Cholera in Calcutta in 1894, and, anti-choleraic inoculation / W.J. Simpson.

CHOLERA IN CALCUTTA

IN

1894

AND ANTI-CHOLERAIC INOCULATION.

CHOLERA.

(Re-printed from Health Officer's Annual Report on the Health of Calcutta for 1894.)

Cholera.

1. The mortality from cholera, though nearly twice as high in 1894 as 1893, which recorded the lowest mortality on record, was well below the average; there were 1,695 deaths, and of these 577 occurred in Suburban Calcutta and 1,118 in Urban Calcutta. The figures are as follows :—

	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.
Town	2,272	1,603	1,741	1,198	1,734	1,079	963	1,553	1,257	596	1,118
Suburbs	...	...	...	...	...	1,236	916	1,402	762	273	577
Combined Area ...	...	...	...	...	...	2,315	1,879	2,955	2,019	869	1,695

An investigation into the distribution of comma bacilli in Calcutta, more especially in water.

2. The heaviest mortality was in March and April, and it was at the beginning of the latter month that an investigation was undertaken by Professor Haffkine and myself to ascertain the distribution of comma bacilli in Calcutta, specially in water. For this purpose 582 specimens were collected in 211 localities and examined. Of the 211 localities, 110 were from tanks, 15 from private wells inside houses, 26 from drains, 12 from the river Hooghly, 4 from canals, 4 from bathing-platforms, 24 from street hydrants and 24 from milk markets and vendors, 4 of food and 4 of air in infected houses. Of the 582 specimens no fewer than 432 were of tank waters. The tanks or ponds form a special feature in the physical topography of Calcutta. Originally excavated to raise the surrounding land, in order that huts and houses might be built on the raised land, the tanks became useful, first, as reservoirs of rain-water for supplying the neighbourhood, or the surrounding cluster of huts, with water for drinking and for domestic purposes; and, secondly, as a convenient receptacle into which the drainage of the locality should flow. Different districts differ in the number of ponds which they contain; some are honeycombed with these tanks, and during the rainy season there is actually in some areas more water than land; others have fewer tanks, and a number of them are protected from drainage pollution. The public tanks are also, as a general rule, well looked after; but the majority of tanks are the mere drainage cesspools of the locality. Much has been said regarding the filthiness of these ponds. They more or less resemble pea-soup in colour, and their composition has been officially reported as concentrated London sewage. The drainage from latrines often find an easy and convenient outlet into their waters; soiled clothes of the sick and of the healthy are washed therein; men, women and children bathe and perform their ablutions in the pond, while oxen, buffaloes, horses, goats and other animals are taken down to the water's edge, and there given a bath. In such water the inhabitants cleanse their domestic utensils and soak, macerate and wash their rice and *dhal*, and not infrequently prepare other kinds of food. No analysis is needed to determine the unsuitability of the tanks for use for domestic purposes, because the colour of the water and its smell is sufficient to condemn its purity.

A description of the tanks and their uses.

It is to these tanks that for years past localised outbreaks of cholera have been traced. So frequently has this happened that now, whenever a localised outbreak occurs, the routine practice is to place a policeman at the tank to prevent the inhabitants drinking the water.

For years past localised outbreaks of cholera have been traced to these tanks.

3. Of the 110 tanks examined, 46 were tanks around which cholera existed at the time of the investigation; 5 were tanks around which cholera had existed a month to six weeks previously and had disappeared, and 59 were tanks around which cholera had not appeared during the four months of 1894. The result of examination was as follows: Out of 46 tanks around which cholera existed, commas were found in 42, that is, in 91·3 per cent.; out of 5 tanks, where cholera had disappeared a month to six weeks previously, commas were found in none. Out of 59 tanks around which cholera had not appeared, commas were found in 11, that is, in 18·8 per cent., and were not found in 44, that is, in 81·8 per cent. Of the wells in the interior of houses 6 were in houses in which there was no cholera and 9 in houses with cholera. Of the 15 wells examined commas were found in only 1 in a cholera house.

The result of the investigated tanks.

Wells.

In the water from 24 street hydrants, 9 of which were in cholera localities, no commas were found. In water taken directly from the river Hooghly, of 11 localities commencing from Pultah at the intake of the Calcutta water-supply and terminating at Howrah Bridge just above the Port of Calcutta, no commas were found. We were unable to ascertain about the existence or not of any cholera cases in these localities. Later in the year commas were found in the unfiltered water of a house supplied from the river a little below the Howrah Bridge. The supply was pumped from the river and delivered by a pipe to the house. In this house an outbreak of cholera had occurred which was the reason for examining the filtered and unfiltered water of the premises.

Hydrants.

River water.

The water of the Chitpore canal, which was used for drinking purposes, was also examined at a time when cholera broke out among the inhabitants residing on its banks. Commas were found in 5 specimens out of 18. The examination was made on the day on which the canal water was changed; 13 specimens taken near the locks were negative, while 5 a little further away were positive.

Chitpore Canal.

In another canal, near which no cholera existed and in an isolated locality, commas were found.

Of 23 samples of milk, 4 of which were taken in cholera localities and 19 were bought in markets and from vendors in the street, one of the former and one of the latter contained commas; of products of milk, eight samples of curd-water were examined and in none were commas found.

Milk.

Curds.

We examined food on only four occasions. In three there were no commas; in one we found commas under the following circumstances:—

In a flour shop a man was pointed out to us as being attacked with diarrhœa. On examining him we ascertained that he had washed his soiled clothes in a tank behind the shop and we discovered the clothes still wetly ng on a part of the flour exposed for sale. We took possession of the flour, and in the laboratory obtained from it a culture of comma bacilli. Air in infected houses was examined on four occasions, once, in a room where two people died of cholera, and in which one of the bodies was still unremoved. The floor of the hut had been soiled with excreta. In the air passed through peptone for two hours no commas were found.

Flour.

Air.

Twenty-six open surface drains of the street were examined, 10 of which were in localities with no cholera and 16 in localities with cholera. In the drains in non-choleraic localities, 5 drains were found infected with commas, and in the choleraic localities 5 drains were also found infected with commas. In one of these cases commas were found in an extremely large proportion in

Surface drains.

the water. and rice in an open drain on the second floor of a house in which the last case of cholera had died a fortnight previously.

Conclusion.

4. The result of these investigations seems to narrow down the relationship between commas in tank water and cholera, whilst no distinct relationship of this kind could be discerned in the other objects examined. If the commas be admitted to be the cause of cholera in man, such a result is easily understood. It is unlikely that the microbes in drains could gain a dir c: access to man, and reach him without the assistance of food or drink. The relationship, moreover, between hydrant water and cholera is excluded in Calcutta by the excellent arrangements for purification and filtration, and it is our belief, as matters stand, no case of cholera is produced in Calcutta by the Municipal filtered water. On the other hand, the inhabitants around the tanks have a most intimate connection with the waters. They bathe, wash their clothes, cleanse their mouths and frequently drink the water and clean their domestic utensils in the tank.

But even in the tanks examined we did not find commas present with an absolute regularity. In 9 per cent. of those in which cholera existed we failed to find them, and in 18 per cent., where cholera did not exist, they were discovered. Notwithstanding the-e exceptions the results appear to us to be one of the strongest confirmation of the direct relationship between the comma bacilli and cholera. The 9 per cent. on the one hand, and the 18 per cent. on the other, seem to us to be within the limits of error as attached to the examination of large tanks, which are subject to all the conditions of their open and exposed nature. These results seem to be more demonstrative, as they correspond in some degree to the slight variations in the results of investigations in men. In a small proportion comma bacilli are missed in cholera patients owing to defects in technique, while in a small proportion of men in whom they are found, they fail to produce serious disturbance owing, probably, to the resisting power of the infected individual.

Great difficulties have been experienced in Europe and elsewhere in distinguishing one comma supposed to be a cholera comma, from another comma supposed to be saprophytic and non-choleraic owing to their great racial variations; the result of this investigation seems to show that in nature there appears to be no water commas except those connected with cholera, varying, as we found them, in their morphological and physiological and biological characters. This investigation again demonstrates the danger of the tanks in relation to cholera and the urgent practical necessity of having them filled up.

Commas also to be found in cows.

5. Commas in Calcutta do not, however, seem to be confined to tanks and drains. For many years past I have been struck with the frequent coincidence of outbreaks of cholera with diarrhœal disease in cattle, and this led Professor Haffkine and myself to examine cows suffering from diarrhœa in several outbreaks, which we met with in different parts of Calcutta and in Howrah, and in these we found commas in the stools of those which were ill and in the intestines of those that died. We also found commas in the cess-pools connected with the cow-sheds in which these animals were suffering. As to the exact connection of these commas to cholera in man there has as yet been no time to determine.

And in Fish.

6. In connection with a further distribution of commas in nature, some singhee fish from Jessore were brought to me in April of this year for examination. They were supposed to be suffering from small-pox, because there were several spots on them. In the course of a careful examination of the fish I found commas in the intestine, which proved by experiment to be of a most virulent type.

Anti-choleraic Inoculation.

7 The most important event which has happened during the year in connection with cholera has been the introduction by the Commissioners of Professor Haffkine's system of inoculation. It was introduced as a tentative measure for the period of one year, but the results have been so favourable that I trust that steps will now be taken to make the inoculation a permanent institution in Calcutta.

It was in May, 1894, that the following letter and note were addressed to the Chairman, and presented to the Commissioners and led them to grant the sum of Rs. 7,500 to defray the cost of a trial of the cholera inoculations for one year:—

I have the honor to forward you the attached Memorandum which I have written on Monsieur Haffkine's cholera inoculation with the view that it shall with this letter be placed before the Commissioners for their most earnest and favourable consideration.

2. Every one acquainted with the ravages of cholera, the intensity of suffering which the disease causes in those who have the misfortune to be attacked, and the failure of any known medicine either to alleviate the pains with certainty, or to cure the disease, will, I am confident, be deeply interested in any discovery or proposed prophylactic, emanating from a scientific source, which has for its object the prevention of cholera or the lessening of its mortality. The Commissioners will be particularly interested in the question, for they reside in, and have under their charge the welfare of the inhabitants of a town from which the disease is never absent, and they are in the midst of that endemic area from which every few years cholera in an epidemic form spreads over India, and at times with such proportions and intensity as to spread over every quarter of the globe. The destruction caused by cholera is more dreaded than small-pox was before the introduction of inoculation and vaccination.

3. The protective influence which *sanitation* exerts against cholera, is certainly one of the greatest hygienic discoveries of the present century. A striking illustration of the protection it affords is furnished by Calcutta itself, where 30 years ago, the annual mortality ranged between 4,000 and 6,000, whereas now it is reduced to between 1,600 and 1,000. And there is every reason to believe that, as the sanitary condition of the town improves, cholera will be still further reduced, and perhaps ultimately stamped out. The day, however, for this consummation is very far distant, and still more so for the Province of Bengal or for India generally.

4. Under these circumstances, the discovery of a further protective, which will give assistance to sanitation in its operations against cholera, is particularly welcome. Of such a protective nature appears to be Professor Haffkine's vaccination against cholera, of which 25,000 individuals in this country have already availed themselves up to this time. Based on scientific grounds so far as the nature of cholera is known in the scientific world of to-day, it will, if proved to be successful, take that place in preventive medicine in relation to cholera which vaccination holds in relation to small-pox. Only a sufficient test can, however, decide this important question. The proof, which Monsieur Pasteur gave in 24 hours, of the efficacy of his vaccine against anthrax in cattle, cannot be applied to human beings. But the result which has attended Professor Haffkine's system in Calcutta, in which over 1,200 people have been vaccinated, is most encouraging, and I would now ask the Commissioners to give the system an extended trial.

5. It will be observed that 1,200 people is a small proportion in a population of over 6,00,000, and yet the results are such as to clearly show that a definite solution of the question is possible within a short time. The inoculations were done in various parts of the town where cholera was prevalent; and there are several instances of cholera being apparently arrested by the inoculations. But the most important observations are to be obtained under condition when the disease continues and allow of a comparison between the inoculated and the non-inoculated. Such a condition presented itself in the case of a local epidemic which took place around two tanks in Kattal Began Bustee, Ward 19, occupied by about 200 people. In this bustee about the end of March, 2 fatal cases of cholera and 2 cases of choleraic diarrhœa occurred. The outbreak led to the inoculation of 116 persons in the bustee out of the 200. Since then 9 cases of cholera, of which 7 were fatal, and 1 case of choleraic diarrhœa have appeared in the bustee, and it is a very extraordinary fact that *all* these 10 cases of cholera have occurred exclusively among the *uninoculated* portion of the inhabitants, which, as stated, forms the minority in the bustee, while *none* of the *inoculated* have been affected.

The fact is a most remarkable one, especially when the details are analysed.

In Ramdhun Dutt's house 6 members out of 8 in the family, were inoculated between the 31st March and the 7th of April. Cholera existed in the neighbourhood, and on the 9th of April, affected one of the members of the family, who subsequently died. *This death occurred in one of the two not inoculated*, the 6 inoculated remaining unaffected.

