

SCHISTOSOMA MANSONI: MIGRATION PATTERNS IN NORMAL AND IMMUNIZED SWISS WEBSTER MICE, BY MEANS OF AUTORADIOGRAPHIC ANALYSIS

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Recovery of schistosomula from the skin and lungs of laboratory hosts, has been applied as an assay of acquired immunity to *Schistosoma mansoni*. However, in all recovery techniques, when a reduction in numbers of recovered worm burden is observed, it is never clear whether this is because their incapacity of crawling out of the chopped pieces, either from skin or lungs. Autoradiography of skin exposed to labeled cercariae, provides an accurate and convincing mean of quantifying skin penetration by cercariae and subsequent migration away from the skin by schistosomula (Georgi et al., 1982, *J. Parasitol.*, 68: 1092-1095).

To estimate the *S. mansoni* worm burden in different organs of normal or immunized animals, aiming also to establish the migration pattern and fate of the parasites, the addition of autoradiography to an existing procedure for radiolabeling schistosome cercariae has provided a useful technique for tracking parasites within their hosts. (Dean et al., 1984, *Am. J. Trop. Med. Hyg.*, 33: 89-96).

In this study, the migration patterns of (⁷⁵Se)-Selenomethionine-labeled challenge cercariae in SW mice previously immunized with a protective *S. mansoni* adult worm extract, "SE" (Tendler et al., 1986, *Int. J. Parasitol.*, 16: 347-352), were analysed by autoradiography of schistosomula and adult worm recovery.

Forty *Biomphalaria glabrata* snails infected for 7 weeks with *S. mansoni*, LE strain, were individually exposed to 20 µCi of (⁷⁵Se)-L-selenomethionine at a specific activity of 20-50 Ci/mmol (Amersham Corp.) for 5 hours and radiolabeled cercariae were recovered 4 days later.

Immunization with SE was performed as previously described (Tendler et al., 1982, *Mem. Inst. Oswaldo Cruz*, 77: 275-283) and consisted briefly of 2 weekly footpad injections of 100 µg of SE in Complete Freund's Adjuvant (Difco, containing 1 mg/ml *M. tuberculosis*). Twenty-one days later, the mice, separated in two groups of 36 animals each, considering further infection by two different routes, received an intraperitoneal injection of the antigen alone, containing 100 µg protein of SE. Control groups consisted of number, sex and age-matched unprimed mice. Vaccinated groups and normal controls were infected simultaneously by percutaneous (tail immersion) or subcutaneous routes, with 180 labeled cercariae/animal, 90 days after immunization. The procedure for compressed organ autoradiography, consisted in mounting tail and site of inoculation skins flat on cardboard with doubly adhesive cellophane tape. Lungs and livers were placed on cardboard, covered with cellophane film and flattened under the weight of a metal cylinder. The cards with compressed tissues were dried at 37-50 °C, for several hours. X-ray film (IBF, Rapid Processing) was secured in juxtaposition to the compressed tissues by a screw press and exposed for 60 days. Labeled schistosomula in the compressed tissues appeared as distinct foci of reduced silver on the developed films. Compressed tissues of three mice/group/route of infection were examined at days 01, 02, 04, 06, 08, 10, 12 and 15 after infection for autoradiographic foci. Adult worms were recovered from the remaining mice of each group, at day 45, by perfusion of hepatic and mesenteric veins.

Protection induced by immunization was determined by a significant adult worm burden reduction in vaccinated mice and the degree of protection was calculated as follows: $P = \frac{C - V}{C} \times 100$, where P = %; C = mean number of parasites recovered from control mice; V =

mean of parasites recovered from vaccinated mice. The mean reduction in worm burden recovery with respect to normal controls was of 46.6% and 54.2% for percutaneous and subcutaneous challenge routes respectively. The migration patterns of young parasites were similar for both infection routes (Figs 1, 2). Immunized animals, appeared to have a delayed arrival of schistosomes in the liver. The tracking of parasites in immunized animals and worm burden reduction at the 45th day after infection, suggest that major attrition occurred after the passage by the lungs, i. e., during migration to the liver.

