and its poison; and in a deep penetrating bite shoving in a stick of nitrate silver hard is very much like repeating the bite, and serves to drive the deeper-lying saliva only deeper still into the tissues and so to place it farther outside, and hence better protected by the albumen-coagulum film formed in the wound by the nitrate of silver treatment. If no albumen were coagulated in the wound, the caustic would or might reach the farthest off and most deeply-lying saliva. But as nitrate of silver forms an albumen-coagulum, why not use an equally strong caustic which forms no coagulum? Hence the use of the fuming acid, which dissolves all albumen it reaches, and penetrates at once without the use of force into all the surrounding tissue spaces. The same holds good for all kinds of bites, and the penetrating acid kills all it reaches. One or two drops suffice for each bite, and the slough soon separates, and the clean wound then left heals readily. I have treated a great many bites in this way, and when my own dogs have gone mad I have invariably found that they had been bitten while I was away from home for some few days on some inspection duty.

Holding the views I have above indicated, I have always strongly objected to cauterising any bites with nitrate of silver, and have invariably advocated the use of strong acid. But whatever the immediate treatment is, it must be prompt. Otherwise, though a domestic animal may be kept under observation, for the human subject there is nothing for it than a visit to a Pasteur Institute, and the sooner India has one the better.

TWO YEARS OF ANTI-CHOLERAIC INOCULATIONS: BEING A REPORT SUBMITTED TO THE CHAIRMAN OF THE CALCUTTA CORPORATION ON JULY 1st, 1896.

By W. J. Simpson, M.D.,
Health Officer, Calcutta.

I have the honour to submit to you the results of the anti-choleraic inoculation work as carried on in Calcutta during the past two years.

2. The vaccines used for this work are prepared in the Laboratory by a specially trained Medical Officer, and the inoculations in the bustees and other parts of Calcutta are done by another Medical Officer.

The following records of the inoculations are kept in the Health Office:—

(1) A daily register filled up at the time of inoculation containing name, father's name, sex, age, caste, occupation, residence and place of inoculation; also any relatives who may be inoculated:

(2) An alphabetical register containing the names of the inoculated with the above details, so that ready reference can be made as to whether a person attacked with cholera has been inoculated:

(3) A ward register showing the residences of the inoculated people, so that when any particular locality is affected with cholera, the inoculated in that locality may be easily found.

3. The number of people inoculated during the period under review was 7,690; of these 5,853 are Hindus, 1,476 Mahomedans, and 361 other classes. The 7,690 inoculations were carried out chiefly by one medical man, who, at the same time, has to perform other duties, such as registering the inoculations, investigating cases and explaining to the people the object of the inoculations. Considering that the system is a new one, that the inoculations are purely voluntary, and everything connected with them has to be explained before the confidence of the people can be obtained, and considering how long new ideas are in taking root among the general population, and in this case it is not merely the acceptance of an idea, but such faith in it as to consent to submit to an operation, the number is certainly satisfactory for a beginning.

The present problem can be compared with the introduction of vaccination against small-pox into Calcutta. It took 25 years before the number of vaccinations reached an average of 2,000; whereas the inoculations against cholera have in two years nearly doubled that average. This is a proof that, in spite of the difficulties which every new movement naturally has to meet with, there are large numbers of people anxious to avail themselves of the protective effect of the inoculations.

