A radiograph taken about a month after admission showed a great diminution in the size of the abscess. He was discharged two months after admission, free from all symptoms of abscess and displaying no physical signs beyond some impairment of resonance over the right lower lobe and some diminution of breath sounds in the same region. When next seen, two months later, he was in good health and back at work. All abnormal physical

FIG. 3.—Four months after admission—no trace of abscess. Lung fields normal.

signs had then completely disappeared, and an x-ray examination (Fig. 3) failed to show any trace of his former lesion.

My object in publishing this case is to call attention to the striking and immediate benefit which followed the efficient draining of the abscess by the assumption of a suitable posture by the patient; there is nothing new in that.

INCUBATIONAL CHANGES IN THE RED CELL COUNT IN INOCULATED MALARIA.

(Preliminary Note.)

BY

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We have taken up Sir Ronald Ross's suggestion¹ that the treatment of general paralysis with malaria should also serve as an opportunity for studying the incubational period of malaria. This note deals only with changes in the red cell count.

Our nine patients were all European male inmates of the Pretoria Mental Hospital, most of them of long standing, but still in fairly good condition when the work was started. We have used one case of dementia praecox as a control. All patients were treated with one and the same strain of benign tertian malaria.

Method Employed.

Quantities of blood, varying between 0.5 and 10 c.cm., were taken from the vein of a patient with malarial fever, under aseptic precautions, but with no regard to the stage of his fever. This quantity was then immediately injected under the skin of the new patient, divided over as large an area as the needle could reach, and well rubbed in.

A drop of blood from the finger was diluted 200 times with the usual pipette, and counts were made with a Thoma-Zeiss counting chamber. From every pipette two drops were counted separately, and a hundred small squares were counted every time.

In a few cases morning and evening counts were made on the same patient. In the absence of fever there was hardly any discrepancy, but an intervening rigor always lowered the count. In such cases the mean was taken. The routine procedure, however, was one daily count performed at approximately identical hours for every patient. In every case counting was started a few days before the injection so as to obtain the average count.

Results.

Sir Ronald Ross¹ mentioned that S. Ben-Harel saw the red cells diminish, in canaries inoculated with *Protozoa*, as early as the day after inoculation, and this decline was progressive day after day, until from 0.5 to 2 million had disappeared from the original normal count of 4.5 to 5 million. We have found the exact opposite, as shown in the table. In it we have included other details about our patients which might be thought to have a bearing on the phenomena observed, although the connexion is none too obvious.

TABLE.

Case Number.	Dose Injected.	Incubation Period (days).	Average Cell Count before Injection (millions per c.mm.).	Highest Count Reached (millions per c.mm.).	Lowest Count Reached (millions per c.mm.).	Malaria in Patient's History.	Duration of Fever (days).	Fever stopped by—
1	5 c.cm.	12	4.7	6.4	3.1	?	33	Itself.
2	2	9	4.7	6.7	3.2	?	30	Neosalvarsan.
3	4	9	5.6	6.7	3.2	?	17	Neosalvarsan.
4	5	6	5.4	6.25	3.5	?	19	Neosalvarsan.
5	1	12	4.8	6.2	2.9	had	58	Neosalvarsan.
6	0.5	17	4.7	6.5	3.65	?	47	Neosalvarsan.
7	1.5	18	5.9	6.4	5.2	had	15	Itself.
8	2	9	6.8	7.9	6.5	?	12	Death.
9	10	14	5.9	6.8	5.3	had	5	Itself.

At the altitude of Pretoria a red blood count of nearly 6 million may be regarded as normal. From the table it is seen that many of our patients were anaemic before the injection of malarial blood. The high count reached by all of them after the injection is all the more remarkable. The very low count following on this is the usual malarial anaemia. But neither the rise nor the fall seems to stand in any fixed relation to the other features: to previous malarial history, to the dose of blood injected, and to whether we used neosalvarsan to stop the fever or it ceased of itself.

From our observations it is clear that an injection of malarial blood is followed by a rapid and marked increase in the number of red cells. This increase is followed by a decrease, and this decrease coincides more or less with the outbreak of fever, or possibly with the appearance of malaria parasites in the peripheral blood stream. Since all the cases injected with malarial blood showed this increase in cell count, and the one case injected with malaria-free blood showed no change at all, we may safely hold the malaria parasites responsible for the increase. This view is further supported by an observation in another patient who had received an injection of malarial blood but for some reason never got as far as a rigor. He just showed an irregular slight rise of temperature for a couple of days, after which the fever died out entirely. In this case a rise in the number of red cells was recorded from 5.04 to 5.78 million.

Conclusions.

A subcutaneous injection of from 0.5 to 10 c.cm. of blood containing benign malarial parasites is quickly followed by a rise in the red cell count amounting to somewhere between 10 and 30 per cent. This rise lasts several days, with minor daily variations, and is followed by a fall, which constitutes the malaria anaemia.

As an injection of malarial blood cannot very well lengthen the life of red blood corpuscles, the rise can only be explained

as an increase in production of red blood cells. Normal blood has no such effect.

An injection of malarial blood is a direct stimulus for the red bone marrow towards increased activity. This stimulus might be applied for therapeutical purposes (forms of anaemia, especially chlorosis). The outbreak of fever can always be prevented by an injection of neosalvarsan as soon as the increase in red cells is well established. The whole process could then be repeated.

We wish to thank the public health authorities of Natal for assisting us in obtaining the strain of malaria; Dr. Griffin of Verulam for his very kind and courteous co-operation in this matter; Dr. J. T. Dunston, Commissioner for Mental Hygiene of the Union of South Africa, for giving us every assistance whilst making these investigations; and Dr. Swift, Acting Commissioner for Mental Hygiene, for his kind permission to publish this note.*

REFERENCE.

