resembling those of dew, provided none of the surrounding blood-vessels are injured by the lancet. The matter thus collected round the punctures is to be carefully taken off on the point of a lancet, or any convenient instrument, and transferred to the surface of one of the plates of glass on which it is to be preserved; care must be taken, at the same time, to confine it to a small spot upon the center of the glass, about the size of a split pea. After having been thus collected, it should be suffered to dry in the common temperature of the atmosphere, and should then be immediately se-

cured by accurately placing the other bit of glass over it, and wrapping them up in gold-beater's skin, or a piece of wetted bladder, in order to secure it from the action of the external air.

Many have preferred pieces of quill or ivory for preserving the matter on; and, from the very little trouble, both in the preservation and inoculation, with matter thus kept, I think it much the best of any that has been heretofore devised; nothing more being necessary, when this mode is had recourse to, than merely touching the point of them with the virus, and permitting it to dry thereon, as above directed.

Many other means have been used for preserving vaccine matter. By some it is said to retain its infectious power for an unlimited time, if kept in dry hydrogen or nitrogen gas. Dr. Pearson, of London, has recommended the preserving it on platina lancets. But, whichever of these ways is adhered to, it will always be found necessary entirely to seclude it from the action of air and of light, it having been lately discovered that either of these agents is capable of decomposing it.

Vaccine inoculation has been frequently complained of, and even objected to, by many, on account of its frequent failure in exciting the complaint. Upon accurate and impartial observation, however, it will be discovered, for the most part, to be owing to mismanagement, or inat-

tention on the part of the physician; for the virus of Vaccina, I believe, if the necessary precautions be used, will take effect nineteen times out of twenty.

On accurately investigating the causes of failure in vaccine inoculation, we shall find them principally to resolve themselves into the three following heads: 1. From a deterioration of the virus; 2. From a peculiar disposition of habit, whereby it is incapacitated to receive the impression of the disease; and, 3. From the method of introducing the matter.

The matter of Vaccina is, no doubt, frequently rendered inert from some peculiar change wrought on it while contained in the vesicle. This change may be produced by some specific morbid action of the vessels secreting it, which, as well as being endowed with the power of elaborating and secreting the most noxious poisons, possess also the faculty of rendering them inert and harmless. That there is a certain change of the properties of the virus immediately ensuing the formation of the efflorescence or areola, is sufficiently evinced from the frequent ineffectual attempts to produce the disease with virus procured after that period, and from its almost uniformly inducing a spurious complaint if it takes effect. It is, indeed, asserted by some, that matter taken at this period has been known frequently to succeed in producing the true disease. But, if we put con-

fidence in what Dr. Jenner says, it must be allowed that such matter is productive of a spurious complaint, thereby frequently misleading the unwary and inexperienced practitioner. The practice ought, therefore, without hesitation, to be abolished; and matter should never be used after having, in any degree, lost its original transparency or limpid consistency; which changes are produced by other causes than that of its own specific inflammation, as the peculiar action of the vessels, that morbid state of them immediately succeeding to mechanical irritation, &c. The properties of the matter are also frequently destroyed from not preserving it on such substances as are incapable of oxydation, and from not securing it properly from the light.

All the above circumstances are evidently frequent sources of failure in the new inoculation. Hence the most scrutinizing and strict attention, in regard to the matter we make use of, is requisite, if we wish to preserve sacred our own reputation and that of the disease.

The second cause of failure which has been mentioned is predicated on the opinion that the system may, at certain times, be so disposed as to incapacitate it for the reception of vaccine impression. For the truth of this position, no vaccinator will require any further evidence than a reference to his own practice. The same fat-

occurs in variolous inoculation. That there is a natural tendency or disposition in the constitution of some to counteract or entirely reject certain morbid impressions, is an incontrovertible fact; and that many morbid changes take place in the system, which have the same or similar effects, cannot for a moment be doubted. When this incapacity of the system arises from the former of these, it is probable that it is occasioned by some peculiar physical arrangement or construction of the component particles of the body; and when from the latter, by some morbid derangement or alteration of them. It sometimes happens that, either from one or other of these causes, the matter, after having been inserted under the cuticle, shall remain in a dormant or inactive state for several days, frequently not less than ten or fifteen, not even exhibiting, all this time, the slightest grade of inflammation, several instances of which are related in a former part of this dissertation.

