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# Neuronal vacuoles in the canine brain

M. Pumarola, B. Juanola\*, Rosmarie Fatzer\*\*

## Summary

Intraneuronal vacuoles have been observed in the motor trigeminal nucleus of the medulla oblongata of two dogs which showed neurological deficits. Its significance and possible relation with the same lesions observed in other animal species are discussed.

**Key words:** neuronal vacuoles – brain – dog

## Neuronale Vakuolen im Gehirn von Hunden

Bei zwei Hunden mit neurologischen Ausfallerscheinungen wurden intraneuronale Vakuolen im motorischen Trigeminskern der Medulla oblongata beobachtet. Die Bedeutung dieser Vakuolen und ihre möglichen Zusammenhänge mit ähnlichen Läsionen bei anderen Tierarten werden besprochen.

**Schlüsselwörter:** neuronale Vakuolen – Gehirn – Hund

Ever since the outbreak of bovine spongiform encephalopathy (BSE) in Great Britain (Wells et al., 1987) and shortly after of a similar disease in domestic cats, feline spongiform encephalopathy (FSE) (Legget et al., 1990; Wyatt et al., 1991), both most likely caused by the sheep scrapie agent via contaminated food (Wilesmith et al., 1992), any neuronal vacuole in the histologic section of a brain evokes uneasiness, in particular if the brain belongs to a species hitherto unaffected by a spongiform encephalopathy, as for instance dog or horse. Meanwhile both BSE and FSE have been diagnosed in captive wild ruminants (for references see Kirkwood et al., 1992; Williams and Young, 1993) and felines respectively (Peet and Curran, 1992; Willoughby et al., 1992). The sudden emergence of a spongiform encephalopathy in cattle and, even more so, in cats suggests that the agent of sheep scrapie spontaneously breaks through the species barrier, and thus it cannot be excluded that sooner or later more species may become host of the agent and develop spongiform encephalopathies.

It has long been known that neuronal vacuoles, one of the main diagnostic criteria in these diseases, may also occur in different species in connection with pathological changes other than a spongiform encephalopathy or alone with no evident cause. According to Zlotnik and Rennie (1958) they are regularly found in normal sheep brain; Fankhauser et al. (1971) describe large neuronal vacuoles in the red nuclei of cattle and consider them as

non-specific; and Wells and McGill (1992) give a synopsis of the species in which nonspecific vacuoles have been found including personal observations in cats and pigs. Neuronal vacuoles in the canine brain are extremely rare; they occasionally have been seen in the motor trigeminal nucleus of the medulla oblongata (personal observation; K. Muñana, Fort Collins/USA, personal communication). Recently we have examined the brains of a 13 years old spayed female German Shepherd with marked old age changes and a 8 months old male Brittany Spaniel with a moderate meningitis; both animals had shown signs suggestive of a multifocal to diffuse neurologic disorder. In both brains we found single or multiple vacuoles in the above mentioned location on either side (fig 1).

The spectrum of species with a spongiform encephalopathy is large. The significance of the neuronal vacuoles in the brains of the dogs studied in this paper is uncertain. They are very much limited to the trigeminal motor nuclei in both animals yet clearly in excess of what may be considered an incidental finding. In contrast with ruminants, where non-specific vacuoles are regularly found, they are extremely rare in dogs. Furthermore both dogs showed signs suggestive of a multifocal to diffuse neurologic disorder. Neither the old age changes in dog 1 nor the rather mild meningo-encephalitis in dog 2 fully explain the neurological signs. A link between the neuronal vacuoles and the clinical observations may exist. At the time being it certainly is inappropriate to classify

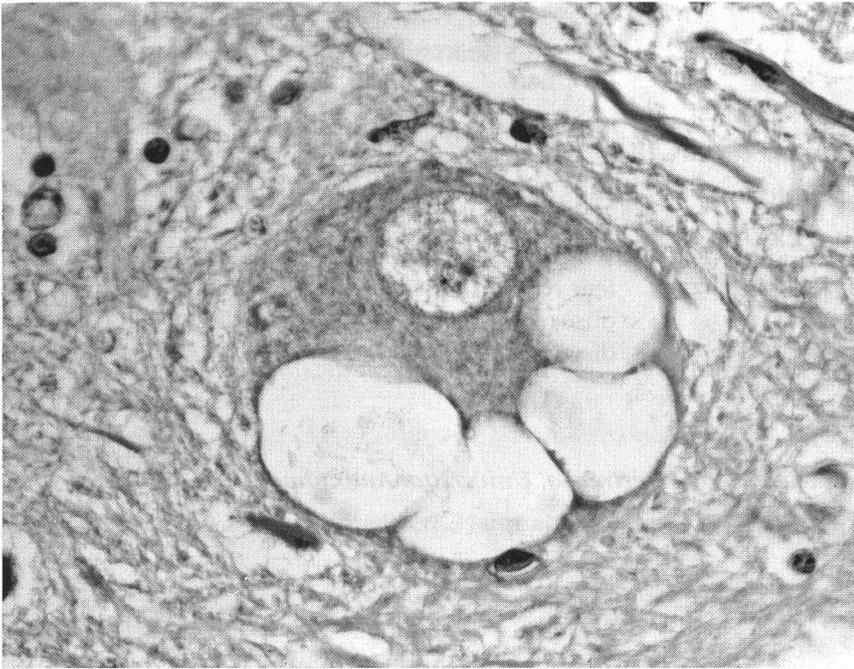


Figure 1: Neuronal vacuolation in the Nucleus motorius trigeminus, medulla oblongata. HE X160

the observation as a spongiform encephalopathy. The distribution and the extent of neuronal vacuolation and/or spongiform changes in the neuropil is variable in this group of diseases dependent on host species and agent strain. We have no way of knowing how a transmissible spongiform encephalopathy would look like in the canine brain. Causes other than a spongiform encephalopathy must be considered. However, if the occurrence of such vacuoles in dogs should become more frequent in the future it might be worthwhile to test prospectively saved frozen brain of neurological cases for Scrapie Associated Fibrils (SAF) by electron microscopy or for the protease resistant isoform of PrP protein by means of immunocytochemistry.

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### Vacuoli neuronali nel cervello canino

Sono stati osservati dei vacuoli intraneuronali nel nucleo motorio trigeminale del midollo allungato in due cani che presentavano sintomi neurologici. Il significato e la possibile relazione con lesioni identiche osservate in altre specie animali vengono discusse.

### Vacuoles neuroniques dans le cerveau du chien

Des vacuoles intraneuroniques ont été observées dans le nucleus trigéminal moteur de la medulla oblongata de deux chiens qui présentaient des symptômes neurologiques. Leur signification et leur relation possible avec des lésions similaires observées chez d'autres espèces animales sont discutées.

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