

Anti-cholera inoculation : report to the Government of India / by W.M. Haffkine.

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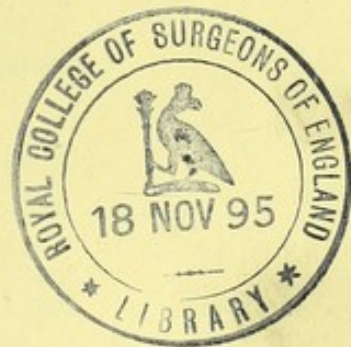
ANTI-CHOLERA INOCULATION.

REPORT

TO THE

GOVERNMENT OF INDIA.

By W. M. HAFFKINE.

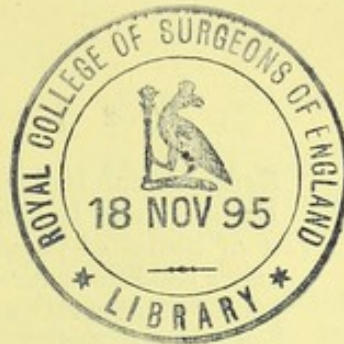


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REPORT
ON
ANTI-CHOLERA INOCULATION.

FROM

W. M. HAFFKINE, SC. D.,

TO

THE SECRETARY TO THE GOVERNMENT
OF INDIA IN THE HOME DEPARTMENT,
SIMLA.

Calcutta, the 25th August 1895.

SIR,

I HAVE the honour to submit the following Report on the experiment of preventive inoculation against cholera, which has been performed in India during the period between the beginning of April 1893 and the end of August 1895.

This report is sub-divided as follows :—

I.—First year (1893-1894)—

Inoculation work done during that year:
inoculations in Civil population,

European and Indian, and in Military,
European and Indian.

List of bodies of population inoculated
under conditions favourable for com-
parative observations on inoculated
and uninoculated.

The only observation in Agra made
during that year.

II.—Second and part of third year (1894-
1895)—

Inoculation work done during that period:
inoculations in Civil population,
European and Indian, and in Military,
European and Indian.

List of bodies of population inoculated
under conditions favourable for com-
parative observations on inoculated
and uninoculated.

Observations made during that period in
Calcutta, Gya, Cawnpore, Dinapore,
and Camp Behta, Lucknow and on the
Assam Tea Gardens.

III.—Summary.

IV.—Conclusions.

I.

FIRST YEAR (FROM APRIL 1893 TO
MARCH 1894).

Inoculation work done during that year.

FROM the beginning of April 1893 to the
beginning of March 1894, the inoculations were
applied in the areas subject to cholera epidemics
in the North-West Provinces and Oudh, and in
the Punjab. The total number of inoculated

during this period was 22,703, of which number about $\frac{2}{3}$ were re-inoculated with 2nd vaccine. The number of inoculated was composed as follows:—

CIVIL POPULATION.*

EUROPEANS—TOTAL OF INOCULATED 740.

North-West Provinces and Oudh.—Agra, number of inoculated 55; Aligarh, 7; Delhi, 32; Jhansi, 54; Lucknow, 198; Mussoorie, 94; Naini Tal, 29; Paori, 8; Ranikhet, 1; Saharanpur, 13.

Punjab.—Abbottabad, 6; Chirat, 7; Dagshai, 8; Dharmsala, 8; Gujerat, 3; Kapurthala, 3; Kasauli, 3; Lahore and Mian Mir, 41; Murree, 33; Nowshera, 2; Patiala, 13; Peshawur, 6; Rajpurah, 2; Sanawur, 30; Sialkot, 5; Simla, 78; Wazirabad, 1.

EURASIANS—TOTAL 75.

Agra, 56; Delhi, 3; Lucknow, 3; Naini Tal, 4. Peshawur, 4; Rawul Pindi, 4; Sialkot, 1.

INDIANS—TOTAL 12,971 (360 Brahmins).

Agra, 580 (117 Brahmins); Aligarh, 63 (3 Brahmins); Almorah, 136; Dehra Dun, 94; Delhi, 388 (4 Brahmins); Dworahat (Kumaun), 252; Hardwar and Jawalapur, 432; Jhansi, 44 (1 Brahmin); Kainur (Garhwal), 344; Lucknow, 30 (8 Brahmins); Mussagali (Garhwal), 124; Mussoorie, 42; Naini Tal, 165 (23 Brahmins); Paori, 1,151; Ranikhet, 102; Sakniana (Garhwal), 325; Shrinagur (Garhwal), 824; Tehri 440.

Abbottabad, 329 (3 Brahmins); Amritsar, 758 (6 Brahmins); Chirat, 4; Dagshai, 8; Dharmsala, 10 (1 Brahmin); Gujerat, 422 (2 Brahmins); Kapurthala, 18; Kasauli, 194 (11 Brahmins); Lahore and Mian Mir, 182 (15 Brahmins); Murree, 96; Nowshera, 3; Pasrur and Seranwali, 2,132 (108 Brahmins); Patiala, 1,048 (16 Brahmins); Peshawur, 317 (7 Brahmins); Rajpurah (Patiala territory) 77 (5 Brahmins); Rawul Pindi, 164 (20 Brahmins); Sanawur, 124 (3 Brahmins); Sangrur, 147 (3 Brahmins); Sansi village near Sialkot, 290; Sialkot, 825 (4 Brahmins); Simla, 169; Wazirabad, 118.

* Inoculation Registers, for the people inoculated in the Punjab and in the North-West Provinces and Oudh, recording the names, father's names or regimental numbers, sex, age, nationality, birth-place, religion or caste, profession, address and date of inoculation, are deposited in the Bacteriological Laboratory in Agra. In the case of troops, the fact of inoculation is entered on the Medical History Sheet; in the case of prisoners, on the jail ticket.

MILITARY.

EUROPEAN TROOPS—TOTAL 2,513 (Officers 273, Men 2,240).

North-West Provinces and Oudh.

Agra	... Officers 33. Men, Royal Artillery, 13 ; East Surrey Regiment 32 ; Commissariat and other departments 11. Total 56 men.
Aligarh	... Medical Officer 1.
Almorah	... Officers 2 ; Medical Officer 1. Total 3.
Delhi	... Officers 12. Men, Royal Artillery, 35 ; Royal West Kent Regiment 28 ; 5th Lancers 1 ; Bedfordshire Regiment 1 ; Border Regiment 1 ; Corps not noted 4. Total 70 men.
Jhansi	... Officers, Royal Artillery, 10 ; Wiltshire Regiment 4 ; Medical Officers 2 ; other departments 1. Total 17 Officers. Men, Royal Artillery, 71 ; Wiltshire Regiment 28 ; other departments 4. Total 103 men.
Lucknow	... Officers, Royal Irish, 9 ; 1st Batn., East Lancashire, 9 ; 16th Lancers 2 ; Royal Artillery 3 ; Horse Artillery 1 ; other Corps 15 ; Medical Officers 14 ; other departments 4. Total 57 Officers. Men, Royal Irish, 213 ; East Lancashire 176 ; 16th Lancers 67 ; Royal Artillery 39 ; Horse Artillery 6 ; East Surrey Regt. 14 ; Highland Light Infantry 1 ; Royal Munster Fusiliers 3. Total 519 men.
Naini Tal	... Officers, 5th Bengal Cavalry, 1 ; other Regiments, 2 ; Medical Officer 1. Total 4. Men, Royal Irish, 6 ; Royal Artillery 1 ; Highland Light Infantry 1. Total 8 men.
Ranikhet	... Officers 2 ; Medical Officer 1. Total 3 Officers. Men, Ranikhet Standing Camp, 128.

Punjab.

Abbottabad	... Officers 8 ; Medical Officers 2. Total 10.
Amritsar	... Medical Officer 1. Man 1.
Chirat	... Officers, 2nd Batn., 5th Northumberland Fusiliers, 1. Men, 2nd Batn., 5th Northumberland Fusiliers, 102 ; Royal Welsh Fusiliers 26 ; Commissariat Dept. 1. Total 129 men.
Daghshai	... Officers 9. Men, Derbyshire Regt., 4 ; 93rd Highlanders 327 ; other Regiments 12. Total 343 men.

Dharmasala ...	Officers, 1/1 Goorkhas, 4 ; 2/1 Goorkhas 4 ; Medical Officers 2. Total 10 European Officers.
Gujerat ...	Medical Officer 1.
Kapurthala ...	Officer 1.
Kasauli ...	Officers 3 ; Medical Officer 1. Total 4 Officers. Men 26.
Lahore and Mian Mir ...	Officers, King's Own Scottish Borderers, 3 ; other Corps 3 ; Medical Officers 7 ; Total 13 Officers. Men, King's Own Scottish Borderers, 82 ; other Corps 5. Total 87 men.
Murree ...	Officers, Royal Artillery, 2 ; 2nd Dragoon Guards 1 ; 11th Hussars 1 ; 1st Devonshire Regt. 1 ; Border Regt. 1 ; 1st Bedfordshire Regt. 2 ; King's Royal Rifles 2 ; other Corps 4 ; Medical Officers 4. Total Officers 18. Men, Royal Artillery, 8 ; 2nd Dragoon Guards 16 ; 11th Hussars 21 ; 1st Devonshire Regt. 7 ; Border Regt. 2 ; 1st Bedfordshire Regt. 65 ; King's Royal Rifles 91 ; Royal Horse Artil- lery 3 ; other Corps 22. Total 235 men.
Nowshera ...	Officers, Royal Welsh Fusiliers, 1 ; 13th Bengal Lancers 2 ; Medical Officer 1 ; Total 4 European Officers. Men, Royal Welsh Fusiliers, 76.
Patiala ...	Medical Officer 1.
Peshawur ...	Officers, 5th Northumberland Fusiliers, 6 ; Medical Officers 4. Total 10 Officers. Men, 5th Northumberland Fusiliers 108 ; Royal Welsh Fusiliers 1 ; 3rd Batn., Rifle Brigade 44 ; other Corps 7. Total 160 men.
Rawal Pindi	Officers, 2nd Dragoon Guards 10 ; Royal Artillery 5 ; Royal Horse Artillery 5 ; De- vonshire Regt. 2 ; Royal Engineers 2 ; 33rd Punjab Infantry 1 ; other Corps 12 ; Medical Officers 2. Total 39 Officers. Men, 2nd Dragoon Guards, 93 ; Royal Artil- lery 34 ; Royal Horse Artillery 60 ; Devon- shire Regt. 5 ; Queen's Bays 7 ; Arsenal 9 ; Commissariat 3 ; other Corps 1. Total 212 men.
Sanawur ...	Officer 1.
Sialkot ...	Medical Officers 3. Men, Royal Horse Artillery, 8 ; 2nd Dragoon Guards 1 ; Scotch Fusiliers 7 ; 11th Hussars 5. Total 21 men.
Simla and Jutogh ...	Officers 17.

Men, Royal Horse Artillery 31; Gordon Highlanders 32; other Corps 3. Total 66 men.

INDIAN TROOPS.

(Native Officers, Non-Commissioned Officers and Men). Total 6,401.