4. There is a certain discomfort produced by the inoculations, such as an attack of fever lasting about 24 hours, pain at the seat of inoculation on moving, thus interfering with heavy physical work for about 36 hours. The discomfort is not, however, worse than that induced by vaccination when the vesicles have risen well, and it has the advantage of not lasting nearly so long. The method of inoculation has been recently simplified by dispensing with the first vaccine, the second now being used directly in smaller doses. This increases slightly the degree of discomfort, but does away with the necessity of undergoing two inoculations. As in vaccination, the symptoms after inoculation, *i.e.*, the degree and duration of the fever and local effect vary according to the idiosyncracy or peculiarity of constitution of the inoculated person; but it is necessary to prominently bring to notice that, although all sorts and conditions of individuals, weak and strong, sickly and healthy, young and old, well-nourished and badly nourished, and often persons suffering from chronic diseases have been inoculated, in every instance without exception, the inoculations have proved perfectly harmless. In several instances like that lately in Serampur, reports have been spread that injury has followed the inoculations. On investigation it has been proved by the official medical and civil authorities that these reports were absolutely untrue. Since

the system is new, and disquieting rumours are harmful, it is important that the Commissioners should know the real state of things in order that they may be able to give assistance in dispelling any false notions on the subject.

5. When an epidemic, such as cholera attacks a town, there are always localities and classes of the population which are not reached by the infection, while, on the other hand, even among those who are actually exposed to the infection, there are a number who escape owing to their hereditary or gradually acquired powers of resistance. As a rule, outbreaks occur in particular localities and houses. The investigations on the effect of the inoculations are made exclusively in those houses in which cholera has actually occurred, the object being to ascertain and compare the incidence of cholera on the inoculated and not inoculated in those houses in which inoculations have been previously carried out. For this purpose affected houses in which inoculations have not been performed and inoculated houses in which cholera has not appeared, are excluded, as they do not generally furnish a reliable basis for comparison.

6. Cases of cholera are notified to the Municipal Office by the following agencies. The registrars of births and deaths of each of the wards; the sub-registrars of the burning ghâts and burial grounds; the authorities of the local hospitals, jails and the fort; the police; the medical practitioners who are asked in confirmity with the Municipal law to notify all cases of cholera on special postcards with which they are provided; and by officers of the Health Department. All notified cases are immediately subjected to an enquiry by the Medical Inspector in charge of the district who has personally to visit the house, and take the necessary precautionary measures to prevent the spread of the disease. In his enquiry as to the circumstances of the attack, he has to fill up a printed form embodying the necessary information, and one of the questions, since the introduction of the inoculation, is whether there are any inoculated people in the house, and whether the attacked person was inoculated or not. This information is at once communicated to the Health Office, and when the case occurs in a house where inoculated people live, the Medical Officer in charge of the inoculations immediately visits the house accompanied by the Medical Inspector, and makes a thorough investigation as to the particulars of inoculated and uninoculated inmates and the incidence of cholera on these respectively. The accuracy of statements as to who are inoculated is checked by the inoculation registers which have already been referred to. A list of these cases is given to the Health Officer who periodically visits the cases and verifies the results. On two occasions the results have been subjected to a further scrutiny. In July 1895, when the number of houses in which observations had been made were 36, M. Haffkine revisited with me ten of the most important which he had not previously seen, and satisfied himself that the returns were absolutely accurate. He would have seen all, but he was not well at the time. And quite recently, during my absence in England, Surgeon-Captain Robson-Scott, I.M.S., Deputy Sanitary Commissioner of the Presidency Circle, made a special investigation on the subject which lasted for several weeks. Dr. Mookerjee and Dr. Chowdry of the Municipal Medical Service were specially deputed to assist him in his enquiry, and the local Medical Inspectors were asked to give him every assistance. The enquiry consisted in visiting affected localities, and those in which inoculations had been carried out and in collecting information from the members of the household and neighbours which, on being brought to the Health Office, was checked by the inoculation registers and by the cholera death registers. The result of this investigation confirmed the accuracy of the previous observations, and Surgeon-Captain Robson-Scott has furnished me with the following Note :—

"In compliance with your request of yesterday, I now send you a short account of my visits to the bustees in Calcutta during last May.

"In the beginning of last May, M. Haffkine asked me to visit those wards in the Town in which anti-choleraic inoculations had been performed on the inhabitants, with the view of testing the accuracy of already recorded observations, and to try and find out if any observations had been missed.

