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RESEARCH AND CONTROL OF ONCHOCERCIASIS
IN THE WESTERN HEMISPHERE

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RESEARCH AND CONTROL OF ONCHOCERCIASIS
IN THE WESTERN HEMISPHERE

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From November 18 to 21, 1974, field workers in Onchocerciasis from both sides of the Atlantic, met at the Pan American Health Organization to assess progress, problems and goals.

1. Global Problem of Onchocerciasis and its Economic Impact
   Alfred A. Buck
   Of key importance is the fact that Onchocerciasis has emerged within the past 20 years as one of the world's major public health problems. This realization comes when resources are diminishing--thus hampering research, control and treatment. Current estimates of 20 million infected and 500,000 blind may be low because more vigorous case finding and more sensitive diagnostic techniques have doubled the estimated number infected in the Volta River Basin where an extensive control program is underway.

2. Pathology of Onchocerciasis
   Daniel H. Connor
   New in the pathology of Onchocerciasis is that 1) microfilariae may be in dilated dermal lymphatics 2) dermal papules are reactions to degenerating microfilariae 3) onchocercal lymphadenitis causes a chronic obstructive lymphadenitis leading to hanging groin, dermal edema, and elephantiasis of limbs and genitalia.
In Yemen, the syndrome called sowda is a unique syndrome of onchocerciasis. A single limb is swollen, hyperpigmented, and covered by a papular eruption. The regional lymph nodes are enlarged and soft resembling lymphosarcoma. Microfilariae in skin are few. Diethylcarbamazine (DEC) given by mouth kills the microfilariae which then provokes an even more acute inflammatory reaction in the involved skin. In Africa, DEC may also unmask occult adult worms by causing an inflammatory reaction to microfilariae in or near them. Similarly, DEC also unmasks massive involvement of lymph nodes by causing nodes to enlarge and become tender.

Post mortem studies are rare but have revealed acute onchocercal inflammation of kidney, liver and lung and an adult *O. volvulus* coiled in the aortic wall at the site of beginning aneurysmal dilation.

Perhaps the most important new concept is that onchocerciasis causes elephantiasis. We have now studied lymph nodes from 40 patients with onchocercal lymphadenitis 5 of these with severe elephantiasis and others with dermal edema and hanging groin. We have no lymph nodes from Africans with elephantiasis that have bancroftian lymphadenitis.

3. Clinical Manifestations and Geographic Differences

Brian L. Duke

Onchocerciasis has distinct variations in the different geographic locations. Location and frequency of nodules, distribution and number of unencapsulated adult worms, the variety of skin changes, lymphadenopathy,
variety of eye lesions, and involvement of deep organs all contribute
to the spectrum of clinical disease. Sowda in Yemen, and erisepela
de la costa are extreme examples, but the differences in incidence of
lesions between forest and savanna, between different parts of Africa,
Guatemala, Mexico and Venezuela, all contribute to the variety of clinical
appearances.

4. Some Aspects of Ocular Onchocerciasis
   John Anderson and Harald Fuglsang
   Detailed new work by Drs. Anderson and Fuglsang compares eye lesions with
dermatitis and with mean microfilarial concentration in the skin of
different sites. Also compared are eye lesions in those living in forest
and in savanna. Blindness is more than 2-1/2 times more common in the
savanna, and sclerosing keratitis more than 4 times as common in savanna.

5. Epidemiological Features of Onchocerciasis
   Alfred A. Buck
   Much epidemiological data has been gathered in nonstandard ways. The
corneal-scleral punch takes uniform sized snips. Diethylcarbamazine
as a diagnostic test (mazzotti) and microfilaruria help establish
incidence and evaluate the severity.

6. Treatment of Onchocerciasis
   Brian O. L. Duke
   Many patients with mild infections have few or no manifestations and
may need no treatment. None of the available drugs is ideal.
Diethylcarbamazine, even in small doses, accentuate the pathological effects by killing microfilariae. Those requiring treatment fall into two groups: those with severe pruritus and those with impaired or threatened vision. Treatment also falls into two categories; nodulectomy and chemotherapy. Diethylcarbamazine and Suramin are most commonly used. Metrifonate (Trichlorophone) and other drugs including arsenicals, e.g. Melarsomyl potassium, antimonials (Astiban) thiabendazole and bisbenzamidazoles have all been used.

7. Side Effects of Suramin
   Harald Fuglsang & John Anderson

Dr. Fuglsang outlined the severe and sometimes fatal side effects of treatment with Suramin. Obviously, this drug must be used under careful control by those with experience.

8. Onchocerciasis Vectors in the Western Hemisphere
   A. Vector Biology and Vector-Parasite Relationships
      Jacques Hamon

Data from the Western Hemisphere are not always adequate to determine which vector fly should be the target of the control program, even though the first vector control program was developed in Mexico. Vectors are more widely distributed than disease and it is surprising, therefore, that the endemic areas remain so sharply defined. The reservoir population, mostly migratory agricultural workers also tends to range much more widely than the endemic areas. Urgent research objectives
include a) morphologic identification of infective larvae within black flies, b) the identification of the human vectors in each geographic focus, and c) an accurate measurement of the transmission of *O. volvulus* and how transmission is modified by the degree of parasitism and incidence, d) distribution of vectors by cytotaxonomic methods and, e) determination of distribution of main vectors and their dynamics.

American vectors will probably be much more difficult to control than African vectors. American vectors inhabit small streams in hilly forested areas and because of their great diversity of environments and bionomics, no one method can be expected to control them everywhere. Further, control of *Simulidae* must prevail for 20 years to allow adult worms to die in the reservoir population. Abate, currently being used to dose rivers in Africa is a biodegradable compound.