There was once a case of Cow-pock came under my observation, in which the efflorescence was entirely suspended for several days beyond its usual time of appearance, by the supervention of measles.

The last, and which is certainly not an unfrequent source of failure, I have noticed as arising from the method of introducing the virus. If, at the time of inoculation, there happens to be

much mechanical irritation occasioned by introducing the matter, the part becomes prematurely inflamed; and this inflammation being of a totally different nature from that induced by the matter itself, the effects of the latter are entirely counteracted, notwithstanding it be ever so genuine. This same cause, very often also, produces a failure, when, from the want of fresh matter, we are under the necessity of using such as has been preserved on cotton. In such cases the portion of thread introduced acts as an extraneous body, giving rise to an issue. Premature inflammation affords us a criterion, whereby we can generally, with a great degree of certainty, judge of the success of the operation, and of the nature of the disease induced.

From what has been above adduced, the following very useful deductions naturally arise.

1. That vaccine virus, either for inoculation or preservation, should always be taken previous to the formation of the efflorescence or areola.

2. That we should always make use of the most recent matter that can be obtained; and, provided it be impracticable to procure it immediately from the vesicle, we should prefer such as has been preserved on those substances that are incapable of oxydation.

3. That as little irritation should be made use of, in its introduction, as can be dispensed with.

This, indeed, may be very little, as it is never necessary to draw blood.

As it respects the mode of vaccine inoculation, there are but two principal ways that are at present practised; namely, by puncture and incision.

The former of these methods I deem preferable in all cases, except where an infected thread is used, and even here, I believe, it is more apt to succeed than incision. Whichever of the ways be made use of, it is necessary for us, in the first place, to provide ourselves with a sharp and clean lancet, being cautious, by all means, not to use one that has been previously armed with variolous virus; for very unpleasant consequences have not unfrequently followed such improper conduct. In making the puncture or incision, we should endeavour, as much as possible, to avoid drawing blood, for if we do, the operation will be less likely to succeed, as the blood, most probably, washes away the virus. After having made the puncture or incision, and carefully introduced the matter, a piece of court or adhesive plaster should be applied immediately over the place, as it gives to the operation greater surety of success. But, whether it arises wholly from restraining the subsequent hæmorrhage, or in part from preventing the evaporation of the more volatile and active properties of the matter, I do not know; but probably from both.

There should also be a preference as to the place of inoculation. The part of the arm, about half way between the shoulder and elbow, near the insertion of the deltoid muscle, is that which is pretty generally preferred at present; and, from its being less exposed to the atmosphere, from there not being any joints or tendons in the neighbourhood, and from its being less liable to injury than almost any other part of the body, I conceive it to be by far the most proper for the purpose.

A Consideration of the Manner in which Vaccine Virus acts on the Human Constitution, and of the Effects it produces.

IT has long been laid down as an incontrovertible fact in medicine, that whatever is applied either to the cuticular, pulmonary, or intestinal surfaces, must, in order to produce its operation on the system, be taken up by the absorbents, and conveyed into the circulatory mass of fluids, whether of a bland nutritious nature, or a violent corrosive poison. It is even supposed, by our best physiologists and physicians, that this is the only rational manner of accounting for the operation of the most noxious agents, and, in short, of almost every medicine the Materia Medica affords.

This, however, is a doctrine which I cannot, at present, accede to, and one, the truth of which I have for a long time doubted, as it does not appear to me possible that any such noxious or extraneous bodies could be received into so pure, uncontaminated, and mild a fluid as the blood, which is intended solely for the nourishment and warmth of the body, without occasioning instantaneous death, or, at least, without producing the most terrible commotion and derangement of the system.

It is said that the small-pox matter, after its introduction under the cuticle, is taken up and conveyed into the circulation through the medium of the absorbents. If this be the case, the matter must, of course, undergo the round of circulation; consequently, owing to its stimulating and poisonous qualities, the system must be excited into morbid or increased action, which action, it is said, tends to throw out the matter on the surface of the body, in form of eruptions.