"During the eleven afternoons or mornings that were devoted to the work, 14 wards were visited, and enquiries were made in 164 different bustees and houses. I was either accompanied by a Medical Inspector or by the Town Inoculator (Dr. Chowdry) and was taken by them to the various quarters where inoculations had been carried out.

"First of all I found out from the inhabitants those dwellings in which cholera had broken out, and afterwards the individual residents in those particular dwellings were questioned, and their statements taken down by me.

"I have been able to convince myself that the method of recording the observations in Calcutta is most satisfactory, and that the recorded observations are correctly stated.

"I intend to continue these visits to the bustees in Calcutta from time to time, and I shall be glad to furnish you with any new information I may gain."

7. The appended table embodies all the observations made since these inoculations were first introduced into Calcutta up to the end of last month. They show that cholera visited no fewer than 76 houses in which one portion of the inmates had been inoculated and the other not, and 1 house in which all the members had been inoculated. The tables give the address, number of inoculated and not inoculated members in the affected household and particulars concerning the attacked.

8. In 77 houses there were 89 deaths from cholera, 77 being among the uninoculated and 12 among the inoculated. The following is an analysis of the observations, showing the relative resistance to cholera of the inoculated and not inoculated, and the distribution of the occurrences in time. This analysis has been kindly made by M. Haffkine, who was furnished with the necessary material by the Officiating Health Officer.

As in six houses in which uninoculated people were attacked, and the inoculated escaped, the

the total inmates, thus allowing very little chance of the inoculated being affected these cases are not counted in the subjoined tables. As regards the rest, the result is exhibited in the following table, which shows the days on which cholera occurred among the non-inoculated and inoculated living in the same households:—

Amongst the uninoculated members after—1, 2, 3, 4, 5, 6, 9, 12, 13, 15, 17, 22, 34, 37, 44, 57, 62, 63, 71, 95, 99, 109, 114, 118, 119, 120, 129, 132, 139, 143, 162, 189, 191, 203, 240, 251, 271,——219——281, 284, 300, 309, 318, 319, 334, 356, 359, 362, 370, 372, 378, 383, 384, 389, 391, 393, 394, 401, 404, 408, 416, 433, 446, 448, 453, 472, 493, 498, 673, 720, 723, 724 and 738 days.

And amongst the inoculated of the same households after, 0, 2, 3, 4,——421,——459——512,——688,——735, and 738 days.

This statement shows in a very characteristic manner firstly that, during the first four days after the inoculation, cholera occurred among the inoculated and non-inoculated, though in a smaller degree among the inoculated as will be shown later on; secondly, after the first four days, there was a period of over a year when there was almost an absolute freedom among the inoculated, while among the non-inoculated in the same houses, cases were occurring during the whole year; and thirdly, after this period cases began gradually to reappear among the inoculated as well as among the non-inoculated.

The grouping of the data according to these three periods gives the following result:—

In the houses where cholera occurred during the first four days—a period in which the protective influence of the vaccine is gradually asserting itself,—there were—

167 uninoculated individuals, who had six deaths (3·59 per cent.) and three attacks ending in recovery, and—

259 inoculated persons who had five deaths (1·93 per cent.) and one attack with recovery.

II. In the houses where cholera occurred during the second period extending over a year, there lived—

502 non-inoculated who had 42 deaths (8·37 per cent.) and five attacks ending in recovery, and—

269 inoculated who had one death (0·37 p. c.)

III. In the houses where cholera had occurred during the third period, *i.e.*, more than a year after inoculation, there were—

238 uninoculated who had 23 deaths (9·66 per cent.) and three attacks with recovery, and—

96 inoculated who had six deaths (6·25 p. c.)