* Ronald Ross, BRITISH MEDICAL JOURNAL, January 19th, 1924.

SMALL-POX: AN UNRECOGNIZED OUTBREAK.

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THE following history illustrates the behaviour of unrecognized small-pox in a community where the only control was the previous partial vaccination of the contacts and the fact that it occurred in institutions under discipline and observation. The facts are related as they came to my knowledge in order better to convey the method by which the outbreak was discovered.

On Saturday, February 16th, I was asked by the medical attendant to see a girl, resident in an institution for female adolescents which is supported partly by voluntary contributions and partly by laundry work. I gave it as my opinion that the patient was suffering from chicken-pox, and very much relieved the administration by offering to remove the case to the Preston Isolation Hospital. This offer was accepted, and the patient was removed to an isolation ward in the diphtheria block at the isolation hospital.

During the week-end I became suspicious of my original diagnosis, and asked Dr. Fisher of the Lancashire County Council staff to see the case. He diagnosed the case as one of small-pox, the points being:

1. The rash was preceded by a definite illness on February 8th—headache, pains in the back, and sickness.
2. The rash first appeared on the face and forehead on February 13th.
3. When the rash was fully developed (February 18th) it tended to affect the extremities rather than the centre of the body, and the exposed rather than protected surfaces. Thus the back of the hand and the arm, the front of the leg, and the forehead were affected, whereas the abdomen, the groin, and the front of the neck were free.
4. The rash appeared in one crop upon the face and appeared successively at different sites lower down the body, affecting the feet last; thus the rash on the face was much older than that upon the feet, and all the spots upon the feet were of the same age.
5. The spots were circular and deeply seated in the skin.
6. The vaccinal condition was definitely negative.
7. Revaccination was not successful.

The diagnosis was agreed to by my assistant and the original medical attendant of the case and by the medical officer of the small-pox hospital to which the patient was removed on that day. She made a good recovery, but was somewhat scarred. There were no subsequent cases.

The usual inquiries as to the source of infection revealed the fact that the laundry was regularly receiving parcels of laundry work from an adjoining institution for boys. This home is managed by a religious brotherhood and receives fifty resident boys on behalf of the Home Office. At this home on December 25th there occurred an illness in one of the boys. A rash appeared on December 29th. I saw the case on December 31st in consultation with the medical officer and diagnosed the illness as chicken-pox. Bearing this case in mind I at once inquired as to the subsequent history, and

found that fourteen additional cases had occurred, as shown in the table.

Case No.	Date of Onset.	Vaccinal Condition.	Case No.	Date of Onset.	Vaccinal Condition.
1	Dec. 25th	Nil	9	Jan. 12th	4 scars
2	Jan. 8th	4 scars	10	" "	4 scars
3	" "	4 scars	11	Jan. 13th	Nil
4	Jan. 11th	Nil	12	" "	Nil
5	" "	1 scar	13	Jan. 14th	Nil
6	" "	Nil	14	Jan. 18th	Nil
7	" "	1 scar	15	" "	Nil
8	Jan. 12th	3 scars			

These lads all suffered from an illness similar to that of the first boy. There was, I am assured, a prodromal illness, nausea, and backache, and in one or two instances sickness. The rash appeared first on the face. As the cases occurred they were removed to an empty dormitory and looked after by the resident nurse. At the date of my visit (February 19th) all the boys were well and mixing freely with the other lads. They presented scars on the shins, knees, and feet, and the boys affected later in the outbreak showed characteristic "seeds" in the soles of the feet. Individual scars were also indicative.

An examination of the remaining boys showed that with one exception all had been vaccinated either in infancy or subsequently. Also that on February 1st and February 15th the medical officer of the institution had arranged for the vaccination of the eight among the above who had not been previously vaccinated. In seven of the eight the attempt to vaccinate was unsuccessful both on February 1st and February 15th. In one case, which in its attack had only a single spot and no scars, vaccination was successful. The seven of the fifteen cases in the table were unsuccessfully revaccinated on February 20th.

In view of the fact that the usual experience of public vaccination, using Government lymph, is 99 per cent. case success and a slightly lower figure for insertion success, the unsuccessful attempt to vaccinate these unvaccinated boys was the subject of correspondence between the public vaccinator and the Government lymph establishment, to which my attention was called by the Ministry of Health early in March.

Summarizing, I found that an epidemic illness resembling small-pox had occurred, and that it had (1) infected all but one of those eight boys not protected by previous vaccination; (2) infected seven boys protected by previous vaccination; (3) failed to infect forty-nine boys and staff protected by previous vaccination; (4) rendered those infected immune to vaccination.

On January 28th the nurse who had attended to the sick boys took her uniform to the laundry at the girls' institution. The case in the latter home occurred on February 8th—eleven days later.

Several interesting points arise. The attack rate was as follows:

Institution.	Period of Exposure.	Previously Vaccinated.	No. of Cases.	Percentage.	Unvaccinated.	No. of Cases.	Percentage.
Boys' Home...	Unlimited	56	7	12.5	9	8	88.8
Girls' Home...	8 days	14	—	—	6	1	16.6
Isolation Hospital	2½ days	48	—	—	9	—	—

The total contacts at the three institutions numbered 126, of whom 111 had been previously vaccinated, and 15 were unvaccinated. All, with 10 exceptions (recent army vaccinations 8, refusals 2), were submitted to vaccination in connexion with the small-pox outbreak.

The case success in those previously vaccinated was 102 : 22, or 21.5 per cent.

In the 14 who had never been vaccinated it succeeded in all but one case.

* Detailed charts sent with this paper have been omitted owing to want of space.