

The three fruits were then invaded with *B. pyocyaneus* and the vibrio could not be recovered after 24 hours.

2nd Experiment:—

The vibrio was recovered and proved to be pure in the melon after 120 hours and in the cucumber and tomato after 72 hours. The reaction of the fruit remained acid except that of the melon, which at the end of the time was invaded by a spore-bearing organism (from the rind) and the reaction changed to alkaline. The vibrio then died out.

3rd Experiment:—

The skin was carefully sterilised before section. Vibrios in pure culture were found to be present in luxuriance after 168 hours in the case of the melon. The reaction of the fruit was still acid.

It was not easy to say whether the vibrio had increased or decreased, but the growth on agar at the end of a week was as luxuriant as after 24 hours. The fruit was then invaded by a spore-bearing organism like that in experiment 2. The reaction became alkaline and the vibrio could not be recovered.

In all cases the identity of the vibrio was proved by all available laboratory tests including the agglutination with high-titre serum. A variant of the above experiment was made by squeezing out juice from a melon, tubing it and sterilising it at 100 degrees C. for 2 or 3 successive days and using this fluid medium, in one case without changing its acidity, and by alkalinising it in another.

The vibrio did not appear to flourish in the medium, the alkaline medium became acid after two days' growth, and the vibrio could only be recovered up to 48 hours, after which it died out in both kinds of medium. The medium may have been modified adversely by heating, as a smell of caramel was detected suggesting that the process of steaming had decomposed the fruit sugar.

If sugar is the nutrient property on which the cholera vibrio supports itself, it would explain why it died out in the heated medium.

CONCLUSION.—*Despite the natural acidity of the fruit, the cholera vibrio is able to live and probably to increase in numbers on the cut surface of a melon for as long as a week. This makes the danger of exposing cut or ruptured melons to the dust and flies of the bazar to be a real one.*

(e) *Experiment to ascertain what bacteria are to be found on the surface of cut or ruptured melons exposed for sale in the bazar.*—This experiment needs to be done before one can say whether the facts we have produced artificially are ever found under natural conditions. It is probable even in epidemic times and in infected neighbourhoods that a very large number of experiments would have to be done before one would be lucky enough to find an infected melon.

This and the departure of the senior writer on leave prevent this part of the enquiry being carried out.

Further experiments on similar lines might be done using *B. coli* as an index of faecal contamination (by dust or flies or human handling) and the behaviour of other intestinal pathogens, e.g., the enteric and dysentery group bacilli on the pulp of fruit, but as far as this paper goes, a few final conclusions are warranted.

GENERAL CONCLUSIONS.

1. The inside of fresh unruptured fruit is sterile.

2. The reaction of melons and tomatoes is strongly acid and of cucumbers is mildly acid at all stages of ripening.

3. The temperature of these fruits is lower than that of the external atmosphere by—

13.89 F. (7.7 C.) in the case of the melon.

15.98 F. (8.8 C.) in the case of the cucumber.

6.01 F. (3.34 C.) in the case of the tomato.

4. The cholera vibrio can be recovered from melons 7 days and from cucumbers and tomatoes 3 days, after they have been inoculated. Melon pulp appears to be a particularly suitable medium for the growth of cholera germs.

These few experiments justify the following advice to troops:—

(1) *Undamaged melons, cucumbers, and tomatoes may be eaten with safety.*

(2) *Ruptured or damaged fruit, and especially sliced melons which have been exposed in the bazar, should be strictly avoided.*

A NEW FORM OF CUTANEOUS LEISHMANIASIS—DERMAL LEISHMANOID.

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THE following paper on a "New Form of Cutaneous Leishmaniasis" was read by me at the meeting of the Medical Section of the Asiatic Society of Bengal held on 8th February, 1922.

The various forms of cutaneous and mucocutaneous leishmaniasis are divided by Castellani and Chalmers as follows:—

- (1) Cutaneous.
- (2) Muco-cutaneous.
- (3) Oro-pharyngeal.

The cutaneous forms are divided by them into:—

- (a) The common variety—The oriental sore.
- (b) The verrucose variety.
- (c) The keloid-form variety.
- (d) The frambœsiform.
- (e) The Papillomatous variety.
- (f) The deep ulcerative variety.

Laveran describes the following forms of cutaneous leishmaniasis:—

- (a) The oriental sore.
- (b) American leishmaniasis.

1. The cutaneous ulcerating form.

2. The cutaneous non-ulcerating form which may be either

(1) Papillomatous or (2) macro-tuberculous.

