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Autor: Monjour, L. / Lecso, G. / Tselentis, Y.
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¹ Laboratoire de Parasitologie expérimentale et INSERM U 313,
Faculté de Médecine Pitié-Salpêtrière, Paris, France

² Laboratoire de Parasitologie, Hôpital Laïkon, Gaudi – Athènes, Grèce

A new apparatus suitable for the use of counter-immunoelectrophoresis in the field: application for the diagnosis of malaria and leishmaniasis

Short communication

L. MONJOUR¹, G. LECISO¹, Y. TSELENTIS², D. MAZIER¹, I. VOULDOUKIS¹,
C. ALFRED¹, C. DANIEL-RIBEIRO¹, D. FROMMEL¹

Counterimmunoelectrophoresis (CIE) has been applied for establishing the diagnosis of infectious diseases. Its application was first undertaken with agar or agarose gels as support for the electrophoretic run (see Guinet, 1978). In the authors' laboratory, CIE was modified by using, instead of agarose gels, cellulose acetate membranes (Gentilini et al., 1972). Routinely employed for the detection of parasitic (Druilhe et al., 1978; Monjour et al., 1978) and fungal (Monjour et al., 1975, 1978) antibodies in patient sera, we demonstrate that CIE can be easily adapted to malaria and leishmaniasis surveys conducted in rural areas, in the field.

The first survey was conducted in Burkina Faso, near Ouagadougou. 629 sera of countrymen living in a malaria holoendemic area were tested for malaria antibodies. The second survey was carried out in Greece, around Athens. 260 sera (humans = 200; dogs = 60) were collected for the detection of *Leishmania* antibodies. All sera were immediately studied in the field by CIE and later, in our laboratory, by CIE and indirect immunofluorescence (IFI).

Leishmania infantum promastigotes were cultured and used as antigens for CIE and IFI as previously described (Monjour et al., 1978). For malaria survey, these two techniques (Druilhe et al., 1978) were employed with parasitized red blood cells (PRBC) from a *Plasmodium falciparum* malaria patient. In our laboratory previous studies based on 150 cases of visceral leishmaniasis, 3000 sera of malaria patients and 7000 sera of subjects with parasitic and non-parasitic infections, showed that CIE has a specificity and a sensitivity equivalent, if not higher, than IFI (unpublished results). Moreover, the rapidity of the CIE method (around 3 h for a serological diagnosis) can easily allow collective detection in village populations.

The usual CIE technique requires standard equipment, comprising electrophoretic tanks (Chemetron – tank mod. 2, pac 5), cellulose acetate membranes (Sebia strips 17 cm × 2,5 cm × 200 μ), the antigens and test sera (Gentilini et al., 1972). For application in the field, in areas devoid of any electricity supply, we adopted the following set-up: a standard 12 volts car battery (45 Amps/h), a fitting for an 8 W fluorescent tube (12 volts D. C. – Mazda & Co.; ref. RBIC 8 T 12), a bridge rectifier (1 Amp., 1000 Volts), an electrolytic capacitor: 200 μF; 180 volts; a potentiometer 10 K Ω; 5 W (Fig. 1). The fitting was used as a current converter to increase the voltage from 12 to around 100 volts in order to obtain rapid electrophoretic migrations. The potentiometer enabled the voltage to be

Correspondence: Dr Loïc Monjour, Laboratoire de Parasitologie expérimentale et INSERM U 313, Faculté de Médecine Pitié-Salpêtrière, 47, Bd de l'Hôpital, F-75834 Paris Cedex 13, France

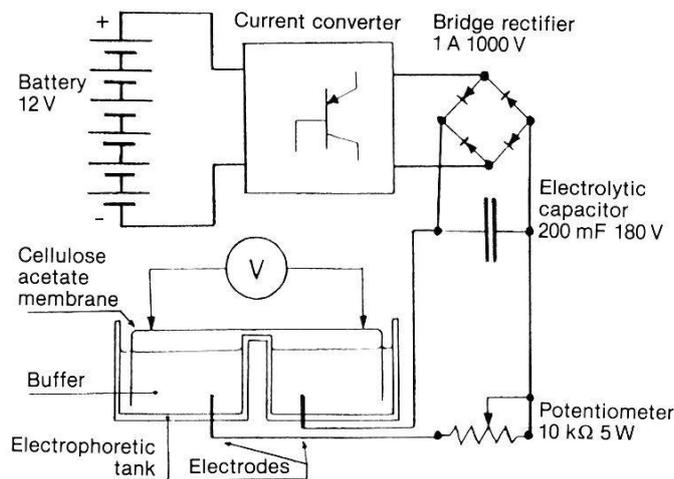


Fig. 1. Ad hoc equipment for the counterimmunoelectrophoresis technique performed in the field.

adjusted as required, between 60 and 75 volts measured at both ends of the cellulose acetate strips. All the equipment involved was encased in a metal envelope for protection.

Results of the CIE technique applied in the field were confirmed in the laboratory with a conventional set-up. In Greece, one already known leishmanian patient (CIE +; IFI reciprocal titer [IRT] = 800) and 3 dogs (CIE +; IRT = 800, 800 and 1600) were proven to be serologically positive. The canine leishmaniasis were confirmed by the presence of amastigotes in bone-marrow aspirates. In Burkina Faso, malaria antibodies were demonstrated by the two techniques for 625 subjects. Four sera were subject to discussion = 2 CIE negative and IFI weakly positive and vice-versa for the two others. In this study, the IFI positive titer range extended from 800 to 25,600.

The value of CIE, has been considered in terms of output. The test was perfectly feasible for up to 400 sera without exploiting the total electricity supply of the battery; it is time-saving, allowing diagnosis of the disease and beginning of the treatment on the same day; lastly, the cost per examination amounts to no more than 0.30 US dollar.

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