Now, in order to prove the fallacy of this doctrine, it is only necessary to observe, that if it were a mere expulsion of the matter absorbed, there could not possibly be so large a quantity thrown out on the skin as, in many instances, there actually is; for the quantity inserted at the time of inoculation is known to every one to be in proportion infinitely small. Whence, then, is the source of this large quantity of matter?

Surely, it would be very preposterous to suppose that the small particle which enters the circulation has the power of producing so large a quantity, by assimilating the blood to its own nature.

Again: it is supposed, by many, that the matter entering the circulation is not directly expelled from the system; but that, in consequence of certain peculiar inherent properties, it is capable of exciting a specific morbid action of the sanguiferous system; and that this specific action disposes the secerning vessels of the skin to take on the office of secreting variolous matter. This, it is true, appears to be a much more plausible theory than the former; but it is, I am persuaded, not without many insurmountable difficulties. By this mode of reasoning it is impossible to account for the long-continued circulation, and consequent application of the matter to the internal surface of the arterial, venous and absorbent systems, without producing a more immediate effect; it being uniformly found that it is several days after inoculation before any symptom of the complaint becomes apparent. If, upon its introduction, it were immediately taken up by the absorbents, it must necessarily, in a very short time, pass into the circulation. Perhaps, however, this may be answered by some, in saying that it remains in the place where it was first inserted, until, by its irritation, it shall have excited the vessels of this

local part to secrete a certain quantity of virus; and that it is then absorbed, and produces all the subsequent phenomena. But, that so acrid and irritating a poison as this should so long remain in contact with the tender and patulous mouths of the absorbents, and should then be taken up by them, seems quite paradoxical. I should rather be inclined to suppose, that, after it had induced this degree of morbid excitement on their sensible extremities, it would be rejected by them, instead of being absorbed.

Again: that so small a particle of matter as is sufficient to produce Vaccina or small-pox should be so infinitely divided as to be applied to the internal surface of the heart, arteries, and all the ramifications of the sanguiferous system, so as to produce all the violent symptoms and phenomena attendant on these diseases, particularly small-pox, appears to me quite impossible. If this theory be true, we must admit that of the divisibility of matter *ad infinitum;* for, if this be the fact, a particle of the virus must necessarily be applied to every portion or particle of matter entering into the constitution of the animal economy; which theory, however clearly it may be proved by mathematical demonstration, is, in a physical sense, altogether incorrect and absurd. I cannot, indeed, suppose it possible, that the matter should so long remain in the circulatory mass of fluids, without producing some sensible change

in the functions of the system. And how it should happen that any thing should pass through the absorbents into the circulation, *in propria forma*, is impossible for me to conceive; it being a fixed law in physiology, I believe, that nothing is capable of entering or passing through the vessels of the human body, without having first undergone an appropriate change, by the influence of living vascular action; or, in other words, not without having been animalized, or assimilated to the nature of the body. By the agency of this peculiar action of parts, are all the different secretions to be accounted for: and upon what other principle than vascular influence or action is the formation of the blood itself to be explained? Further, it does not appear to me reasonable to suppose, that a chemical agent, so much disposed to act upon bodies, and so liable to be acted on and decomposed by other chemical bodies, as vaccine or variolous matter, should exist in contact with such a combination of chemical agents as the blood and other parts of the system, without undergoing the common effect of all such bodies. Is it not highly probable that the portion of ferruginous matter existing in the blood would as soon destroy the activity of the virus while in, as out of the system? It is well known that vaccine, together with variolous, and all other morbid poisons, being by any means deprived of their oxygen, become entirely

inert and harmless. If, therefore, the activity of vaccine and variolous matter depend, in so intimate a manner, on the existence of oxygen in their composition, it clearly follows, that, in passing the routine of circulation, they must lose their effects, as they there meet with numerous substances capable of depriving them of this principle. From whence, then, can we derive support for the theory of absorption?

If it be true that the matter of Vaccina must, in order to produce the disease, be absorbed, and pass through the circulating mass of fluids, why are its effects in so great a measure concentrated in the place of inoculation, and how comes it that there are not eruptions on the surface?

The above facts and observations are sufficient, I am persuaded, to expose the fallacy of the doctrine of absorption, that is, as respects the action of vaccine and variolous virus. I shall now, in as concise and comprehensive a manner as I am able, lay before the reader my own opinion on the subject.

