

AN
INQUIRY
INTO
THE CAUSES AND EFFECTS
OF
THE VARIOLÆ VACCINÆ.

PRICE 7s. 6d.

I shall now conclude this Inquiry with some general observations on the subject and on some others which are interwoven with it.

Although I presume it may be unnecessary to produce further testimony in support of my assertion "that the Cow-pox protects the human constitution from the infection of the Small-pox," yet it affords me considerable satisfaction to say, that Lord Somerville, the President of the Board of Agriculture, to whom this paper was shewn by Sir Joseph Banks, has found upon inquiry that the statements were confirmed by the concurring testimony of Mr. Dolland, a surgeon, who resides in a dairy country remote from this, in which these observations were made. With respect to the opinion adduced "that the source of the infection

is a peculiar morbid matter arising in the horse," although I have not been able to prove it from actual experiments conducted immediately under my own eye, yet the evidence I have adduced appears sufficient to establish it.

They who are not in the habit of conducting experiments may not be aware of the coincidence of circumstances necessary for their being managed so as to prove perfectly decisive; nor how often men engaged in professional pursuits are liable to interruptions which disappoint them almost at the instant of their being accomplished: however, I feel no room for hesitation respecting the common origin of the disease, being well convinced that it never appears among the cows (except it can be traced to a cow introduced among the
 general

general herd which has been previously infected, or to an infected servant), unless they have been milked by some one who, at the same time, has the care of a horse affected with diseased heels.

The spring of the year 1797, which I intended particularly to have devoted to the completion of this investigation, proved, from its dryness, remarkably adverse to my wishes; for it frequently happens, while the farmers' horses are exposed to the cold rains which fall at that season that their heels become diseased, and no Cow-pox then appeared in the neighbourhood.

The active quality of the virus from the horses' heels is greatly increased after it has acted on the nipples of the cow, as it rarely happens that the
horse

horse affects his dresser with fores, and as rarely that a milk-maid escapes the infection when she milks infected cows. It is most active at the commencement of the disease, even before it has acquired a pus-like appearance; indeed I am not confident whether this property in the matter does not entirely cease as soon as it is secreted in the form of pus. I am induced to think it does cease*, and that it is the thin darkish-looking fluid only, oozing from the newly-formed cracks in the heels, similar to what sometimes appears from erysipelatous blisters, which gives the disease. Nor am I certain that the nipples of the cows are at all times in a state to receive the infection. The appearance of the disease in the spring and the

* It is very easy to procure pus from old sores on the heels of horses. This I have often inserted into scratches made with a lancet, on the found nipples of cows, and have seen no other effects from it than simple inflammation.

early part of the summer, when they are disposed to be affected with spontaneous eruptions so much more frequently than at other seasons, induces me to think, that the virus from the horse must be received upon them when they are in this state, in order to produce effects: experiments, however, must determine these points. But it is clear that when the Cow-pox virus is once generated, that the cows cannot resist the contagion, in whatever state their nipples may chance to be, if they are milked with an infected hand.

Whether the matter, either from the cow or the horse will affect the sound skin of the human body, I cannot positively determine; probably it will not, unless on those parts where the cuticle is extremely thin, as on the lips for example.

I have known an instance of a poor girl who produced an ulceration on her lip by frequently holding her finger to her mouth to cool the raging of a Cow-pox sore by blowing upon it. The hands of the farmers' servants here, from the nature of their employments, are constantly exposed to those injuries which occasion abrasions of the cuticle, to punctures from thorns and such like accidents; so that they are always in a state to feel the consequences of exposure to infectious matter.

It is singular to observe that the Cow-pox virus, although it renders the constitution unsusceptible of the variolous, should, nevertheless, leave it unchanged with respect to its own action. I have
already

already produced an instance * to point out this, and shall now corroborate it with another.

Elizabeth Wynne, who had the Cow-pox in the year 1759, was inoculated with variolous matter, without effect, in the year 1797, and again caught the Cow-pox in the year 1798. When I saw her, which was on the 8th day after she received the infection, I found her affected with general lassitude, shiverings, alternating with heat, coldness of the extremities, and a quick and irregular pulse. These symptoms were preceded by a pain in the axilla. On her hand was one large pustulous sore, which resembled that delineated in Plate No. 1.

* See Case IX.

It is curious also to observe, that the virus, which with respect to its effects is undetermined and uncertain previously to its passing from the horse through the medium of the cow, should then not only become more active, but should invariably and completely possess those specific properties which induce in the human constitution symptoms similar to those of the variolous fever, and effect in it that peculiar change which for ever renders it unsusceptible of the variolous contagion.