Agra	... 17th Bengal Infantry 1.
Almorah	... 1/3 Goorkha Rifles 255.
Dehra Dun	... 1/2 Goorkhas 414.
Delhi	... 36th Sikhs 485.
Jhansi	... 45th Sikhs 32.
Lucknow	... 4th Bengal Cavalry 1; 7th Bengal Cavalry 112; 8th Bengal Cavalry 1; 7th Bengal Infantry 108. Total 222.
Abbottabad	... 1/5 Goorkha Rifles 69; 2/5 Goorkha Rifles 53; No. 1, Kohat Mountain Battery 172; 1st Punjab Infantry 66. Total 360
Amritsar	... 20th Punjab Infantry 12.
Chirat	... 13th Bengal Lancers 16.
Dharmasala	... 1/1 Goorkhas 525; 2/1 Goorkhas 662. Total 1,187.
Kapurthala	... 1st Imperial Service Regt. 162.
Lahore and Mian Mir	... 20th Punjab Infantry 8; 19th Bengal Lancers 13; 34th Pioneers 15. Total 36.
Nowshera	... 13th Bengal Lancers 233; 37th Dogras 38. Total 271.
Patiala	... Imperial Service and other troops 2,134.
Peshawur	... 14th Sikhs 132; 28th Punjab Infantry 18; 31st Punjab Infantry 89. Total 239.
Rawal Pindi	... 33rd Punjab Infantry 13; 11th Bengal Lancers 13. Total 26.
Sangrur	... 1st Jhind Infantry 451.
Sialkot	... 12th Bengal Cavalry 45; 38th Dogras 56. Total 101.

List of bodies of population inoculated under conditions favourable for comparative observations on inoculated and uninoculated.

The selection of the above-mentioned localities and groups of individuals was determined chiefly by the willingness of the people to undergo the preventive treatment; but, at the same time, in every place efforts were made to concentrate the operations on bodies of population living under

similar and comparative conditions, and supervised by medical and sanitary authorities, in order that, on the occasion of cholera outbreaks, a comparison could be made between the resistance of inoculated and uninoculated individuals.

This object was especially obtained in the following places :—

CIVIL POPULATION.

INDIANS.

N.-W.-P. and Oudh.—Agra. Transport and Police Lines ; Orphanage in St. Peter's College.

Fixed agricultural village population in the Kumaun and Garhwal Himalayas, situated parallel to the Haridwar pilgrim road and having for centres the following villages : Dwarahat, Kainur, Mussagali, Paori (population of the village, Chopra Mission School and establishment of the Settlement Officer), Sakoliana and Shrinagar.

The Tahsili School, Almorah.

Punjab.—Jail population and inhabitants of a supervised Sansi village in the following places : Amritsar, Gujerat, Patiala, Sangrur, Sansi village near Sialkot, and Sialkot.

MILITARY POPULATION.

EUROPEAN TROOPS.

N.-W.-P. and Oudh.—Lucknow, Royal Irish Fusiliers and East Lancashire Regiment.

Punjab.—Chirat and Peshawur, Northumberland Fusiliers ; Daghsai, 93rd Highlanders.

NATIVE TROOPS.

N.-W.-P. and Oudh.—Almorah, 1/3 Goorkha Rifles ; Dehra Dun, 1/2 Goorkhas ; Dehli, 36th Sikhs ; Lucknow, 7th Bengal Cavalry and 7th Bengal Infantry.

Punjab.—Abbottabad, No. 1, Kohat Mountain Battery ; Dharamsala, 1/1 and 2/1 Goorkhas ; Kapurthala, 1st Imperial Service Regt. ; Nowshera, 13th Bengal Lancers ; Patiala, Imperial Service and other Regts. ; Peshawur, 14th Sikhs ; Sangrur, 1st Jhind Infantry.

The only Observation in Agra made during the recorded year.

Only one case of cholera was noted as having occurred in the midst of inoculated people. This was in the family of an inoculated Indian named

Abdul Suttar, Mussulman, head constable, in the police lines in Agra. It was reported that the man and his wife, the latter of whom was not inoculated, partook of a fermented infusion of country cucumber seeds, the wife developing a bad attack of cholera, from which she recovered after two days' illness, and the man remaining unaffected.

II.

SECOND AND PART OF THIRD YEAR (FROM MARCH 1894 TO END OF AUGUST 1895.)

Inoculation work done during that period.

FROM the beginning of March 1894 the inoculations were applied in the endemic areas of Lower Bengal and Assam, where the difficulties for carrying out the work and inducing the people to undergo the inoculation were particularly great. The total number of inoculated during that period was 19,473, of which 1,860 were inoculated at the cost and by the Medical Officers of the Health Department of Calcutta, a special laboratory for this purpose having been established by the Municipality in August 1894. About $\frac{2}{3}$ of the total number of inoculated were re-inoculated with the 2nd vaccine. The total number of inoculated was composed as follows :—

CIVIL POPULATION.*

EUROPEANS—TOTAL 129.

Lower Bengal.—Bankipore, 16 inoculated individuals ; Calcutta, 25 ; Chittagong, 24 ; Dinapore, about 30† ; Dum-Dum, 2 ; Gya, 9.

* The inoculation Registers recording particulars of the people inoculated in Bengal Proper and in Assam, are deposited in the Health Office of Calcutta. In the case of troops the fact of inoculation has been entered on the Medical History Sheet ; in the case of prisoners, on the jail ticket.

† The Register book containing particulars of these inoculations in Dinapore has been left with the 13th Bengal Infantry, and not returned at the time of writing this Report.

Assam.—Tea Gardens,* Alyne (Luckipore P. O.), 2; Anniepore (Ratabari P. O.), 4; Badurpore, 2; Burnie Braes (Hailikandi P. O.), 2; Chargola (Ratabari P. O.), 1; Hatecherra (Silchar P. O.), 1; Jellalpore (Atgram P. O.), 3; Kekragool (Dullabcherra P. O.), 1; Lalong (Luckipore P. O.), 3; Lungla, 1; Maguracherra (Dullabcherra P. O.), 1; Makum (Margherita P. O.), 8; Patecherra (Coombir P. O.), 2; Patemara (Coombir P. O.), 1; Singlacherra (Dullabcherra P. O.), 4; Silchar, 3; Sonatolah (Lungla F. O.), 1; Sonajuli (Borjuli P. O.), 1; Tarrapore (Banskandi P. O.), 1; Tarvincherra (Ratabari P. O.), 1.

EURASIANS—TOTAL 50.

Bankipore, 1; Calcutta, 4; Chittagong, 35; Dinapore, about 10.†

INDIANS—TOTAL 18,085 (394 Brahmins).

Lower Bengal.—Bankipore, 24; Calcutta, 4,452 (366 Brahmins); Chittagong and Oodaleah, 866 (6 Brahmins); Dinajpur 76 (1 Brahmin); Dinapore, about 10;† Dum-Dum, 191; Gya, 720 (11 Brahmins); Mudiali near Calcutta, 79 (10 Brahmins).

Assam.—Tea Gardens,* Adam Tila (Chandkhira P. O.), 321; Alyne (Luckipore P. O.), 288; Anniepore (Ratabari P. O.), 372; Badurpore 1; Baliyan (Tinsukia P. O.), 123; Burnie Braes (Hailikandi P. O.), 449; Chargola (Ratabari P. O.), 295; Craig Park (Kalain P. O.), 64; Degubber (Kalain P. O.), 379; Dhing Bridge Station (Assam Railway), 106; Dooloogram (Silchar P. O.), 79; Duna (Atgram P. O.), 28; Fuskuri (Kalighat P. O.), 124; Hatecherra (Silchar P. O.), 177; Huerijan (Tinsukia P. O.), 659; Hukumpukri (Tinsukia P. O.), 302; Ialatal (Kalain P. O.), 92; Jellalpore (Atgram P. O.), 28; Kajuricherra (Kalighat P. O.), 298; Kalacherra (Ratabari P. O.), 212; Kalain Tea Estate (Kalain, Magenta, Konapara and Sandhura Gardens, Kalain P. O.), 1,140; Kalaincherra (Kalain P. O.), 145; Kalighat, 71; Karkurie (Kalain P. O.), 429; Kekragool (Dullabcherra P. O.), 137; Lalong (Luckipore P. O.), 84; Loobacherra (Kanai Ghat P. O.), 33; Lungla, 412; Makum (Margherita P. O.), 740; Maguracherra (Doolabcherra P. O.), 73; Nuthwanpur (Atgram P. O.), 138; Pallarbund and Alipore (Banskandi P. O.), 454; Patecherra (Coombir P. O.), 242; Patemara (Coombir P. O.), 800; Powai (Margherita P. O.), 262; Rajghat (Kalighat P. O.), 282; Singlacherra (Dullabcherra P. O.), 160; Silchar, 10; Sona-

* In addition to the name of the Tea Garden the Local Post Office has been mentioned for easy reference.

† The Register book containing particulars of these inoculations in Dinapore has been left with the 13th Bengal Infantry, and not returned at the time of writing this Report.

juli (Borjuli P. O.), 718; Sonatolah (Lungla P. O.), 45
Tarrapore (Banskandi P. O.), 371; Tarvincherra (Ratabari
P. O.), 272; Tikak Coal Mine (Dhing Bridge Railway
Station), 251.

MILITARY POPULATION.

EUROPEAN TROOPS—TOTAL 987 (Officers 21, Men 966).
Dinapore ... Officers, 70th Field Battery, Royal Artillery,
2; 2nd Batn., Manchester Regiment, 8;
13th Bengal Infantry 1; Medical Officers
4. Total 15 Officers.
Men, 2nd Batn., Manchester Regiment, 580.
70th Field Battery, Royal Artillery, 67,
other Corps 3. Total 650 men.
Dum-Dum ... Officers, 2nd Batn., Royal Sussex Regiment,
3; Medical Officers 2. Total 5 Officers.
Men, 2nd Batn., Royal Sussex Regiment, 314;
Commissariat and Ordnance Departments,
2. Total 316 men.
Silchar ... Officer 1.
NATIVE TROOPS—TOTAL 223.
Dinapore ... 13th Bengal Infantry, *over* 100.*
Dum-Dum ... 6th Bengal Light Infantry, 11.
Silchar ... 2nd (Q. O.) Bengal Light Infantry 42; As-am
Military Police 70.

*List of bodies of population inoculated under con-
ditions favorable for comparative observations in
inoculated and un-inoculated.*

CIVIL POPULATION.

INDIANS.

Calcutta ... The Bustees.
Chittagong ... The Jail. The Oodaleah Tea Garden
(Hathazar P. O.).
Dinajpur ... The Jail.
Dum-Dum ... The Native followers of the Royal Sussex
Regiment.
Gya ... The Jail.
The above mentioned Tea Estates near the following Post
Offices :—
Borjuli, Margherita, Tinsukia, in Upper Assam.
Dullabcherra, Kalighat, Lungla, Patharkandi, Ratabari,
in Sylhet.
Atgram, Banskandi, Coombir, Hailikandi, Kalain, Lucki-
pore, Silchar, in Cachar.

