Can a Link Between Cattle and Human Disease be Proven or Disproven?

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Introduction

There are numerous laboratory strains of transmissible spongiform encephalopathies (TSEs), distinguishable on the basis of their disease characteristics in panels of inbred mouse lines.[1] The main criteria used to identify different TSE strains are the incubation periods of the disease in these mice and the distribution of pathological changes seen in their brains, expressed as a "lesion profile". Studies on TSE strain characteristics after passage in hosts of different species or genotypes have shown that the agent contains an informational component that is independent of the host.[2,3] In recent years strain typing methods have been used to explore epidemiological links between spongiform encephalopathies occurring in different species.

BSE has been transmitted to mice from the brains of eight unrelated cattle, collected at intervals through the epidemic and from different locations. The incubation periods and lesion profiles in mice were remarkably uniform in this series, suggesting that a single major strain of BSE was present in each source.[4,5] This is in agreement with the uniformity of neuropathological changes seen in cattle with BSE throughout the epidemic.[6] Indirect transmission of BSE to mice from experimentally-infected sheep, goats and pigs have shown that the characteristic BSE phenotype can be retained after passage through different species, demonstrating that these methods can be used to determine whether BSE has spread accidentally to other species.[5] Closely similar disease characteristics were seen in transmissions to mice of novel spongiform encephalopathies from domestic cats and from two exotic bovid species (kudu and nyala), supporting the suspicion that these animals had been accidentally infected with the BSE strain of agent from a dietary source.[5,7]

Transmissions from sheep with natural scrapie, collected either before (twenty sheep) or after (nine sheep) the start of the BSE epidemic, have given variable results, with no individual sources resembling BSE. These results provide no evidence either that BSE was derived from sheep scrapie or that BSE has spread from cattle to sheep. However, only a small sample of sheep with natural scrapie has been tested and a link between scrapie and BSE cannot be ruled out on the basis of this study. These studies are now being extended to include transmissions from recent cases of Creutzfeldt-Jakob disease (CJD) where there is a possible occupational or dietary link with BSE. So far transmissions have been set up from two dairy farmers with CJD who had had BSE in their herds and three "new variant" CJD cases. These experiments are all still in progress. If the results of any of these CJD transmissions resemble the BSE transmissions, this would provide good evidence that BSE has spread to humans. However, a difference between the CJD and BSE transmissions would not disprove such a link, as there is experimental evidence that TSE strain characteristics may sometimes change when passaged through a new species.[2]

References

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