Zeitschrift: Acta Tropica
Herausgeber: Schweizerisches Tropeninstitut (Basel)
Band: 19 (1962)
Heft: 3

Artikel: Miscellanea : Increased number of mast cells and helminthic diseases : experimental mastocytosis in mice
Autor: Fernex, Michel / Fernex, Pierre
DOI: https://doi.org/10.5169/seals-311028

Nutzungsbedingungen
Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. Mehr erfahren

Conditions d'utilisation
L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. En savoir plus

Terms of use
The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. Find out more

Download PDF: 20.08.2025

ETH-Bibliothek Zürich, E-Periodica, https://www.e-periodica.ch

Miscellanea.

Increased Number of Mast Cells and Helminthic Diseases. Experimental Mastocytosis in Mice.*

By Michel Fernex and Pierre Fernex,
Swiss Tropical Institute, Basle

Mast cells are very active elements of the connective tissue. They synthesize, store and secrete heparin and histamine, and are able to liberate many enzymes and other active substances during degranulation. They are known to have a definite role in connective tissue repair and turn-over (6, 8, 9).

The increased number of mast cells in the loose connective tissue of myocardial interstitium (3) and in the dense connective tissue of skin (4) observed in a series of Africans as compared to Europeans arised the question of the cause of this relative mastocytosis of the African. The hypothesis first advanced that nutritional factors as Vit. B-avitaminosis were responsible (2) could not be confirmed. Malaria, so common a disease all over Africa, was not found to cause an experimental mastocytosis either in chickens or monkeys (1). Finally, bacterial infections have no action on the mast cell number (5bis).

The parallelism between the increase of mast cells in connective tissue and that of eosinophils in the blood, observed in Africans, is not at all fortuitous, and may give a new orientation. Histamine, produced almost exclusively by mast cells (6, 8) has a strong eosinotactic activity (5), and stimulates the eosinopoiesis (12). The main activity of eosinophils seems to neutralize histamine (11, 7) and eosinophils appear where histamine has been produced in excessive amounts (5).

Eosinophilia is commonly observed in relation to helminthic diseases. Since eosinophilia seems to be nothing more than a secondary phenomenon following mast cell hyperactivity, the question thus arises: whether there is some relationship between helminthic infestation, highly endemic in tropical countries, and the observed African mastocytosis.

Two experiments on helminthic infections in mice were performed, in order to test this hypothesis.

Experiment I: Hymenolepis nana and Syphacia infection in white mice.

28 young mice are treated for these helminthic diseases over a two weeks' period with Dithiazamin, Promintic and an Antimonium V derivate; then definitely kept away from other mice which might be a source of naturally occurring worm infection.

16 of them held in a special room outside without contact constitute the control series.

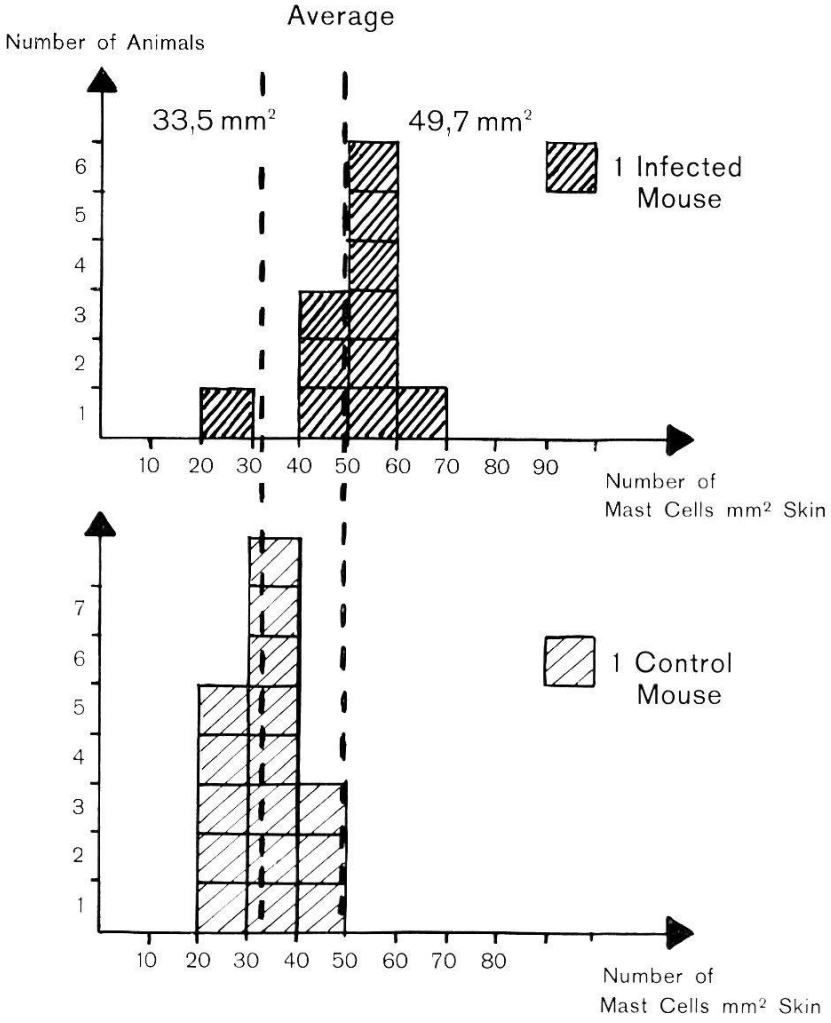
12 are infected at first with a mixture of usual food and feces of mice infected with the oxyurid nematode *Syphacia*. Then, one week later, each mouse receives orally 300 eggs of *Hymenolepis nana*.