* The Register book containing particulars of these inoculations in
Dinapore has been left with the 13th Bengal Infantry, and not returned
at the time of writing this Report.

MILITARY.

EUROPEAN TROOPS.

Dinapore ... The Manchester Regiment. The 70th Field
Battery. Royal Artillery.
Dum-Dum ... The Sussex Regiment.

NATIVE TROOPS.

Dinapore ... 13th Bengal Infantry.

*Observations on the effect of Inoculation made during
the years 1894-1895.*

DURING this period cholera appeared in the midst of the inoculated population in the following places :—Calcutta, Gya, Cawnpore, Dinapore and Camp Behta, Lucknow ; Tea Gardens : Karkurie (Kalain P. O.), Kalain, Chargola (Ratabari P. O.), Kalacherra (Ratabari P. O.), Degubber (Kalain P. O.), Burnie Braes (Hailikandi P. O.), Pallarbund (Banskandi P. O.), Loobacherra (Atgram P. O.), Sandhura (Kalain P. O.), Lungla and Adam Tila (Chandkhira P. O.).

OBSERVATIONS IN CALCUTTA.

*(Collected and recorded by the Health Officer,
Dr. W. J. Simpson.)*

FROM the commencement of operations in Calcutta, on the 11th of March 1894, up to the end of August 1895, cholera occurred in 36 houses containing inoculated people. The subjoined tables show the localities and addresses of these houses, the number of inoculated and uninoculated inhabitants in them, and the occurrences in both of these groups.

Observations in Calcutta.

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 amongst the inoculated.	Number of uninoculated in the house and particulars of the cholera patient, if he was amongst the uninoculated.
I.—Cantopher's Lane, 8, Ward 20.	2 persons inoculated 2 days before with 1st vaccine. Prankristo, Hindoo, male, 10 years, died on 30-3-94.	13 persons uninoculated
II.—Ramdhon Dutt's house, Katal Bagan Bustee, Ward 19.	6 persons inoculated 9 days before.	2 persons uninoculated Bilashmoni Dassee, Hindoo, female, 45 years, died on 10-4-94.
III.—Munglo Jamar'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, Mahomedan, 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.

Observations in Calcutta—(continued.)

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 amongst the inoculated.	Number of uninoculated in the house and particulars of the cholera patient, if he was amongst the uninoculated.
V.—Karim Ali's house, at Katal Bagan Bustee, Ward 19.	3 persons inoculated 37 days previously.	5 persons uninoculated Tetar Bewah, 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 Chakravarty'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.

Observations in Calcutta—(continued.)

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 amongst the inoculated.	Number of uninoculated in the house and particulars of the cholera patient, if he was amongst the uninoculated.
V. I.—H. L. Mukerjee's Coolie Dépôt, at 2, Chatto Baboo's Lane, Ward 19.	22 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.
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 Bustee, Ward 19.	2 persons inoculated 300 days before.	6 persons uninoculated Satkuri Nikari, Hindoo, male, 45 years, died on 27-1-95.

Observations in Calcutta—(continued.)

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 amongst the inoculated.	Number of uninoculated in the house and particulars of the cholera patient, if he was amongst the uninoculated.
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 Ghosh'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 Ghosh, 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's 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.

Observations in Calcutta—(continued.)

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 amongst the inoculated.	Number of uninoculated in the house and particulars of the cholera patient, if he was amongst the uninoculated.
XXII.—Sookhon Khan's house, Kurya 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.—Lakshmoni 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 and 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 Devi'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.

Observations in Calcutta—(continued.)

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 amongst the inoculated.	Number of uninoculated in the house and particulars of the cholera patient, if he was amongst the uninoculated.
XXVI.—Shaik Hossain Box'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.
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., Muchiparah Road, Ward 19.	3 persons inoculated, 401 to 404 days before.	8 persons uninoculated. 1. Marihur Bebee, Mahomedan, female, 80 years, died on 7-5-95. 2. Shaik Abbash, Mahomedan, male, 45 years, died on 7-5-95.

Observations in Calcutta—(continued.)

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 amongst the inoculated.	Number of uninoculated in the house and particulars of the cholera patient, if he was amongst the uninoculated.
XXX.—Chonilal Koor-mie's house, 16, Jorabagan Street Bustee, Ward 5.	3 persons inoculated, 132 days before.	18 persons uninoculated. Panchoo, 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 Jabbar, Mahomedan, male, 3½ years, died on 2-6-95. 2. Sheanath, Mahomedan, male, 32 years, died on 3-6-95.
XXXII.—Karim Box'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, Haldarparah Road, Ward 22.	4 persons inoculated, 120 days before.	11 persons uninoculated. Nogendra Bala, Hindoo, female, 23 years, attacked on 13-6-95, recovered.

Observations in Calcutta—(continued.)

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 amongst the inoculated.	Number of uninoculated in the house and particulars of the cholera patient, if he was amongst the uninoculated.
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.—Sridhar Poirah's house, 114-H, Jaun Bazar Street, Ward 19.	15 persons inoculated, 109 days before.	26 persons uninoculated. Rada Krishan, Hindoo, male, 22 years, died on 9-7-95.
XXXVI.—Rotikanto Das's house, at 66, Annond 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.

There lived in the affected houses before cholera appeared in them 521 inhabitants, of whom 181 were inoculated, from 1 to 459 days before the occurrence, while 340 remained uninoculated.

The uninoculated members of these houses had altogether 45 cases with 39 deaths from cholera; the inoculated had 4 fatal cases, of which 1 occurred 459 days after the first inoculation, in a child that had not been brought for the 2nd inoculation; and the 3 others, from 1 to 4 days after the

1st inoculation, in people who had not yet had time to undergo the 2nd inoculation.

Disregarding the distribution of the cases *in time* and taking the total of inhabitants and occurrences, the percentages were as follows :—

335* uninoculated	45 cases (13·43%),	39 deaths (11·64%)
181 inoculated	4 cases (2·21%),	4 deaths (2·21%).

The reduction of cases among the inoculated, in comparison with the uninoculated, has been 6·08 times; the reduction of deaths only 5·27 times; this makes the “case mortality” among the inoculated (4 deaths in 4 cases representing 100 per cent.) higher than among the uninoculated (39 deaths in 45 cases representing 86·55 per cent.).

There being in this treatment two hypodermic injections, of two different vaccines, each of which requires about 5 days for producing its full effect (in correspondence with a nearly similar period in vaccination against small-pox), the subjoined tables show the occurrences, in inoculated and uninoculated, as regards their distribution *in time*, after inoculation.

During the first 5 days (after the first inoculation), <i>vide</i> cases I, III, VIII, X, XI, XII, XV and XXII in the Tables.	In 75 uninoculated there occurred 5 cases (6·66%), 3 deaths (4%)
	In 52 inoculated there occurred 3 cases (5·77%), 3 deaths (5·77%)
During the second 5 days (after the second inoculation), <i>vide</i> case II and again case III.	In 8 uninoculated there occurred 2 cases (25%), 2 deaths (25%)
	In 17 inoculated there occurred 0 case (0%), 0 deaths (0%)

* During the course of the observation in the same houses deaths from cholera reduced the number of the uninoculated bringing the total of 340 uninoculated to an average of 335 (*vide* cases III, XIX, XXIII, XXVII and XXXII.)

After the first 10 days and up to the 459th day, <i>vide</i> again case III and all the remaining Nos.	}	In 263 uninoculated there occurred 38 cases (14.45%), 34 deaths (12.93%)
		In 134 inoculated there occurred 1 case (0.75%), 1 death (0.75%)

Setting aside the occurrences in inoculated and non-inoculated during the first 10 days and considering those that occurred after the 10 days expired, the proportion of cases was 19.27, and that of deaths 17.24 times smaller in the inoculated than in the uninoculated, and that proportion extended up to the 459th day after the operation.

The results in Calcutta being the best observed up to now, I thought it most important to ascertain for myself the degree of precision to be attributed to the observations. On the 30th of July last Dr. W. J. Simpson and I, accompanied by Medical Inspectors of the Municipality of Calcutta, went into the suburban parts of the town and revisited the following localities :—

- Golam Rohoman's house, at Joratola Bustee, Ward 21, case VI of the Tables.
- Isoo Mistry's house, at Beg Bagan Bustee, Ward 21, case VII.
- Shaik Hingoo's house, at Beg Bagan Bustee, Ward 21, case VIII.
- Bipatha Chamar's house, at Nichoo Bagan Bustee, Ward 21, case XIV.
- Durga Churn's house, at 20-H-1, Middle Road, Entally, Ward 19, case XXIV.
- Nistarini Devi's house, at 2, Nokuleswartolla Lane, Ward 22, case XXV.
- Mohit Chamar's house, at Nichoo Bustee, Ward 21, case XXVIII.
- Abdul Aziz's house, at 17-H, Muchiparah Road, Ward 19, case XXIX.
- Babar Ali's house, at Nichoo Bustee, Ward 21, case XXXI.
- Karim Box's house, at Nichoo Bustee, Ward 21, case XXXII.
- Abdul Hakim's house, at Katal Bagan Bustee, Ward 19, case XXXIV.

The details regarding the cases, stated in the Tables (which had been communicated to the

Commissioners of the Calcutta Municipality in monthly reports), were found to be of unexceptional accuracy ; the number of inoculated and uninoculated in each house were carefully verified and found exact in all instances ; both groups were living mixed in the same houses, belonging to the same class of people and representing, in each house, defined and well isolated units of observation. The cases of cholera in inoculated people, stated in the Tables, were known to all the people around and pointed out to us immediately ; no other cases besides those stated have been mentioned.

A number of observations, which took place during the last year, were investigated at the time by myself, before my expedition in Assam ; in their number were the very important cases I, II, III (*vide* the Tables) and others.

OBSERVATIONS IN THE GYA JAIL.

(*Recorded by Surgeon-Lieutenant-Colonel R. Macrae, Superintendent and Civil Surgeon.*)

THE inoculations were applied after 6 cases with 5 deaths had occurred in the jail during the preceding week. The injection of the 1st vaccine took place on the 18th and 19th July 1894, that of the 2nd vaccine, on the 23rd and 24th. The important feature of the observations in Gya was that, while the number of inoculated was slightly higher than the number of those left uninoculated, both groups have been put in all other respects (age, sex, health, housing, clothing, feeding, drink, work, hours of sleep, and other habits of life) in as identical conditions as can be possibly obtained in a community.

In the interval between the 1st and 2nd inoculations the prisoners were kept in the jail; after the 2nd inoculation was performed, the majority of inoculated and uninoculated were removed into camp, while the rest of both groups were left in the jail.

During the stay of the whole of the prisoners in the jail the occurrences were as follows :—

I	209 uninoculated, 7 cases (3.35%), 5 deaths (2.39%).
	211 inoculated, 5 cases (2.37%), 4 deaths (1.89%).

After the 2nd inoculation had been performed, the occurrences were :—

Among those moved into camp—

II	146 uninoculated, 6 cases (4.11%), 2 deaths (1.37%).
	171 inoculated, 2 cases (1.17%), 1 death (0.58%).
	and among those left in the jail—
	49 uninoculated, 7 cases (14.28%), 3 deaths (6.12%).
	32 inoculated, 1 case (3.12%), no deaths (0%).

