

could be detected between the curative action of the autoclaved and that of the unautoclaved solution. The average length of time at which blacktongue symptoms reappeared after treatment ended was 17 days for the autoclaved and 16 days for the unautoclaved solution.

We conclude, therefore, that nicotinic acid has little if any of its vitamin potency destroyed by autoclaving. It thus resembles in this respect, as well as others, the P.P. factor of Goldberger.

### 9810 P

#### Successful Transmission of Cutaneous Leishmaniasis by the Bites of *Stomoxys calcitrans*.

D. A. BERBERIAN. (Introduced by E. W. Dennis.)

*From the Department of Parasitology, the American University of Beirut, Beirut, Lebanon.*

The experiments carried out by Sergent, Sergent, Parrot, *et al.*,<sup>1</sup> Adler and Theodor,<sup>2, 3, 4</sup> incriminated the sandfly as the probable vector of cutaneous leishmaniasis. This hypothesis has been supported by the fact that it has been possible to infect sandflies under experimental conditions, and to produce the cutaneous lesions by the injection of crushed infected sandflies. Furthermore, the sandfly theory of transmission of cutaneous leishmaniasis has been attractive because of the readiness with which leishmanias exflagellate and multiply in the alimentary tract of these insects, and the epidemiological evidence apparent in the close correspondence of the distribution of certain species of sandflies with the distribution of cutaneous leishmaniasis. However, we have not been entirely satisfied with the sandfly theory of transmission because of the following facts:

1. Critical experiments designed to demonstrate the transmission by the bite of the sandfly have regularly failed. Although it is conceivable that infection may be accomplished by crushing an infected sandfly at the site of the bite, the likelihood of this occurring would appear to be rather remote to any person who has attempted to destroy a sandfly while in the act of biting.

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<sup>1</sup> Sergent, Ed. *et Et.*, Parrot, L., Donatien, H., *et* Beguet, M., *Arch. Sc.*, 1921, **173**, 1030.

<sup>2</sup> Adler, S., and Theodor, O., *Ann. Trop. Med. and Parasit.*, 1925, **19**, 365.

<sup>3</sup> *Ibid.*, 1926, **20**, 175.

<sup>4</sup> *Ibid.*, 1927, **21**, 89.

2. There is no evidence that sandflies are attracted to lesions as preferential sites for feeding, and, as *L. tropica* is confined to the lesions, the probability of a sandfly acquiring the infection would be remote even though there was ample opportunity to feed on persons exhibiting suitable lesions.

3. Should a sandfly actually feed from the oriental sore under natural conditions, it should be remembered that the parasites are limited to the endothelial cells, and the likelihood of infected tissue cells being ingested with the blood must be rather small.

4. Data published by Smith, Mukerjee, *et al.*,<sup>5</sup> indicate that only 25% of sandflies infected on their first bite, and few, if any, infected on their second or third feeding would survive for the period of 6-8 days required for *L. tropica* to become infective in *Phlebotomus sergenti*<sup>6</sup> and *P. papatasi*<sup>7</sup> respectively.

Attracted by the possibility of sucking or biting flies, which are commonly attracted to skin lesions, transmitting oriental sore and kala azar mechanically, we have carried out experiments using *S. calcitrans*, house flies and bed bugs. We have successfully transmitted cutaneous leishmaniasis by the bites of *S. calcitrans*.

The source of infection consisted of a lesion produced on the author by the intracutaneous inoculation of 0.1 cc. of 14-day-old culture of *L. tropica*. The lesion first appeared about 15 days after inoculation, and was used during the period 80-90 days after inoculation.

On July 11, 1937, two stable flies were fed on the lesion and were immediately transferred to the anterior aspect of the left thigh of volunteer No. 2. Each fly bit once after being transferred. On July 20, 1937, one fly was fed on the lesion and immediately placed on volunteer No. 2 at approximately the same place used for the feeding on July 11th; the fly bit twice. On July 21st, four flies were fed on the lesion and immediately transferred to the volunteer as on 2 previous occasions; the 4 flies bit a total of 7 times. The volunteer was bitten a total of 11 times by 7 flies.

A pin-point violaceous papule appeared at the site of the bites on the volunteer 5 months after the last feed; the lesion increased in size, and on January 20, 1938, was 2 mm. in diameter. On January 22nd, six months after feeding, a second papule appeared near the first lesion. Examination of a smear prepared from the first lesion on January 24th showed numerous Leishman-Donovan bodies.

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<sup>5</sup> Smith, R., Mukerjee, S., Halder, K. C., and Chiranji Lal, J., *Ind. J. Med. Res.*, 1936, **24**, 295.

<sup>6</sup> Adler, S., and Theodor, O., *Ann. Trop. Med. and Parasit.*, 1929, **23**, 1.

Thus at least 2 positive transmissions have resulted from 11 bites by only 7 flies, and it is possible that lesions will develop at the site of other bites.

We may conclude that transmission of oriental sore by means of stable flies is possible, and in view of the ease of transmission, it seems probable that transmission by this method frequently occurs under natural conditions. A complete report on our experiments using *S. calcitrans* and other insects will be published later. We believe that *S. calcitrans* and similar blood-sucking flies may be capable of transmitting visceral leishmaniasis under natural conditions, and experiments to test this hypothesis are included in our program.

### 9811 P

#### The Diagnosis of Venous-arterial Shunt by Ether Circulation Time Method.

WILLIAM BENENSON AND WILLIAM M. HITZIG. (Introduced by George Baehr.)

*From the Medical Service, Queens General Hospital, and the Medical Service and Cardiographic Laboratory of the Mount Sinai Hospital, New York City.*

Recently McGuire and Goldman<sup>1</sup> showed that in certain types of congenital heart disease the arm to carotid sinus circulation time was considerably abbreviated. They regarded this apparent increase in the velocity of blood flow as characteristic of venous-arterial shunt. To their interesting observations we wish to add our findings with the ether<sup>2</sup> and saccharin<sup>3</sup> circulation time methods, which we believe offer conclusive evidence for the presence of right to left shunt.

Ether (5 minims) injected into an antecubital vein in normal individuals enters the right heart whence it reaches the pulmonary capillary bed and becomes volatilized. The time elapsing between the injection and the detection of the ether smell in the nose represents the arm to lung time, which in normal individuals and in those with circulatory failure is always a fraction of the arm to

<sup>1</sup> McGuire, J., and Goldman, F., *Am. Heart J.*, 1937, **14**, 230.

<sup>2</sup> Hitzig, W. M., *PROC. SOC. EXP. BIOL. AND MED.*, 1934, **31**, 935; *Am. Heart J.*, 1935, **10**, 1080.

<sup>3</sup> Fishberg, A. M., Hitzig, W. M., and King, F. H., *PROC. SOC. EXP. BIOL. AND MED.*, 1933, **30**, 651.