Thus a comparison of the proportion of deaths among the inoculated and non-inoculated in the three periods gives the following result. During the first period of four days, the number of deaths among the inoculated was 1·86 times smaller than among the non-inoculated. During the second period lasting over a year the number of deaths among the inoculated was 22·62 times smaller than among the non-inoculated; and during the third period, *i.e.*, more than a year after the inoculation, the number of deaths among the inoculated was only 1·54 times smaller than the non-inoculated.

Of the six inoculated belonging to the last group, who were attacked more than a year after inoculation, five had *received* only one inoculation, with the first weak anti-cholera vaccine, and the 6th inoculated on the 3rd of June, 1894, had two inoculations given in very weak doses, as was practised before the observation made in July and August, 1894, in the East Lancashire Regiment in Lucknow. In this observation at Lucknow, it was shown for the first time that the effect of weak doses, with which the inoculations were begun in India, tends to disappear as time goes on, and this is confirmed by the Calcutta statistics. This fact brings the Calcutta statistics into conformity with those obtained in other parts of India, and thus confirms the accuracy of the observations made. Since the latter part of 1894 the doses used in the treatment and the strength of the vaccines have been increased, with the object of producing a more lasting effect. But no figures are as yet available to demonstrate whether by such increased doses the object we aim at is actually obtainable.

Without excluding the occurrences of cholera in the inoculated during the four days necessary for treatment, and considering the results for the whole period of time, from the first day of the operations in Calcutta up to the end of last month, the results are as follows:—

654 uninoculated individuals had 71 deaths (10·86 per cent.), while

402 inoculated in the same households had 12 deaths (2·99 per cent.).

9. This shows that notwithstanding the incomplete protective effect of the first four days and the gradual disappearance of the resistance in those inoculated with weak doses of weak vaccines, which a large number of the inoculated people have received, the mortality amongst the inoculated, compared with that of the uninoculated, was in the proportion of 1 to 3·63, giving a reduction of mortality of 72·47 per cent., or, in other words, in houses where inoculations were performed, and which were subsequently visited by cholera, there occurred for every 11 deaths amongst the uninoculated three deaths amongst a similar number of inoculated.

The results of Calcutta are fully confirmed by those obtained in other parts of India wherever it was possible to make all the necessary observations with precision, and wherever the cases were sufficiently numerous to show the effect of the inoculation. A summary of these cases is subjoined.

Outside Calcutta, since the commencement of the inoculations in India in April, 1893, opportunities for an exact comparison of the respective powers of resistance against cholera of inculated and non-inoculated persons presented number of inoculated present was under $\frac{1}{10}$th of

themselves—(1) in Lucknow in the East Lancashire Regiment; (2) in Gaya in the Jail; (3) in Cachar among the tea garden coolies; (4) in Margherita among coolies of the Assam-Burmah Railway Survey; (5) in Durbhanga in the Jail; (6) in the cooly camp at Bilaspur; and (7) in Serampur among the general population.

(1) In the East Lancashire Regiment the inoculations were done with weak vaccines given in weak doses. Cholera occurred between the 14th and 15th month after inoculation, with the following result:—

640 non-inoculated soldiers had 120 cases (18·75 per cent.) with 79 deaths (12·34 per cent.).

133 inoculated soldiers had 18 cases (13·53 per cent.) with 13 deaths (9·77 per cent.).

(2) In Gaya the inoculations with weak vaccines in weak doses were applied during an existing epidemic, with results as follows:—

202 non-inoculated prisoners had 20 cases. (9·90 per cent.) with ten deaths (4·95 per cent.).

207 inoculated prisoners had eight cases (3·86 per cent.) with five deaths (2·41 per cent.).

(3) In the Cachar tea gardens according to the latest report from Dr. Arthur Powell, the Medical Officer, the result of the inoculations since their introduction among the coolies is as follow:—

Kalain—

1,079 Uninoculated—50 cases, 30 deaths = 2·78 per cent.

1,250 Inoculated—3 cases, 2 deaths = 0·16 per cent.