Analysing the occurrences in regard to their distribution *in time*, the results were as follows :—

During the first 5 days, following the 1st inoculation	210 uninoculated, 7 cases (3.33%), 5 deaths (2.38%).
	212 inoculated, 5 cases (2.36%), 4 deaths (1.89%).
During the next 5 days, following the 2nd inoculation.	197 uninoculated, 9 cases (4.57%), 4 deaths (2.03%).
	206 inoculated, 3 cases (1.46%), 1 death (0.48%).
During the next (last of the epidemic) 4 days.	192 uninoculated, 3 cases (1.56%), 1 death (0.52%).
	201 inoculated, no cases (0%), no deaths (0%).

Disregarding the distribution of the occurrences *in time*, and taking the total of inhabitants and occurrences, the percentages were as follows :—

202 uninoculated,	20 cases (9.90%), 10 deaths (4.95%)
207 inoculated,	8 cases (3.86%), 5 deaths (2.41%)

The number of cases among the inoculated appears to have been reduced 2.56 times in comparison with the uninoculated, whereas the number of deaths was reduced only 2.05 times; therefore, "the case-mortality" among the inoculated (62.5%) appears in this instance also higher than among the uninoculated (50%).

OBSERVATIONS IN CAWNPORE.

*(Communicated by Surgeon-Major J. L. Peyton,
Station Hospital, Cawnpore.)*

DURING the outbreak of cholera in the North West Provinces in July and August of last year, 19 cases of cholera with 13 deaths occurred among the European troops in Cawnpore. The numbers of inoculated and uninoculated in the affected corps are stated as 75 and 797 respectively, the former having undergone the inoculation 13 months previously. All cases and deaths occurred among the uninoculated, giving a percentage as follows :—

797 uninoculated,	19 cases (2·38%),	13 deaths (1·63%)
75 inoculated,	no cases (0%),	no deaths (0%)

OBSERVATIONS IN DINAPORE AND CAMP BEHTA.

(Collected by the Officers commanding the Companies of the 2nd Batn. Manchester Regiment, and transmitted by Surgeon-Lieutenant C. Barry.)

THE inoculations in the 2nd Batn., Manchester Regiment were applied in Dinapore and in the camp at Behta during the epidemic of July and August 1894, after 13 cases and 9 deaths occurred among the troops. During the 6 days which followed the inoculations, and while there were 193 men inoculated and 729 uninoculated, 6 more cases with 3 deaths occurred in the Regiment amongst the uninoculated. After this 387 more men came for the inoculation. No other cases were observed.

The percentage of occurrences was as follows :—

729 uninoculated,	6 cases (0·82%),	3 deaths (0·41%).
193 inoculated,	no cases (0%),	no deaths (0%).

OBSERVATIONS IN LUCKNOW.

(Collected from the documents of the East Lancashire Regt. and revised by Surgn.-Col. Martin, P.M.O.)

THE inoculations in Lucknow were performed in May 1893. In July and August 1894 cholera attacked the 1st Btn., East Lancashire Regiment, of an average strength, at that time, of 773 men. Of these 133 had been inoculated, and 640 were uninoculated. The occurrences were as follows :—

640 uninoculated, 120 cases (18·75%), 79 deaths (12·34%).
133 inoculated, 18 cases (13·53%), 13 deaths (9·77%).

The small amount of protection which the inoculation afforded in this case may have depended on the mild effect which the injections produced on the men at the time of the operation in 1893 in comparison with the severity of the epidemic which attacked the Regiment. It is recorded in the Lucknow Inoculation Registers that only in 2 men out of the 185 inoculated in 1893, a marked febrile reaction was obtained ; in 77 individuals the vaccinal fever was only slight, while in 66 there was no reaction, an effect which was due to the weakness of the vaccines procurable at that period of work, and to the small doses used. The influence of the vaccines was possibly further reduced at the time of the epidemic by a lapse of 14 to 15 months.

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 1st and 2nd inoculations, with the exception of the last 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 (*vide* the tables), 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 inoculated was in a dysenteric woman of 40, who had been inoculated only with the 1st vaccine and had been refused the 2nd inoculation, a week before her death, because

* *Vide* pp. 33 and ff.

of her precarious state. The subjoined table gives the percentage of occurrences :—

Uninoculated—

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 {	0.24%	} 1 death {	0.24%
In the affected lines, 129		(in inocula- ted once) 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 the last 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, 2, 1,062, 1,166, 1,165 ; giving an average 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 percentages of occurrences were as follows :—

Uninoculated—

On the whole garden, 1,375	} had 22 cases {	1.6%	} 10 deaths {	0.73%
In the affected lines, 105		20.96%		9.52%
In the affected houses, 48		45.83%		20.83%

* Vide pp. 33 and ff.

Inoculated—

On the whole garden, 681	had 2 cases	{ 0.29% }	1 death	{	0.15%
In the affected lines, 97	(in inocula-	{ 2.06% }			
In the affected houses, 19	ted once)	{ 10.53% }			

**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 to cases of what is called in those districts "choleraic diarrhoea," but what, 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 were separated by a period of 5 months.

Cases of undoubted cholera.—There have been 4, with 2 fatal issues, particulars being given in the annexed tables; all occurred in the uninoculated coolies. One of these cases (fatal) was in a coolie who arrived on the garden on the same day, and is excluded from the calculations below.

The percentage of occurrences was as follows:—

Uninoculated—

On the whole garden, 1,007	had 3 cases	{	0.30%	}	1 death	{	0.10%
In the affected lines, 23							
In the affected houses, 10							

Inoculated—

On the whole garden, 291	had no cases	{	0%	}	no death	{	0%
In the affected lines, 11							
In the affected houses, 5							

Cases of "choleraic diarrhoea"—

Uninoculated	On the whole garden, 1,007	5 cases	{	0.50%	}	No
	In the affected houses, 26					
Inoculated	On the whole garden, 291	3 cases	{	1.03%	}	fatali-
	In the affected houses, 8					

(in inoculated once).

**OBSERVATIONS ON THE KALACHERRA 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 had been taken with pains in the abdomen, which lasted for $9\frac{1}{2}$ hours; she was then taken with vomiting and purging, and died in $2\frac{1}{2}$ 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 Kalacherra :—

Uninoculated—

On the whole garden, 520	} had 4 cases {	0.77%	} 3 deaths {	0.58%
In the affected lines, 13		30.77%		23.07%
In the affected houses, 11		36.36%		27.27%

Inoculated—

On the whole garden, 211	} 1 case (inoculated once).	0.47%	} 1 death {	0.47%
In the affected lines, 4		0.25%		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 :—

Uninoculated—

On the whole garden, 1,170	} had 2 cases {	0.17%	} 2 deaths {	0.17%
In the affected lines, 70		2.86%		2.86%
In the affected houses, 7		28.57%		28.57%

Inoculated—

On the whole garden, 451	No cases { 0% }	No death { 0% }
In the affected lines, 63		
In the affected houses, 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, particulars being given in the adjoining table. Both cases occurred in uninoculated coolies. The percentages of the occurrences were as follows:—

Uninoculated—

On the whole garden, 228	had 2 cases { 0.88% }	1 death { 0.44% }
In the affected lines, 64		
In the affected houses, 5		

Inoculated—

On the whole garden, 387	No cases { 0% }	No death { 0% }
In the affected lines, 62		
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:—

Uninoculated—

On the whole garden, 657	had no cases { 0% }	No death { 0% }
In the affected lines, 7		
In the affected houses, 3		

Inoculated—

On the whole garden, 318	had 2 cases { 0.63% }	1 death { 0.31% }
In the affected lines, 3		
In the affected houses, 2		

OBSERVATIONS IN THE LUNGLA TEA GARDEN,
LUNGLA P. O.*(Collected by Surgeon-Captain Hare, I.M.S., and
W. Marillier, Esq., Manager.)*

There was a large number of cases of diarrhoea in inoculated and uninoculated, some with mild choleraic symptoms. All recovered, except three, with undoubted cholera symptoms, which ended fatally. The three fatal cases were in uninoculated coolies and are recorded in the subjoined Tables. The percentages were as follows :—

Uninoculated—

On the whole garden, 2,050 } had 3 cases { 0.15% } 3 deaths { 0.15% }
In the affected houses, 8 }

Inoculated—

On the whole garden, 421 } had no cases { 0% } no deaths { 0% }
In the affected houses, 0 }

CASES IN THE BURNIE BRAES (HAILIKANDI, P. O.),
LOOBACHERRA (ATGRAM P. O.), KALAINCHERRA
(KALAIN P. O.) AND SANDURA (KALAIN P. O.)
TEA GARDENS.

No returns have been received as yet from these gardens, except 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 Loobacherra, 4 cases with 2 deaths in Kalaincherra and 2 cases with 1 death in Sandura, all in uninoculated coolies. Of these gardens, in Burnie Braes and in Kalaincherra, a large proportion of the population had been inoculated (449 and 145 respectively, making $\frac{1}{4}$ to $\frac{1}{2}$ 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.

Summarising the observations made on the gardens, on coolies inoculated *once*, that is, before

the 2nd inoculation was applied, the results are as follows :—

Total of uninoculated on all the affected gardens—*

In the whole population, 7,272	} had 38 cases	{	0.52%	{	19 deaths	{	0.26%
In the affected lines, 374			10.16%				5.08%
In the affected houses, 103			36.89%				18.35%

Total of inoculated on all the affected gardens—

In the whole population, 3,162	} had 5 cases	{	0.16%	{	3 deaths	{	0.09%
In the affected lines, 369			1.36%				0.82%
In the affected houses, 40			12.50%				7.50%

The 2nd inoculation on these gardens (in Sylhet and Cachar) were performed between the end of April and the end of July of this year, after the cholera season had finished.

* Exclusive of the 20 cases with 12 deaths in new uninoculated coolies and 11 cases with 5 deaths in old uninoculated coolies, but regarding which the returns have not yet arrived.