May it not, then, be reasonably conjectured, that the source of the Small-pox is morbid matter of a peculiar kind, generated by a disease in the horse, and that accidental circumstances may have again and again arisen, still working new changes upon it,

it, until it has acquired the contagious and malignant form under which we now commonly see it making its devastations amongst us? And, from a consideration of the change which the infectious matter undergoes from producing a disease on the cow, may we not conceive that many contagious diseases, now prevalent among us, may owe their present appearance not to a simple, but to a compound origin? For example, is it difficult to imagine that the measles, the scarlet fever, and the ulcerous sore throat with a spotted skin, have all sprung from the same source, assuming some variety in their forms according to the nature of their new combinations? The same question will apply respecting the origin of many other contagious diseases, which bear a strong analogy to each other.

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There are certainly more forms than one, without considering the common variation between the confluent and distinct, in which the Small-pox appears in what is called the natural way.—About seven years ago a species of Small-pox spread through many of the towns and villages of this part of Gloucestershire: it was of so mild a nature, that a fatal instance was scarcely ever heard of, and consequently so little dreaded by the lower orders of the community, that they scrupled not to hold the same intercourse with each other as if no infectious disease had been present among them. I never saw nor heard of an instance of its being confluent. The most accurate manner, perhaps, in which I can convey an idea of it is, by saying, that had fifty individuals been taken promiscuously and infected by

by

by exposure to this contagion, they would have had as mild and light a disease as if they had been inoculated with variolous matter in the usual way. The harmless manner in which it shewed itself could not arise from any peculiarity either in the season or the weather, for I watched its progress upwards of a year without perceiving any variation in its general appearance. I consider it then as a *variety* of the Small-pox*.

In some of the preceding cases I have noticed the attention that was paid to the state of the

* My friend Dr. Hicks, of Bristol, who during the prevalence of this distemper was resident at Gloucester, and Physician to the Hospital there, (where it was seen soon after its first appearance in this country) had opportunities of making numerous observations upon it which it is his intention to communicate to the Public.

variolous matter previous to the experiment of inserting it into the arms of those who had gone through the Cow-pox. This I conceived to be of great importance in conducting these experiments, and were it always properly attended to by those who inoculate for the Small-pox, it might prevent much subsequent mischief and confusion. With the view of enforcing so necessary a precaution, I shall take the liberty of digressing so far as to point out some unpleasant facts, relative to mismanagement in this particular, which have fallen under my own observation.

A Medical Gentleman (now no more), who for many years inoculated in this neighbourhood, frequently preserved the variolous matter intended for his use, on a piece of lint or cotton, which, in
its

its fluid state was put into a vial, corked, and conveyed into a warm pocket; a situation certainly favourable for speedily producing putrefaction in it. In this state (not unfrequently after it had been taken several days from the pustules) it was inserted into the arms of his patients, and brought on inflammation of the incised parts, swellings of the axillary glands, fever, and sometimes eruptions. But what was this disease? Certainly not the Small-pox; for the matter having from putrefaction lost, or suffered a derangement in its specific properties, was no longer capable of producing that malady, those who had been inoculated in this manner being as much subject to the contagion of the Small-pox, as if they had never been under the influence of this artificial disease; and many, unfortunately, fell

victims to it, who thought themselves in perfect security. The same unfortunate circumstance of giving a disease, supposed to be the Small-pox, with inefficacious variolous matter, having occurred under the direction of some other practitioners within my knowledge, and probably from the same incautious method of securing the variolous matter, I avail myself of this opportunity of mentioning what I conceive to be of great importance; and, as a further cautionary hint, I shall again digress so far as to add another observation on the subject of Inoculation

Whether it be yet ascertained by experiment, that the quantity of variolous matter inserted into the skin makes any difference with respect to the subsequent mildness or violence of the disease, I
 know

know not; but I have the strongest reason for supposing that if either the punctures or incisions be made so deep as to go *through* it, and wound the adipose membrane, that the risk of bringing on a violent disease is greatly increased. I have known an inoculator, whose practice was "to cut deep enough (to use his own expression) to see a bit of fat," and there to lodge the matter. The great number of bad Cases, independent of inflammations and abscesses on the arms, and the fatality which attended this practice was almost inconceivable; and I cannot account for it on any other principle than that of the matter being placed in this situation instead of the skin.

It was the practice of another, whom I well remember, to pinch up a small portion of the skin

on the arms of his patients and to pass through it a needle, with a thread attached to it previously dipped in variolous matter. The thread was lodged in the perforated part, and consequently left in contact with the cellular membrane. This practice was attended with the same ill success as the former. Although it is very improbable that any one would now inoculate in this rude way by design, yet these observations may tend to place a double guard over the lancet, when infants, whose skins are comparatively so very thin, fall under the care of the inoculator.