The results so far obtained, are basically in agreement with previous reported data on the migration pattern of *S. mansoni*, as well as on the sites of parasite attrition in vaccinated and control animals experimentally infected (Georgi et al., 1982, *J. Parasitol.*, 68: 1092-1095; Mangold & Dean, 1983, *Am. J. Trop. Med. Hyg.*, 32: 785-789; Dean & Mangold, 1984,

Parasitology, 88: 249-266; Dean et al., 1984, *Am. J. Trop. Med. Hyg.*, 33: 89-96; Dean & Mangold, 1984, *Ibidem*: 97-103; Knopf et al., 1986, *Ibidem*, 35: 1173-1184; Wilson & Coulson, 1986, *Parasitology*, 92: 83-100; Wilson et al., 1986, *Ibidem*: 101-116; Kamiya & McLaren, 1987, *Exp. Parasitol.*, 63: 98-107) and also suggest that the times of peak lung schistosomula accumulation in control and immunized mice probably depend on the route of cercarial administration (Figs 1, 2). As for the five foci early detected (day 4) in the liver of one control mouse (Fig 2B) they might be due to infeasible young forms that possibly failed to complete the lung phase and were passively carried by blood stream to the liver.

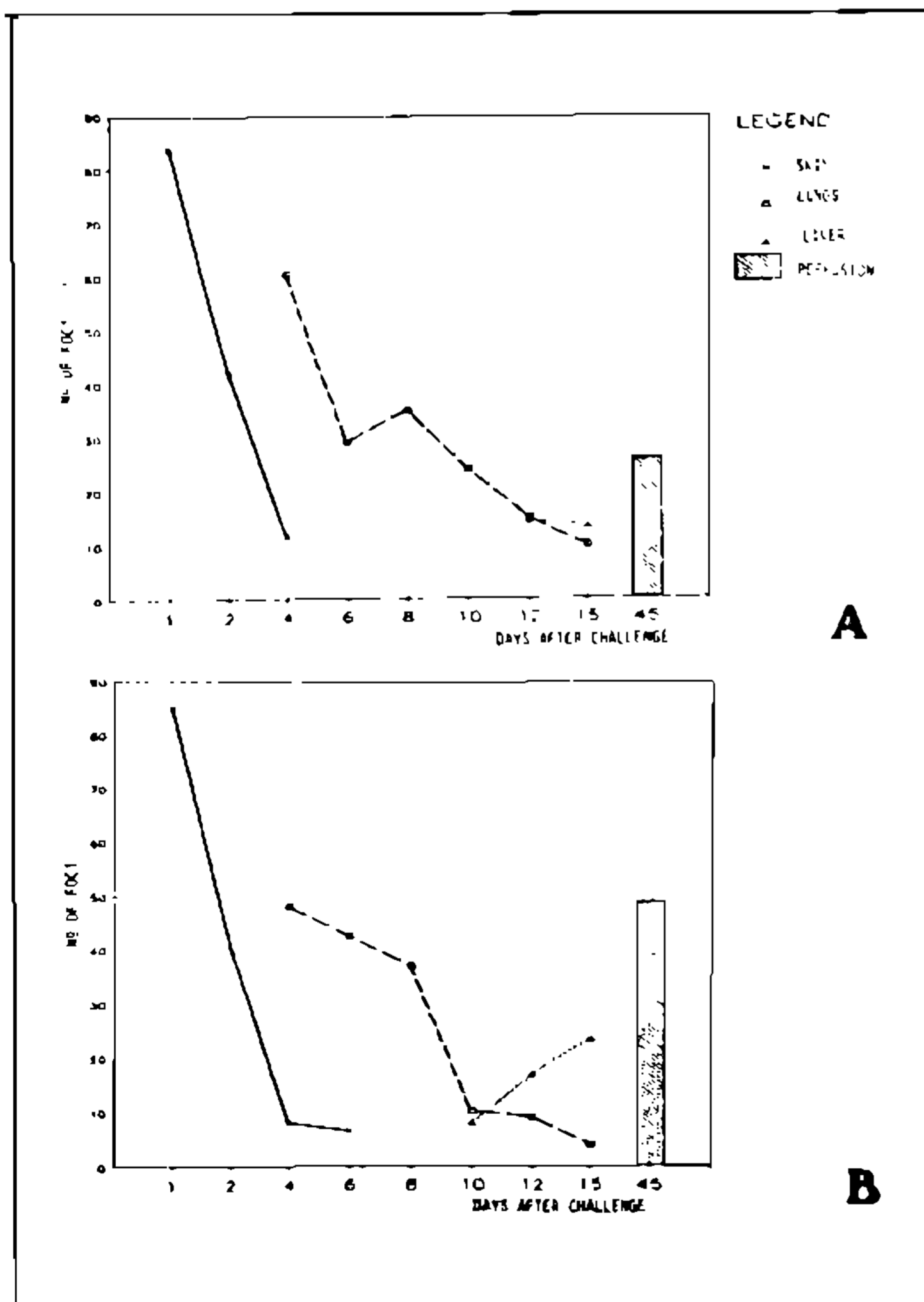


Fig. 1: autoradiographic tracking of percutaneous challenge — A: SW mice vaccinated with (3x) SE-FCA. B: SW mice normal control.