Date of Attack.	Particulars regarding the individual attacked with cholera.				Total number of unincubated present on the date of attack.		Total number of inoculated present on the date of attack.		Number of people who arrived in the place during the preceding fortnight.		Particulars regarding the un-inoculated people who lived in the affected house on the date of attack (including the patient, if uninoculated).		Particulars regarding the inoculated people who lived in the affected house on the date of attack (including the patient, if inoculated) and serial number in Inoculation Register.						Date of recovery of the patient.	Date of death.
	Name and Father's Name.	Caste.	Birth-place.	Date of arrival in the place.	In the whole place.	In the affected group of houses.	In the whole place.	In the affected group of houses.	Uninoculated (on date of attack).	Inoculated.	Name and Father's Name.	Sex.	Age.	Serial Number in the Register.	Date of 1st inoculation.	Date of re-inoculation.				
16-3-95	Mangli, Baburam ...	Kal	Rewa	New coolie.	133	21	377	75	...	...	Mangli, Baburam Satila, Amon Jagni, Mangli Budu, Mangli	M F F M	25 30 8 4	...	...	...	...	...	...	18-3-95
16-3-95	Somai ...	Kal	Rewa	New coolie.	133	21	377	75	...	...	Somai Latra, Somai	M M	29 20	...	...	...	...	...	...	18-3-95
17-3-95	Satila, Panchan ..	Chamar	Rewa	New coolie.	133	21	377	75	...	...	Satila, Panchan ... Badu	F M	27 35	...	...	...	...	...	...	19-3-95
18-3-95	Gonesha, Badu ...	Chamar	Rewa	New coolie.	133	21	377	75	...	...	Sanesha, Badu ...	M	10	...	...	...	...	...	...	18-3-95
18-3-95	Methuri, Badu ..	Chamar	Rewa	New coolie.	133	21	377	75	...	...	Methuri, Badu ...	F	4	...	...	...	...	...	...	19-3-95
19-3-95	Booti, Badu ...	Chamar	Rewa	New coolie.	177	65	377	75	...	...	Booti, Badu ...	F	10	...	...	...	...	...	22-3-95	...
20-3-95	Kaisalla, Bodhi ...	Kal	Rewa	New coolie.	175	64	377	75	...	...	Kaisalla, Budhu ... Mongli, Keshan ...	F F	38 25	...	...	...	...	...	23-3-95	...
17-4-95 18-4-95	Dhadra, Manua ... Manua	Rajowar Rajowar	Cachar Hazari- bagh.	1892 Yrs. ago	180 194	38 38	420 420	67 67	...	...	Dhadra, Manua ... Manua Mohini, Raghu ...	M M F	3 38 28	...	...	...	...	...	21-4-95	18-4-95

Date of Attack.	Particulars regarding the individual attacked with cholera.				Total number of uninculcated people present on the date of attack.			Total number of people who arrived in the place during the preceding fortnight.			Particulars regarding the uninculcated people who lived in the affected house on date of attack (including the patient, if inoculated).		Particulars regarding the inoculated people who lived in the affected house on date of attack (including the patient, if inoculated), date of their inoculation and serial number in Inoculation Register.					Date of death.
	Name and Father's Name.	Caste.	Birth-place.	Date of arrival in the place.	In the whole place.	In the affected group of houses.	In the whole place.	In the affected group of houses.	Uninoculated (on date of attack).	Inoculated.	Name and Father's Name.	Sex.	Age.	Serial Number in the Register.	Date of 1st inoculation.	Date of re-inoculation.	Date of recovery of the patient.	
21-4-95	Raton	Chamar	Ghazipur	Yrs. ago	194	38	420	67	...	...	Raton Lockhea Bochia, Raton	M	35	...	...	...	24-4-95	
												F	32	...	...	...
												F	4	...	11-2-95	...		
21-4-95	Sulka, Kanai	Kal	Rewa	New coolie.	194	62	420	75	...	...	Sulka, Kanai Jogni, Mongli Budu, Mongli	M	19	...	...	...	25-4-95	
												F	8	...	...	...
												M	4	...	...	...
26-4-95	Sukaru, Jairam	Mahali	Ranchi	Yrs. ago	194	38	420	67	...	...	Sukaru, Jairam Mongal, Mongal Lockon, Mongal Samari I, Bola Samari III	F	40	...	11-2-95	Not done.	27-4-95	
												M	38	...	11-2-95	...		
												M	6	...	11-2-95	...		
												F	45	...	11-2-95	...		
												F	26	...	11-2-95	...		
25-5-95	Ramkalia, Bandu	Dusad	Gya	Yrs. ago	225	64	391	62	...	...	Ramkalia, Bandu	F	50	...	...	...	28-5-95	
												M	20	...	8-2-95	...		
												F	20	...	8-2-95	...		
												M	51	...	...	...
												F	230	...	...	...
28-5-95	Mangri, Pirtam	Musahar	Gya	Yrs. ago	230	64	382	62	...	...	Mangri, Pirtam Kartik, Aklu Bandra, Aklu Sukri, Aklu	F	32	...	...	...	...	29-5-95
												M	12	...	...	...
												M	9	...	...	...
												F	1	...	...	...
												M	39	110	8-2-95	22-4-95		

[illegible]

*Name of Place : Kalain, Konapara, Magenta Gardens, Kalain P.O., H. Weir, Esq., Managing Partner ;
Dr. Arthur Powell, Medical Officer—continued.*

Date of Attack.	Particulars regarding the individual attacked with cholera.				Total number of un-inoculated present on the date of attack.		Total number of inoculated present on the date of attack.		Number of people who arrived in the place during the preceding fortnight.		Particulars regarding the un-inoculated people who lived in the affected house on the date of attack (including the patient, if uninoculated.)		Particulars regarding the inoculated people who lived in the affected house on the date of attack (including the patient, if inoculated), date of their inoculation and serial number in Inoculation Register.						Date of recovery of the patient.	Date of death.
	Name and Father's Name.	Caste.	Birth-place.	Date of arrival in the place.	In the whole place.	In the affected group of houses.	In the whole place.	In the affected group of houses.	Uninoculated (on date of attack.)	Inoculated.	Name and Father's Name.	Sex.	Age.	Serial Number in the Register.	Date of 1st inoculation.	Date of re-inoculation.				
19-3-95	Salua, Ganpat	Munda Do.	Ranchi Do.	Yrs. ago Do.	606	36	606	13	...	...	Salua, Ganpat Chandmoni, Pagla	M	21	...	...	...	...	21-3-95	
19-3-95	Chandmoni, Pagla	Do.	Do.	Do.	606	36	606	13	...	...	Chandmoni, Pagla	F	50	...	...	...	...	22-3-95	
19-3-95	Sukurmoni, Ganpat	Do.	Cachar	Do.	606	36	606	13	...	...	Sukurmoni, Ganpat do. Boothon, Puni,	F	7	504	9-2-95	...	...	20-3-95	
											do.	F	13	502	9-2-95	...	...	
											do.	F	9	503	9-2-95	...	...	
											do.	F	11	503	9-2-95	...	...	
19-3-95	Alla, Patra	Munda	Ranchi	Yrs. ago	606	36	606	13	Alla, Patra	F	25	9-2-95	...	21-3-95	
19-3-95	Kali, Ram	Munda	Ranchi	Yrs. ago	606	36	606	13	...	...	Kali, Ram Raja Ram, Koka	F	20	...	...	...	...	22-3-95	
												M	30	...	...	...	...
28-3-95	Aliya, Bholu	Mahali	Parulia	Yrs. ago	606	21	606	21	...	...	Aliya, Bholu Drupodi, Lala Dukni, Pabon Dulari, Fulari Bhiku, Jo. Chand Joychand, Lala Jira, Jibon	F	25	...	...	...	...	30-3-95	
												F	38	...	...	...	...
												F	14	...	...	...	...
												F	59	...	...	...	...
												M	5	...	...	...	...
												M	34	...	...	...	...
												F	20	...	...	9-2-95	...		
28-3-95	Ator Ali, Arjat Ali	Musalman.	Chandrapur.	1894	606	21	606	21	...	...	Ator Ali, Arjat Ali Arjat Ali	M	19	...	...	...	...	30-3-95	
												M	45	...	...	...	...

*Name of Place: Chargola Garden, Chargola Division, Chargola Tea Association, Ratabari P. O., E. Todd Taylor, Esq., Manager;
Dr. A. Allen, Medical Officer—continued.*

Date of Attack.	Particulars regarding the individual attacked with cholera.				Particulars regarding the un-inoculated people who lived in the affected house on the date of attack (including the patient, if uninoculated).				Particulars regarding the inoculated people who lived in the affected house on the date of attack (including the patient, if inoculated), date of their inoculation and serial number in Inoculation Register.				Date of death.							
	Name and Father's Name.	Caste.	Birth-place.	Date of arrival in the place.	In the whole place.	In the affected group of houses.	Total number of un-inoculated present on the date of attack.	In the whole place.	In the affected group of houses.	Total number of inoculated present on the date of attack.	Number of people who arrived in the place during the preceding fortnight.	Name and Father's Name.		Sex.	Age.	Serial Number in the Register.	Date of 1st inoculation.	Date of re-inoculation.	Date of recovery of the patient.	
14-4-95	Ragonundan, s. o. Latchman. <i>Symptoms:</i> Purging, vomiting, extremities cold, cramps, suppression of urine for four days (till death).	Bhor	Ghazipur, Bimoo.	Old resident	1007	6	291	4	Ragonundan, s. o. Latchman. Roopia, d. o. Latchman. Soropia, d. o. Latchman. Batchia, d. o. Latchman.	M F F F	22 14 12 8	...	243 197 28-1-95 235	28-1-95 28-1-95 28-1-95	18-4-95
15-4-95	Anopie, d. o. Hassanu <i>Symptoms:</i> Purging, vomiting, suppression of urine, extremities cold, utter collapse, slow recovery.	Gwalah	Munda, Ballie.	Old resident	1007	13	291	6	...	...	...	Anopie, d. o. Hassanu. Nehura, s. o. Kishun.	F M	20 2	...	...	...	...	18-4-95
15-4-95	Poet, s. o. Balchand <i>Symptoms:</i> Suffered from fever for 2 months beforehand. On 15th purging, vomiting, extremities cold, suppression of urine, utter collapse, slow recovery.	Kumhur	Ghazipur, Dehawa.	Old resident	1007	4	291	1	...	...	...	Poet, s. o. Balchand Mohangee, d. o. Chowha. Gongan, s. o. Balchand Mohadata, d. o. Balchand.	M F M F	28 40 25 20	...	...	...	...	18-4-95

pression of urine for 18 hours, extremities cold, utter collapse. *Treatment:* Castor oil, laudanum. Out in about 4 days.

I Jakoo, s. o. M 16 218 28-1-95
Dookorun.

*Name of Place : Kulucherra Garden, Chargola Tea Association, Chargola Division, Ratubari P. O., E. Todd Naylor, Esq., Manager ;
J. C. Tristram, Esq., Managing Assistant ; Dr. A. Allen, Medical Officer.*

21-2-95	Ennessarie, d. o. Joji <i>Symptoms:</i> Pains in abdomen from mid- night to 9.30 A.M.; then vomiting and purging till midday, when death occurred.	Gwalah, Ohirui.	Ghazipur	Old resident	520	12	212	7	...	...	Mohabir, husband of the patient.	M 18	...	Ennessarie, d. o. Joji.	F 15	91	30-1-95	...	21-2-95
14-4-95	Gopi, s. o. Lockman	Dôm ...	Ghazipur	Old resident	520	13	211	4	...	...	Gopi, s. o. Lockman	M 16	...	...	...	...	...	17-4-95	...
16-4-95	Arjun, s. o. Lochi ...	Dôm ...	Ghazipur	Old resident	520	13	211	4	...	...	Arjun, s. o. Lochi	M 30	...	...	...	...	...	...	19-4-95
28-4-95	Seborath, s. o. Arjun <i>Symptoms:</i> Seborath had been ill some weeks, when, in the low state he was in, he took the disease (cholera was in his line).	Dôm ...	Ghazipur	Old resident	520	12	211	4	Seborath, s. o. Arjun. Lackronia, d. o. Bazawn. Gharbaran, s. o. Lockman. Gubardan, s. o. Lockman. Sukoli, d. o. Lockman. Nowbot, s. o. Arjun Ramsurath, s. o. Arjun. Arjun. Bholool, d. o. Arjun.	M 3 F 35 M 11 M 8 F 26 M 18 M 2 F 7	1-5-95
16-4-95	Brijmohan, s. o. Abilack.	Chamar	Ghazipur	Old resident	520	12	211	5	...	...	Brijmohan, s. o. Abilack.	M 27	...	...	...	...	...	...	20-4-95

Name of Place : Pallorband Tea Garden (Banskandi P. O.), W. Mason, Esq., Manager.