THE CALCUTTA PHOTOTYPE CO.

DR. G. N. MOOKERJEE.
DR. R. SEN.
DR. J. N. DUTT.
DR. SIMPSON.
PROFESSOR HAFFKINE.

INTRODUCTION OF ANTI-CHOLERAIC VACCINATION INTO A CALCUTTA BUSTTEE, IN MARCH 1894.

In Shaik Subratee's house, there resided 14 persons. Two cases of choleraic diarrhœa occurred among them. After this 7 out of the 14 were inoculated. Since then one case of choleraic diarrhœa has occurred in an adult not inoculated.

In Karam Ali's house, the family consisting of 8 members, 3 were inoculated on the 31st March. On the 7th of May, 1 of the 5 who were not inoculated, was affected with and died of cholera.

In Mungloo Jamadar's house a fatal case of cholera occurred on the 29th of March. On the 31st 11 members of the family, out of a total of 18, were inoculated. The effect of the inoculation in this house produced a great impression on the inhabitants of the bustee. 4 other cases of cholera, 3 of which proved fatal, have since occurred in the house, all 4 have been among the 7 not inoculated; the 11 inoculated remained perfectly free.

The remaining cases of cholera in the bustee occurred in adjoining huts among persons who had not been inoculated.

6. To give finality to the observations, it is necessary to repeat similar tests over and over again; a 100 observations with similar results would set at rest for ever the exact value of this prophylactic. There is no place in the world where these investigatons can be carried out with such accuracy and ease as in Calcutta. It is the most civilised centre in Asia where cholera is always present, and it possesses the means of setting in motion all the machinery necessary for the carrying out of the inoculations on a thoroughly reliable basis, for keeping the important records and for comparing the results. One or two years' inoculations in Calcutta, with the results carefully recorded, will possess a value impossible to obtain by long years of inoculations in other parts of India. By giving such a trial to the system, the Municipality of Calcutta will be settling one of the most important problems of the day, thereby not only conferring an incalculable benefit on the inhabitants of the capital of India and on the inhabitants of India, but also on the inhabitants of the world.

MEMORANDUM ON CHOLERA AND PROFESSOR HAFFKINE'S ANTI-CHOLERAIC VACCINATION.

1. TEN years ago Professor Koch visited Calcutta for the purpose of ascertaining whether the microbe, which he had discovered in the intestinal discharges and intestines of cholera patients in Egypt, were also to be found in cholera patients in India. I was in Egypt at the time of the discovery, inquiring into the cause of the spread of cholera from another point of view, and I remember the sensation created in that country. This was all the more profound, for Professor Koch was already well known for the brilliancy of his work, and the thoroughness with which every undertaking was accomplished. I need not enter into the details of his work in Calcutta; they are well known to the Commissioners. Suffice it to say that Professor Koch was able to confirm in every respect his previous observations in Egypt, and to satisfy himself that the *comma bacillus* stood in a very intimate relationship with the production of cholera. An English Commission was sent out to Calcutta to enquire into this discovery, and though unable to endorse Dr. Koch's view that the *comma bacillus* was the cause of cholera, the members affirmed that this microbe was intimately connected with cholera cases. Investigation made in Calcutta in the Government Laboratory during the past 10 years has led Professor Cunningham to confirm this view of the Commission.

2. By the time Dr. Koch had returned to Germany, cholera had broken out at Toulon in France, and there again he was able to demonstrate the presence of the *comma bacillus* in cholera patients. His co-worker in Toulon was Dr. Roux, who had been one of the members of the French Commission from Pasteur's Laboratory which had visited Egypt in 1883, and which from the shortness of duration of the epidemic, were unable to complete their investigation, and to discover any micro-organism of a special kind in the cholera patients examined. Dr. Roux, therefore, went to Toulon as a most competent and experienced opponent of Dr. Koch; the searching investigation, however, which he then made with Dr. Koch completely satisfied him of the value of the discovery, and from that time the *comma bacillus* has been acknowledged in Pasteur's Laboratory as the real infective cause of cholera. Since then, wherever cholera has appeared, researches have shown the *comma bacillus* to be invariably present.

3. An accident which occurred in Professor Koch's Laboratory confirmed his views, and demonstrated in a positive manner that the microbe was the infective causal agent of cholera. A doctor in attendance on the course of instruction given at the Berlin Laboratory to medical men, for the cultivation of *comma bacilli* for diagnostic purposes, became affected with diarrhœa, which developed later on into an attack of cholera. He had rice-water stools, suffered from great weakness, unquenchable thirst, almost complete suppression of urine and spasmodic contraction of feet and toes, with shooting pains in the feet. His discharges were examined by Dr. Koch and found to contain *comma bacilli*. No case of cholera existed in Germany at the time; the doctor had previously been handling and cultivating *comma bacilli*, and the evidence points to his having become infected with this microbe. The patient fortunately recovered.

On the other hand, some observers have swallowed *comma bacilli*, and have been none the worse. This is, however, in accordance with the fact that not every one exposed to the infection of cholera is attacked, and one affirmative case is evidently more valuable than many negative. Professor Pettenkoffer, the well-known Hygienist of Munich, who is opposed to the view that the microbes are in themselves the sole cause of cholera, swallowed some of the *comma bacilli*, and was taken very ill with colic pains and rice-water purging. His Assistant, Professor Emmerich, also tried the same experiment, and suffered to the extent that he was purged 18 times in one day, and his illness like Professor Pettenkoffer's lasted several days. Professor Pettenkoffer pointed out that these experiments were a confirmation of the view that the *comma bacilli* are the true infective agent of cholera, while at the same time he believed that the experiment proved that local conditions and predisposition of the individual were also necessary elements in the production of fatal cholera.

After the experiment of Professor Pettenkoffer, Professor Metschnikoff, in the Pasteur Institute, interpreting the result as unfavourable to the *comma bacillus* being the causal agent of cholera, instituted a series of experiments with the object of testing the point. In these experiments one of the men who swallowed the microbe, was affected with such a characteristic attack of cholera that Professor Metschnikoff was forced to abandon his position, and acknowledge unreservedly that the relationship could no longer be doubted.

4. In the meantime researches were being made to discover a method by which a vaccine could be prepared that would protect the body against the poison elaborated by the *comma bacillus*. The preparation of vaccines against infectious diseases is one of the problems exercising the minds of medical scientists of the day. Begun a century ago by Jenner in his discovery of vaccination and its protective influence against small-pox, a great impetus was given to the subject by Monsieur Pasteur in his discovery of vaccines against chicken cholera and against anthrax—a fatal disease affecting the cattle of France. Monsieur Pasteur was able to demonstrate the efficiency of his vaccine in a manner that can only be employed on the lower animals. At Pouilly-le-Fort, in the midst of an assemblage of scientists, representatives of scientific societies, Government officials, landlords, farmers and representatives of the press, he performed the following experiment:—60 sheep were taken, 10 of these were put aside, 25 were vaccinated with the anthrax vaccine and 25 were left untouched. 12 days afterwards the 50 sheep were inoculated with virulent anthrax, and the next day the 25 unvaccinated sheep were dead, while the 25 that had been vaccinated were perfectly well, and during the whole time they were kept under observation, they presented the same degree of health as the 10 sheep that had been put aside for comparison. Subsequent to this remarkable event was the discovery of a vaccine against rabies, and some animal diseases and now follows the discovery by Professor Haffkine of a vaccine against cholera, a discovery made in Pasteur's Laboratory where the preparation of vaccines has been an object of special study.

5. In nature the virus of infectious diseases, such as small-pox, for instance, is extremely variable, causing at one time a very mild and at other times an extremely virulent disease. In small-pox inoculations the virus for which was obtained from the natural disease, there was no certainty as to the results. Sometimes a mild form of small-pox was produced, and sometimes a very dangerous form. The method was abandoned when a fixed vaccine against small-pox was discovered in the vesicle produced on the cow.

6. The problem which therefore had to be solved in the preparation of a vaccine against cholera, was to find the means of fixing the virus in a well determined strength, and to be able to keep it for an undefinite time at that known strength. Professor Haffkine solved the problem. He discovered a means of engrafting on animals the cholera microbe and cultivating it indefinitely on such animals. This gave him his vaccine. At the same time he was able to increase the cholera microbes to a strength which produced with certainty a specific infectious disease on animals and against which he was able to protect them.

By this double discovery Monsieur Haffkine, in addition to obtaining his vaccine, was able to show with the *comma bacillus* as conclusively on animals, as Monsieur Pasteur had done at the great demonstration at Pouilly-le-Fort with anthrax, that he possessed a vaccine which would protect animals against a fatal infectious disease caused by the cholera *bacillus*.

7. For cholera inoculation there are two vaccines, one mild, the other strong. For a complete vaccination it is necessary to inoculate twice ; first of all with the mild vaccine which produces some pain at the seat of inoculation, discomfort and fever for about one day ; a period of 5 days is allowed to elapse, and then a second inoculation is performed with the second or strong vaccine. This second inoculation produces a similar form of malaise to that caused by the first. The discomfort on the whole is milder and of shorter duration than that of vaccination against small-pox. Its harmlessness was established by very careful and patient observation on medical men and scientists, who were inoculated in Europe soon after the discovery.

8. It was first proposed that Monsieur Haffkine should proceed to Siam where, by inoculating whole villages, a decision might be come to as to the value of anti-choleraic vaccination. After an interview, however, with Lord Dufferin, Ambassador in Paris, it was considered that

the best country for such an enquiry was the endemic area of Bengal. Lord Dufferin took a great interest in the matter writing to the Secretary of State for India and to Lord Lansdowne, while the Ambassadors Baron de Mohrenheim and Baron de Staal put themselves to much trouble and recommended Monsieur Haffkine and his mission very warmly to the British Government. Monsieur Haffkine visited London with the object of having an interview with Lord Kimberley, and explaining his system to the leaders of the medical profession in London. His reception there was of the most cordial nature. I was in London at the time, and met Monsieur Haffkine on several occasions. The English Government through the Secretary of State for India granted facilities for Monsieur Haffkine visiting every part of India, writing to the Government of India on the subject, who in their turn have rendered him valuable assistance. In his mission Monsieur Haffkine arrived in Calcutta in March 1893, and some time was taken up in preliminary matters. Cholera was not very prevalent in Calcutta then, for it was an exceptional year in this respect, and Monsieur Haffkine consequently accepted an invitation to Agra, where Mr. Hankin, the Government Bacteriologist, was anxious he should begin inoculations. In Agra he inoculated over 900 persons, European and Indian, among whom were a number of European officers including General Morton, commanding the troops in the Agra Division, Mr. Neale, the Commissioner, and others. From Agra he was invited to Aligarh, where he inoculated 80 Europeans and Indians. Once the inoculations were begun, the invitations from different places in Northern India came in so rapidly that Monsieur Haffkine has been unable to accept them all. Since his arrival in India he has inoculated about 25,000 persons.

9. The subjoined list kindly furnished to me by Monsieur Haffkine gives the places and the number of persons in round numbers that he has inoculated :—

Place	Number.	Remarks.
Agra	Over 900	Europeans and Indians.
Aligarh	80	Ditto.
Jhansi	250	Including a hundred soldiers (Sikhs).
Lucknow	1,200	Which include 497 British soldiers, 130 Bengal Infantry, 120 Bengal Cavalry and 250 children in LaMartinere School.
Sanawar	250	Indians and Europeans.
Kasauli	220	Indian and European soldiers.
Dagshai	350	Men of the 93rd Highlanders.
Delhi	880	Which include 500 men of the 36th Sikh Regiment and 50 children of the Mission School.
Simla	400	Europeans and Indians.
Jatogh	60	Soldiers of the Royal Artillery.
Patiala	3,400	Which include the family of the Maharajah and 2,400 sepoys.
Sangrur (Jhind State) ...	750	Which include 500 sepoys.
Rawalpindi	400	Which include about 250 European soldiers.
„	370	Followers of Sirdar Ayub Khan.
Murree	370	Which include 300 European soldiers, Mr. Thorburn, the Divisional Commissioner, Ayub Khan, his 5 children and his brother.
Abbottabad	850	Which include 130 men of the 5th Goorkha Regiment, 200 men of the 1st Mountain Battery and 125 of the Bengal Infantry.
Peshawar Valley (Peshawar, Chirat and Nowshera).	1,100	Almost exclusively soldiers and sepoys.
Naini Tal	211	Europeans and Indians.
Tour from Naini Tal to Hurdwar through Mussoori	5,200	Which included at Almorah 250 of the 3rd Goorknas, at Rhanikhet about 150 British soldiers, at Dehra-Doon 500 men of the 2nd Goorkhas, and 2,200 villagers of the fixed agricultural population.
Lahore and Main-Miar ...	370	Chiefly Europeans.
Sialkote	1,100	Which include 200 soldiers, European and Native.
Pasrur and Seranwali (Sialkote District.)	2,200	Which include about 300 school children.
Amritsar	800	
Gujerat	300	
Dhurmsala	1,200	Men of the 1st Goorkha Regiment.
Kapurthala	180	Which include 100 of the Rajah's sepoys.
Calcutta	1,200	Chiefly of the fixed bustee population.
Chittagong	930	The European population, Mr. Waller, the Commissioner, native officials and others.