Kalaincherra—

685 Uninculated—10 cases, 7 deaths = 1·02 per cent.

155 Inoculated nil nil.

Degubber—

250 Uninoculated—12 cases, 10 deaths = 3·94 per cent.

407 Inoculated—5 cases with recovery, nil.

Duna—

121 Uninoculated—4 cases, 2 deaths = 1·65 per cent.

29 Inoculated nil nil.

Sandura—

454 Uninoculated—2 cases, 1 death = 0·22 per cent.

51 Inoculated—1 case with recovery, 1 death = 1·96 per cent.

Karkuri—

198 Uninoculated—15 cases, 9 deaths = 4·54 per cent.

443 Inoculated—2 cases with recovery, 1 death = 0·23 per cent.

Craig Park—

185 Uninoculated—1 case, 1 death = 0·54 per cent.

46 Inoculated nil nil.

The summary of these gardens gives the following results:—

Uninoculated 2,976 had 60 deaths = 2·02 and 94 cases = 3·16.

Inoculated 2,381 had 4 deaths = 0·17 and 11 cases = 0·56.

This table shows that, amongst the inoculated, there were 11·88 times fewer deaths and 6·87 fewer cases than among the uninoculated.

(4) In Margherita, in a camp of coolies, collected for the Assam-Burmah Railway Survey, and escorted by the Assam Military Police, there were—

(*a*) Among the 12 Gurkha sepoys, who were not inoculated, one fatal case; and—

(*b*) Among 147 non-inoculated coolies, 33 cases (22·44 per cent.) with 29 deaths (19·25 per cent.).

Among 196 inoculated coolies four cases (2·04 per cent.), with 4 deaths (2·04 per cent.).

(5) In the Durbhanga Jail, cholera continued only four days after inoculation, with the following results:—

99 non-inoculated prisoners had 11 cases (11·11 per cent.) with 11 deaths (11·11 per cent.).

110 inoculated had five cases (4·54 per cent.) with three deaths (2·73 per cent.).

(6) In the cooly camp at Bilaspur, Central Provinces—

100 non-inoculated had five deaths (5 per cent.);

150 inoculated had one death (0·67);

the proportion of deaths among the inoculated being 7·5 times less than among the non-inoculated.

(7) In Serampur:—

During the first two days after inoculation—

51 non-inoculated had one death and one case with recovery—

27 inoculated had one death and one case with recovery.

After the first two days after inoculation—

51 non-inoculated had one death and two attacks with recovery.

42 inoculated had nil and one attack with recovery.

In cases such as Serampur where the occurrences are few and have occurred during the first days, no conclusion can be drawn.

10. In addition to the evidence drawn from direct observations on man in epidemics, and which has been adduced in this report proving the efficacy of the inoculations against cholera, I beg to bring to the notice of the Commissioners a further proof of their protective power derived from a totally different series of experiments. I was recently in Berlin, and visited the Imperial Institute for infectious disease, where I had a long conversation with Professor Koch on the subject of the anti-choleraic inoculations. He informed me that the results of the observations made in India had perfectly satisfied him of the value of the inoculations, and that recently a series of experiments instituted by himself, Professor Pfeiffer and Dr. Kolle had enabled them to prove that the inoculations were protective. A little over six months ago the doctors, students and others belonging to the Imperial Institute were inoculated against cholera, and

the serum of their blood was afterwards taken and subjected to certain experiments which conclusively showed that the serum of inoculated people has a rapid and absolutely destructive effect on the *comma bacillus*, exceeding in this respect by 200 times the power of the serum of ordinary individuals.