A very respectable friend of mine, Dr. Hardwicke, of Sodbury in this county, inoculated great numbers of patients previous to the introduction of the more moderate method by Sutton, and with
such

such success, that a fatal instance occurred as rarely as since that method has been adopted. It was the doctor's practice to make as slight an incision as possible *upon* the skin, and there to lodge a thread saturated with the variolous matter. When his patients became indisposed, agreeably to the custom then prevailing, they were directed to go to bed and were kept moderately warm. Is it not probable then, that the success of the modern practice may depend more upon the method of invariably depositing the virus in or upon the skin, than on the subsequent treatment of the disease?

I do not mean to insinuate that exposure to cool air, and suffering the patient to drink cold water when hot and thirsty, may not moderate the eruptive symptoms and lessen the number of pustules;
yet

yet, to repeat my former observation, I cannot account for the uninterrupted success, or nearly so, of one practitioner, and the wretched state of the patients under the care of another, where, in both instances, the general treatment did not differ essentially, without conceiving it to arise from the different modes of inserting the matter for the purpose of producing the disease. As it is not the identical matter inserted which is absorbed into the constitution, but that which is, by some peculiar process in the animal economy, generated by it, is it not probable that different parts of the human body may prepare or modify the virus differently? Although the skin, for example, adipose membrane, or mucous membranes are all capable of producing the variolous virus by the stimulus given by the particles originally deposited upon them,

yet

yet I am induced to conceive that each of these parts is capable of producing some variation in the qualities of the matter previous to its affecting the constitution. What else can constitute the difference between the Small-pox when communicated casually or in what has been termed the natural way, or when brought on artificially through the medium of the skin? After all, are the variolous particles, possessing their true specific and contagious principles, ever taken up and conveyed by the lymphatics unchanged into the blood vessels? I imagine not. Were this the case, should we not find the blood sufficiently loaded with them in some stages of the Small-pox to communicate the disease by inserting it under the cuticle, or by spreading it on the surface of an ulcer? Yet experiments have determined the impracticability

practicability of its being given in this way ; although it has been proved that variolous matter when much diluted with water, and applied to the skin in the usual manner, will produce the disease. But it would be digressing beyond a proper boundary, to go minutely into this subject here.

At what period the Cow-pox was first noticed here is not upon record. Our oldest farmers were not unacquainted with it in their earliest days, when it appeared among their farms without any deviation from the phænomena which it now exhibits. Its connection with the Small-pox seems to have been unknown to them. Probably the general introduction of inoculation first occasioned the discovery.

Its rise in this country may not have been of very remote date, as the practice of milking cows might formerly have been in the hands of women only; which I believe is the case now in some other dairy countries, and, consequently that the cows might not in former times have been exposed to the contagious matter brought by the men servants from the heels of horses*. Indeed a knowledge of the source of the infection is new in the minds of most of the farmers in this neighbourhood, but it has at length produced good consequences; and it seems probable from the precautions they are now disposed to adopt, that the

* I have been informed from respectable authority that in Ireland, although dairies abound in many parts of the Island, the disease is entirely unknown. The reason seems obvious. The business of the dairy is conducted by women only. Were the meanest vassal among the men, employed there as a milker at a dairy, he would feel his situation unpleasant beyond all endurance.

appearance of the Cow-pox here may either be entirely extinguished or become extremely rare.

Should it be asked whether this investigation is a matter of mere curiosity, or whether it tends to any beneficial purpose? I should answer, that notwithstanding the happy effects of Inoculation, with all the improvements which the practice has received since its first introduction into this country, it not very unfrequently produces deformity of the skin, and sometimes, under the best management, proves fatal.

These circumstances must naturally create in every instance some degree of painful solicitude for its consequences. But as I have never known fatal effects arise from the Cow-pox, even when
 impressed

impressed in the most unfavourable manner, producing extensive inflammations and suppurations on the hands; and as it clearly appears that this disease leaves the constitution in a state of perfect security from the infection of the Small-pox, may we not infer that a mode of Inoculation may be introduced preferable to that at present adopted, especially among those families, which, from previous circumstances we may judge to be predisposed to have the disease unfavourably? It is an excess in the number of pustules which we chiefly dread in the Small-pox; but, in the Cow-pox, no pustules appear, nor does it seem possible for the contagious matter to produce the disease from effluvia, or by any other means than contact, and that probably not simply between the virus and the cuticle; so that a single individual in a family

might at any time receive it without the risk of infecting the rest, or of spreading a distemper that fills a country with terror. Several instances have come under my observation which justify the assertion that the disease cannot be propagated by effluvia. The first boy whom I inoculated with the matter of Cow-pox, slept in a bed, while the experiment was going forward, with two children who never had gone through either that disease or the Small-pox, without infecting either of them.