Among the distinguished Indians inoculated are—

Maharajah of Patiala, Kanwar Sahib, Prince of Patiala, the brother of the Maharajah, the family of the Kanwar Sahib, the Vazir of Patiala, the Prime Minister of Patiala, the Bakhshi Sahib, War Minister of Patiala, the Court of the Maharajah of Patiala, the Court of the Maharajah of Sangrur, Ayub Khan, cousin of the Amir of Kabul, his five children, his younger brother and others.

Invitations to introduce the inoculations into the following places have been received :—

Allahabad by Civil Surgeon Hope Simpson, Mirzapur by Civil Surgeon Drake Brockmann, Akola by Deputy Commissioner Morrison, Saugur by Mr. Hamilton, Poona by General Gatacre, Bareilly by Civil Surgeon Emerson, Meerut by the Commanding Officer, Sambulpur by Dr. Whitcombe, Deesa by Station Staff Officer, Dholepur by the Maharajah of Dholepur, Mhow by Surgeon-Colonel Davis, Ahmednaggur by Civil Surgeon Henderson, and Assam by Principal Medical Officer, Surgeon-Colonel Stephen.

A very large number of medical men also have been inoculated with the view of encouraging and setting an example to others. Among these may be mentioned—Dr. Harvey, Inspector-General of Bengal, Dr. Stephen, acting principal Medical Officer, Assam, Dr. Roe, Officiating Sanitary Commissioner, Punjab, Dr. Manifold ; Dr. Milward and Dr. Wilcocks, Agra, Dr. Roberts, Aligarh, Dr. Nixon, Jhansi, Dr. Hooper, Lucknow, Dr. Dennys, Delhi, Dr. O'Connor, Delhi, Dr. Lewtas and Dr. Cunningham, Simla, Dr. Owen, Patiala, Dr. Nicholson, Sangrur, Jhind State, Dr. Doyle, Peshawar, Dr. Henvey, Abbottabad, Dr. Ruttledge, Dehra-Doon, Dr. Mulroney, Amritsar, Dr. Hubert, Gujerat, Dr. Fairweather, Kapurthala, Dr. James, Lahore, Dr. Bent, Agra, Dr. Gross, Lucknow, Dr. Earle, Sanawar, Dr. Stoker, Dhurmsala, and many others.

10. I give these lists because they will show the Commissioners that all classes of the population are interested in these inoculations, and the total number done without the slightest mishap having occurred will convince them of the harmlessness of the vaccine.

11. What will interest the Commissioners still more, however, are the results which have been obtained by the inoculation in Calcutta. This year, as soon as the cholera season began, Monsieur Haffkine came down to Calcutta, and in the course of 6 weeks inoculated over 1,200 persons in different parts of the town where cholera was prevalent. The numbers and the short time of the inoculations are obviously insufficient to allow of definite comparisons being drawn, but one or two remarkable facts which have been observed where the proportion of inoculations in the locality has been larger than in others, and where a small local epidemic of cholera prevailed, arrest the attention. About the end of March two fatal cases of cholera and two cases of choleraic diarrhœa occurred in Kattal Bagan Bustee in a population grouped around two tanks. This outbreak led to the inoculation of 116 persons in the bustee out of about 200. Since the 116 cases were inoculated, 9 more cases of cholera, of which 7 were fatal, and 1 case of choleraic diarrhœa, have appeared in the bustee. *All these* 10 *cases of cholera have occurred exclusively among the not-inoculated portion of the inhabitants, which, as stated, forms the minority in the bustee, and none of the inoculated have been affected.*

12. The following facts were observed :—In Ramdhun Dutt's house, 6 members, out of 8 in the family, were inoculated between the 31st of March and the 7th of April. On the 9th of April cholera affected one of the members of the family who subsequently died. This death occurred in one of the two not-inoculated, the 6 inoculated remaining unaffected.

In Shaik Subratee's house, there resided 14 persons. Two cases of choleraic diarrhœa occurred among them. After this, 7 out of the 14, were inoculated. Since then one case of choleraic diairrhœa has occurred in an adult not inoculated.

In Karam Ali's house, the family consisting of 8 members, 3 were inoculated on 31st March, and on the 7th of May 1 of the 5, who were not inoculated, was affected with cholera and died.

In Mungloo Jemader's house a fatal case of cholera occurred on the 29th of March. On the 31st, 11 members of the family, out of a total of 18, were inoculated. It so happened that cholera again breaking out in the house, attacking 4 persons, 3 of whom died, *selected* 4 *of the* 7 *not-inoculated*, while the 11 inoculated remained perfectly free.

It is unnecessary to quote instances in other localities where cholera appeared in a house and seemed to be arrested by inoculation.

13. As stated previously the numbers are still too small for any definite conclusions, but they are sufficient to indicate the manner in which this all-important question will be solved. To carry on these observations in Calcutta on a large scale, in its most affected parts during the next one or two years would, in my opinion, solve the question, for it is obvious that under these conditions, a sufficient number of facts would be collected in Calcutta to determine the amount of protection that can be given by Monsieur Haffkine's anti-choleraic vaccine to individuals or communities in an affected locality ; and accordingly I recommend the Commissioners to give the system an extended trial.

Introduction and progress of the inoculations in Calcutta.

Dr. Chowdry and Dr. Ghose, both able and thoroughly reliable men, who had been carefully taught the method of preparing the vaccines and the technique of the inoculations, were specially deputed to carry on the work

The inoculations once introduced into Calcutta went on in a very satisfactory manner until news came from Lucknow of the severe outbreak of cholera in the East Lancashire Regiment in which Professor Haffkine had inoculated a number of soldiers when he was in Northern India. Rumour magnified the events connected with this outbreak and distorted the facts connected with the inoculations, and as a result the current of public opinion which had previously been in favour of inoculation set in strongly in the opposite direction. The advocates of anti-choleraic inoculations were abused in no particularly measured terms, and the inoculations were held up to be the source of every possible evil and danger. I was enabled, however, by the subjoined Note written in reply to a question put by one of our Commissioners to place the facts relating to the inoculations at Lucknow and elsewhere in their true light, and at the same time to summarise the observations which had been made up to the time the Memorandum was written :—

With reference to the question of the Hon'ble Soorendro Nath Banerjee whether "the attention of the executive has been drawn to the statements which have appeared in the newspapers regarding the alleged failure of the Haffkine's system," I have the honor to communicate all the observations which have been made in different localties in India on the effect of the anti-choleraic inoculations since my Note on the subject to Municipality in May of this year. The localities comprise Cawnpur, Gya, Dinapore, Lucknow and Calcutta.

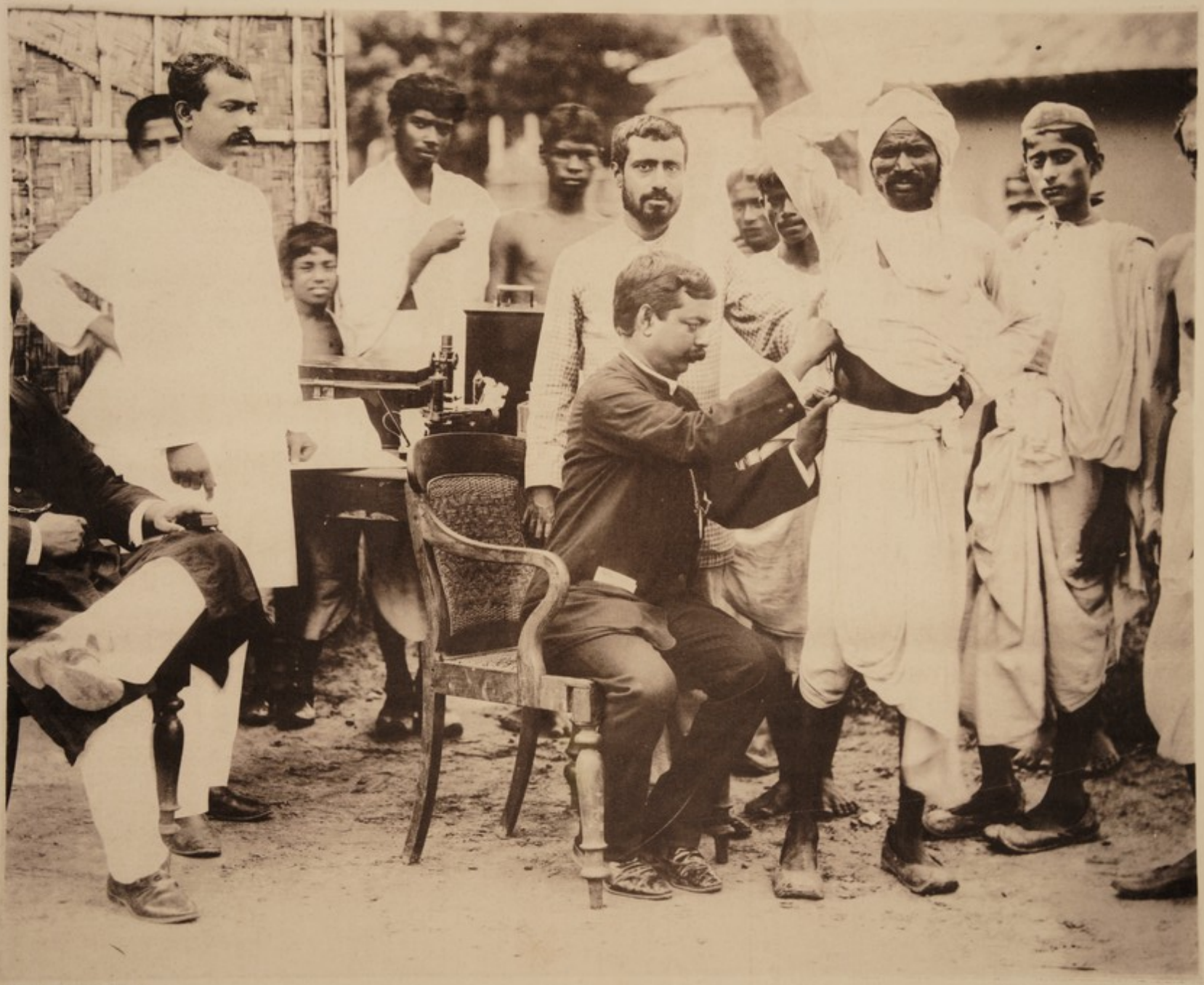
At Cawnpore last year a small number of persons was inoculated, of which 80 were in the Munster Regiment. During the severe epidemic of this year cholera attacked the regiment, its strength being at the time 797 not-inoculated and 75 inoculated ; 19 cases with 15 deaths occurred among the not-inoculated men, none of the inoculated being affected.

In the Gya district also cholera was prevalent in a severe form and affected the Gya jail on the 9th of July of this year, causing by the 18th 6 cases and 5 deaths. On the 18th and the following day, 215 prisoners were inoculated ; during the period of the outbreak the average number of the inoculated present were 207 against 202 not-inoculated. Surgeon-Major Macrae, the Superintentent of the Jail, who has given the details of this epidemic, states in his account that the inoculations "being purely voluntary, no selection of prisoners was possible, but all classes of the jail were represented—male and female, old and young, habituals and less frequent offenders, strong and weakly, convalescent and even hospital patients sent their representatives ; no difference of any kind was made between inoculated and non-inoculated ; they were under absolutely identical conditions as regards food, water, accommodation, &c., in short in every possible respect." In this instance the comparison was made between the inoculated and not-inoculated under conditions which render the observations extremely valuable. In making this comparison it will be remembered that a period of about 10 days has been claimed as necessary for securing the full effect of the vaccines, the first inoculation taking about five days to act and the second inoculation, the more important of the two, a similar period.

The results summarised were as follows :—

	Not-inoculated.		Inoculated.	
	Cases.	Deaths.	Cases.	Deaths.
During first 5 days after 1st inoculation	7	5	5	4
During 3 days after 2nd inoculation	5	3	3	1
After 8 days from 1st inoculation	8	2	...	...
	20	10	8	5

From the table it will be seen that a gradually increasing difference was produced, even during the period necessary to complete the treatment, 8 cases and 5 deaths occurring among the inoculated against 12 cases and 8 deaths among the not-inoculated, and that after this period, 8 cases and 2 deaths occurred among the not-inoculated and no cases or deaths among the inoculated. Dr. Macrae, referring to these figures, remarks that "further observations are necessary to prove whether the inoculations as now practised will prove of lasting benefit, the results obtained in Gya seem to me to justify the conclusion that their temporary beneficial effect is undoubted. I think there is every reason to believe that better results would have been obtained, had the inoculations been performed at an earlier period instead of during the epidemic." In connection with this opinion expressed by Dr. Macrae, I may inform the Commissioners that endeavours are now being made to improve the vaccines by the introduction of modifications in their preparation, which have for their object the shortening of the period that has to elapse before the vaccines exercise their full protective power.