18-4-95	Kunjo, s. o. Megho	Dasad	Monghyr	1890	1170	70	453	63	Kunjo, s. o. Megho Romon, s. o. Gonor IV. Mongri, d. o. Akloo. Nunie, d. o. IV. Mongri.	M 10 M 28 F 30 F 1	14-4-95
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Name of Place: Pallarbund Tea Garden (Banskandi P.O.), W. Mason, Esq., Manager—continued.

(42)

Date of Attack.	Particulars regarding the individual attacked with cholera.				Total number of <i>uninoculated</i> people on the date of attack.		Total number of <i>inoculated</i> people on the date of attack.		Number of people who arrived in the place during the preceding fortnight.		Particulars regarding the <i>uninoculated</i> people who lived in the affected house on date of attack (including the patient, if uninoculated).		Particulars regarding the <i>inoculated</i> people who lived in the affected house on the date of attack (including the patient, if inoculated), date of their inoculation and serial number in Inoculation Register.						Date of recovery of the patient.	Date of death.	
	Name and Father's Name.	Caste.	Birth-place.	Date of arrival in the place.	In the whole place.	In the affected group of houses.	In the whole place.	In the affected group of houses.	In the whole place.	In the affected group of houses.	Uninoculated (on date of attack.)	Inoculated.	Name and Father's Name.	Sex.	Age.	Serial Number in the Register.	Date of 1st inoculation.	Date of re-inoculation.			
5-6-95	Brandia, d. o. Akloo <i>Symptoms:</i> Purg- ing, vomiting, sup- pression of urine, cramps in arms and legs, death same day.	Boghta	Deoghur	Feb. 1894	1169	69	450	63	...	...	Bandia, d. o. Akloo Parbotty, d. o. Bulakie. Toolsi, s. o. Janokie	F F M	28 2 35	...	...	...	...	...	...	...	5-6-95
5-6-95	II Bashi, s. o. Choita Singh. <i>Symptoms:</i> Had fever for two days before; had after- wards three bad stools, during about 24 hours, and was visibly pulled down; after this had fever again and recovered; out next day.*	Masoor	Hazari- bagh.	Old resident	1169	99	450	45	...	...	Moolia, d. o. Notol Singh. Sookra, s. o. Choita Singh. Dasooa, s. o. Choita Singh. Gangie, d. o. Doomia	M M M F	29 13 10 7	...	...	...	66	20-3-95	...	...	6-6-95.

Name of Garden: Degubber, Kulain P. O., Dr. Arthur Powell, Medical Officer; H. Channey, Esq., Manager.

25-5-95	Ramkalia, Bandu ...	Dusad ...	Gya ...	Years ago.	225	64	301	62	...	...	Ramkalia, Bandu	F	50	...	...	...	...	...	...	25-5-95
											Budua, Jaganath Nageswary, Gha-mari.	M F	20 20	51 230	8-2-95 8-2-95	22-4-95 22-4-95	...	...	...	...

* It is scarcely possible to recognize cholera in these symptoms.

III.

SUMMARY.

OF the observations recorded above, those in Calcutta, Gya, Lucknow and on the Kalain Tea Gardens may be selected as the most complete for forming an idea of the effect of these inoculations.

I believe the observations in the Gya Jail to be of special importance, for the reasons already stated and because the figures giving the smallest results as derived from the inoculation present the surest basis for calculations. The method applied during an existing epidemic showed its effect in a gradual diminution of occurrences in the first 10 days of its application, a diminution which finally brought about a difference from 20 cases with 10 deaths among the uninoculated to 8 cases with 5 deaths among the inoculated, which is a reduction of $2\frac{1}{2}$ and 2 times respectively.

On the Kalain Gardens cholera occurred a short time after the inoculation with the *1st vaccine* had been applied, but at an interval sufficient for the vaccine to produce its full effect. The result was the reduction of cases and deaths in the proportion of 1 to 4, the number of occurrences being four times less in the inoculated compared to the not inoculated.

The most prolonged observations have been made by the Health Department of the Municipality of Calcutta, which has since August 1894 possessed a special laboratory for carrying out the inoculations in the affected quarters of the town. These observations refer to people inoculated, some with the 1st, and some with both, vaccines, from 1 to 459 days before cholera occurred in their homes. Excluding the occurrences

during the first 10 days after inoculation, the results show a diminution of cases and of deaths in the proportion of 1 to 19 and of 1 to 17 respectively, the number of occurrences being 19 and 17 times less in the inoculated compared with the not inoculated.

The observations in Lucknow, in the East Lancashire Regiment, although slightly favourable to the inoculated, reveal the possibility of time wearing out the effect of these inoculations.

Taking as a standard the results of inoculation in the Gya Jail, where the measure was applied *a week* after the epidemic started, and where only $\frac{1}{2}$ the number of deaths and $\frac{2}{3}$ of the number of cases were spared to the inoculated, it appears that the same measure applied to the East Lancashire Regiment at the commencement of the epidemic, with a similar result as in Gya, would have reduced the number of cases among the 640 uninoculated from 120 to 48, and the number of deaths from 79 to 39, sparing to the uninoculated part of the regiment 78 attacks with 40 deaths, a result which would have been precious, independent of the question as to the duration of the effect of the inoculation.

The power of producing a long lasting effect would evidently increase the value of this inoculation far beyond the limits traced in the above lines. It is possible that such an effect can be obtained by a simple increase in the strength of the vaccines and in the doses administered ; or perhaps by some other modification in the method now practised, which is to be tried by application in practice. This question can be solved only by long years of observations.

IV.

CONCLUSIONS.

CHOLERA being a disease having its origin in the East, the efforts which have for their object its stamping out or mitigation, or the prevention of its spread, are necessarily directed to those localities in which the disease has a permanent abode, and from which it starts periodically in epidemic form to invade other countries. It was with this object that the researches on cholera, with special reference to inoculation, were undertaken and carried on in my laboratory, in the Pasteur Institute in Paris, between 1889 and 1893. The experiments resulted in the elaboration of the present method, which, when tried on animals, was found to render them resistant against every form of cholera poisoning otherwise fatal to them.

The physiological and pathological effect on *man* was then studied on some 60 persons, mostly medical and scientific men interested in the solution of the problem. The effect was found to be harmless to health.

The next step was to transfer the operations to the East, where their efficacy could be first of all tested in cholera-affected localities and, if ascertained to be favourable, put into practice. The territory of Siam was selected as the first where the inoculations were to be started. It was on the advice of Lord Dufferin, the British Ambassador in Paris, and after a consultation with the scientific authorities in England and the Secretary of State for India, that it was determined to choose Bengal as the first and the most important of the countries affected by cholera where the preventive treatment ought to be applied.

The introduction of this new practice among the Asiatic populations was attended with exceptional difficulties. The first problem which had to be solved was to familiarise the people with the system and everything relating to it. The inhabitants of the northern part of India were the first to come forward to submit themselves to the inoculation, while all attempts to apply them in Lower Bengal were in the beginning frustrated.

In the course of the first year 22,703 people were inoculated in the North-West Provinces and Oudh and in the Punjab. This included all classes of the population, Civil and Military, European, Hindoo, Mahomedan, Sikh, and among these were peasants and princes, noblemen and workmen.

Only in the 2nd year it became possible to direct the operations to those parts of the country where cholera always prevails, and where the method could be subjected to the required test. From March 1894 to July 1895, 19,473 individuals were inoculated in some of the most affected localities of India. The results obtained during this period, summarised on the preceding pages, seem to indicate that in the inoculations we possess a means of effectively combating cholera epidemics.

I am of the opinion that this experimental stage is not yet in that advanced condition to be completely closed. During my sojourn in India my only object has been to test the method on every occasion whenever I could obtain the possibility of applying it, and I think that great attention should be still directed to this object. At the same time, the observations already collected justify steps being taken to give the inoculations a more extended application, and to bring them within the

range of ordinary practice, which is the last stage of a method intended to be a prophylactic against a preventible disease.

The measures which have already been taken by Government to facilitate the spread of the inoculations, and the gradual development of these measures, as the inoculations proceeded, are to be seen from the letters and circulars appended to this report.

Owing to the action of the Government of India, a certain number of officers in the Government service have been deputed to learn the *technique* connected with these inoculations.

In the Agra Laboratory under the Government of the North-West Provinces there is a trained staff acquainted with the preparation of these vaccines, and able to prepare and keep in readiness materials required for the inoculation.

In Calcutta, under the Municipal authorities, there exists an agency for carrying out the inoculations and a special laboratory for the preparation of the vaccines.

I believe that in this there exists a nucleus of an organization which, if developed, can carry out effectively the system of inoculations in this country. Sufficiently enlarged, it certainly could as a commencement, perform important work on the occasion of epidemics, and lead to the permanent introduction of the system in the affected provinces of India.

This could be accomplished by the Medical Officers instructed in the *technique* of the inoculations being warned at the seasons when epidemics may be expected to be in readiness to visit the affected places and to carry on this work. For the preparation of vaccines, some of the

staff in each of the laboratories under Government might be invited to learn the *technique* in the laboratories in which it is now being carried out*, and to prepare and keep in readiness the materials required for the inoculation to supply them to the specially deputed Medical Officers when applied for.

Now that a considerable number of people have been inoculated in different parts of India, and the system has become known, to a certain extent, it lies with the Government to consider whether special measures should be introduced to facilitate the work of the Medical Officers. In my experience I found that the voluntary character of the inoculations was a great element in their favour in the eyes of the population. At the same time certain action on the part of Government, showing that the system meets with their approval, is an authoritative recommendation which facilitates the work to a great extent.

I would think it most important that Government should recommend the inoculations to the large bodies of men under their charge who, in the course of their duties, are subject to cholera epidemics, such as the troops, prisoners, coolies employed on railways, on public and military works, coolies passing through emigration depôts, etc. By a circular from Government attracting the attention of Municipalities, such as Dacca and Poori, where cholera is particularly prevalent, to the results obtained from the inoculations, an impulse could be given to local initiative and an encouragement to try the method within their jurisdiction. A similar circular to large employers

* Municipal laboratory, Calcutta.

Laboratory of the Chemical Examiner and Bacteriologist, Agra.

of labour, such as the directors of tea companies, coal mines, private railway lines, &c., drawing their attention to the inoculations would help in diffusing knowledge on the subject and aid in the progress of this work.