I believe it is a well established and almost universally admitted fact in physiology, that there is a remarkable and intimate connection, or sympathy, existing between the surface of the body and the stomach. This is, indeed, proven by every day's experience. It has been observed, by a very learned and sagacious physician, that the skin might very properly be considered a kind

of second stomach, through the medium of which we are enabled to communicate to the system the effect or influence of almost every article in medicine; and that, in time, it would probably supersede the necessity of the internal exhibition of very many nauseous and disagreeable remedies. Modern practice teaches us, that opium, camphor, nicotiana, mercury, emetic-tartar, terebinthina, and many other medicines, prove equally effectual when applied to the surface as when taken internally. Hence we see that we are enabled to purge, salivate, puke and sweat, by this mode of administering medicines. No one, I apprehend, will attempt to explain the effects of these medicines, when applied in this manner, upon any other principle or theory than that of sympathetic association. If this be the manner in which medicines, when so applied, operate on the system, are we not, by analogical reasoning, irresistibly led to conclude, that all morbid poisons produce their effects in the same identical way? Most clearly we are.

The interval of time that takes place between the introduction of the virus, and the coming on of the constitutional symptoms, is very satisfactorily explained by this consent of parts, but not by absorption. The manner in which this circumstance is explained, by the former of these, is, that the morbid topical action, induced by the virus at the place of inoculation, requires a cer-

tain time to accumulate sufficient force to affect the stomach; and the stomach, after having received this impression by sympathizing with the skin of the arm, affects the heart and arteries, by their secondarily sympathizing with this organ, producing all the phenomena of the concomitant fever, which is always in direct ratio with the derangement of this viscus. And from the ready sympathy of the stomach in some instances, and in some particular idiosyncrasies, are the varieties and different degrees of violence of the complaint to be explained. The eruptions in the small-pox are explained in this way: that the variolous virus, from its producing, by the consent of parts, a peculiar or specific irritation on the heart and arteries, the secerning vessels of the skin are thereby induced to assume that particular species of action which affords the secretion of variolous matter. Are not the operation of all morbid poisons much more rationally explained upon the principles of this theory than upon those of absorption? And have we not reason to anticipate the explanation of the operation of all medicines upon the same principle? Certainly, the operation of opium, bark, wine, volatile alkali, arsenic, and a number of others, as before mentioned, are only explicable in this way.

Another fact, which very much invalidates the theory of absorption, is, that Dr. Physick, of Philadelphia, has proved, by various experi-

ments, that mercury, when administered for the cure of syphilis, does not enter into the circulation.

The antagonists of the sympathetic theory may probably urge this objection—that if the chyle is taken up by the lacteals, medicines, in consequence of their being taken into the stomach, and actually mixed with this fluid, must also be taken up at the same time. But the advocates of this opinion will do well to recollect, that the chyle is a bland, innocuous fluid, intended solely for the nourishment and support of the system.

Now, if this be the use to which the chyle is destined, it is clear that, if it carried along with it all the irritating and poisonous substances taken into the stomach, it would certainly be very far from answering this purpose. Neither does it appear to me reasonable to suppose, that nature ever intended the lacteals, or any part of the absorbent system, to take up or convey any thing but their own appropriate fluids. If they should, it would be contrary to the laws of physiology, to suppose that such substances should pass on through them in *propria forma*. I believe it is almost universally admitted, that the vessels themselves, by their own specific actions, form or secrete the fluids which they convey; consequently, if there ever is any thing absorbed or taken up by them, it must neces-

sarily undergo that peculiar change, in order that it may pass on through them. Further: if every thing that passes into the stomach and intestines was as readily absorbed and carried into the circulation as the chyle, the blood must necessarily, in a very short time, become one of the most heterogeneous and contaminated fluids in nature. But, contrary to all this, we find it to be one of the most mild, salutary, and nutritious; composed invariably of a certain number of constituent parts; never varying, either in health or disease, except in its consistency and the relative proportion of its constituent principles. Again: if things were absorbed and carried into the blood, we should certainly be enabled, by experiments, to discover them; but notwithstanding the vast number that have been instituted for this purpose, not the least particle of extraneous matter has ever been detected in it.