After three months, blood eosinophils are counted in the Fuchs-Rosenthal chamber. Then all animals, the control and the infected series, are sacrificed. Skin samples of abdominal wall are fixed in formol 4%, embedded in paraffin, cut at 7 microns, stained with toluidine blue. Mast cells in the dermis are counted in 40 microscopic fields of ¼ mm². The mast cell number is given by square millimeter.

* Financial assistance for these investigations was kindly provided by a grant from the Swiss National Foundation for Scientific Research.

TABLE I.

Mast cell number in infected and non-infected mice (naturally occurring infections).



Comparison of mast cell number in dermis of infested mice (*Hymenolepis nana* and *Syphacia*): average 49.7 MC/mm², and in control series: average 33.5 MC/mm².

The average blood eosinophilia is 1611/mm² in infected mice, and 807/mm² in control series.

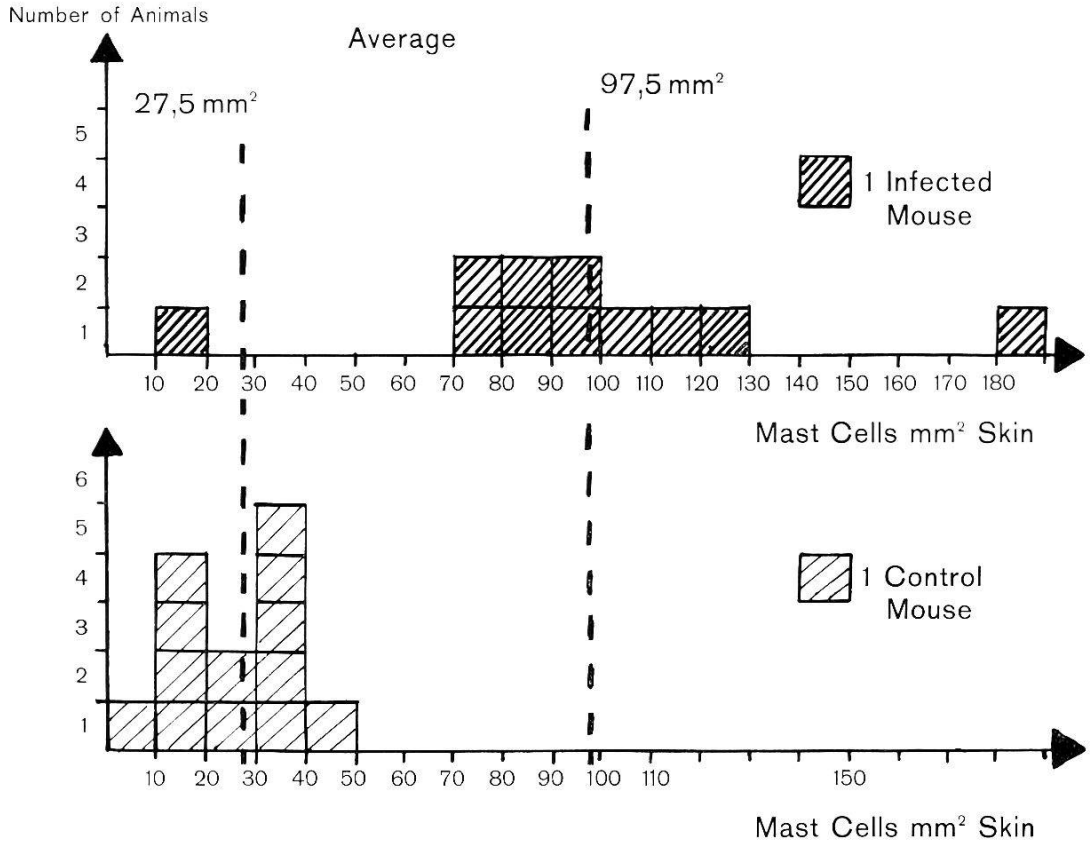
Result: A massive infection with *Hymenolepis nana* and *Syphacia* produces after 3 months an increase in mast cell number of the skin in white mice. Blood eosinophils are equally increased.

