

RESEARCH NOTE

Parasitism of Adipocytes by *Trypanosoma cruzi*

Zilton A Andrade, Honassys R Rocha Silva

Laboratório de Patologia Experimental, Centro de Pesquisas Gonçalo Moniz-FIOCRUZ, Rua Valdemar Falcão 121, 40945-001 Salvador, BA, Brasil

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Frequent and marked involvement of the murine adipose tissue occurs during acute infection with Type I strains of *Trypanosoma cruzi* (Peruvian and Y strains). It represents a peculiar tropism of these virulent strains of *T. cruzi* and therefore it is important to determine which cell within the adipose tissue is the preferential site of parasitism. It has been claimed that adipoblasts are parasitized by *T. cruzi* in dogs with congenital Chagas' disease (ES Campos 1930 *Ann Fac Med S Paulo* 5: 383-393). However, studies with routine histopathology are inadequate for this proposal, since superposition of structures can lead to spurious findings. Fat cells (adipocytes) are usually not listed among the several cell types that can be parasitized by *T. cruzi* amastigotes. This study uses immuno-histochemistry and electron microscopy to demonstrate that adipocytes can indeed be a preferential site of *T. cruzi* amastigote multiplication.

Young (15/18g), male and female, outbred Swiss mice were intraperitoneally inoculated with 100,000 trypomastigotes of the Peruvian strain of *T. cruzi* in citrate blood. The peaks of parasitemia and mortality occurred by the 11th day after inoculation. Animals were daily sacrificed from the 5th day on. Fatty tissues from the base of the heart, retroperitoneum and subcutaneous dorsal area were fixed in Millonig formalin, pH 7.2, embedded in paraffin and the 5-micrometer-thick sections were

either stained with hematoxylin and eosin or submitted to an avidin-biotin-peroxidase method after treatment with a monospecific anti-*T. cruzi* serum. Tiny pieces of fatty tissue were immediately fixed in glutaraldehyde, post-fixed in osmium tetroxide, embedded in epon and the contrasted ultra-thin sections examined in a Zeiss EM-9 electron microscope at 50mv.

Amastigotes identified by the presence of a kinetoplast, a prominent central nucleus, primordial flagellum and the peripheral arranged microtubular apparatus were found among the mitochondria within the cytoplasmic rim of the adipocyte, sometimes encircling large fat drop or droplets (Fig. 1). Their distribution at the periphery of the adipocyte, not disturbing the morphology of the fat droplet, is clearly demonstrated in sections immunostained for *T. cruzi* antigen by peroxidase (Fig. 2).

Parasitism of adipose tissue by *T. cruzi*, with formation of subcutaneous nodules (lipophagic granulomas) has been observed as a new and unusual finding in recipients of cardiac transplants (NAG Stolf et al. 1987 *J Heart Transplant* 6: 307-312). Although involvement of adipose tissue by *T. cruzi* is unusual, it is indeed an old finding, which has been reported several years ago as "lipochagomas", occurring in small children with acute Chagas' disease (S Mazza, RS Freire 1940 *Publ MEPR* 46: 39-57) and which has also been the subject of particular experimental observations made in dogs (Campos *loc. cit.*) and mice (RJ Alvarenga 1960 Thesis, UFMG, Medical School, Belo Horizonte, MG, 52pp.). Adipose tissue parasitism by *T. cruzi* seems to correlate with increased strain virulence or host susceptibility, or both. The situation observed in heart transplantation suggests a link between *T. cruzi* adipocyte parasitism and immunodepression.

Experimentally, the type of fat tissue most commonly involved is the gray rather than the yellow fatty tissue. The former contains cells with a more abundant cytoplasmic rim, with many mitochondria and the fat is distributed in multiple droplets instead of a single one as seen in yellow fat. Further studies are necessary to clarify which cell receptor or receptors are facilitating penetration of *T. cruzi* into adipocytes.