To conclude this subject, I would beg leave to ask the advocates for absorption, whether it appears in any way probable, or even possible, agreeable to the laws of chemistry, that a substance should remain, for any length of time, in so powerful a solvent and chemical agent as the gastric juice, without having wrought upon it some particular change?

If the doctrine of sympathy, nervous consent, or associated motion, whichever you may please to term it, explains, in a satisfactory and

rational manner, all the phenomena, and if the data upon which it is predicated be just, upon the principles of philosophical induction, it is certainly right to give this the preference to all others.

Much more might easily be adduced in support of this theory, but the limits which I have prescribed to this Dissertation will not permit.

To many it may appear an act of supererogation to offer any thing further respecting the beneficial effects of Vaccina. But the very illiberal conduct and groundless opposition inculcated and persisted in by many, induces me to make the following observations.

The first and most important advantage of Vaccine inoculation is, that those persons who have once regularly and truly passed through the disease are rendered thereby for ever after unsusceptible of the small-pox, either by inoculation or contagion. In proof of this assertion I might adduce numerous instances, upon the respectable authorities of Jenner, Ring, Aikin, Pearson, and many others who have written on the subject, of persons remaining completely secure from the attack of small-pox, for ten, twenty, thirty, forty, fifty, and even sixty years, after having been infected with Cow-pock: but, in order to save time, I shall beg leave to refer any person desirous of becoming more particularly informed on the subject, to the authors I have

quoted, and also to the Medical and Physical Journal of London, and to the Medical Repository of New-York, where he will find a detail of almost every thing that has transpired on the subject. Of its protecting the system for one, two, and even three years, against the effects of small-pox, we have numerous instances in our own city.

During my stay at the New-York Kine-pock Institution, about one hundred and twenty or thirty patients, as before stated, were inoculated with Cow-pock, ten of which number, at the request of the Medical Board, I, at the expiration of the year, tested with the most active and recent small-pox matter I could procure. The virus alluded to was taken from the pustules of a person labouring under a very full burthen of them in the natural way; a sufficient quantity of which, in the course of half an hour after it was procured, was carefully inserted into both arms of every one of the ten; but they uniformly resisted it; none of their inoculations exhibiting any other appearance of their having succeeded than a small red pimple, (and many of them not even this) which, as is usual in such cases, altogether disappeared, in a very short time, without the least symptom of small-pox. Several of the other patients have informed me that, since they had undergone vaccination, they had been repeatedly exposed to variolous contagion, in its most viru-

lent and concentrated form, but without the least effect. One of them told me, some time in May last, that he had slept, for several nights successively, in the same bed with a person who was labouring under the small-pox in the natural way, of a most malignant type, but had never experienced any inconvenience from it. The inflammation excited by the virus, in the cases above stated, is an undoubted proof of its activity.

Dr. Seaman, of this city, having very politely favoured me with the perusal of his official register, I am enabled, by his consent, to exhibit a statement of the number he has inoculated, and of the success he has met with. It appears that the number inoculated by him amounts to two hundred and forty-two, (*i. e.* from the 22d of May, 1801, till the 31st of August, 1802) of which fifty-eight have since undergone variolous inoculation, some of them repeatedly, but all with that uniform resistance that is ever consequent upon real Vaccina. It may, perhaps, be of importance to observe, that two of the number were taken into a room where a person was labouring under the casual small-pox, of a very malignant type, and were exposed to it in every way that could be devised: the pillow-case, which was so stiff with matter as nearly to stand erect, was even taken from under the head of the infected person, warmed by the fire, and held

under their noses; and they were made to put their hands into the bed to him, but all without effect. Such well authenticated cases as these, to which might be added a thousand more, equally well attested, must certainly be sufficient to carry full conviction to the most prejudiced mind.

To the prophylactic virtue of Vaccina may be added another of almost equal importance: I mean its salutary and effectual influence in the removal of many inveterate and disagreeable complaints. It is alleged by Dr. John Redman Coxe, of Philadelphia, and by many of the most eminent vaccinators in Europe, that children of weakly and debilitated constitutions frequently have their health amazingly improved by passing through the Cow-pock; so much so, in many instances, as to acquire a healthy and robust habit in a very short time.