THE CALCUTTA PHOTOTYPE CO.

DR. S. GHOSE.

DR. J. CHATTERJEE.
DR. J. CHOWDRY.

ANTI-CHOLERAIC VACCINATION IN CALCUTTA, IN 1895.

On the 17th of July, at the same time as cholera was prevalent in the Gya jail, an outbreak of cholera occurred in the Manchester Regiment stationed at Dinapore. Inoculations were performed on the 4th and 5th of August on 193 men. On the 6th, 9th and 10th 6 cases occurred among the not-inoculated. Later on 387 other men of the regiment were inoculated. No other cases of cholera occurred in the regiment.

The observation which has attracted general notice from the apparent failure of the system was at Lucknow where inoculations were performed in May 1893, in the East Lancashire, Royal Irish, 16th Lancers 7th Bengal Infantry, 7th Bengal Cavalry and general population in the Civil Lines. In 1894 cholera appeared among the native population of Lucknow in the form of an epidemic distinguished by its extreme virulence, patients succumbing in the course of a few hours. It is stated that the epidemic was of a most malignant type. In the latter part of July it entered the cantonments and attacked the East Lancashire, almost exclusively confining its ravages to that regiment. In the East Lancashire 185 men were inoculated in May, 1893. From the statistical returns obtained from the Military authorities at Lucknow, it appears that, at the time of the outbreak in July, 1894, the strength of the men, including those in hospital, was 773, and of these 133 were inoculated as recorded, in the Inoculation Registers, and 640 were not inoculated.

The following table shows the total number of attacks and deaths in not-inoculated and inoculated :—

	No. of men present.	No. of attacks.	Percentage of strength.	No. of deaths.	Percentage of strength.
Not-inoculated	640	120	18·75	79	12·34
Inoculated	133	18	13·53	13	9·77

In the record placed at our disposal in Lucknow, Surgeon-Major Milward,* who was ordered by the authorities to attend the affected regiment and who collected complete details regarding the inoculated and not-inoculated, presents the incidence of the epidemic in two groups—one relating to the cantonment, the other to the camp. Following Dr. Milward's mode of grouping of the observations it appears that the epidemic in the camp caused 86 cases and 51 deaths among 307 not-inoculated and 13 cases and 9 deaths among 67 inoculated ; while that in the cantonment caused 34 cases and 28 deaths among 333 not-inoculated and 5 cases and 4 deaths among 66 inoculated. The epidemic in the camp thus appears to have been twice as severe as in the cantonment, but the result as regards the inoculations is much the same as is to be seen from the following tables :—

CANTONMENTS.

Not-inoculated had 10·21 per cent. of cases and 8·41 per cent. of deaths.

Inoculated 7·57 „ „ 6·06 „ „

CAMP.

Not-inoculated had 28·10 per cent. cases and 16·61 per cent. deaths.

Inoculated 19·40 „ „ 13·43 „ „

Both observations having been carried out under different conditions, the similarity of the result enhances the significance of the figures as it lessens the possibility of their being in both cases accidental. It will be seen from the figures that, though the effect in the instance of the Lucknow epidemic was smaller than in all others and of itself much below what is aimed at, still they represent a tendency to lower the number of cases as well as the number of deaths.

The small effect produced in Lucknow was probably due to the two following circumstances :—

First of all the vaccines used in Lucknow were much weaker than the virus of the epidemic. It has been previously stated that the epidemic among the civil population in Lucknow was of a most malignant type ; that in the East Lancashire it was also of a similar character, senior medical officers of long experience in the country stating that such a virulent cholera had not been seen by them for very many years past. With reference to the strength of the vaccine, Lucknow having been one of the first places in which the inoculations were carried out on an extensive scale, they were done with great caution, and only small doses of a vaccine relatively weak were given, the doses being between one-third and a half of those now administered. Judging from the symptoms recorded in the Registers, the effect produced by these small doses was only slight ; for instance, 60 out of 185 had no reaction after the inoculation, 70 had slight fever and only 2 marked fever.

Secondly, there is the possibility of the immunity of the inoculated men having partially disppeared. It is known that immunity varies in the length of time that it lasts, and it is possible, in cholera inoculations, especially when done with weak vaccines, as in the case of Lucknow, the immunity may be sufficient to protect from a prevailing epidemic or an epidemic of the first year, and yet have only slight protective influence later on. But this protective influence, as has been shown, manifested itself in Lucknow after a period of between 14 and 15 months.

The Lucknow epidemic has shown that the degree of intensity at which the vaccines were maintained, and the doses given at that time were not sufficient to counteract a virus so virulent as that which attacked the Lancashire Regiment. The epidemic has taught the necessity of using a vaccine of higher protective power. This can only be obtained by special laboratories of which the Calcutta one is the first in India.

Two protective measures were put to the test at Lucknow in this epidemic—one was the inoculation, the other was the movement into camp. A comparison of both measures is in favor of the inoculation, for it appears that the movement into camp was not attended by a reduction of deaths, but actually by a large increase over that which occurred in the cantonment ; whereas the inoculation was attended by a lessening of the cases and deaths of the inoculated in contrast to those not-inoculated.

Hitherto the movement into camp has been considered the best method of combatting an epidemic in a body of men. The conditions during the epidemic in Lucknow districts were such that this measure not only failed but proved disastrous. The moving into camp, notwithstanding this example, is all the same an excellent measure of defence, and would with reason be adopted in every outbreak in spite of any exceptional results.

*The Senior Medical Officer in principal charge at that time was Surgeon-Major Hughes, A. M. S

But even under these exceptional conditions the inoculation which were performed between 14 and 15 months previously, under the disadvantages previously stated, preserved a favourable tendency.

In Calcutta the following further observations have been made :—

1. In Golam Rahaman's house at Joratolla Bustee, Ward 21, 5 members were in March last inoculated out of a family consisting of 11. One of the *uninoculated* 6 was affected with and died of cholera on 17th June, 1894.

2. In Issoo Mistree's house, at Beg Bagan Bustee, Ward 21, 4 members were in March last inoculated out of a family of 6. One of the *uninoculated* 2 was attacked by cholera and died on 22nd June, 1894.

3. In Shaik Hingoo's house, at Beg Bagan Bustee, Ward 21, 6 members were on 17th June inoculated out of a family consisting of 9. One of the *uninoculated* 3 was attacked by cholera on 22nd June, 1894. This case ended in recovery.

4. In Gonesee Bewah's house, at 16 Jorabagan Street, 4 members out of a family consisting of 5 were inoculated in May last. The only member that was *not-inoculated* was affected with and died of cholera on 11th July, 1894.

5. In Jodunath Chakravaty's house, at 155 Upper Chitpore Road Bustee, 4 members out of a family consisting of 11 were inoculated on 11th August, 1894. One out of the *not-inoculated* 7 was attacked by cholera on 13th August. This case has now ended in recovery.

6. In H. L. Mukerjee's cooly depôt, at Chattoo Baboo's Lane, Ward 19, 25 persons were inoculated out of 58. One out of the *not-inoculated* 33 was attacked by cholera on 13th August and died on 15th August.

7. In Narain Mistree's house, at 155 Upper Chitpore Road Bustee, 3 members out of a family consisting of 11 were inoculated on 11th August, 1894. One out of the *not-inoculuted* 8 was affected with cholera on the 14th of August and died on the 15th of August.

8. In Narain Marick's house at 155 Upper Chitpore Road Bustee, Ward 1, 3 members out of a family consisting of 8 were inoculated on 11th August, 1894. One out of the uninoculated five named Kali Dassi, Hindu female, aged 22 years, was attacked by cholera on 12th October and died on October 15th.

No case of cholera has occurred among the inoculated.

These observations must be added to those which I had the honor to communicate to the Commissioners in my first Note on the subject in May last.

Assuming even that the vaccines have no lasting effect, but that their temporary protective power is proved beyond doubt by a series of observations similar to those recorded, it is evident that a power is placed in our hands which is simply invaluable to control epidemic.

From this summary of observations, together with those given in May last, it is evident that the number of attacks and deaths in the inoculated have been constantly smaller than in the not-inoculated, although to different degrees in different localities. The conclusion to be drawn from this fact is that the effect of the vaccines is to increase the resistance of the inoculated against the disease. The result hitherto obtained justifies the application of the method under any condition, and tends to confirm the view that we have in the inoculations a highly promising measure of defence against cholera. The principle confirmed, the conditions under which the inoculations can be applied, so as to obtain the highest amount of benefit from them will be gradually determined, and this can only be done by obervations such as those now set forth. In this respect the experiences of Gya and Lucknow are most important in showing in what direction modifications are needed in the preparation and administration of the vaccines to secure the best results—first, as regards immediate protection during a prevailing epidemic ; and secondly, as regards protection of a more permanent character.

The attacks shook public confidence which is only slowly being regained.

Though this Note satisfied the Commissioners of the groundless nature of the attacks against inoculation, these had been sufficient to shake public confidence in the new system, and it is now only recently that a reaction has taken place, and the inoculations are again coming into more favour. Since October the following additional observations have been made :—

(1) In Bipatha Chamar's house at Nichoo Bagan Bustee, Ward 21, 3 members, out of 9, were inoculated on 14th March, 1894. Cholera broke out in the bustee again in the month of December, 1894, and *one* of the 6 *non-inoculated*, named Bipatha, Hindoo male, 40 years, was attacked by cholera on 10th December, 1894, that is, 271 days after inoculation in this house, and died on the 11th.

(2) In Surendra Nath Ghosh's house at 33, Shampuker Street Bustee, Ward 1, 3 members, out of 14, were inoculated on 17th March, 1894. *Three* out of the *uninoculated* 11, named Sailendra Kumar Ghose, Hindoo male, 1½ years, Natoo Dassee, Hindoo female, 6, and Indra Mati Dassee, Hindoo female 5, were attacked by cholera on 29th March, 1st April and 4th April, 1895, that is, 377 days, 380 days and 383 days after inoculation in this house, and died on 30th March, 1st April and 9th April, respectively.

(3) In Gopal Dass' house at 33-4-13, Shampuker Street Bustee, Ward 1, 12 members, out of 25, were inoculated on 17th March, 1894. *One* out of the *uninoculated* 13, named Kusum Behara, Hindoo male, 40, was affected with cholera on 5th April, 1895, that is, 384 days after inoculation in this house, and died on the 7th.

(4) In Sookun Khan's house at Kurya Bustee, Ward 21, where a case of cholera ended fatally on 2nd April, 1895 and where another case cropped up on 4th April, which also proved fatal on the 6th, a Mahomedan girl, named Samsunnessa, aged 8 years, of a family consisting of 3, was inoculated on 4th April, 1895. She got an attack of cholera on the same day, a few hours after inoculation, and died on the 6th.

(5) In Munshi Maniruddin's house at 6, Marquis Street, Ward 13, 9 members, out of 52, were inoculated on 10th May, 1894. *Three* out of the 43 *non-inoculated*, named Manglo, Hindu male, aged 11 years, Rashmani, Hindu female, 4 years, and Chamroo, Hindu female, 5 years, were attacked by cholera on 1st, 6th and 7th May, 1895, that is, 356 days, 361 days and 362 days after inoculation in this house, and died on 3rd, 6th and 7th May, respectively.

(6) In Guru Prosad Khotta's house at 23, Nimtola Ghat Street Bustee, Ward 5, 2 persons, out of 12, were inoculated on 15th May, 1894. *One* out of the *uninoculated* 10, named Chanchala Bewah, Hindu female, 25 years, was attacked by cholera on 30th March, 1895, that is, 319 days after inoculation in this house, and died on the following day.

(7) In Mohit Charan's house at Nichoo Bustee, Ward 21, 10 members, out of 34, were inoculated on 13th December, 1894. *One* out of the 24 *non-inoculated* named Dhanpatia, Hindu female, 7 years, was attacked by cholera on 5th May, 1895, that is, 143 days after inoculation in this house, and died on the 6th.

(8) In Lakshimani Dhye's house at 66-1, Bolloram Dey's Street, Ward 5, 5 members, out of 13, were inoculated on 13th December, 1894. *Two* out of the *non-inoculated* 8, named Mati Bewah, Hindu female, 21 years, and Garabini Dassee, Hindu female, 32 years, were attacked by cholera on 6th and 10th April, 1895, that is, 114 and 118 days after inoculation in this house, and died on 9th and 11th April, respectively.

(9) In Ambica Charan Roy's house at Isvar Ganguly's Lane, Ward 22, 3 members, out of 5, were inoculated on 1st January, 1895. *One* out of the 3 *inoculated*, named Ambica Charan Roy, Hindu male, 40, who was in attendance on four fatal cases of cholera, previous to and after his inoculation, was attacked by cholera on 5th January, that is, 4 days after inoculation, and died on the 6th.

(10) In Pitambar Sirkar's house at Kopidanga Bustee, Ward 25, 4 members, out of 9, were inoculated on 17th January, 1895. *One* out of the *uninoculated five* was attacked by cholera on 21st March, 1895 and died on March 26th.