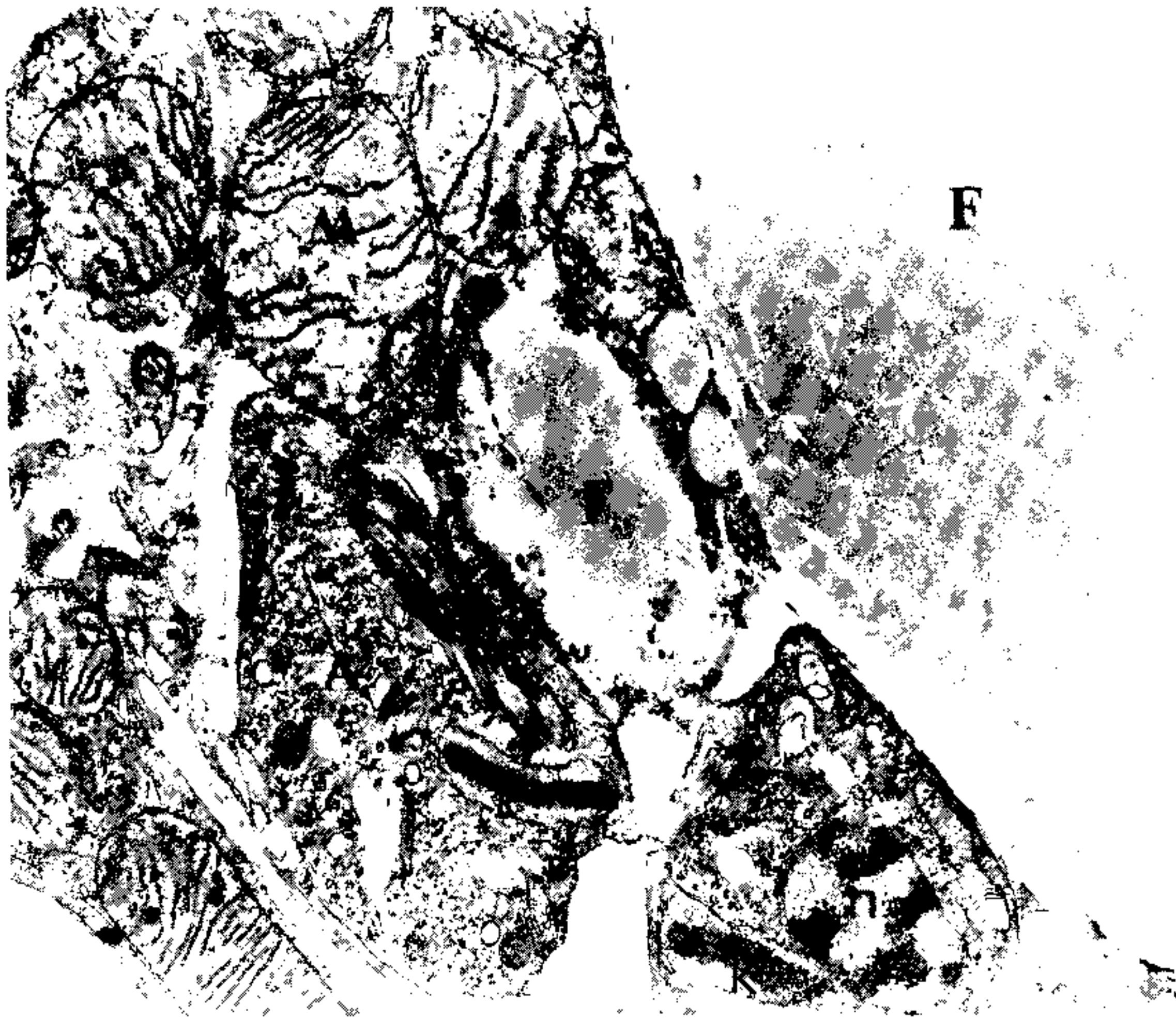


Fig. 1: portion of the cytoplasm of an adipocyte containing large and small fat droplets (F) and also two *Trypanosoma cruzi* amastigotes (A), with kinetoplast (k), flagellum (f) and nucleus (n). The parasites are surrounded by mitochondria (M) which are present within the cytoplasmic rim of the fat cell. Electron micrograph, X 7,000.

