XENOMONITORING FOR HUMAN ONCHOCERCIASIS.
Roles of L_3 analysis, ATP, and Other Indicators used in Onchocerciasis: Implications for their Usefulness in LF and Recommendations for Future Studies.

Ed Cupp, Ph.D., Professor Emeritus, Auburn University.

The Onchocerciasis Control Programme (OCP), begun in Africa in 1974, has provided a paradigm for filariid-associated disease control where the main strategy was "entomocentric", i.e. controlling disease by reducing vector – human contact. The OCP experience produced useful vector-based data that related transmission of *O*. *volvulus* infective stage larvae (L_3s) to disease using a basic transmission index: Annual Transmission Potential (ATP) = # of *O*. *volvulus* L_3s per person per year. After L_3 transmission was reduced or blocked, it was assumed that there would be a slow decline in ATP as the parasite population aged and adult worms eventually died out over a 12-14 year period. As pre-control baselines, it was observed that different ATPs could be correlated with intensity of disease, thereby providing a set of metrics that could be used to evaluate progress toward control and disease elimination. Using this approach, an ATP ≤ 100 was acceptable primarily because no onchocercal blindness occurred at this level with no risk to resettlement of agricultural areas that previously had been abandoned. More recent analysis, evaluating the impact of ivermectin monotherapy on onchocerciasis, has demonstrated that interruption of transmission leading to elimination of *O. volvulus* is associated with an ATP in the range of 5-20, with an ATP of 8 being the lowest calculated at which an *O. volvulus* population can survive. Epidemiological models developed for Africa (ONCHOSIM) and the Americas (EuSIMON) also provide insight to elimination thresholds using (a) L_3 density per 1,000 parous flies (< 1 + fly) or (b) PCR pool analysis (absence, or near absence, of infective stage larvae per 10,000 flies).

Several WHO publications have proposed that ATP should not be used to quantify LF risk because it would involve laborious and unacceptably hazardous field-work. However, ATP has been used historically and contemporaneously in LF epidemiology with an excellent record of achievement. Examples include comparison of transmission intensity in different locations, correlation of ATP Levels to morbidity, measurement of transmission variation within communities, comparison of vectorial capacity among sibling vector species, and measurement of the impact of integrated control (chemotherapy and vector control) on transmission. These endeavors mirror those conducted in onchocerciasis control and research where the ATP also served as a core metric.

Suggestions for further research on the usefulness of ATP in LF elimination programs focus on (i) the safety issue, (ii) the precision of the ATP calculation due to transmission inefficiency by the vector, (iii) the adaptability of onchocerciasis PCR pool screening for LF ATP calculations, (iv) the relevance of ATP as a metric for indicating an elimination threshold, and (v) the predictive value of ATP when compared to other LF elimination indicators such as microfilaremia and antigenemia prevalences.