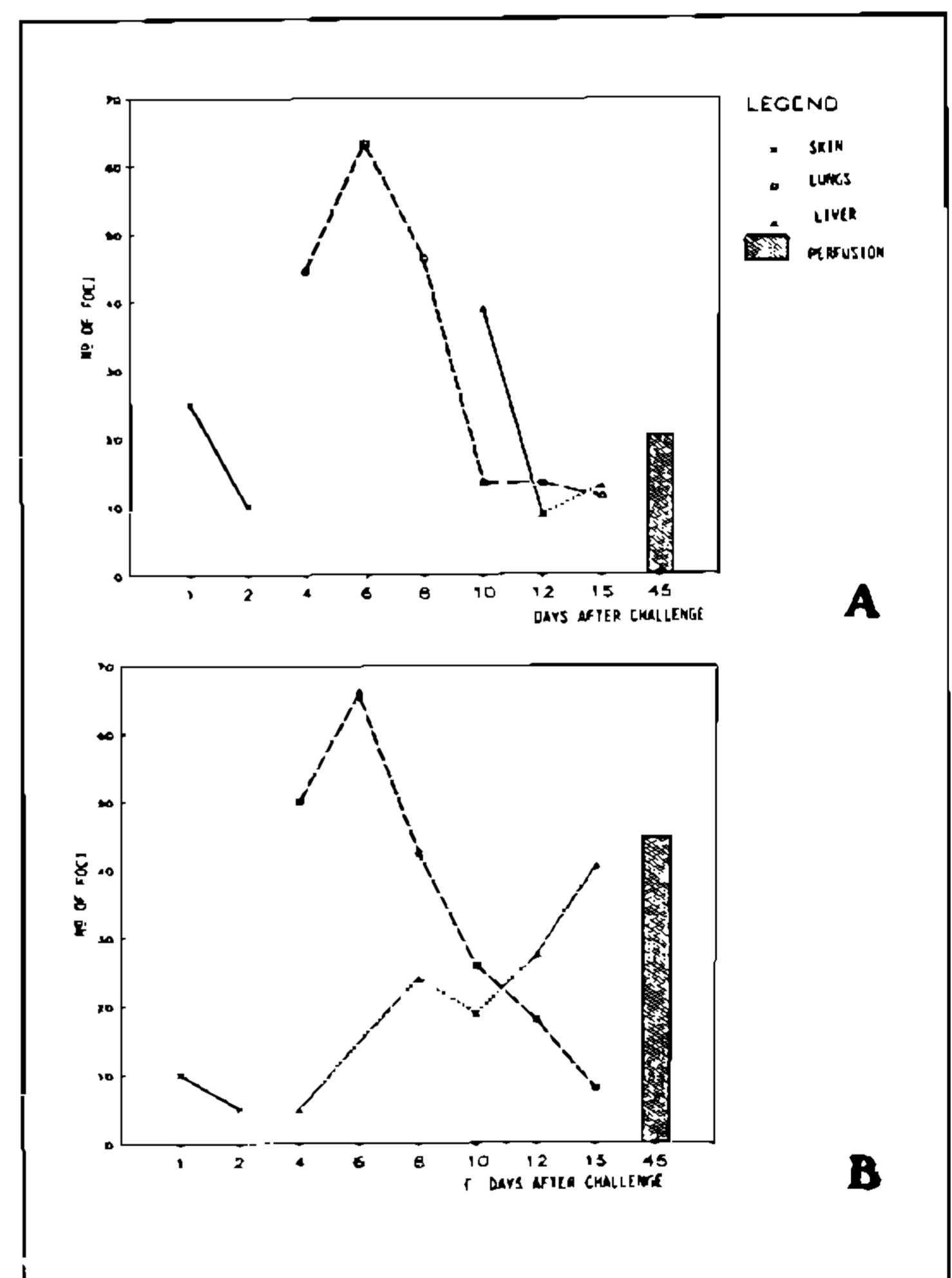


Fig. 2: autoradiographic tracking of subcutaneous challenge — A: SW mice vaccinated with (3x) SE-FCA. B: SW mice normal control.

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