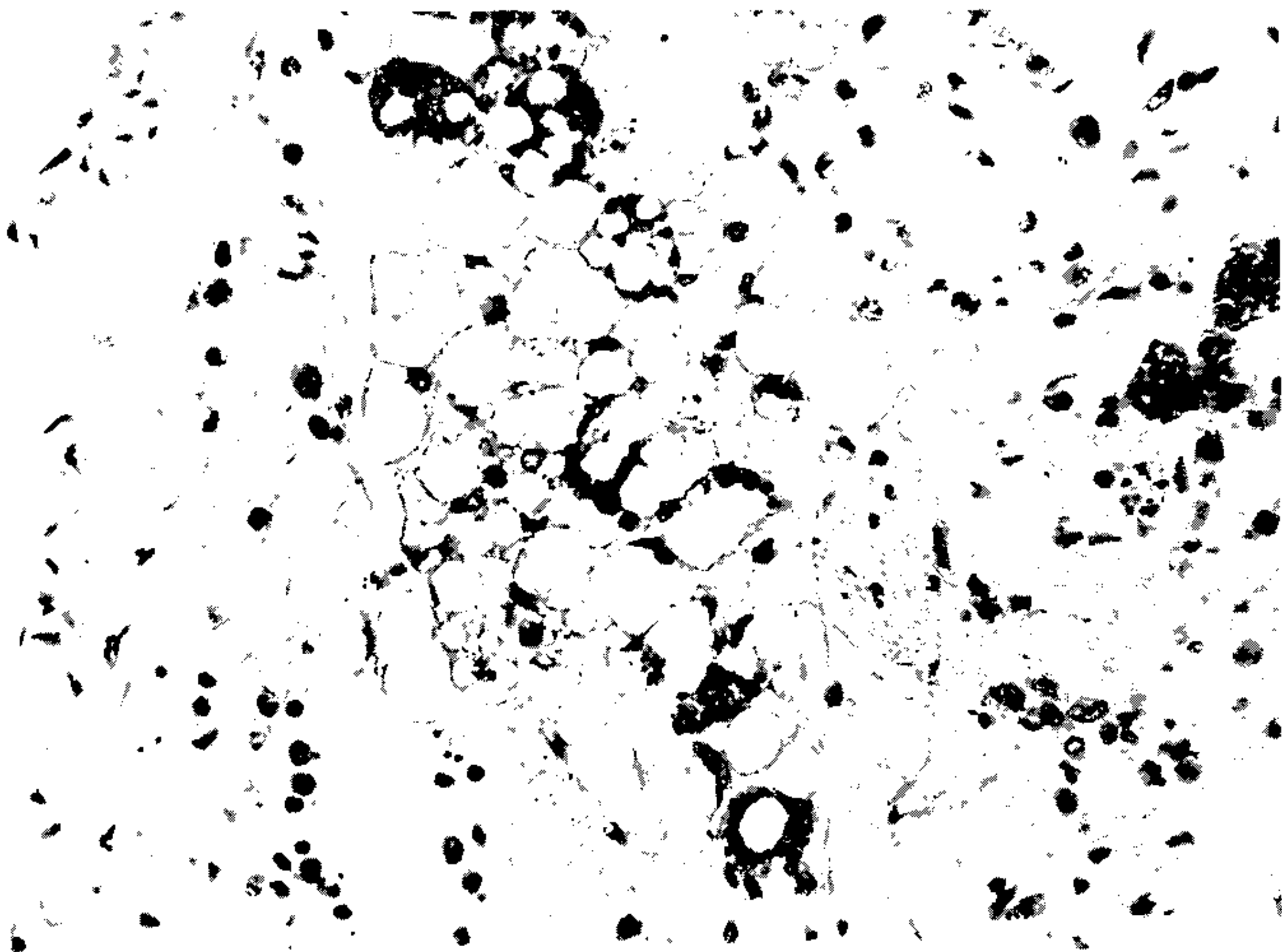


Fig. 2. numerous *Trypanosoma cruzi* amastigotes appear forming complete or incomplete dark rings at the periphery of adipocytes after being immunostained with peroxidase. Immuno-histochemistry, X 400.