Letter to the Editor
Onchocerciasis, Cysticercosis, and Epilepsy

Dear Sir:

Katabarwa and others reported on detection of nodules of Taenia solium cysticerci mistakenly identified as Onchocerca volvulus nodules in a post-treatment survey after 12 years of ivermectin mass treatment in Uganda. On the basis of this observation, they suggest that neurocysticercosis may be the cause of frequent occurrence of epileptic seizures, which has been reported from several onchocerciasis-endemic areas.

Over the past 15 years, a positive correlation between the prevalence of epilepsy and that of onchocerciasis has been reported from various African areas. All of these studies used microscopy for the detection of microfilariae in dermal biopsy specimens as an unequivocal diagnostic means of infection with O. volvulus. Contrary to what is suggested by Katabarwa and others, these studies did not rely on nodule counts, which could be biased by the presence of subcutaneous cysticercosis. Kaiser and others in western Uganda found a close relationship between the prevalence of epilepsy and the prevalence of skin microfilariae. Newell and others in the province of Bururi in southwestern Burundi performed a case-control study in two areas with different endemicity levels for onchocerciasis. They confirmed a significant association between epilepsy and O. volvulus infection in hyperendemic villages and a less pronounced effect in mesoendemic villages. Boussinesq and others in Cameroon and Dozie and others in Nigeria demonstrated a positive relationship between the prevalence of epilepsy and mean community microfilarial densities. In their analysis of patients without previous ivermectin treatment, Boussinesq and others also demonstrated that intensity of infection was significantly higher in epilepsy patients than in pair-matched controls.

Information on the possible influence of cysticercosis on epilepsy is available for the study areas of three of the above-mentioned studies: First, in western Uganda, serologic test results for T. solium were positive in one and borderline in three of 53 epilepsy patients, and the significant correlation between onchocerciasis and epilepsy was not affected when these patients were excluded. During four years of repeated visits to the study villages and patient homes, pig-breeding was not observed to be a common practice in the area (Kaiser C, unpublished data). Thus, neurocysticercosis cannot be considered a relevant cause for the elevated epilepsy prevalence found by Kaiser and others.

Second, in southwestern Burundi, a serologic study on cysticercosis was performed in the two villages included in the above-mentioned investigation on onchocerciasis. This study found a higher seroprevalence for cysterceral antibodies in 103 patients with epilepsy than in controls, but this difference was not significant (11.7% versus 2.8%; P = 0.06). In contrast, a case-control study from an area in northern Burundi, which was not endemic for O. volvulus but was infested with T. solium, showed a highly significant association between cysticercosis and epilepsy.

Third, in one village in the area (Mbam Valley, Cameroon) examined by Boussinesq and others, a case-control study detected cysticercal antibodies in 17 (18.3%) of 93 patients with epilepsy compared with 12 (14.8%) of 81 controls (a non-significant difference; odds ratio = 1.3, 95% confidence interval = 0.6–3.0). This finding suggests that in the areas of the studies conducted in Burundi and Cameroon, where O. volvulus and T. solium are co-endemic, the expected influence of cysticercosis on epilepsy may be masked by the effect of onchocerciasis as a competing etiologic factor.

As demonstrated by Katabarwa and others and in other studies, T. solium infection is widespread in Africa and can be co-endemic with onchocerciasis in many areas. We agree with Katabarwa and others that subcutaneous cysticercal cysts may be confused with onchocercal nodules in co-endemic areas, and that this is of relevance because it could produce a bias in evaluation of onchocerciasis control measures with rapid epidemiologic assessment methods. This distortion may be small at the outset of a control campaign because even in disease-endemic areas the prevalence of subcutaneous cysticerci in the general population is usually low, especially in Africa. However, the distortion will increase over time when the relative fraction of nodules caused by adult filaria of O. volvulus decreases either because of a direct effect of repeated drug administration on the preexisting adult worms or indirectly by reducing transmission of onchocerciasis and incidence of new nodules. The accuracy of assessing onchocerciasis endemicity by nodule palpation could be improved by taking into account that subcutaneous cysticerci are predominantly found on the upper limbs and on the head, whereas onchocerical nodules are usually localized (at least in Africa) on the lower part of the body. In this respect, it would be of interest to know from what anatomic sites the nodules reported by Katabarwa and others were excised.

In conclusion, a positive correlation between onchocerciasis and epilepsy has been demonstrated in areas that are endemic for O. volvulus throughout West, Central, and East Africa. Whether this correlation constitutes a causal relationship is not known. In contrast to the suggestion of Katabarwa and others, epidemiologic data on cysticercosis from the respective areas do not support the hypothesis that neurocysticercosis could be the cause of onchocerciasis-associated epileptic seizures. Studies combining appropriate neuroepidemiologic, clinical, and parasitologic methods are needed to clarify 1) the etiology of excess incidence of epilepsy in areas endemic for O. volvulus, 2) the effect of T. solium on epilepsy at the community level in Africa, and 3) the possible interaction of both diseases in co-endemic areas.

REFERENCES
Leichsenring L, 1996. The prevalence of epilepsy follows the
distribution of onchocerciasis in a west Ugandan focus. *Bull
World Health Organ* 74: 361–367.

growth and onchocerciasis, in two areas of different endemcity
of onchocerciasis in Burundi. *Trans R Soc Trop Med Hyg* 91:
525–527.

Relationship between onchocerciasis and epilepsy: a matched
case-control study in the Mbam Valley, Republic of Cam-

5. Dozie IN, Onwuliri CO, Nwoke BE, Chukwuocha UM, Chik-
wendu CI, Okoro I, Njemanze PC, 2006. Onchocerciasis and
epilepsy in parts of the Imo river basin, Nigeria: a preliminary

bazi M, 2007. Mortality from epilepsy in an onchocerciasis-
48–55.

7. Newell ED, Vyungimana F, Geerts S, van Kerckhoven I, Tsang
and members of their families in Burundi. *Trans R Soc Trop

8. Nsengiumva G, Druet-Cabanac M, Ramankandrasana B,
Bouteille B, Nsizabira L, Preux PM, 2003. Cysticercosis as a
major risk factor for epilepsy in Burundi, east Africa. *Epilepsia*
44: 950–955.

9. Dongmo L, Druet-Cabanac M, Moyou SR, Zebaze DR, Niann-
shi AK, Sini V, Mapoure N, Echouffo TJB, Djeumen WC,
Ndumbe PM, 2004. Cysticercosis and epilepsy: a case-control
study in Mbam Valley, Cameroon. *Bull Soc Pathol Exot* 97:
105–108.

10. Dumas M, Grunitzky K, Belo M, Dabia F, Deniau M, Bouteille B,
Kassankogno Y, Catanzano G, Pestre Alexandre M, 1990. Cy-
sicercose et neurocysticercose: enquete epidemiologique dans

11. Druet-Cabanac M, Boussinesq M, Dongmo L, Farnarier G,
Bouteille B, Preux PM, 2004. Review of epidemiological stud-
ies searching for a relationship between onchocerciasis and