(11) In Abdool Aziz's house at 17-H, Mochiparah Road, Ward 19, 3 persons, out of 11, were inoculated on 29th March, 1894. Two out of the 8 uninoculated, named Marihur Bibee, Mahomedan female, 80 years, and Shaik Abbash, Mahomedan male, 45 years, were attacked by cholera on 3rd and 6th May, 1895, that is, 401 and 404 days after inoculation in this house, and both died on the 7th.

(12) In Satcowri Nikari's house at Kantal Bagan Bustee, Ward 19, 2 persons, out of 8, were inoculated on 31st March 1894. One, out of the 6 *uninoculated*, named Satcowri Nikari, Hindu male, 32 years, was attacked by cholera on 25th January 1895, that is, 300 days after inoculation in this house, and died on the 27th.

(13) In Shaik Hossain Box's house at 8-H-12, Middle Road, Entally, Ward 19, 1 person, out of 10, was inoculated on 1st April 1894. One, out of the 9 *uninoculated*, named Shaik Fakeer, Mahomedan male, 25 years, was attacked by cholera on 29th April, 1895, that is, 394 days after inoculation in this house, and died on 5th May, 1895.

(14) In Durga Churn Bose's house at 20-H-1, Middle Road, Entally, Ward 19, 2 members, out of 8, were inoculated on 1st April, 1894. Two, out of the 6 *uninoculated*, named Radhamoni Dasi, Hindu female, 30 years, and Surendra Chandra Basu, Hindu male, 3 years, were attacked by cholera on

13th and 28th April, 1895, that is, 378 and 393 days after inoculation in this house. The first case afterwards ended in recovery; while the second one proved fatal on 28th April, that is, on the day of attack.

(15) In Nistarini Devi's house at 2, Nakulessartola Lane, Ward 22, 2 persons, out of 8, were inoculated on 13th February, 1895. One, out of the 6 *uninoculated*, named Nagendrabala, Hindu female, 3½ years, was attacked by cholera on 25th April, 1895, that is, 71 days after inoculation in this house, and died on the 26th.

Summary of the work done from March 1894 to 31st May, 1895 and the results which have been observed.

Since the commencment of anti-choleraic inoculations in Calcutta, 4,227 persons have been operated on, which is double the number that presented themselves in one year for vaccination against small-pox, 25 years after vaccination had been introduced into Calcutta. Details are given in the subjoined table :—

Anti-choleraic inoculations in Calcutta from March, 1894 to 31st May, 1895.

HINDOOS.					MAHOMEDANS.					OTHER CLASSES.					
ADULTS.		CHILDREN UNDER 12 YEARS.		TOTAL.	ADULTS.		CHILDREN UNDER 12 YEARS.		TOTAL.	ADULTS.		CHILDREN UNDER 12 YEARS.		TOTAL.	GRAND TOTAL.
M.	F.	M.	F.		M.	F.	M.	F.		M.	F.	M.	F.		
1,610	430	709	440	3,189	355	29	379	240	1,003	20	8	5	2	35	4,227

Of the 4,227 inoculated, 3,189 were Hindus, 1,003 Mahomedans and 35 other classes, 1,775 were children under 12 years of age. No case of cholera has occurred among those who subjected themselves to the second inoculation, and no case of cholera has occurred among the inoculated after 5 days had elapsed. Like vaccination against small-pox, the inoculation against cholera appears to require a certain period to act on the human system before its efficacy is absolute. In vaccination a period of 8 or 9 days is usually required to establish full protection, and a similar period, or one not much different, seems necessary in anti-choleraic inoculation. In three instances it has happened in these cholera inoculations, when cholera was in the house at the time of the inoculations, or appeared almost immediately after, that those who were inoculated were attacked before the protective influence of the inoculation had time to assert itself. One was a person attacked a few hours after inoculation, cholera being in the house at the time of inoculation; the second an individual attacked 3 days after, and the third on the fourth day. The last individual was in attendance on 4 fatal cases of cholera previous to and after the first inoculation. If all cases be included in the statistics, cholera appeared from a few hours to 404 days after inoculation in 28 houses. The total number of inmates in these affected houses was 395; of this number, 145 were inoculated and 250 not-inoculated. The number of cases that occurred among the 145 inoculated was 3, which was followed by a fatal issue in all, giving a percentage of attacks and deaths of 2·06 per cent. The number of attacks among the 250 non-inoculated was 35 and of deaths 30, giving a percentage of cases of 14 and of deaths 12. If, however, all cases are excluded which occurred within 8 days of inoculation, then cholera occurred in 21 houses. The total number of inmates in those houses was 291 ; of this number, 101 were inoculated and 190 not-inoculated. Among the 101 inoculated there were no cases of cholera, while among the 190 uninoculated, the number of attacks was 29, and of deaths 26, giving a percentage of cases of 15·26 and of deaths of 13·68.

	No. of attacks.	No. of deaths.	Percentage of cases.	Percentage of deaths.
No. of inoculated ... 101	...	...	...	...
No. of not-inoculated ... 190	29	26	15·26	13·68

The following table gives the details regarding the 21 houses, in which cholera appeared after the 8th day of inoculation :—

1	2	3	4	5	6	7	8	9
House in which inoculations were performed and in which cholera afterwards appeared	Date on which inoculations were performed	No. of inoculated present at date of attack.	No. of uninoculated present at date of attack.	Length of time between date of inoculation and date of attack	Name of person attacked and religion, sex and age.	Whether person attacked had been inoculated.	Date of recovery.	Date of death.
I.—In Bipatha Chamar's house at Nichoo Bagan Bustee, Ward 21	14th March, 1894 ...	3	6	271 days ...	Bipatha H. M. 40 years ..	No	.....	11th December, 1894.
II.—In Golam Rohoman's house at Joratolla Bustee, Ward 21	Ditto ...	5	6	95 ,, ...	Sabujan Bebee M. F. 50 ...	No	.....	17th June, 1894.
III.—In Issoo Mistry's house Beg Bagan Bustee, Ward 21	15th March, 1894 ...	4	2	99 ,, ...	Makul Bebee M. F. 30 ...	No	.....	22nd June, 1894.
IV.—In Surendra Nath Ghosh's house at 33 Shampuker Street Bustee, Ward 1	17th ,, ...	3	11	377 ,, ...	Sailandra Kumar Ghosh H. M. 1½	No	.....	30th March, 1895.
				380 ,, ...	Nattoo Dassee H. F. 6 ...	No	.....	1st April, 1895.
				383 ,, ...	Indramutty Dassee H. F. 5 ...	No	.....	9th ,,
V.—Gopal Dass' house at 33-H-13 Shampuker Street Bustee, Ward 1 ...	Ditto ...	12	13	384 ,, ...	Kusum Behara H. M. 40 ...	No	.....	7th ,,
VI.—In Abdul Aziz's house at 17-H Muchiparah Road, Ward 19	29th March, 1894 ...	3	8	401 ,, ...	Marihur Bebee M. F. 80 ...	No	.....	7th May, 1 95.
				404 ,, ...	Shaik Abbash M. M. 45 ...	No	.....	Ditto.
VII.—In Satkori Nikari's house at Katal Bagan Bustee, Ward 19 ...	31st March, 1894 ...	2	6	300 ,, ...	Satkouri Nikari H. M. 45 ...	No	.....	27th January, 1895.
VIII.—In Ramdhon Dutt's house at Katal Bagan Bustee, Ward 19	31st March, 1894 ..	6	2	9 ,, ...	Bilashmoni Dassee H. F. 45 ...	No	.....	10th April, 1894.
IX.—In Shaik Subratee's house at Katal Bagan Bustee, Ward 19	Ditto ...	7	7	17 ,, ...	Shaik Babu M. M. 30	No	18th April, 1894	,.....
X.—In Karim Ali's house at Kattal Bagan Bustee, Ward 19 ,, ...	Ditto ...	3	5	37 ,, ...	Tetar Bewah M. F. 35	No	.....	7th May, 1894.
XI.—In Mungloo Jemadar's house at Kattal Bagan Bustee, Ward 19 ...	Ditto ...	11	7	12 ,, ...	Ameron M. F. 40	No	.....	12th April, 1894.
				15 ,, ...	Perun Bebee M. F. 25	No	16th April, 1894	.....
XII.—In Shaik Hossain Box's house at 8-H-12 Middle Road, Entally, Ward 19	1st April, 1894 ...	1	9	394 ,, ...	Shaik Fakeer M. M. 25 ...	No	.....	3rd May, 1895.
XIII.—In Durga Churn Bose's house at 20-H-1 Middle Road, Entally, Ward 19	Ditto ...	2	6	378 ,, ...	Radhamoni Dassee H. F. 30 ...	No	18th April, 1895	.....
				393 ,, ...	Surendra Chundra Bose H. M. 3	No	.....	28th April, 1895.
XIV.—In Munshi Maniruddeen's house at 6 Marquis Street, Ward 15 ...	10th May, 1894 ...	9	43	356 ,, ...	Mangloo H. M. 11			
				361 ,, ...	Rashmoni H. F. 4	No	.....	3rd May, 1895.
				362 ,, ...	Chamroo H. M. 5	No	.....	6th ,,
						No	.....	7th ,,
XV.—In Guru Prosad Khottah's house at 23 Nimtolla Ghat Street Bustee, Ward 5	15th ,, ...	2	10	319 ,, ...	Chanchala Bewah H. F. 25 ...	No	.....	31st March, 1895.
XVI.—In Gonessee Bewah's house in one room at 16 Jorabagan Street, Ward 5	Ditto ...	4	1	57 ,, ...	Balkristo Das H. M. 40 ...	No	.....	11th July, 1894.
XVII.—In Naran Marick's house at 155 Upper Chitpore Road, Ward 1 ...	11th August, 1894 ...	3	5	62 ,, ...	Kali Dassee H. F. 22	No	.....	15th October, 1894.
XVIII.—In Mohit Chamar's house at Nichoo Bustee, Ward 21	13th December, 1894...	10	24	143 ,, ...	Dhonpatia H. F. 7	No	.....	6th May, 1895.
XIX.—In Lakhimoni Dhye's house at 66-1 Bolloram Dey's Street, Ward 5	Ditto ...	5	8	114 ,, ...	Mati Bewah H. F. 21	No	.....	9th April, 1895.
				118 ,, ...	Gorobini Dassee H. F. 32 ...	No	.....	11th ,,
XX.—In Pitamber Sircar's house at Kopidanga Bustee, Ward 25	17th January, 1895 ...	4	5	63 ,, ...	Pelye H. F. 65	No	.....	26th March, 1895.
XXI.—In Nistarini Devi's house at 2 Nokuleswar Tolla Lane, Ward 22 ...	13th February, 1895...	2	6	71 ,, ...	Nogendra Bala H. F. 3½ ...	No	.....	26th April, 1895.
21 houses.	From 14th March 1894 to 31st February 1895.	101	190	From 9 to 404 days.	29 persons attacked	None of the inoculated attacked.	3 recoveries.	26 deaths.

In addition to the above I have to add the following observation in Shibpore, communicated to me by a gentleman resident there, in whose house inoculation was performed at the invitation of Dr. Purvis, Civil-Surgeon of Howrah :—

Shibpore, 10th April, 1895.

To the Health Officer of the Calcutta Corporation.

Sir,—I have the pleasure to inform you that 6 members of a family of 7, in the house of Baboo Banikanta Mookerjee, Kalikumar Mookerjee's Lane, Shibpore, were inoculated by you and Dr. J. Chowdry in the beginning of July, 1894.

The only remaining member, wife to the above-mentioned Banikanta Baboo, who was left *uninoculated*, was affected with and died of cholera in March last.

I need scarcely mention that all the inmates of the household took the same food and drink, and were otherwise in identical conditions. I may add that cholera is now raging in this part of the locality.

Bemala Charan Mitra.

It will be observed in the above observations that there were two houses in which only 2 persons were left not inoculated, and when cholera entered the house, it selected one of the two not inoculated persons in *each* house; and further, there were two houses where all the inmates except one had been inoculated, and when cholera appeared, it attacked the only one person not inoculated in *each* house.

Though the observations are not numerous enough to settle the question, yet as they stand, they are sufficiently favourable to warrant the view that, in this system, there is certainly protection against cholera. To what degree it is impossible at the present time to hazard an opinion, and it is only by the continuance of the inoculations and the careful noting of the results that a correct conclusion can be come to.

Monsieur Haffkine has recently been working in the tea gardens of Assam, which are frequently visited by cholera. He began his work there in the early part of this year, and Dr. Arthur Powell of Cachar has recently communicated to me the results hitherto observed in three gardens.

They are tabulated as follows :—

From 9th February to 16th April.

Gardens.	Uninoculated—Cholera.			Inoculated—Cholera.		
	Inhabitants.	Cases.	Deaths.	Inhabitants.	Cases.	Deaths.
Kalain	1,609	29	11	607	2	1
Karkuri	147	9	5	377	.....	.....
Total ...	1,756	38	16	984	2	1

From 16th April to 28th May.