Owing to ill-health I am now on the eve of leaving India, but am fully aware that the question of anti-cholera inoculation as originally conceived has not yet been solved. The complicated problem of introducing the inoculations, in proportion to their protective power, as an adopted prophylactic among the populations of the East, remains practically untouched. On regaining my health it is my intention to contribute to this object by every means in my power. With the approval of the Government of India, I would like to re-visit this country, and with the assistance of the agency sketched above, or such as the Government would judge fit to appoint, to give the inoculations a development corresponding to their actual value.

It remains for me to express to the Government of India my sense of obligation for the assistance they have always given me during my work in this country.

The experimental base and the *technique* of this method may be learned from the following publications :—

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| " Sur le choléra asiatique chez le cobaye." | } Par Mons. W. M. Haffkine : Comptes rendus des Séances de la Société de Biologie, Paris, Juillet, 1892. |
| " Sur le choléra asiatique chez le lapin et chez le pigeon." | |
| " Inoculation de vaccins anti-cholériques à l'homme." | |
| Prof. Max. Gruber on Haffkine's Method of Strengthening the Cholera Virus.— <i>Wiener Medizinische Wochenschrift</i> , 1892. | |
| Dr. Iavein on Haffkine's Anti-Cholera Vaccines.— <i>Annales de l'Institut Pasteur</i> = Paris, 1892. | |
| Dr. Tamamcheff on Haffkine's Carbolic Anti-Cholera Vaccines.— <i>Ibid.</i> | |

- E. H. Hankin, M.A., on Haffkine's Method of Vaccination against Cholera.—*British Medical Journal*, 1892.
- "On Haffkine's Method of Vaccination against Asiatic-Cholera," by A. E. Wright, M.D., Professor of Pathology, and Surgeon-Captain D. Bruce, M.B., Assistant Professor of Pathology (from the Pathological Laboratory, Army Medical School, Netley).—*British Medical Journal*, February 4th, 1893.
- "A lecture on Anti-Cholera Inoculation," by W. M. Haffkine.—*British Medical Journal*, February 11th, 1893: "Injections against Cholera," a lecture by M. Haffkine.—*The Lancet*, February 11th, 1893.
- "Vaccination against Asiatic-Cholera," by Mons. W. M. Haffkine, lecture delivered in the Calcutta Medical College on the 24th March 1893.—*Indian Medical Gazette*, April, 1893.
- "Report of a case of Inoculation with Carbolicized Anti-Choleraic Vaccine (Haffkine.)" By Surgeon-Captain C. C. Manifold, M.B., I.M.S.—*Ibid.*
- "Technique of Haffkine's Anti-Choleraic Inoculation," by W. M. Haffkine, E. H. Hankin. Chemical Examiner to the Government of the North-West Provinces and Oudh, and to the Central Provinces, and Surgeon-Major Ch. A. Owen, I.M.S., Medical Adviser to H. H. the Maharajah of Patiala.—*Indian Medical Gazette*, June, 1894.
- "The Introduction of Anti-Choleraic Vaccination into Calcutta," by W. J. Simpson, M.D., Health Officer.—*Ibid.*
- "Cholera and Preventive Inoculation in Gya Jail," by Surgeon-Major R. Macrae, M.B., I.M.S., Superintendent and Civil Surgeon of Gya District.—*Indian Medical Gazette*, September, 1894.
- "Additional Observations on Anti-Choleraic Inoculations in India," by W. J. Simpson, M.D., Health Officer.—*Indian Medical Gazette*, November, 1894.
- "A Contribution to the Etiology of Cholera," by Mons. W. M. Haffkine and W. J. Simpson, M.D., M.R.C.P., D.P.H.: "Transactions of the First Indian Medical Congress," pp. 28—31, Calcutta, 1895.—*Indian Medical Gazette*, March, 1895.
- "Anti-Choleraic Inoculation in India," by Mons. W. M. Haffkine. Communication to the First Indian Medical Congress made on 28th December 1894, and Discussion on Cholera: "Transactions of the First Indian Medical Congress," pp. 31—38, Calcutta, 1895.—*Indian Medical Gazette*, January and February, 1895.

"Result of Mons. Haffkine's Anti-Cholera Inoculations in Cachar," by A. Powell, B.A., M.CH.—*Indian Medical Gazette*, July, 1895.

"Anti-Choleraic Inoculation Bulletin," from the Pallorbund Tea Garden, by W. Mason, Manager of the Garden.—*Ibid.*

"Anti-Cholera Inoculations" with Returns of Cholera cases in the Kalacherra and Chargola Tea Gardens, by Dr. A. Allen.—*Indian Medical Gazette*, August, 1895.

"Bulletins from Calcutta Municipal Laboratory: Anti-Choleraic Inoculations in Calcutta," from 24th of May 1894 to 24th of July 1895, by W. J. Simpson, M.D., Health Officer.—*Indian Medical Gazette*, June 1894 to August 1895.

(Sd.) W. M. HAFFKINE, SC. D.

APPENDICES.

No. ^{4 Medical}
169-178.

FROM

H. LUSON, Esq.,

Offg. Under-Secy. to the Govt. of India.

TO

ALL LOCAL GOVERNMENTS AND

ADMINISTRATIONS.

Home Department.
Medical.

Calcutta, the 29th March 1893.

SIR,

I AM directed to forward copy of a Despatch from the Secretary of State No. 13 Revenue, dated the 2nd February 1893, with enclosure, and to request that (with the permission of ^{His Excellency the Governor in Council} _{His Honour the Lieut. Govr. (& Chf. Commr.)}) Dr. Waldemar Haffkine may be given every facility for visiting districts and towns where cholera may be prevalent, for seeing hospitals where cholera patients may be under treatment, and for enquiring into the causes and circumstances of cholera epidemics. I am to add that if he wishes to try his prophylactic against cholera by vaccination, he should be permitted to do so, only after the proposed remedy has been

(54)

fully explained to the person to be operated upon or to his friends, and after the patient's consent or that of his friends has been obtained.

No. $\frac{4 \text{ Medical}}{179}$.

COPY, with copy of the Despatch from Her Majesty's Secretary of State No. 13 Revenue, dated the 2nd February 1893, forwarded to the Military Department for information and such further action as may be considered necessary.

No. 180.

COPY forwarded to Dr. Waldemar Haffkine for information.

By order,

H. LUSON,

Offg. Under-Secy. to the Govt. of India.

No. 13 (Revenue).

FROM

HER MAJESTY'S SECRETARY OF STATE FOR INDIA.

TO

HIS EXCELLENCY THE MOST HONORABLE THE

GOVERNOR-GENERAL OF INDIA IN COUNCIL.

India Office, London, the 2nd February 1893.

MY LORD MARQUIS,

I FORWARD for the information of your Excellency's

Government, copy of a letter
Foreign office letter dated 26th January, with enclosure. from the Foreign Office enclosing a request from the Russian Ambassador on the subject of Dr. Waldemar Haffkine's Scientific Mission to India.

2. I shall be glad if your Government will give Dr. Haffkine every facility for visiting districts, towns and military stations where cholera may be prevalent ; for seeing hospitals where cholera patients may be under treatment ; and for enquiring into the causes and circumstances of cholera epidemics.

FROM

SIR T. H. SANDERSON,

Under-Secy. of State for Foreign Affairs.

TO

UNDER-SECRETARY OF STATE FOR INDIA.

Dated Foreign Office, the 26th January 1893.

SIR,

I AM directed by the Earl of Rosebery to enclose a copy of a note from the Russian Ambassador relative to a scientific mission to India, which is to be undertaken immediately by Dr. Waldemar Haffkine, for the purpose of studying the cholera.

His Excellency requests that, in addition to the letters to the Viceroy with which Dr. Haffkine has been furnished, he should be given special authority from the Secretary of State for India to enable him to visit freely all the districts where garrisons are stationed, and ensure for him a good reception by the officers in command, in order that the sphere of his inquiries may be extended as much as possible.

I am to request that you will move the Secretary of State for India to cause His Lordship to be informed at his early convenience of the reply which should be given to the Russian Ambassador.

Londres, le 26 Janvier 1893.

M. le COMTE,

M. le Dr. Waldemar Haffkine, sujet russe, universellement connu pour des travaux et découvertes

bactériologiques, est sur le point de se rendre aux Indes Anglaises pour y étudier l'épidémie cholérique. Il est déjà muni de lettres d'introduction de Lord Kimberley et de Lord Dufferin pour le Viceroy des Indes, ainsi que de recommandations spéciales de l'autorité médicale supérieure de Londres pour les confrères Asiatiques. Mais il a été prévenu qu'il serait urgent qu'il fût, en outre, pourvu d'une autorisation spéciale du Ministre de la guerre Britannique qui lui assurât le libre accès des contrées plus particulièrement occupées par les garnisons militaires et un accueil bienveillant de la part des commandants locaux dont la protection lui permettrait d'étudier le fléau au milieu de ces centres les plus contaminés.

Je me permets en conséquence de solliciter auprès de Votre Excellence en faveur de M. Haffkine la recommandation susdite qui lui permettrait d'entreprendre la sphère de ses explorations scientifiques entreprises dans un but si éminemment humanitaire.

J'ai, etc.,

(Sd.) BARON DE STAAL.

M. LE COMTE DE ROSEBERY, K.G.

No. 1345.

FROM

THE PRINCIPAL MEDICAL OFFICER,

Her Majesty's Forces in India.

TO

ALL DIST. PRINCIPAL MEDICAL OFFICERS,

Bengal Command.

Dated Simla, the 25th April 1893.

MEMORANDUM.

THE following letters relating to a method of vaccination as a preventive against cholera are published for information. Attention is invited to a lecture by Mr. Haffkine and an article by Surgeon-Captain Bruce,

Army Medical Staff, published in the *British Medical Journal* of 11th February 1893, page 278, and 4th February, page 227, respectively; also to a lecture by Mr. Haffkine, published in the *Indian Medical Gazette* for April 1893, and a communication by Surgeon-Captain Manifold, Indian Medical Service, in same number.

By order,

R. EXHAM, *Surgn.-Lieut.-Col.*,
Secy. to the Principal Medical Officer,
Her Majesty's Forces in India.

Copy of a letter, dated 9th February 1893, from the Director-General, Army Medical Department, London, to the Principal Medical Officer, Her Majesty's Forces in India.

IN acquainting you that the gentleman named in the margin, who has been
Mr. Waldemar Mor- studying the Pasteur system
decai Haffkine. in Paris, has been granted permission by the Secretary of State for India to visit all the cholera camps in that country with the view of introducing to the Military Medical Officers the method of vaccination as a preventive against cholera, I have the honour to request that you will be so good as to cause every facility to be afforded to Mr. Haffkine for the purposes he has in view.

Copy of a letter, dated 22nd March 1893, from Mr. W. M. Haffkine, to the Principal Medical Officer, Her Majesty's Forces in India.

[Translation.]