The variety of cutaneous leishmaniasis described in the present paper is of extreme pathological and clinical importance. It differs from any form of cutaneous leishmaniasis described in the literature and appears to afford the missing link between cutaneous and visceral leishmaniasis or kala-azar and leads one to conclude that the special pathogenic properties of the parasites of kala-azar may be so modified after antimonial treatment that it may subsequently give rise clinically to a form of cutaneous leishmaniasis, thus proving the identity of the parasite of kala-azar and that of cutaneous leishmaniasis.

Among the multitude of kala-azar patients treated by me with intravenous injection of antimony, I met with four cases which, within six months to two years after completion of treatment, came to me with a peculiar form of cutaneous eruption which at first sight gave an impression of tuberculous leprosy. In none of them, however, could any lepra bacilli be found. When they came to me with these eruptions, there were no clinical symptoms of kala-azar.

The appearance of these cutaneous eruptions in patients who have apparently recovered from kala-azar after antimonial treatment made me suspect that they might be due to a cutaneous infection of these individuals in whom there was not a complete sterilization of the organs against the leishmania, though their virus had been attenuated by repeated antimonial injections. This led me to examine the scrapings from the cutaneous nodules of these cases with the help of Dr. Surendra Nath Ghose, Bacteriologist, Presidency General Hospital, Calcutta. The examination of the scrapings led to the remarkable discovery that the eruptions were due to cutaneous infection by the parasites of kala-azar.

During the antimonial treatment of kala-azar, the following results may follow :—

- (1) Cure.
- (2) Apparent cure followed by a relapse.
- (3) No improvement.

A fourth result may follow, and this is what happened in the four cases mentioned above. The visceral leishmaniasis may be cured, but a few leishmania may be left behind with their virus so attenuated that they gave rise to a milder disease, namely, cutaneous leishmaniasis.

I give here the full history of the last case in which this transformation of a case of visceral leishmaniasis (kala-azar) into one of cutaneous leishmaniasis took place. The case was seen by Dr. Surendra Nath Ghose and myself.

Patient, aet. 31, an inhabitant of Barisal, gave a history of fever coming on with rigors from February, 1917, which was not benefited by quinine. In May, 1917, he had an attack of pneumonia. His fever persisted and there was progressive enlargement of the spleen. He was again treated with quinine which was given intramuscularly in doses of 10 grains for 6 days. He states that after this he was free from fever

till the end of June 1917. In July, he again had an attack of intermittent fever, the temperature ranging between 99 degrees F. to 105 degrees F. He was again given intramuscular injections of quinine but with no benefit.

In January 1918, he came to Calcutta and was seen by Dr. Ghose and myself. When we examined him for the first time, his spleen was found enlarged, extending 6 inches below the costal margin and the liver extended 3 inches below the costal arch. The fever was of an intermittent type. He was at first given a course of treatment with soamin. The results of blood examination before treatment of soamin were R. B. C. 3,000,000, W. B. C. 3,500, Hb. 30 per cent. and differential count showed polymorphonuclears 60 per cent., lymphocytes 24 per cent., large mononuclears 14.8 per cent., and eosinophiles 1.2 per cent. The treatment with soamin was not followed by any improvement. Spleen puncture was made and the smear showed the presence of Leishman Donovan bodies. A few L. D. bodies were also found in peripheral blood. The patient was now treated with intravenous injection of tartar emetic given twice a week in doses of $\frac{1}{2}$ to 10 c.c. He had altogether thirty injections. The fever stopped after 10 injections. When he left the treatment, there was marked improvement in his general condition, the spleen and the liver could not be felt below the costal margin and the blood condition was :—

R. B. C. 4,000,000.

W. B. C. 7,500.

Hb. 70 per cent.

No parasites could be found on spleen puncture.

He has had no fever since his treatment with antimony was stopped.

In the beginning of 1919, he noticed faint whitish patches on his face. These gradually spread. These patches were neither anaesthetic nor hyperaesthetic. They gradually spread over the whole body in front and behind in about six months. He was at first treated with arsenic internally. The patches became worse during cold weather. Subsequently, papillomatous nodules appeared over the face, the trunk and the extremities.

Patient was seen by me very recently. I asked Dr. Ghose to make a very careful examination of the scrapings and the juice from the papillomatous nodules for the presence of L. D. bodies. The smears showed a very large number of L. D. bodies in some of the slides.

Description of the present rash.—The whole of the body is covered with eruptions which are described as follows :—

(1) On the face there are papillomatous nodules somewhat resembling small leprotic nodules.

(2) There is a slight erythematous appearance on the cheeks and the forehead.