Kalain	1,105	4	3	1,140	.....	.....
Karkuri	190	3	1	420	1(?)	1(?)
Degubber.. ...	225	2	...	392	.....	.....
Total ...	1,520	9	4	1,952	1(?)	1(?)

In other gardens inoculated, there has been no cholera except in Looba and Sandura, where few people have been inoculated.

Gardens.	Uninoculated—Cholera.			Inoculated—Cholera.		
	Inhabitants.	Cases.	Deaths.	Inhabitants.	Cases.	Deaths.
Looba	450(?)	3	1	33	.....	.....
Sandura	320(?)	2	1	52	.....	.....
Total ...	770(?)	5	2	85	.....	.....

Dr. Powell remarks that no one was attacked with cholera who had been reinoculated, that is, who had undergone the second inoculation. Dr. Powell further remarks that "it is unfortunate that neither of the fatal cases among the inoculated were seen by any medical man." The cooly Nemai, in Kalain, who was inoculated on 9th February, disappeared from the estate a few days later. His wife reported his death from cholera in a neighbouring bustee on the 16th March. Professor Haffkine and Dr. Powell accepted her diagnosis and statement. As regards the second death, though registered as a case of cholera, the accuracy of the cause assigned is extremely doubtful. Dr. Powell saw the woman on April 11th, when she was suffering from sloughing dysentery and unable to move out of her house. On the 26th she was seized with acute pain in the abdomen, collapse, vomiting and some loose stools, dying in an hour or two. The Doctor Baboo had taken leave, and by the time Dr. Powell heard of her death she was registered as a case of cholera, and had been buried so long that a *postmortem* was out of the question. Dr. Powell believed her death to be due to perforation of a dysenteric ulcer. But even taking as accurate the 3 cases with 2 deaths, which are reported as having occurred among the inoculated in the first 3 gardens, the result is very different from the 47 cases and 20 deaths among the non-inoculated in the same gardens.

Conclusion.

The Assam results are distinctly favourable to the inoculations, and when those in Calcutta, in Gya, in Cawnpore, in Dinapore and even in Lucknow are added, it must, I think, be admitted that the evidence which is accumulating is gradually becoming so strong as to remove all doubts regarding the efficacy of the inoculation in rendering the body more resistant against cholera. As to the duration of the protection, I have previously mentioned that this is a matter which time alone can settle.

Calcutta, 8th June, 1895.

W. J. SIMPSON, M. D.

1060—23-8-95—500.

To the CHAIRMAN of the CORPORATION of CALCUTTA,

16th August, 1895.

Sir,

Now that a year has passed since the Commissioners granted the sum of Rs. 7,500 for the purpose of carrying on anti-choleraic inoculations in Calcutta I have the honor to submit a report on the work done and also a summary of the results obtained not only in Calcutta, but in other parts of India in the period in which these inoculations have been practised in this country.

2. In the Note which I had the honor of presenting to the Commissioners in May of last year, recommending an extended trial of Professor Haffkine's system in Calcutta, I brought particularly to the attention of the Commissioners the remarkably favorable results which had followed this system in the case of Katal Bagan Bustee. The events connected with Katal Bagan Bustee will be still fresh in the minds of the Commissioners, for they produced a deep impression on all who were interested in the prevention of cholera. A group of people, living under similar condition in a bustee with cholera among them, were subjected to an experimental test. The test which was of peculiar importance, as it marked an advance on the Laboratory experiences, consisted in the inoculation of 116 persons out of a localised group of 200, among whom 2 fatal cases of cholera and 2 cases of diarrhœa had already occurred, and in comparing the liability of the inoculated and uninoculated to the prevailing disease. The continuance of the disease in the bustee permitted of this comparison, and it was found that no cases occurred subsequently among the inoculated, whereas 10 cases, of which 7 proved fatal, occurred among the not inoculated.

3. From the time the Haffkine system was first introduced into Calcutta till 15th July, 1895, 4,397 persons have been inoculated which is more than double the number of vaccinations performed annually in this city 25 years after vaccination against small-pox had been introduced. Of the 4,397 persons inoculated, 1,060 were Mahomedans, 25 Europeans, 10 Eurasians and 3,302 Hindoos including 363 Brahmins. The following statement gives further details :—

HINDOOS.					MAHOMEDANS.					OTHER CLASSES.					
Adults.		Children under 12 years.		Total.	Adults.		Children under 12 years.		Total.	Adults.		Children under 12 years.		Total.	Grand total.
M.	F.	M.	F.		M.	F.	M.	F.		M.	F.	M.	F.		
1,693	440	723	446	3,302	386	29	392	253	1,060	20	8	5	2	35	4,397

4. The number would undoubtedly have been greater and the observations which follow probably more numerous, had not the events connected with the Lucknow outbreak in the East Lancashire Regiment lessened public confidence in the efficacy of the prophylactic. This decline in public estimation was mainly due to the manner in which the facts relating to the Lucknow epidemic were distorted, and to the virulent attacks by ignorant people on the inoculations which were stigmatised as being everything that was evil, and the source of the most loathsome diseases and of every ill

to which man is heir to. The distrust engendered by these misrepresentations and fulminations was, however, only of a temporary nature, and when the exact circumstances connected with the Lucknow outbreak came to be known and understood, and it was seen that the inoculated had in reality suffered less and had fewer deaths proportionately than the not inoculated, the confidence created by the Calcutta experience began to be considerably restored.

5. The observations made during the period under record may be divided into those of a negative and positive character. Of the negative kind it has several times been observed that, when the inoculations were introduced into an infected locality, the cholera ceased in the course of a few days; it has also been noticed that, in some localities notorious for their recurring cholera, and, where, on account of this, large numbers have been inoculated, cholera has during the year been particularly absent. In the case of a small bustee in which the people petitioned to be inoculated, because they were constantly suffering from cholera, not a single case has occurred since the inoculations last year.

6. Evidence of a more convincing and more direct nature exists, however, in the observations of a positive kind collected during the period under review.

Opportunities for comparing the liability to cholera of inoculated with uninoculated living under similar conditions in the same houses presented themselves no fewer than 36 times—once in Seebpore across the river, and 35 times in Calcutta. These opportunities arise from the circumstance that cholera during its season will, sooner or later, appear in some of the huts in the bustees of Calcutta. When this happens in huts in which no previous inoculation have been performed, no materials for an observation are forthcoming; but when it happens in huts in which some of the inmates have been inoculated and the others have not, the essentials necessary for observation and comparison are existent. There were 36 such occurrences in 36 houses, and they are of the utmost importance for they furnish 36 observations, separate both in time and locality, and they allow of conclusions being drawn regarding the value of the inoculations. In the 36 houses the total number of inmates was 521; of this number, 181 were inoculated and 340 not inoculated. The uninoculated members of these houses had altogether 45 cases with 39 deaths; the inoculated had 4 fatal cases, of which one occurred 459 days after the first inoculation in a child who had not been brought for the second inoculation; and the 3 others from 1 to 4 days after the first inoculation before the protective influence of the vaccine had time to assert itself, and therefore before the 2nd vaccine could be applied. Including all cases without reference to their occurrence *in time* the percentages were as follows:—

335* uninoculated	45 cases	(13·43%)	35 deaths (11·64%)
181 inoculated	4 cases	(2·21%)	4 deaths (2·21%)

The difference in these figures show that the not inoculated were 6·08 times more liable to attack and 5·27 times more liable to death from cholera than the inoculated.

Analysis of the figures, and classification of the occurrences *according to time* demonstrate the results to be even more strikingly favorable. It will be borne in mind that there is in the treatment two injections, one 5 days later than the other; the first is made with the weak vaccine and requires 5 days for its full protection, and the other with the stronger vaccine which requires another 5 days to secure complete action; a similar period of 8 or 9 days is necessary for the full protective power of vaccine against small-pox.

* Deaths from cholera at the time of the observations reduced the original number of 340 uninoculated to an average of 335.

The figures are as follows :—

During the first 8 days.

Average number present at date of attack.		Cases.	Percentage.	Deaths.	Percentage.
Not inoculated ...	75	6	8·0	4	5·33
Inoculated ...	52	3	5·77	3	5·77

After 8 days.

Average number present at date of attack.		Cases.	Percentage.	Deaths.	Percentage.
Not inoculated ...	265	39	14·72	35	13·21
Inoculated ...	140	1	0·71	1	0·71

The above figures show that during the first 8 days before the vaccines have time to protect the system, the inoculated and not-inoculated present a similar liability. This similar liability disappears after the first vaccine has been in the system for 5 days, the 3 deaths among the inoculated occurring previous to the fifth day. After 8 days, and, in fact after 5 days, the difference in liability to attack becomes very marked, the inoculated living in the same houses in Calcutta being 20 times safer from attack and 18 times securer from death than the not-inoculated should cholera enter the house. This is protection of a very decided character. Further, the single death among the inoculated was 459 days after the inoculation in a child who had not undergone the full treatment, that is, she had only been inoculated with the weak vaccine. No case of cholera occurred among those who subjected themselves to both inoculations.

7. The subjoined statement gives the details connected with each of these 36 observations :—

Name of the locality where cholera occurred in houses with inoculated inhabitants.	Number of inoculated in the house and particulars of the cholera patient, if he was inoculated.	Number of uninoculated in the house and particulars of the cholera patient, if he was uninoculated.
I.—Cantopher's Lane, 8, Ward 20.	2 persons inoculated 2 days before with first vaccine. Prankristo, Hindoo, male, 10 years, died on 30-3-94.	..... 13 persons uninoculated.
II.—Ramdhone Dutt's house, Katal Bagan Bustee, Ward 19.	6 persons inoculated 9 days before.	2 persons uninoculated. Bilashmoni Dasee, Hindoo, female, 45 years, died on 10-4-94.
III.—Munglo Jamadar's house, at Katal Bagan Bustee, Ward 19.	11 persons inoculated 2, 6, 12 and 15 days before.	7 persons uninoculated (present on dates of attack 7, 6, 5 and 4 persons.) 1. Raju Bewah, Mahomedan, female, 40 years, died on 2-4-94. 2. Burseton, Mehomedan, female, 5 years, died on 6-4-94. 3. Ameren, Mahomedan, female, 40 years, died on 12-4-94. 4. Perun Bebee, Mahomedan, female, 25 years, attacked on 16-4-95, recovered.
IV.—Shaik Subratee's house, at Katal Bagan Bustee, Ward 19.	7 persons inoculated 17 days before.	7 persons uninoculated. Shaik Baboo, Mahomedan, male, 30 years, attacked on 18-4 95, recovered.
V.—Karim Ali's house, at Katal Bagan Bustee, Ward 19.	3 persons inoculated 37 day previously.	5 persons uninoculated. Tetar Bewa, Mahomedan, female, 35 years, died on 7-5-94.
VI.—Golam Rohoman's house, at Joratola Bustee, Ward 21.	5 persons inoculated 95 days before.	6 persons uninoculated. Sabujan Bebee, Mahomedan, female, 50 years, died on 17-6-95.
VII.—Isoo Mistry's house, at Beg Bagan Bustee, Ward 21.	4 persons inoculated 99 days before.	2 persons uninoculated Makal Bebee, Mahomedan, female, 30 years died on 22-6-95.
VIII.—Shaik Hingoo's house, at Beg Bagan Bustee, Ward 21.	6 persons inoculated 5 days before.	3 persons uninoculated Daulat Bebee, Mahomedan, female, 19 years, attacked on 22-6-94, recovered.
IX.—Gonessee Bewah's house, at Jorabagan Street, Ward 5.	4 persons inoculated 57 days before.	1 person uninoculated Balkristo Das, Hindoo, male, 40 years, died on 11-7-94.
X.—Jodunath Chackravarty's house, 155, Upper Chitpore Road Bustee, Ward 1.	4 persons inoculated 2 days before.	7 persons uninoculated Nundu Lal, Hindoo, male, 13 years, attacked on 13-8-94, recovered.
XI.—H. L. Mukerjee's Cooly Depôt, at 2, Chatoo Baboo's Lane, Ward 19.	28 persons inoculated 3 days before.	33 persons uninoculated Bhagoo, Hindoo, male, 30 years, died on 15-8-94.
XII.—Narain Mistry's house, 155, Upper Chitpore Road Bustee, Ward 1.	3 persons inoculated 3 days before.	8 persons uninoculated Digamburie Dassee, Hindoo, female, 55 years, died on 15-8-94.
XIII.—Narain Marick's house at 155, Upper Chitpore Road, Ward 1.	3 persons inoculated 62 days before.	5 persons uninoculated Kali Dassee, Hindoo, female, 22 years, died on 15-10-94.
XIV.—Bipatha Chamar's house, at Nichoo Bagan Bustee, Ward 21.	3 persons inoculated 271 days before.	6 persons uninoculated Bipatha Chamar, Hindoo, male, 40 years died on 11-12-94.