9. Simulium Control Program in Uganda

Michael A. Prentice

In Uganda, control was very successful. The Victoria Nile was dosed at the Owen Falls dam eliminating *Simulium damnosum* and transmission for 70 kms downstream, roughly the stretch of Nile between Lake Victoria and Lake Kioga. Control has also been established in the Budondo Forest, Masaba, Kabalega, in the West Nile district, Kigezi and in the Ruwenzori region.

10. Control of Simulium in Mexico

John B. Davies

The three endemic areas are mountainous lined by thousands of small streams (each with many breeding sites) and many covered by vegetation.
The endemic areas have a high rainfall and insecticide carry in the streams is poor. Thus, redosing at 500 meter intervals is necessary. Rising labor costs and the terrain make manual treatment impractical. Aerial spraying must now be considered in spite of the steep mountains.

11. Robles' Disease in Guatemala

Horacio Figueroa Marroquin

Intensive nodulectomy programs have been underway for almost 50 years. This has reduced blindness but not the incidence of infection. Furthermore, the number of nodules being removed remains the same even in those areas where all nodules have been removed twice a year for 50 years. Nodulectomy must therefore be done in conjunction with vector control.

12. Onchocerciasis in Venezuela

Jacinto Convit

Recent campaigns of case finding have caused an apparent increase in incidence in two areas of Venezuela. Onchocerciasis in Venezuela is characterized by a mild dermatitis with few microfilariae in the skin. There is a low incidence of blindness. The low concentration of microfilariae in the skin prevent the vector flies from ingesting many microfilariae. This favors the survival of vector flies. 2,432 patients have been treated with Suramin, 21 of these developed albuminuria, others had exfoliative dermatitis, pruritus and edema of palms and soles. 33.8 percent had side effects but none of these was serious. There were no deaths from treatment.
13. Onchocerciasis in Mexico

Mario Salazar Mallen

The three endemic areas have high altitude, a temperate climate, and heavy rains which produced fast moving and quickly changing rivulets where the *Simulidae* breed. Patients have photophobia and conjunctivitis, with two-thirds of those infected having eye signs. Forty-three percent have skin changes and thirty-four percent have nodules. Lymphadenopathy develops after treatment with DEC and most patients have eosinophilia and increased levels of IgE. The vectors are *Simulium ochraceum*, *S. metallicum*, and *S. callidum*. DEC and metrifonate are used for treatment. The latter causes less therapeutic shock than DEC. Suramin and Mel W cause toxic side effects in Mexicans and are no longer used. Streams have been dosed with one part per million of 30% DDT in xylol once a week at intervals of 250 meters. Research priorities in Mexico include 1) development of a reliable serologic test for diagnosis, 2) better methods for eliminating *Simulidae*, 3) basic research on the pathology, and 4) better drugs.

14. Onchocerciasis in the Republic of Colombia

Augusto Corredor A.

The newly discovered and only focus of onchocerciasis in Colombia is centered 120 kilometers from the Pacific port of Buenaventura on San Juan de Micay river. Thirty percent of those above the town of Lopez--where the river is turbulent--are infected. Infections were mild, nodules were present in 23 percent of patients, mostly on the hips and chest. *Simulium exiguum*, *Simulium mexicanum*, and *Simulium ochraceum* all breed in the area. The only anthropophilic vector was *S. exiguum* and is presumed to be the vector.
15. Onchocerciasis in Brazil

Mario A. P. Moraes

The first Brazilian with onchocerciasis was discovered in 1967 and since then a focus has been defined and studied in the extreme north of Brazil along the headwaters of the Demini river. This is a remote area, the waters being navigable only in the rainy season. There are no roads and the only entrance is by a missionary aircraft. In the region studied 25 to 63 percent of the Yanomama Indians are infected; 15.5 percent have nodules mainly on the scalp. The vector is probably *Simulium amizonicum*. 
RECOMMENDATIONS

Biology & Control of Vectors

The most urgent needs are:

1) Basic information on vectors in newly discovered foci of onchocerciasis in Brazil and Columbia.

2) More work on establishing a laboratory colony of vector Simulidae

3) Developing sound larvicidal techniques

Pathology

The most urgent needs are:

1) A systematic study on histopathology of the disease. To date all histopathologic studies have been more or less accidental afterthoughts and especially needed are autopsies on heavily infected subjects.

2) Histopathological studies combined with studies on basic immunology - to determine how microfilariae provoke inflammatory reactions and how Diethylcarbamazine mobilizes and kills microfilariae.

3) A practical laboratory model of onchocerciasis

4) In vitro maintenance of O. volvulus - adults, larvae and microfilariae.

5) Studies to reveal the basic pathophysiological mechanisms of ocular Onchocerciasis.
**Immunology**

The most urgent needs are:

1) Application of standard immunological techniques including those leading to:
   a) preparation of antigens
   b) preparation of fluorescein conjugated antisera
   c) the determination of the role of cell mediated immunity in the inflammatory reaction

2) Serological methods for diagnosis and case finding

3) Studies of all aspects of the immune response

4) Studies of host resistance to natural infections

5) Protective immunity - is it possible?

6) Do onchocercal antigens pass the placenta - for instance, can infants be born with induced immune tolerance?

**Clinical Pharmacology and Therapeutics**

The most urgent needs are:

1) To take laboratories and hospital facilities into the endemic areas

2) To develop new drugs to treat the disease. These must be discovered by systematic search and testing.