

# IMMUNOLOGY OF HUMAN FILARIASIS

## ONCHOCERCIASIS OF CATTLE AND MAN : SEROLOGICAL RECOGNITION OF PARASITE SPECIFIC AND CROSS-REACTIVE ANTIGENS

HOCH B.\*, WAHL G.\*, ENYONG P.\*\*, LÜDER C.G.\*,  
HARNETT W.\*\*\*, RENZ A.\*\*\*\*

**KEYWORDS** : *Onchocerca volvulus*, *Onchocerca ochengi*, antigen recognition, crossreactivity concomitant immunity, Cameroon.

The endemicity of human onchocerciasis in North-Cameroon can be related to the presence of cattle. In the Adamawa highland, an area of intensive cattle breeding, human onchocerciasis is hypoendemic, although the transmission of *O. volvulus* infective third-stage larvae is much higher than in the hyperendemic savanna area, where cattle breeding is almost non-existing (Wahl, 1991). Onchocerciasis-associated eye lesions and blindness very rarely occur in the highland, whilst in the savanna region, severe onchocerciasis in the human population is frequent (Renz *et al.*, 1987). *Simulium squamosum*, the vector of human onchocerciasis in this area also transmits *O. ochengi*, a cattle filaria, which out-numbers the infective larvae of *O. volvulus* in man-biting flies by a factor of over ten in the highland area. It is believed, that the ongoing and intensive transmission of this bovine species to man induces cross-protective immunity against forthcoming larvae of *O. volvulus* (cf. abstracts Renz *et al.*, Wahl *et al.*).

In this study we first compared the protein composition of *O. ochengi* and *O. volvulus* and then examined the antigen recognition by sera from patients living in the highland (cattle breeding) or savanna area. It was of particular interest to identify *O. ochengi* antigens that refer to contact of highland patients with this cattle filaria.

Using one- and two dimensional electrophoresis the two filariae showed a high homology. However some species-specific proteins could be identified in *O. ochengi* and *O. volvulus* extracts, with molecular weights of 32, 6.3, 5.3 kDa and 16, 9.4, 9.1, 5.6 and 5.1 kDa, respectively. Sera from cattle recognized a major *O. ochengi*-specific antigen duplett of 28 kDa, whilst other specific antigens migrated between 10-20 kDa. Using Tricine-SDS-PAGE and immunoblotting human sera identified a possible *O. ochengi*-specific antigen of 7 kDa.

Comparison of the two patient groups from the savanna (with high microfilarial density in the skin) and highland (few microfilariae or skin-negative) revealed distinct differences in respect to their antigen recognition ; low molecular weight antigens of both filaria species were recognized

much stronger by patients from the savanna, whilst antibodies (IgG) from sera of highland onchocerciasis patients rather bound to *O. ochengi* than to *O. volvulus* antigens (Hoch *et al.*, 1993). These highland patients also showed a pronounced IgG3-reactivity to *O. ochengi* antigens indicating that an increased IgG3 activity might be important in acquired immunity to onchocerciasis, like it was also observed in putatively immune persons in Guatemala (Boyer *et al.*, 1991).

A stronger recognition of *O. ochengi* antigens could also be shown by preadsorbing human sera with *O. volvulus* antigen. IgG4 antibodies of one microfilaria-negative highland patient bound low molecular weight *O. ochengi* antigens of 17, 16.5, 14 and 12 kDa, but not any of *O. volvulus*. This selective recognition of *O. ochengi* antigens by onchocerciasis patients from the highland may indicate abortive infection with this bovine filaria species, which apparently does not complete its development in the human host.

The homology between *O. ochengi* and *O. volvulus* and the parasite-specific differences in the serological reactivity between patients from the cattle breeding area and the savanna support our hypothesis of cross-protective concomitant immunity, induced by infective larvae of the filarial cattle parasite *O. ochengi*.

## REFERENCES

- BOYER A.E., TSANG V.C.W., EBERHARD M.L., ZEA-FLORES G., HIGHTOWER A., PILCHER J.B., ZEA-FLORES R., ZHOU W., REIMER C.B. : Guatemalan human onchocerciasis. II Evidence for IgG3 involvement in acquired immunity to *Onchocerca volvulus* and identification of possible immune-associated antigens. *J. Immunol.*, 1991, **146**, 4001-4010.
- HOCH B., WAHL G., ENYONG P., LÜDER C.G.K., HARNETT W., SCHULZKEY H., RENZ A. : Onchocerciasis in Mensch und Rind : Serologische Erkennung von artspezifischen und kreuzreaktiven Antigenen. *Mitt Österr. Ges. Tropenmed. Parasitol.*, 1993, **15**, 51-60.
- RENZ A., WENK P., ANDERSON J. FUGLSANG H. : Studies on the dynamics of transmission of onchocerciasis in a Sudan-savanna area of North-Cameroon. V. What is a tolerable level of Annual Transmission Potential ? *Ann. Trop. Med. Parasit.*, 1987, **81**, 263-274.
- WAHL G. : Die *Onchocerca* Arten der Rinder in Nord-Kamerun und ihre Bedeutung für die Epidemiologie der menschlichen Onchocerciasis. Dissertation Universität Tübingen, 1991, 103 p.

\* Institute of Tropical Medicine, Universität Tübingen, Wilhelmstrasse 27, 72074 Tübingen, Germany.

\*\* Medical Research Station, P.O. Box 55, Kumba, Cameroon.

\*\*\* Department of Immunology, University of Strathclyde, 31 Taylor Street, Glasgow G4 0NR, U.K.

\*\*\*\* Fachgebiet Parasitologie, Universität Hohenheim, Emil-Wolff-Strasse 34, 70599 Stuttgart, Germany.