Name of the locality where cholera occurred in houses with inoculated inhabitants.	Number of inoculated in the house and particulars of the cholera patient, if he was inoculated.	Number of uninoculated in the house and particulars of the cholera patient, if he was uninoculated.
XV.—Ambica Charan Roy's house, Tallygunge Road, Ward 22.	3 persons inoculated 4 days before with 1st vaccine. Ambica Charan Roy, Hindoo, male, 40 years, died on 6-1-95.	2 persons uninoculated.
XVI.—Satkuri Nikari's house, at Katal Bagan Buste, Ward 19.	2 persons inoculated 300 days before.	6 persons uninoculated. Satkuri Nikari, Hindoo, male, 45 years, died on 27-1-95.
XVII.—Pitamber Sircar's house, at Kopidanga Bustee, Ward 25.	4 persons inoculated 63 days before.	5 persons uninoculated. Pelye, Hindoo, female, 65 years, died on 26-3-95.
XVIII.—Baboo Banikanto Mukerjea's house, Kalikumar Mukerjea's Lane, Shibpore.	6 persons inoculated 240 days before.	1 person uninoculated. Baboo Banikanto Mukerjea's wife, Hindoo, female, 25 years, died in March 1895.
XIX.—Surendra Nath Ghose's house, at 33, Shampuker Street Bustee, Ward 1.	3 persons inoculated 370 to 383 days before	11 persons uninoculated (average present 10 uninoculated.) 1. Soilandra Kumar Ghose, Hindoo, male, 1½ years, died on 30-3-95. 2. Nattoo Dassee, Hindoo, female, 6 years, died on 1-4-95. 3. Indramutty Dassee, Hindoo, female, 5 years, died on 9-4-95.
XX.—Guru Prosad Khottah's house, at 23, Nimtolla Ghat Street Bustee, Ward 5.	2 persons inoculated 319 days before.	10 persons uninoculated. Chanchala Bewah, Hindoo, female, 25 years, died on 31-3-95.
XXI.—Gopal Dass' house, at 33/H/13, Shampuker Street Bustee, Ward 1.	12 persons inoculated 384 days before.	13 persons uninoculated. Kusum Behara, Hindoo, male, 40 years, died on 7-4-95.
XXII.—Sookhon Khan's house, Kurja Bustee, Ward 21.	1 person inoculated on the same day with 1st vaccine. Samsen Nessa, Mahomedan, female, 8 years, died on 6-4-95.	2 persons uninoculated.
XXIII.—Lakhimoni Dhye's house, at 66-1, Boloram Dey's Street, Ward 5.	5 persons inoculated 114 to 118 days before.	8 persons uninoculated (on dates of attack present 8 and 7.) 1. Mati Bewah, Hindoo, female, 21 years, died on 9-4-95. 2. Gorobini Dassee, Hindoo, female, 32 years, died on 11-4-95.
XXIV.—Durga Churn Bose's house, at 20-H-1, Middle Road, Entally, Ward 19.	2 persons inoculated, 378 to 393 days before.	6 persons uninoculated. 1. Radhamoni Dassee, Hindoo, female, 30, attacked on 13-4-95; recovered. 2. Surendra Chandra Bose, Hindoo, male, 3 years, died on 28-4-95.
XXV.—Nistarini Dewi's house, at 2, Nokuleswartolla Lane, Ward 22.	2 persons inoculated 71 days before.	6 persons uninoculated. Nogendra Bala, Hindoo, female, 3½ years, died on 26-4-95.
XXVI.—Shaik Hossain Bux's house, at 8-H-12, Middle Road, Entally, Ward 19.	1 person inoculated, 394 days before.	9 persons uninoculated. Shaik Fakir, Mahomedan, male, 25 years, died on 3-5-95.

Name of the locality where cholera occurred in houses with inoculated inhabitants.	Number of inoculated in the house and particulars of the cholera patient, if he was inoculated.	Number of uninoculated in the house and particulars of the cholera patient, if he was uninoculated.
XXVII.—Munshi Manirudeen's house, at 6, Marquis St., Ward 13,	9 persons inoculated, 356 to 362 days before.	43 persons uninoculated. (Average present 42.) 1. Mangloo, Hindoo, male, 11 years, died on 3-5-95. 2. Rashmoni, Hindoo, female, 4 years, died on 6-5-95. 3. Chamroo, Hindoo, male, 5 years, died on 7-5-95.
XXVIII.—Mohit Chamar's house, at Nichoo Bustee, Ward 21.	10 persons inoculated, 143 days before.	24 persons uninoculated. Dhonpatia, Hindoo, female, 7 years, died on 6-5-95.
XXIX.—Abdul Aziz's house, at 17-H., Moochipara Road, Ward 19.	3 persons inoculated, 401 to 404 days before.	8 persons uninoculated. 1. Marihur Bibee, Mahomedan, female, 80 years, died on 7-5-95. 2. Shaik Abbash, Mahomedan, male, 45 years, died on 7-5-95.
XXX.—Chonilall Koormie's house, 16 Jorabagan Street Bustee, Ward 5.	3 persons inoculated, 132 days before.	18 persons uninoculated. Punchoo, Hindoo, male, 45 years, died on 28-5-95.
XXXI.—Babar Ali's house, Nichoo Bustee, Ward 21.	5 persons inoculated, 448 days before.	7 persons uninoculated. On the 2nd June, date of attack, present 7. 1. Abdul Jubbar, Mahomedan, male, 3½ years, died on 2-6-95. 2. Sheanath, Mahomedan, male, 32 years, died on 3-6-95.
XXXII.—Karim Bux's house, at Nichoo Bustee, Ward 21.	3 persons inoculated, 446 to 453 days before.	8 persons uninoculated. (Average present 7.) 1. Modon, Hindoo, male, 8 years, died on 4-6-95. 2. Phool, Hindoo, male, 2 years, died on 6-6-95. 3. Rashu, Hindoo, male, 5 years, died on 9-6-95.
XXXIII.—Narain Chandra Banerjee's house, at 58, Halderpara Road, Ward 22.	4 persons inoculated, 120 days before.	11 persons uninoculated. Nogendra Bala, Hindoo, female, 23 years, attacked on 13-6-95 ; recovered.
XXXIV.—Abdul Hakim's house at Katal Bagan Bustee, Ward 19.	2 persons inoculated, 459 days before. Samsun Nessa, Mahomedan, female, 8 years, died on 5-7-95. Inoculated only with 1st vaccine.	5 persons uninoculated.
XXXV.—Sridhor Poirah's house, 114-H, Jaun Bazar Street, Ward 19.	15 persons inoculated, 109 days before.	26 persons uninoculated. Radha Krishna, Hindoo, male, 22 years, died on 9-7-95.
XXXVI.—Rotikant Dass' house at 66, Anondo Gopal Palit's Lane, Ward 19.	1 person inoculated, 309 days before.	6 persons uninoculated. Shubad, Hindoo, male, 10 years, died on 14-7-95.

8. There are in the above observations some very remarkable cases, and I would invite the special attention of the Commissioners to four of these. They are cases in which the proportion of inoculated living in the house or room was much larger than that of the not inoculated and yet when cholera appeared it picked out the not inoculated leaving the inoculated free. They are the houses marked on the list 3, 8, 16 and 36.

In No. 3 which is Isoo Mistry's house Begbagan, 4 persons out of 6 were inoculated in March, 1894, and fatal cholera appeared in the house in June of the same year, and selected for attack *one of the two not-inoculated* the 4 inocculated remaining free of the disease.

In No. 8 on the list which is Ramdhone Dutt's house at Katalbagan bustee, 6 persons out of 8 were inoculated in March, 1894, and fatal cholera entered the house in the following April, and attacked *one of the two not inoculated* leaving the 6 inoculated unaffected.

In No. 16 which is Gonessee Bewah's house at 16 Jorabagan Street, 4 persons out of 5 living together in one room were inoculated on the 15th of May, 1894, and fatal cholera showed itself in the room in the next July, and attacked the *only one not inoculated* the 4 inoculated keeping quite healthy.

In No. 36 which is the house of Baboo Banikanta Mookerjee, Kalikumar Mookerjee's Lane, Shibpore, 6 members of a family of 7 were inoculated in July, 1894. In March of 1895, *the only one not inoculated* was affected with cholera and died, the inoculated remaining quite well.

9. Were there no other instances than these 4, I should feel justified in recommending the Commissioners to continue the cholera grant, but with the list which I have presented I have no hesitation in saying that it is my duty to do so in order that the benefits of the inoculations may be brought within the reach of the poorer inhabitants of Calcutta, and of all those even of the better class who may desire to be inoculated. That cholera is no respecter of persons in the endemic area even under conditions which appear to be satisfactory in their sanitary aspects the sad death of Sir Henry Harrison, the late highly respected Chairman of the Municipality, and the more recent death of Brigade-Surgeon Lieutenant Colonel Coates, the former Principal of the Calcutta Medical College, are instances which will recall themselves to every one in Calcutta.

10. The grant was asked for last year as an experiment; now it is asked as a means of affording protection against cholera to those inhabitants of Calcutta who may wish to avail themselves of the measure. In doing this I would place before the Commissioners the observations corroborative of the efficacy of the inoculation which have been obtained independently in other parts of India and which together with those in Calcutta form such a mass of evidence in their favor as to remove all objections based on preconceived opinions, imaginary theories or prejudice.

11. In my last Memorandum on the subject, dated 1st October, I recorded the cases at Gya, Cawnpore, Dinapore and Lucknow and I shall here recapitulate the principal facts connected with these observations.

At the Gya Jail inoculations were performed during the progress of an epidemic and after 6 cases and 5 deaths had occurred. Half the prisoners were inoculated, the remainder being left not-inoculated. The incidence of the disease on the two groups was as follows:—

	Not-inoculated.		Inoculated.	
	Cases.	Deaths.	Cases.	Deaths.
During first 5 days after 1st inoculation	7	5	5	4
During 3 days after 2nd inoculation	5	3	3	1
After 8 days from 1st inoculation	8	2	...	...
Total ...	20	10	8	5

It will be observed from this statement that there was a gradual diminution of cases and deaths among the inoculated, and after 8 days there were no cases or deaths among the inoculated, while there were among the not-inoculated 8 cases and 2 deaths. It is further to be noted that the mortality among the not inoculated was twice that among the inoculated. In connection with this reduction of mortality, it may be stated that the antitoxin treatment of diphtheria which has caused a commotion throughout the civilised world does not reduce the mortality from diphtheria more than that secured by the anti-choleraic inoculations applied at the time of an epidemic of cholera in the Gya jail.

In Cawnpore when cholera broke out among the troops 13 months after the inoculations, the results were—

	Numbers.	Cases.	Percentage.	Deaths.	Percentage.
Uninoculated ...	797	19	2·38	13	1·63
Inoculated ...	75	...	...	...	...

At Dinapore in the Manchester Regiment the inoculations were applied during an epidemic after 13 cases and 9 deaths occurred with the following result :—

	Numbers.	Cases.	Percentage.	Deaths.	Percentage.
Uninoculated ...	729	6	0·82	3	0·41
Inoculated ...	193	...	...	...	...

In Lucknow in the East Lancashire Regiment a part of which had been inoculated 14 to 15 months previously, cholera broke out in July, 1894 with the following result.

	Number present.	No. of attacks.	Percentage of strength.	No. of deaths.	Percentage of strength.
Not inoculated	640	120	18·75	79	12·34
Inoculated	133	18	13·53	13	9·77

This table shows only a small proportion in favor of the inoculation, probably due as was explained at the time to the weakness of the vaccine used, and the effect still further lessened by the lapse of time.

12. To these observations I have now to add those recently collected by the medical officers and managers of the Assam Tea Gardens, and which have been kindly given me by M. Haffkine. They confirm the general results obtained elsewhere as to the protective influence of the inoculations.

OBSERVATIONS IN THE KARKURIE TEA GARDEN, NORTH-WESTERN CACHAR TEA CO., KALAIN P. O.

(Collected by Dr. Arthur Powell, Medical Officer, and H. Chamney, Esq., Manager.)

The inoculations in Karkurie (North Cachar) with the first vaccine were done in the beginning of February, 1895; the inoculations with the second vaccine at the end of April. The annexed tables refer to cases of cholera which occurred on the garden in the interval between the first and second inoculations, with the exception of three which occurred later.

Out of the 14 cases of cholera recorded up to the end of May, 8 were in new coolies, who had contracted the disease within a fortnight after their arrival. As the new coolies are, as a rule, more susceptible to cholera than the old ones, and, moreover, present in some cases the possibility of having contracted the disease on their way, and as there were no inoculated amongst them for a comparison with the uninoculated, they are excluded from the calculations below.

