# LETTERS TO THE EDITOR

## A Newly Recognized Neurodegenerative Disorder of Horned Hereford Calves

DEAR SIR:

Several inherited neurodegenerative diseases of cattle have been described in various breeds. Some diseases involve accumulation of storage products, for example, manosidosis in purebred Angus (1,2), $GM_1$ gangliosidosis in inbred Friesians (3,4,5) and neuronal lipodystrophy in Beefmasters (6). Other diseases are distinguished by widespread focal swelling of axons, for example hereditary neuraxial edema (7). Inherited epilepsy (8,9,10), spastic syndrome (11), "doddlers" (12), and congenital tremor (13,14) present with neurological signs such as epilepsy and tremors, without any pathological findings. This letter describes several calves born with severe neurological signs and a generalized disorder of the nervous system characterized by excessive accumulations of neurofilaments within neurons.

The syndrome was first noted in 1980 in a herd of horned Hereford cattle consisting of 60 registered cows and 120 commercial cows in southern Alberta. Six calves were affected during 1980 and 1981 from the registered herd. All appeared normal at birth, except they were unable to stand without assistance. Fine tremors were seen, which were more pronounced in the hind limbs and neck. Responses to stimulation or spontaneous activity resulted in exaggerated movements, increased tremor oscillation and progressive muscle weakness. Some calves died through inannition while others showed a transient improvement followed by deterioration with a spastic paraplegia. Generalized tremors were easily induced by a variety of stimuli and spinal reflexes were exaggerated or depressed. Despite these neurological difficulties, the calves remained alert.

Considerable inbreeding had occurred in this herd and examination of the pedigrees suggested an autosomal recessive trait. The salient pathological finding in these calves was ongoing neurofilamentous neuronal degeneration involving multiple cell groups in the central nervous system and ganglion cells within the peripheral and autonomic nervous systems.

Characterizing this neuronal degeneration was an enormous swelling of the perikaryon and distention of the neuritic processing by an opalescent, faintly fibrillar, amphophilic material which appeared to be arranged in whorls as outlined by entrapped, coarsely clumped Nissl substance. This material did not stain with Luxol fast blue nor by the periodic acid-Schiff technique. Bodian silver preparations revealed fine argentophilic fibrils coursing through the amphophilic material and extending into the neuritic processes. These fibrils did not form fibrillary tangles. Because of the marked swelling of the neuronal cell body, the nucleus was eccentrically displaced. Vacuolar degeneration was not a feature of the process.

Electron microscopic examination revealed that the motor neuronal cell bodies were massively distended by densely packed, interlacing, whorled arrays of neurofilaments surrounding and displacing the nucleus and extending into the dendritic processes.

This disorder resembled giant axonal neuropathy of man (15) and dogs (16), canine spinal muscular atrophy of Brittany spaniels (17) and a lower motor neuron disease seen in a cat in association with accumulations of neurofilament (18). Also, poisoning by triorthocresylphosphate (19), vincristine (20), colchicine (21) and B-B$^1$ iminodipropionitrile (22) similarly induce neurofibrillary degeneration, either predominantly within the axon or neuronal perikaryon. The role of neurofilament has been recently reviewed (23), but the exact pathogenesis of this disorder is still unclear. Further work is required to describe and evaluate this new syndrome.

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## Porcine Enterovirus

DEAR SIR:

In the past year we have made seventeen isolations of porcine enteroviruses from scouring piglets. These isolates have been predominantly from outbreaks of diarrhea occurring in the immediate postweaning period. In most cases, other significant enteropathogens were not identified. In one continuing outbreak, porcine enterovirus was isolated from three separate submissions, approximately a week apart, in the absence of other consistently isolated pathogens.

Pathologically a range of mild to severe villus atrophy has been observed. Generally few deaths have been reported, but considerable loss in condition is evident. The clinical disease seems to persist somewhat longer than rotaviral enteritis. Due to cost restrictions, we unfortunately have not been able to attempt pathogenicity testing of our isolates in piglets.

Enteroviruses do not have distinctive morphological characteristics or occur in aggregates in feces and thus will not be readily picked up by direct electron microscopy. In cell culture we have found swine testicle cells to have greater sensitivity than primary pig kidney cells. Our isolates have been identified on the basis of source, typical rapid cytopathic effect in cell culture, lack of hemagglutination with guinea pig erythrocytes, size and appearance of cell culture extracted virions in the electron microscope and in some cases by an immunodiffusion reaction with hyperimmune serum.

Enteroviruses are reportedly widespread in swine, often occurring in association with enteritis, however their isolation is seldom given diagnostic significance in enteric disease. This may not be entirely accurate for the neonatal or early postweaning pig. It would appear that the lack or sudden loss of passive protection from maternal milk antibodies creates a susceptible animal that may indeed show clinical disease when exposed to enterovirus. It would be unlikely that the enteroviruses we have isolated have any extraordinary pathogenic attributes but merely represent other less frequently recognized members of the growing list of agents that may induce enteritis in this age group of swine, and should receive diagnostic consideration.

Yours sincerely,

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## Vaccination Against Infectious Respiratory Disease of Cattle

DEAR SIR:

Dr. S.W. Martin's (Can Vet J 1983; 24: 10-19) application of statistical methods to the evaluation of vaccines used to control respiratory disease of cattle is original and commendable in addressing this important but neglected field of study.

Evaluation of vaccines must also take into account their purpose and limitations. A live virus vaccine usually produces a mild form of the disease. The rationale is that the specifically primed defences of the animal will prevent that disease if the animal is subsequently exposed to the mild type of the same virus. The effects of a live viral vaccine on infectious agents other than the specific virus it contains are poorly understood, but enhancing or inhibiting effects should be considered, e.g. interferon, bacteria-enhancing or bactericidal activity.

A viral vaccine cannot be expected to immunize against bacterial causes of respiratory disease, e.g. pasteurellosis, but it may indirectly, partially control infectious respiratory disease. For example, infectious bovine rhinotracheitis (IBR) vaccine will immunize against IBR virus only, which hopefully will reduce the number of virulent IBR virions available to synergize with *Pasteurella* spp (1). Only a pasteurella vaccine can be expected to immunize against pasteurellosis.

Infectious respiratory disease of cattle is associated with numerous infectious agents (viruses, bacteria, fungi, mycoplasma) and these in various combinations or some possibly even alone, may produce infectious respiratory disease. Therefore optimal control by biologics would require immunization with effective vaccines against most of these viral and bacterial agents. This is an unrealistic goal. Virus vaccine selection is based on the predicted prevalence of the particular virus or viruses under the existing conditions of husbandry. This prediction may not always be correct and viruses other than those in the vaccine may produce clinical infectious respiratory disease in combination with bacteria. Consequently measuring the efficacy of mono or even bivalent vaccines by relating them in field trials to *reduction* in respiratory disease of multifactorial etiology or to weight gains, which are also influenced by many-factors, requires well planned and controlled studies. But as Dr. Martin states, field evaluations of vaccine efficacy have generally been lacking in proper methodology, analysis and reporting.

It is therefore important that veterinarians inform their clients of the purpose and limitations of each vaccine, so that it is used accordingly and not judged by unfair criteria, such as its ability to control infectious respiratory disease caused by agents which it does not contain. Evaluation of the efficacy of vaccines requires methods which are relevant to their intended