11. Thus the evidence that the inoculations are of a protective nature is of the strongest character whether we consider the observations obtained in Calcutta, or those collected from other parts of India, and this evidence amounts to positive demonstration when to these facts carefully collected during the past two years in India, and the previous experiments carried out by M. Haffkine in Paris, and which gave rise to these inoculations, there are added the experimental facts regarding the serum of the blood of the inoculated and the special properties it acquires after inoculation. The mass of evidence is so strong that it has convinced the scientific authorities in England who for a long time considered that sufficient evidence was lacking as regards the casual relationship between the *comma bacillus* and cholera. When I visited, in May last, the Laboratory of Dr. Klein, the eminent bacteriologist to the Local Government Board of England, he informed me that he was perfectly convinced now that the *comma bacillus* is the causal agent of cholera, and he no longer, as formerly, entertains any doubts on the subject. This is a most important communication from a scientist who, in his position as a scientific adviser to the medical Department of the Local Government Board, has for a long time exercised great caution in giving a decisive opinion, though always prepared with an open mind, to consider new facts experimental or otherwise.

With these facts before the Commissioners there can be no hesitation in permanently continuing the anti-choleraic grant, so that inoculations may become in Calcutta one of the agencies by which the Health Department combats cholera. With *comma bacilli*, in cholera seasons, in the river where so many take their daily bath, in Tolly's Nullah and the Circular Canal, the water of which is used for domestic purposes, in the bathing-platforms and in many tanks the risks to the poorer people of being attacked with cholera is exceedingly great, and it is my duty to urge upon the Commissioners the importance of adding to their defensive weapons against cholera the powerful one of inoculation.

FOUR CASES OF YAWS: WITH REMARKS ON THE IMPORTANCE OF RECOGNISING AND SEGREGATING CASES IN INDIA.*

By Surgn.-Capt. H. Pilgrim, M.B. (London).

A few days ago when inspecting coolies on an emigrant ship just returned from Fiji, I came across four typical cases of Yaws, or "Coco" as they call it in Fiji. Having been in the West Indies for several years, I was able to recognise that these cases were in all essentials identical with yaws, the ravages of which disease in many of the islands of the West Indies are so notorious and far-reaching, that the public there spot it at once, in the same way as with us they usually recognise chicken-pox or measles. I have thought it well to show these cases to the Medical Society and to comment on them, not only because the disease is most interesting and rare, so rare that I am sure very few of you can have seen it, but also because I think it is most important that we in India should be able to readily recognise the disease whenever we meet it, and take steps, when possible, to prevent the spread of so contagious a disease amongst the teeming population of India. To assist the imagination in realising the danger and results of such an extension of the disease, I will tell you what has happened in the West Indies. Whether the disease originated or not with the negroes in Africa (and this seems doubtful) there can be no reasonable doubt that it was introduced into the West Indies by the African negroes that were imported in thousands to serve as slaves. From that time up to the emancipation in 1838, it was more or less prevalent in an epidemic form in all the islands, the prevalence being much increased by a practice that existed amongst the slaves of inoculating themselves or "buying the yaws" as they called it, with a view to escaping work and qualifying for all the privileges in medical comforts that were freely given to such as were affected by this disease. After the emancipation it considerably decreased in most of the islands, and in two of them has completely disappeared. In the sixties, however, there was a marked recrudescence of the disease in several of the islands, the type became severe, and the disease spread so extensively amongst the black population, that various industries began to suffer, and later on Bowerbank remarks that, "the coolie immigration was crippled by the ravages of this disease;" still later on the matter was represented to the Home authorities, and we find in 1871 the Colonial Office applying to the College of Physicians for advice as to how this disease might best be dealt with; that learned body was obliged to admit that they knew next door to nothing about it, and were not in a position to advise as to what measures should be adopted for arresting the progress of the disease. As a result of recognising more clearly the contagious nature of this disease, in several of the islands yaws hospitals were established for its isolation and treatment. In Dominica the industries were suffering so severely from the disabling effects of this disease on its labourers, that they went a step further; and the Legislature passed various laws by which the *compulsory* segregation of every one suffering from yaws was effected; and for the better

* A paper read at the July meeting of the Calcutta Medical Society.