On the dates of the attacks in the 6 other cases, the total number of uninoculated on the garden was: 17th April, 180; 18th April, 194; 21st April, 194; 26th April, 194; 25th May, 225; 28th May, 230, making an average of 203 people; the total number of inoculated on the same dates was 420, 420, 420, 420, 391, 382, or, on an average, 409 All the cases occurred in two lines, one of which had 38 uninoculated and 67 inoculated inhabitants, and the other 64 uninoculated and 62 inoculated, giving a total of uninoculated in the two lines of 102, and of inoculated 129. The affected houses contained 3, 3, 0, 1 and 4, total 11 uninoculated inhabitants, and 0, 1, 5, 2 and 1, total 9 inoculated. The uninoculated had 5 cases with 2 deaths, the inoculated 1 death. The death in the inoculated was in a dysenteric woman of 40, who had been inoculated only with the first vaccine, and had been refused the second inoculation, a week before her death, because of her dysenteric illness. The subjoined table gives the percentage of occurrences :—

Uninoculated—		Percentage.		Percentage.
On the whole garden, 203 ...	had 5 cases ...	2·46	2 deaths	0·98
In the affected lines, 102 ...		4·90		1·96
In the affected houses, 11 ...		45·45		18·18
Inoculated—				
On the whole garden, 409 ...	had 1 case (in inoculated once)	0·24	1 death	0·24
In the affected lines, 129 ...		0·77		0·77
In the affected houses, 9 ...		11·11		11·11

Observations in the Kalain Tea Gardens, Kalain P. O.

(Collected by Dr. A. Powell, medical officer, and H. Weir, Esq., managing proprietor.)

The cases recorded in the annexed returns, except 4, occurred in the interval between the 1st and 2nd inoculations, which in this instance also were separated by a period of 2 to 3 months. Out of the 35 cases of cholera recorded, 11 were in coolies who had arrived on the garden within a fortnight before the attack, and are excluded from the calculations.

On the dates of attacks the population of the whole garden was: uninoculated, 1,609 (10-3-95); 1,608 (11-3-95); 1,608 (12-3-95); 1,609 (17-3-95); 1,609 (18-3-95); 1,609 (19-3-95); 1,612 (28-3-95); 1,628 (2-4-95); 1,634 (10-4-95); 1 (in an isolated hut) (15-4-95); 1,190 (4-5-95); 1,076 (9-5-95); 1,080 (12-5-95); giving an average of 1,375 uninoculated.

Inoculated, present on the same dates, 606, 606, 606, 606, 606, 606, 606, 606, 606, 2, 1,062, 1,166, 1,165; giving an avaerage of 681 inoculated.

The population of the affected lines was—

Uninoculated 37 (an average) 20 (an average) 1, 17, 19, 2, 9—Total 105.

Inoculated 13, 21, 2, 25, 19, 0, 17—Total 97.

The population of the affected houses: uninoculated, total, 48; inoculated, total, 19.

The pecentages of occurrences were as follows :—

Uninoculated—		Percentage		Percentage.
On the whole garden, 1,375 ...	had 22 cases ...	1·6	10 deaths	0·73
In the affected lines, 105 ...		20·95		9·52
In the affected houses, 48 ...		45·83		20·83
Inoculated—				
On the whole gardens, 681 ...	had 2 cases (in inoculated once.)	0·29	1 death	0·15
In the affected lines, 97 ...		2·06		1·03
In the affected houses, 19 ...		10·53		5·26

Observations in the Chargola Garden, Ratabari P. O.

(Collected by Dr. A. Allen, medical officer, and E. Todd Naylor, Esq., Manager.)

Two lists of cases have been communicated from Chargola, one referring to cases of undoubted cholera, another, cases of what is called in those districts "choleraic diarrhœa," but which judging from their occurrence during the cholera season, might have been cases of mild (all non-fatal) attacks of cholera.

All cases occurred in the interval between the 1st and 2nd inoculation which in this garden was a period of 5 months.

Cases of undoubted cholera.—There were 4 cases with 2 fatal issues, all occurred in the uninoculated coolies. One of the fatal cases was in a cooly who arrived on the garden on the same day, and is excluded from the calculations below.

The percentage of occurrences was as follows :—

			Percentage.		Percentage.
Uninoculated—					
On the whole garden, 1,007 ...			0·30		0·1
In the affected lines, 23 ...	had 3 cases	...	13·04	1 death	4·35
In the affected houses, 10 ...			30		10
Inoculated—					
On the whole garden, 291 ...					
In the affected lines, 11 ...	had no cases	...	...	no death	...
In the affected houses, 5 ...					
Cases of "choleraic diarrhœa"—					
Uninoculated: On the whole garden, 1,007 / In the affected houses, 26	5 cases	...	0·50 / 19·23	No deaths.	
Inoculated: On the whole garden, 291 / In the affected houses, 8	3 cases	...	1·03 / 37·5	No deaths (inoculated once.)	

Observations on the Kalachera Tea Garden, Ratabari P. O.

(Collected by E. Todd Naylor, Esq., and J. C. Tristram, Esq., managers, and Dr. A. Allen, medical officer.)

On this garden, contiguous to the Chargola Garden, cholera occurred 2 days after it appeared in Chargola. There were in all 4 cases with 3 deaths; all in uninoculated coolies. About 2 months previously, while there was no cholera in the district, an inoculated woman was attacked with pains in the abdomen, which lasted for 9½ hours; she was then attacked with vomiting and purging, and died in 2½ hours, without presenting any other symptoms. Her death was attributed at the time to some poisonous substance swallowed by accident. As the managers were asked to get recorded all cases inoculated in which any choleraic symptoms should be observed, this case was put down in the return, and is included in the calculation below. Percentages of occurrences in Kalachera :—

			Percentage.		Percentage.
Uninoculated—					
On the whole garden, 520 ...			0·77		0·58
In the affected lines, 13 ...	had 4 cases	...	30·77	3 deaths	23·07
In the affected houses, 11 ...			36·36		27·27
Inoculated—					
On the whole garden, 211 ...					
In the affected lines, 4 ...	1 case (inoculated once)	...	0·47 / 0·25	1 death	0·47 / 0·25
In the affected houses, 1 ...			100		100

Observations in the Pallarbund Tea Garden, Banskandi P. O.

(Collected by W. Mason, Esq., manager.)

There were two deaths from cholera in uninoculated coolies. The percentages were as follows :—

			Percentage.		Percentage.
Uninoculated—					
On the whole garden, 1,170 ...			0·17		0·17
In the affected lines, 70 ...	had 2 cases		2·86	2 deaths	2·86
In the affected houses, 7 ...			28·57		28·57
Inoculated—					
On the whole garden, 451 ...					
In the affected lines, 63 ...	No cases	...	...	No death	...
In the affected house, 1 ...					

Observations in the Degubber Tea Garden, Kalain P. O.

(Collected by Dr. A. Powell, medical officer, and H. Chamney, Esq., manager.)

There were 2 cases in Degubber; 1 fatal. Both cases occurred in uninoculated coolies. The percentages of the occurrences were as follows :—

			Percentage.		Percentage.
Uninoculated—					
On the whole garden, 228 ...			0·88		0·44
In the affected lines, 64 ...	had 2 cases	...	3·12	1 death	1·55
In the affected houses, 5 ...			40		·20
Inoculated—					
On the whole garden, 382 ...					
In the affected lines, 62 ...	No cases	...	...	No death	...
In the affected houses, 3 ...					

Observations in the Adam Tila Tea Garden, Chandkhira P. O.

(Collected by H. A. Brown Constable, Esq., manager.)

Two cases with 1 death are reported from Adam Tila, both in people inoculated once, 2 and 2½ months after inoculation. The percentages of occurrences are as follows:—

		Percentage.		Percentage.
Uninoculated—				
On the whole garden, 657 ...	had no cases ...	...	No death	...
In the affected lines, 7 ...				
In the affected houses, 3 ...				
Inoculated—				
On the whole garden, 318 ...	had 2 cases (inoculated once.)	0·63	1 death	0·31
In the affected lines, 3 ...		66·66		33·33
In the affected houses, 2 ...		1·00		50

Cases in the Burnie Braes (Hailikandi, P. O.), Loobachera (Atgram P. O.), Kalainchera (Kalain P. O.) and Sandura (Kalain P. O.), Tea Gardens.

No returns have been as yet received from these gardens, further than a communication that, since the date of the inoculation, there occurred 2 cases with 1 death in Burnie Braes, 3 cases with 1 death in Loobachera, 4 cases with 2 deaths in Kalainchera and 2 cases with 1 death in Sandura, all in uninoculated coolies. Of these gardens, in Burnie Braes and in Kalainchera a large proportion of the population had been inoculated (449 and 145, respectively, making ¼ to ½ of the whole population); in the two other gardens, the proportion of inoculated was from $\frac{1}{14}$ to $\frac{1}{6}$ of the total.

13. Summarising the observations made on the gardens, on coolies inoculated *once*, that is, before the second inoculation was applied, the results are as follows:—

*Total of uninoculated on all the affected gardens**—

		Percentage.		Percentage.
In the whole population, 5,222 ...	had 38 cases	0·73	19 deaths	0·36
In the affected lines, 374 ...		10·16		5·08
In the affected houses, 95 ...		40·		20·

Total of inoculated on all the affected gardens—

		Percentage.		Percentage.
In the whole population, 2,741 ...	had 5 cases	0·18	3 deaths	0·11
In the affected lines 369 ...		1·36		0·2
In the affected houses, 40 ...		12·50		7·50

* Exclusive of the 19 cases with 11 deaths in new uninoculated coolies, and 11 cases with 5 deaths in old uninoculated coolies, but regarding which the returns have not yet arrived.

14. To this information I have to add that contained in two letters addressed to me recently by two influential mercantile firms in Calcutta, in whose gardens inoculations have been carried out. They are additional observations to those already mentioned and improve the results given by Mons. Haffkine to a considerable extent:—

To Health Officer,

We have pleasure in communicating the under-noted extract from a letter from Mr. H. Weir, Manager of Kalline Tea Estate, Cachar, dated 3rd instant, on subject of Dr. Haffkine's experiments in inoculation for cholera.

Calcutta, 12th July, 1895. Macneill and Co.

Our results here since I last wrote you on the subject are all most favourable. As regards inoculation I mean, we have had 4 cases in all. No. 1 died had not been inoculated: 5 other people in his house had been and escaped any attack.

No. 2 recovered; had not been inoculated.
„ 3 died „ „ „
„ 4 died „ „ „

I hope Dr. Simpson will be successful in getting the Municipal Commissioners to give a decent grant to try Dr. Haffkine's system properly. We have a very elaborate and complete register we keep for the Professor here. The Professor took enormous pains and trouble working far into the night examining every tube microscopically, and this for week after week, so it was only fair to do what we could in return; again only by careful

comparison and record of inoculated households *versus* non-inoculated, and households in which half were inoculated and half not inoculated could we fairly test his system. The Professor is a gentleman of most charming and gentle manner, and it is quite a pleasure to me to be able to do him any slight service. His work is exceedingly laborious, and it must be a great strain, besides involving a very heavy expenditure from his private fortune. No one who has met the Professor can fail to wish success to both the cause (science *versus* disease) and the man.

We have received from the local Manager of the North-Western Cachar Tea Company a statistical statement of the results of Professor Haffkine's cholera inoculation on the Company's estates. As we believe this statement to be of value to you, we have pleasure in herewith submitting a copy.

Calcutta, 24th July, 1895.

DUNCAN BROTHERS AND CO.

At *Degubber* we had 5 cases of cholera, two of which were inoculated and both recovered; the three uninoculated cases all died.

*At *Kurkoorie* we had 16 cases: uninoculated 14, of which 11 died and 3 recovered, one case twice inoculated recovered the other case only received the first inoculation and died, but there is some doubt if death was not caused as much by a long attack of dysentery.

H. CHAMNEY.

KURKOORIE TEA ESTATE,
The 14th July, 1895.

*At *Kurkoorie* over 400 were inoculated, and only 200 left uninoculated.

These letters indicate the interest that is being taken in the subject, while their contents furnish strong proof of the value of the inoculations.

15. At the Indian Medical Congress when the observations of Assam had not been made and when the observations in Calcutta were only 13 instead of 36 as now, the medical profession received the results with much favor, and were unanimously of opinion that the inoculations should be tried, on as extensive a scale as possible. More recently at a largely attended Meeting of the Calcutta Medical Society, when similar figures to those I now bring to the notice of the Commissioners were laid before the members, they were so impressed with their value, that they unanimously passed a resolution that the inoculation ought to be continued.

16. With this report before them I trust the Commissioners will have no hesitation in sanctioning a grant of Rs. 10,000. This sum is needed to place the inoculations on a satisfactory basis. By securing more than one trained vaccinator, the inoculations can be spread with greater facilities, and much can be done which it was impossible to do this year owing to a very limited establishment. By granting facilities to carry out this important work in the Capital of India, which is regarded as the centre of "the home of cholera" and the city of all others in the East, to which Governments turn for information concerning this disease, as indicated in the scientific missions of Koch from Germany, Klein from England, Zahn from Geneva and Shakespere from America, the Commissioners will not only be conferring a public benefit on the inhabitants of Calcutta who are so subject to cholera, but they will also be leading the way to the introduction of a prophylactic measure, which, either in its present or in a modified form, may be expected to effect an enormous reduction in the ravages of cholera among Eastern and Western populations.

W. J. SIMPSON, M. D., M. R. C. P., D. P. H.,
Health Officer.

1118—27-8-95—600.