Vaccination for cholera as a means of protection against that disease has been established by experiments performed on guinea-pigs, and subsequently applied to animals of different organization. It is

found that all these animals, preserved by means of our vaccine, subsequently support with impunity every description of fatal infection which in the case of non-vaccinated animals produces death. Consequently on these results, the operation has been performed on human beings, commencing with the personal staff of our laboratory, and afterwards put to the test on about sixty persons varying in age from 19 to 68 years.

The symptoms produced by this operation in no way entail danger to health, and consist in a rise of temperature of from one to two degrees centigrade after about ten or fifteen hours. This rise of temperature disappears, effacing itself gradually, from fifteen to twenty hours afterwards. At the point where inoculation has been effected, a slight hardening of the skin remains, which disappears in from two to four days without causing the formation of a blister or any other mortification of the tissue. These symptoms have been found to be exactly identical with those produced among animals.

The period of immunity conferred by this vaccine cannot yet be determined. Up to date it has been found, among the animals operated upon, intact four and a half months after the operation. The object of my present mission in India is to realise the application of this method in the choleraic districts. Consequent on a decision arrived at by His Excellency the Secretary of State for India, the Director-General, Medical Department of the Army, has authorised me, as noticed in the document I have the honour to forward you, to visit the various military centres situated in the choleraic districts, and there to put into practice, with the assistance of the military surgeons, the system of vaccination for cholera. I have the honour, therefore, to request that the Office of the Principal Medical Officer for the Forces in India would be good enough to communicate this decision to the surgeons of the army in India, and to beg them to be so kind as to inform me in the

event of there being among the troops confided to their care any person or persons willing to submit themselves for the vaccination in question. In the latter event, I would proceed to the places indicated ; I would teach the surgeons how to prepare the vaccine, and I would instruct them in the method of vaccinating those persons who might be willing to be operated upon in the future.

[*Translated in the Intelligence Branch of the Quarter-master-General in India.*]

No. ^{9 Medical}
424—433

FROM

C. J. LYALL, ESQ., C.S.I., C.I.E.,
Secretary to the Government of India.

TO

THE CHIEF SECRETARY
TO THE GOVERNMENT OF MADRAS.

THE CHIEF SECRETARY
TO THE GOVERNMENT OF BOMBAY.

THE SECY. TO THE GOVT. OF BENGAL,
Municipal Department.

THE CHIEF SECRETARY
TO THE GOVERNMENT OF
THE N.-W. PROVINCES AND OUDH.

THE CHIEF SECRETARY
TO THE GOVERNMENT OF THE PUNJAB.

THE CHIEF COMMISSIONER
OF THE CENTRAL PROVINCES.

THE CHIEF COMMISSIONER OF BURMA.

THE CHIEF COMMISSIONER OF ASSAM.

THE CHIEF COMMISSIONER OF COORG.

THE RESIDENT AT HYDERABAD.

Home Department
Medical.

Dated Simla, the 24th July 1893.

SIR,

I AM directed to invite attention to the Circular letter from this Department No. ^{4 Medical} 169-78, dated the 28th March 1893, in which it was requested that, with the permission of ^{His Excellency the Governor in Council} His Honour the Lieut.-Govr. (and Chf. Commr.),

Dr. Waldemar Haffkine might be afforded facilities in conducting his enquiries and work in connection with cholera epidemics.

2. The Surgeon-General, with the Government of India, has suggested that Local Governments and Administrations should be asked whether they could arrange to depute the Deputy Sanitary Commissioners of their respective Provinces (where such appointments exists) to learn from Dr. Haffkine the processes required for the preparation of the cholera virus and its subsequent inoculation. These officers, it is presumed, could be spared for a short time during the present season of the year without much inconvenience. It has also been suggested that a few selected Civil Surgeons in each Province might be deputed to assist Dr. Haffkine while he is in their own or in adjacent districts, and to learn his system, so as to be able to carry on the inoculation independently after his departure.

3. These suggestions commend themselves to the Government of India. It appears to have been practically established that Dr. Haffkine's system of inoculation is free from danger, but its efficacy as a prophylactic against cholera cannot be ascertained without enlarging the field of experiment in the manner proposed. I am accordingly to say that, if ^{His Excellency the Governor in Council} His Honour the Lieutenant-Governor (and Chief Commr.) has

you have

no objection, the Governor-General in Council would be

(61)

if effect were given to the suggestions communicated in para. 2.

I have the honour to be,
SIR,
Your most obedient Servant,
C. J. LYALL,
Secy. to the Govt. of India

No. $\frac{9 \text{ Medical.}}{434}$.

COPY forwarded to $\frac{\text{Dr. Haffkine}}{\text{the Military Department}}$ for information, in continuation of $\frac{\text{letter}}{\text{endorsement}}$ No. $\frac{387}{390}$, dated 11th July 1893.

No.

COPY forwarded to the Foreign Department, in continuation of endorsement No. 197, dated the 28th March, for information and such further action as may be considered necessary.

By order,
P. G. MELITUS,
Depy. Secy. to the Govt. of India.

To

DR. W. HAFFKINE.

(Copy.)

No. $\frac{564.}{C}$

FROM

THE SANITARY COMMISSIONER,

N.-W. P. & Oudh.

To

THE DEPUTY COMMISSIONER, *Garhwal*.

Dated Naini Tal, the 16th September 1893.

SIR,

I HAVE the honour to state that Prof. Haffkine will, under the auspices of Government, undertake a tour in Garhwal for the purpose of performing anti-cholera inoculations among the people. It is intended that he should inoculate the population of several, two or three or more important villages *en route* Ranikhet to Pauri, Srinagar, and Hardwar.

I shall be obliged if you will kindly indicate the exact route naming bungalows and stages on the road, and endeavour to persuade the people to submit to the operation.

The names of important villages adjacent to the bungalows where a halt should be made to perform operations on as an extended scale as practicable should be indicated. Assistance also should be rendered by placing a responsible and influential Deputy Collector on duty to accompany Prof. Haffkine.

Prof. Haffkine with whom will be associated Dr. Thorold, Deputy Sanitary Commissioner, will in all likelihood leave Ranikhet, on the 30th instant, and proceed *via* Dwarahat, Kelani, and Kainur to Pauri, but the exact route and distances might be named by you.

You will doubtless have already heard from the Commissioner of the Division on the subject, and will, I am sure, render all assistance to make Prof. Haffkine's tour a success.

(True Copy.)

(Sd.) G. HUTCHESON, M.D.,

Sanitary Commr., N.-W. P. & Oudh.

(63)

(Copy.)

No. 563

FROM

THE SANITARY COMMISSIONER,

N.-W. P. & Oudh.

TO

THE DEPUTY COMMISSIONER, *Almora.*

Dated Naini Tal, the 16th September 1893.

SIR,

I HAVE the honour to inform you that Prof. Haffkine, accompanied by Dr. Thorold, Deputy Sanitary Commissioner, will reach Almora on the 21st, and under the auspices of Government, on the afternoon of that date, commence anti-cholera inoculations. He will also operate on the following date the 22nd. On the 24th and 25th, he will be at Ranikhet for the same purpose, and return to Almora to carry out the secondary operations on the 27th.

I shall be obliged if you will kindly announce to the people, Native and European, the circumstance of his visit and do all you can to induce the people to present themselves for inoculation at Almora and Ranikhet.

You will doubtless have already received a communication from the Commissioner on the subject; and it is intended by the Government that all possible assistance should be given Prof. Haffkine.

(True Copy.)

(Sd.) G. HUTCHESON, M.D.,

Sanitary Commr., N.-W. P. & Oudh.

No. 857P—D.

FROM

H. J. S. COTTON, Esq., C.S.I.,

Chief Secy. to the Govt. of Bengal,

TO

THE INSPECTOR-GENERAL OF JAILS.

Dated, Darjeeling, the 22nd September 1894.

JAILS.

SIR,

I AM directed to acknowledge the receipt of your letter dated, 4th September 1894, together with its enclosures from Dr. Macrae, Civil Surgeon of Gaya, reporting on the outbreak of cholera in the Gaya jail.

2. The outbreak was serious, as there were altogether 34 cases, out of which 20 died, all apparently caught from an under-trial prisoner who came into jail with the germs of the disease already developed in him. The Lieutenant-Governor is satisfied that Dr. Macrae, who was in charge of the jail, took all necessary measures to palliate the force of the epidemic.

3. The most interesting point connected with the outbreak is the result of Dr. Haffkine's operations which were conducted under the circumstances explained in your letter. Professor Haffkine, assisted by Surgeon-Colonel Harvey, the Inspector-General of Civil Hospitals, who was on a visit of inspection to Gaya at the time, and by Dr. Macrae, inoculated 215 out of 433 prisoners, or nearly exactly half of the jail population. The result of the experiment is as follows :—

	INOCULATED.		UNINOCULATED.	
	Cases.	Death.	Cases.	Death.
During the first five days after inoculation	5	4	7	5
During three days after the second inoculation	3	1	5	3
After eight days from first inoculation	Nil	Nil	8	2
Total ..	8	5	20	10

These results appear to the Lieutenant-Governor to justify the confidence expressed by yourself and the other medical officers concerned in the reality of the protection, which is only claimed by Professor Haffkine himself when an interval of ten days has elapsed after the first inoculation.

4. You now propose that voluntary inoculation in jails on Professor Haffkine's system should be encouraged as far as possible. You observe that the voluntary character of the operation should be emphatically insisted on, and that the Superintendent of the jail should be made responsible for recording in every individual case that the inoculation had been made voluntarily and in accordance with the expressed desire of each prisoner to be afforded the opportunity of protection from cholera. If precautions of this nature are taken, there would seem to be no objection to inoculation on the ground of interference with the prejudices of the people or of subjecting persons who are not free agents to scientific experiment, and it would appear possible, without exercising any compulsion, to protect the inmates of jails to a large extent from the ravages of cholera. Looking, however, to the necessity of proceeding with great caution in such matters, and to the orders which have already been passed both by this Government and the Government of India, discouraging jail experiments with Dr. Haffkine's antidote against cholera, the Lieutenant-Governor does not consider that any general measures should be taken at present for trying the experiment in Bengal jails. But the circumstances are different in cases where outbreaks of cholera have actually occurred, as was the case in Gaya; the Government is under an obligation to resort to any remedy which seems as hopeful as this one does to prevent the course of the disease; and in such cases, therefore, the Lieutenant-Governor authorises you to sanction the introduction of inoculation on Professor Haffkine's system by the medical officers in charge of jails, with all the safeguards contemplated in your letter to ensure volun-

(66)

tary treatment. These orders appear to go as far as is desirable at present, and I am to request that you will take the necessary steps for carrying them out.

5. Printed spare copies of the valuable reports received regarding the incidence of the Gaya epidemic are enclosed herewith for use in your office.

I have the honour to be,

SIR,

Your most obedient Servant,

H. J. S. COTTON,

Chief Secy. to the Govt. of Bengal.

No. 858P—D.

COPY of the correspondence forwarded to the Inspector-General of Civil Hospitals, Bengal, for information.

By order of the Lieutenant-Governor of Bengal,

J. LANG,

Offg. Under-Secy. to the Govt. of Bengal.

DARJEELING,

The 22nd September 1894.