Experiment II: Schistosoma mansoni infection in mice.

24 young mice are treated against helminthic diseases. 13 are taken as control animals, and isolated as before. 11 are infected 4 times subcutaneously with 30 cercarias of *Schistosoma mansoni* at two weeks' interval. All the animals are sacrificed after 3 months, and abdominal skin samples are coloured as previously for mast cell counting. The mast cell number is expressed per square millimeter of dermis.

TABLE II

Comparison of mast cell number in dermis of infected and non-infected mice.



Mice infected with *Schistosoma mansoni:* average 97.5 MC/mm², and control series: average 27.5 MC/mm².

Result: Repeated infestations with *Schistosoma mansoni* cercarias produce after 3 months an increase in mast cell number of the skin in white mice up to three times the normal values, this is about twice the number found in Hymenolepis/Syphacia infection.

Discussion and conclusion.

It has been found that allergic reactions, histamine-liberators (5, 8), injection of worm extracts (13) and worm infections (10, 14) not only produce an increased mast cell secretion, but also stimulate mitosis in partially degranulated mast cells, with a consequent increase in mast cell number. The hypereosinophilia occurring in helminthic disease is parallel to the increase in mast cells and is secondary to the mast cell hyperfunction. It is interesting to note that in our experiment the increase in mast cell number is much more important after an infection with *Schistosoma mansoni* than after a mixed infection with *Syphacia* and *Hymenolepis nana* which are normally occurring parasites in mice.

We failed to obtain either hypereosinophilia or mastocytosis in cotton rats heavily infected with *Litomosoides carinii*. Thus there appears to be a perfect host parasite relationship, no pathological process occurring.

Helminthic diseases, highly endemic in Dakar and scarce in Europe, might therefore be the explanation for the relative mast cell hyperplasia observed in Africans compared to a similar European series.

References.

1. FERNEX, M. (1959). Etude du taux des mastocytes au cours d'une infection malarique expérimentale. — Acta trop. *16*, 362.
2. FERNEX, M. (1960). Contribution à l'étude physio-pathologique des mastocytes dans le myocarde. — Actual Cardiol. angéiol. int. *9*, 4.
3. FERNEX, M. (1961). Mast cells in the myocardium. Pathophysiological result of the variation in the number of mast cells. A geographic pathological approach. — Acta trop. *18*, 177.
4. FERNEX, M. (1961). Die Mastzellenzahl in ihrer Beziehung zur Atherosklerose. — Helv. med. Acta *28*, 334.
5. FERNEX, M. (1962). Mastocytose et éosinophilie. Contribution à l'étude physiopathologique des hyperéosinophilies. — Bull. Soc. Path. exot. *55* (séance du 8 mai, à paraître).

5bis. GUSTAFSSON, B. E. & CRONBERG, S. (1962). Number and size of the mast-cells in the mesentery and peritoneal fluid of germfree rats. — Acta Rheum. Scand. (in press).

6. KELLER, R. (1960). Biochemische Eigenschaften und physiologische Bedeutung der Gewebsmastzellen. — Schweiz. med. Wschr. *90*, 503.
7. KOVACS, A. & KOVACS-JUHAS, E. (1955). Über die Isolierung eines in den weißen Blutkörperchen nachgewiesenen «natürlichen Antihistamins». — Biochim. biophys. Acta *17*, 406.
8. RASANEN, T. (1958). Tissue eosinophils and mast cells in the human stomach wall in normal and pathological conditions. — Acta path. microbiol. scand. Suppl. *129*.
9. RILEY, J. F. (1959). The mast cells. — Edinburgh and London: E. & S. Livingstone Ltd.
10. TALIAFERRO, W. H. & SARLES, M. P. (1939). The cellular reactions in the skin, lungs and intestine of normal and immune rats after infection with *Nippostrongylus muris*. — J. infect. Dis. *64*, 157.
11. VAUGHN, J. (1953). The function of eosinophil leukocyte. — Blood *8*, 1.
12. VERCAUTEREN, R. (1953). The properties of the isolated granules from blood eosinophilia. — Enzymologia *16*, 1.
13. WEINBERG, M. & SÉGUIN, P. (1914 & 1915). Recherches biologiques sur les éosinophiles. — Ann. Inst. Pasteur *28*, 470; *29*, 323.
14. WELLS, P. D. (1962). Mast cell, eosinophil and histamine levels in *Nippostrongylus brasiliensis* infected rats. — Exp. Parasit. *12*, 82.