In Duncan's Annals of Medicine, vol. i. lustrum 2, p. 327, there is a case related of a very singular chronical affection of the arm, which, after a lengthy and ineffectual treatment, with all the various medicines that could be devised, was, in a very short time, completely cured by inoculation with Vaccina.

In Turkey it is said to have proved effectual in securing persons from the plague.

In France (as mentioned in a former part of this dissertation) it has been successfully practised in preventing the rot in sheep: and it is sup-

posed, by Dr. Jenner, to produce a disease in the canine species, which renders them unsusceptible of hydrophobia. If this latter be the case, does not analogical reasoning lead us to the conclusion, that it may be productive of the same happy effect in the human species?

These, it appears, are the great and important advantages arising from the mild and benignant effects of Vaccina, which, in addition to its gentle aspect, unites the double advantage of giving to the system security against that deadly foe, the small-pox, and of removing from it many obstinate diseases: while the small-pox, on the contrary, although it is, by the present improved mode of inoculation, in a great measure disarmed of its terrors, in some instances proves fatal. And although fewer deaths happen in an equal number of persons who undergo the small-pox now than formerly, yet it must be admitted that the general prevalence of inoculation tends to spread and multiply the disease itself; of which, though its violence be much abated by the modern mode of treatment, the contagious quality remains in full force.

It deserves also to be noticed, that notwithstanding the fatality of the small-pox is very much lessened by the improvement in modern inoculation, the deaths induced by it are not inconsiderable: they are estimated at about one in every three hundred throughout England, and at

about one in every hundred in London; while the loss in the natural small-pox is probably not less than one in six. The same, no doubt, will apply in this country. It has been ascertained, by calculation, that not less than forty millions of the human species fall victims to the fatal ravages of this disease in every century!

It has been asserted by many, that although Vaccina, when conducted by skilful persons, may prove efficacious in shielding the constitution against the small-pox, its advantages over the latter were much depreciated on taking into consideration the vast number of accidents and mistakes that are liable to happen in it before the world shall have become sufficiently acquainted with its general laws. And they have from hence concluded, that the Cow-pock, in the aggregate, was rather an evil than a benefit to mankind. This, however, is a very flimsy pretext, for it is certainly much better to submit to temporary inconvenience than to be for ever afflicted with such a destructive evil as the small-pox. Nor ought it to be overlooked, that mistakes have frequently occurred in the inoculated variola; and instances are not wanting, in which persons supposed to have passed through it by inoculation, have caught it afterwards in the natural way. Several such cases I myself have witnessed.

To the fatality of the small-pox may be added the many irremediable affections which it fre-

quently leaves behind it in the system; as lameness, blindness, deafness, &c. It must be known to every experienced inoculator, that small-pox also calls into action the latent seeds of scrophula and other strumous complaints, of which there are many cases on record. Another, and which is considered by many as an imaginary evil of this disease, is the deformity of the skin which it frequently induces, even under the inoculated form. In the view of philosophy and reason, this may indeed be said to be an imaginary evil, unworthy of regard: but, until the world shall become peopled with philosophers and wise men, mankind will shudder at the contemplation of a disease which robs the most lovely part of creation of all their beauty.

Another important advantage which Vaccina possesses over the small-pox, is its non-contagious quality, being communicable in no other way than by inoculation, or an absolute insertion of the matter under the cuticle. Children that have never had the complaint may even sleep in the same bed with those that are infected with it, without experiencing the least inconvenience.

Why, then, upon an appreciation of all these important advantages of Vaccina, is the public mind so indifferent to its propagation? It is said that, in Sicily, it is received with enthusiasm, and that an hospital has been already established, by his Sicilian Majesty, for the inoculation of

the poor. Institutions of a similar nature have been established at Malta and Naples; and we are informed that vaccine inoculation has been adopted throughout the papal dominions, in the kingdom of Etruria, and in the Ligurian Republic. Is it not surprising that the magistrates and rulers of more enlightened nations do not follow their laudable example? Its progress, however, like that of all other innovations, though ever so well founded, must be slow, when the prejudices and prepossessions of the public are to be contended with. It is, nevertheless, established upon the broad and immutable basis of truth, which, firm as the Newtonian rock, will remain unshaken amidst the waste of ages; and the superstructure erected thereon will afford an asylum of protection, by recourse to which mankind will be enabled to rid themselves of a monster!

THE END.