individually, it is important that their contributions be acknowledged in these proceedings.

The collaboration of the local communities in 22 linguistic groups has allowed us to collect over 4000 blood samples, other specimens and interviews. Their participation has been generous and, without it, our knowledge of prion diseases would be more limited. The Papua New Guineans who attended the meeting represented all those people from Papua New Guinea who have assisted in the research on kuru over many years.

Kuru is no longer a priority for the people affected: their health concerns are now focused on diseases that are no longer common in wealthy countries and on the emerging AIDS epidemic. For the duration of the project, we have tried to provide medical care where possible and to source external funding for development projects.

The team’s work is part of the ongoing research started by Vincent Zigas and Carleton Gajdusek in 1957 and there are many others, including some of those attending the meeting, who were the pioneers of kuru research. Much of the current research success has been dependent on the goodwill and integrity shown by the pioneers to the people of the kuru-affected region and to the long-term relationships established early on with those populations. We have tried as much as possible to follow the example set by the early research workers.

I also thank John Collinge, Frank Cooper and the staff at the MRC Prion Unit. There have also been other members of the MRC Prion Unit who have assisted in the fieldwork: Edward McKintosh, Skip Jackson, Toby Bentley, Edward Lagan and, most recently, Dafydd Thomas, who assisted with the clinical examination of patients.

I thank the Wellcome Trust for initially funding the project and, more recently, the Medical Research Council for funding support, the Life Neurological Trust for making a generous donation to the local preschools and the British High Commission in Port Moresby for funding the Okapa District Water Supply Project.

Finally, I would like to emphasize that the PNGIMR has contributed, and continues to contribute, to medical research at an international level, supports the annual Medical Symposium in PNG and publishes the *PNG Medical Journal*. It is important that the world sees Papua New Guinea in the positive light that it deserves.

My 'brush' with kuru research

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In November 1966, I received, to my surprise, formalin-fixed pieces of brain tissue from a young kuru patient (Tabaso, female, 12 years) from Dr Michael Alpers at the NIH with the request for electron microscopy (EM). At that time, I was engaged in EM studies of infectious diseases of the central nervous system, especially of progressive multifocal leukoencephalopathy (PML), a conventional slow virus disease. I was delighted by the new challenge since my interest in kuru went back already to 1960. Through an epidemiology/neurology network starting with Dr Leonard Kurland at the NIH, and extending to Prof. Francis M. Forster, in Madison, Wisconsin I had heard of this exciting new brain disease studied by Dr D. C. Gajdusek in Papua New Guinea. I received several reprints, which I also used for my teaching, but I was not able to obtain histologic slides for review since they had been sent to the Bunge Institute in Antwerp (letter by Marion Poms, NIH, to Prof. Forster, 18 January 1960).

In the autumn of 1966, I greatly enjoyed hearing follow-ups on the kuru 'story' while participating in the 'Workshop on Slow Viruses', sponsored by the Multiple Sclerosis Society, and held at the USPHS Rocky Mountain Laboratory, in Hamilton, Montana, 12–13 September. Dr Gajdusek reported on the disappearance of kuru as a disease of childhood, and that there had been an overall 40% decrease in cases, and Dr Clarence J. Gibbs discussed the transmission of kuru to chimpanzees. I had been asked to present additional data on PML. I also brought to the group's attention the recent demonstration of paramyxovirus-
like particles in subacute sclerosing panencephalitis by the French neuropathologist M. Bouteille and collaborators. The electron microscope had led again to success in the 'slow virus' field.

The chief aims for my kuru EM studies were a 'hunt' for virus particles in this transmissible disease and the description of the ultrastructure of the plaques in the cerebellar cortex. The samples of cerebellum and putamen were post-fixed in 2% glutaraldehyde and 2% osmium tetroxide. Ultra-thin sections were prepared from seven Epon blocks and were contrasted with lead citrate and uranyl acetate. They were viewed in an EMU-3G electron microscope with a highest original magnification of $33,500$.

A chance for presenting my preliminary findings came a few months later, during a symposium entitled 'Pathogenesis and etiology of demyelinating diseases', which took place in Locarno, Switzerland. Mrs Edith Pette, one of its organizers, had invited me to give a paper on my EM studies of PML. Several kuru investigators (Dr E. Beck, Dr E. J. Field & Dr C. J. Gibbs) had also been invited, and I got permission to speak during a discussion period (Zu Rhein 1969). Dr Beck had already summarized her light microscopic findings.

My analysis of 189 electron micrographs revealed no virus particles in either nuclei or cytoplasm of neurons or glial cells. At lower magnifications, rounded accumulations of electron-dense materials (figure 1) could be identified in considerable numbers between the granule cells of the cerebellum. Higher resolution revealed a woven pattern of these plaques (figure 2). Centrally, the meshwork of fibrils was dense and seemingly criss-crossing. However, towards the periphery, the fibrils were drawn out into radiating pointed bundles, giving the deposits a star-shaped appearance. The width of the fibrils was approximately 10 nm and when cut across (figure 2, inset), they appeared rounded or angular, and markedly electron opaque. Owing to the optical limitations of the scope, the surface details of the fibrils could not be analysed. A helical pattern seemed possible. The kuru plaques did resemble in their ultrastructure the stellate forms of amyloid as seen in murine spleens in experimental amyloidosis (Gueft & Ghidoni 1963). Owing to post-mortem changes in the kuru tissues, the relationship of the peripheral portions of the plaques to the surrounding tissues could not be established and a potential site for amyloid formation could not be suggested. In sections of the putamen, no plaques were seen. The main abnormalities were intraneuronal vacuoles containing curled membrane fragments. These vacuoles reached the size of neuronal nuclei, onto which they were sometimes juxtaposed.

Another, much more extensive study of human kuru tissue was conducted soon after mine by Field et al. (1969). The diameter of the fibrils was smaller, and they appeared to be hollow; and there were lattice structures in some plaques which I had never encountered. However, the authors also used a comparison with amyloid.

Subsequent to my initial work, no further collaboration was initiated by the kuru investigators. I turned my attention to transmissible mink encephalopathy, another 'unconventional' slow virus disease, much at home in the State of Wisconsin. Mostly together with graduate student Bob Eckroade, transmission studies to wildlife animals and to rhesus monkeys were carried out, and the clinical course and pathological features were studied (Zu Rhein et al. 1974). No amyloid plaques were encountered.

**REFERENCES**