(3) On the trunk, the upper and the lower extremities, there are slightly raised brown



Dermal Leishmanoid—showing the eruptions in the upper half of the body,



Leishmania Donovanii in a smear from the scrapings of the papillomatous nodules.

patches which are extensively spread over the whole body. A few papules are also present in these parts.

(4) There are some erythematous patches in the extremities, especially the lower.

(5) No ulceration or scab formation in any part of the body. Other features—no anæsthesia, no loss of knee-jerks, no thickening of the nerves. No eruptions in the mucous membrane of the mouth and nostrils.

Liver and spleen normal. On examination of the splenic body by spleen puncture, no L. D. bodies were found. No rise of temperature. The patient complains of no other trouble, except the ugly appearance of the body due to the eruptions.

Result of blood examination on 1st February, 1922 :—

Hb. 75 per cent.

R. B. C. 4,500,000.

W. B. C. 10,000.

Polymorphonuclears 62 per cent.

Lymphocytes 24 per cent.

Large mononuclears 6 per cent.

Eosinophilis 8 per cent.

The blood report does not at all correspond to that of kala-azar. No L. D. bodies could be detected in the peripheral blood.

Examination of the scrapings.—L. D. bodies are found in very large numbers, especially in the juice expressed from the papillomatous nodules. A few have also been found from the brownish patches. No lepra bacilli.

In view of the fact that the eruptions are due to leishmania infection whose virus has been modified by antimonial treatment, I propose to call this form of cutaneous leishmaniasis *dermal leishmanoid* just as small-pox modified by vaccination is called varioloid.

I shall study the morphological character of the flagellate forms of these parasites after culturing them with the help of Major Knowles, I. M. S., Protozoologist, Calcutta School of Tropical Medicine.

This case, along with three others of a similar type that I have observed, is a remarkable one, as they appear to point to the identity of the parasites of visceral and cutaneous leishmaniasis.

It seems that the virus of the parasite of kala-azar was attenuated in these cases by the antimonial treatment and a case of deadly visceral leishmaniasis was converted into one of cutaneous leishmaniasis. We thus have a direct proof of the identity of the parasites of visceral and dermal leishmaniasis, which has been attempted to be proved indirectly by complicated inoculation experiments.

Of the three other cases met with by me, one resembled the present case in the rash being generalized over the whole body. The other two cases had less generalized rash, most of the papillomatous eruptions being present on the

face, there being some brownish patches over the arms.

One of these cases was treated with further injections of antimony and he appeared to improve. The second one, a boy of 15 years, was given six intravenous injections of tartar emetic in doses of 3 to 5 c.c., but he left treatment before any improvement was noticed. I propose to treat the present case with combined treatment of intravenous injection of antimony and soamin and shall report the results in a future communication.

It has been suggested by Manson that the treatment of kala-azar with a vaccine made from the virus of oriental sore is worth trial. May it be further suggested that in places where kala-azar is very prevalent, the inhabitants should be vaccinated with the virus of oriental sore as a prophylaxis against kala-azar?

Apart from the interest in the above case on account of its forming a new hitherto unknown clinical entity, it raises the following most suggestive questions :—

(1) Are the parasites of kala-azar in the process of destruction by antimonial treatment eliminated by the skin and are cases of kala-azar therefore more infective during antimonial treatment?

(2) If the parasites are eliminated by the skin, do they also enter the system through the skin at the time of primary infection?

The above case, after being exhibited by me at the meeting of the Medical Section of the Asiatic Society of Bengal, held on 8th February, 1922, was exhibited at the Calcutta School of Tropical Medicine on 9th February, 1922.

I append here a drawing showing the eruptions on the upper part of the patient's body. A drawing from the scrapings from one of the nodules is also appended herewith showing the presence of *Leishmania donovani* which mostly seem to be extra corpuscular in the smear. As stated before, I have met with four cases of dermal leishmanoid.

Perhaps such cases are more common than has been suspected and more cases will be met with by observers who are treating kala-azar with antimonial preparations.

I am indebted to the Editor, *Indian Medical Gazette*, for announcing my discovery of this new form of cutaneous leishmaniasis in the *Indian Medical Gazette* for March, 1922.

I suggest that workers in the field of kala-azar should look out for such cases of infection by *Leishmania donovani sine kala-azar* as a result of antimonial treatment.

Since the above paper was sent to the editor, *Indian Medical Gazette*, I have succeeded in developing flagellated forms of *Leishmania donovani* with the help of Major R. Knowles, I. M. S., on N.N.N. medium from the juice obtained from the eruptions by puncture. Blood cultures were negative.