A young woman who had the Cow-pox to a great extent, several sores which matured having appeared on the hands and wrists, slept in the same bed with a fellow-dairy maid who never had been infected with either the Cow-pox or the Small-pox, but no indisposition followed.

Another

Another instance has occurred of a young woman on whose hands were several large suppurations from the Cow-pox, who was at the same time a daily nurse to an infant, but the complaint was not communicated to the child.

In some other points of view, the inoculation of this disease appears preferable to the variolous inoculation.

In constitutions predisposed to scrophula, how frequently we see the inoculated Small-pox, rouse into activity that distressful malady. This circumstance does not seem to depend on the manner in which the distemper has shewn itself, for it has as frequently happened among those who have had it mildly, as when it has appeared in the contrary way.

There

There are many, who from some peculiarity in the habit resist the common effects of variolous matter inserted into the skin, and who are in consequence haunted through life with the distressing idea of being insecure from subsequent infection. A ready mode of dissipating anxiety originating from such a cause must now appear obvious. And, as we have seen that the constitution may at any time be made to feel the febrile attack of Cow-pox, might it not, in many chronic diseases be introduced into the system, with the probability of affording relief, upon well-known physiological principles?

Although I say the system may at any time be made to feel the febrile attack of Cow-pox, yet I have a single instance before me where the virus acted

acted locally only, but it is not in the least probable that the same person would resist the action both of the Cow-pox virus and the variolous.

Elizabeth Sarfenet lived as a dairy maid at Newpark farm, in this parish. All the cows and the servants employed in milking had the Cow-pox; but this woman, though she had several sores upon her fingers, felt no tumors in the axillæ, nor any general indisposition. On being afterwards casually exposed to variolous infection, she had the Small-pox in a mild way.—Hannah Pick, another of the dairy maids who was a fellow-servant with Elizabeth Sarfenet when the distemper broke out at the farm was, at the same time infected; but this young woman had not only sores upon her hands, but felt herself also much indisposed for a day

day or two. After this, I made several attempts to give her the Small-pox by inoculation, but they all proved fruitless. From the former Case then we see that the animal economy is subject to the same laws in one disease as the other.

The following Case which has very lately occurred renders it highly probable that not only the heels of the horse, but other parts of the body of that animal, are capable of generating the virus which produces the Cow-pox.

An extensive inflammation of the erysipelatous kind, appeared without any apparent cause upon the upper part of the thigh of a sucking colt, the property of Mr. Millet, a farmer at Rockhampton, a village near Berkeley. The inflammation con-
tinued

tinued several weeks, and at length terminated in the formation of three or four small abscesses. The inflamed parts were fomented, and dressings were applied by some of the same persons who were employed in milking the cows. The number of cows milked was twenty-four, and the whole of them had the Cow-pox. The milkers, consisting of the farmer's wife, a man and a maid servant, were infected by the cows. The man servant had previously gone through the Small-pox, and felt but little of the Cow-pox. The servant maid had some years before been infected with the Cow-pox, and she also felt it now in a slight degree: But the farmer's wife who never had gone through either of these diseases, felt its effects very severely.

That the disease produced upon the cows by the colt and from thence conveyed to those who milked them was the *true* and not the *spurious* Cow-pox*, there can be scarcely any room for suspicion; yet it would have been more completely satisfactory, had the effects of variolous matter been ascertained on the farmer's wife, but there was a peculiarity in her situation which prevented my making the experiment.

Thus far have I proceeded in an inquiry, founded, as it must appear, on the basis of experiment; in which, however, conjecture has been occasionally admitted in order to present to persons well situated for such discussions, objects

* See Note in Page 7.

for a more minute investigation. In the mean time I shall myself continue to prosecute this inquiry, encouraged by the hope of its becoming essentially beneficial to mankind.

FINIS.

ERRATA.

- Page 5, Line 4, after the word *shiverings* insert *succeeded by heat*.
Line 16, for *needlestly* read *heedlestly*.
- 24, Last line but one, for *fore* read *tumour*.
- 40, Line 12, for *Macklove* read *Marklove*.
- 41, Note—for *scepticus* read *septicus*.
- 60, Last line, for *moderate* read *modern*.