PRIONS

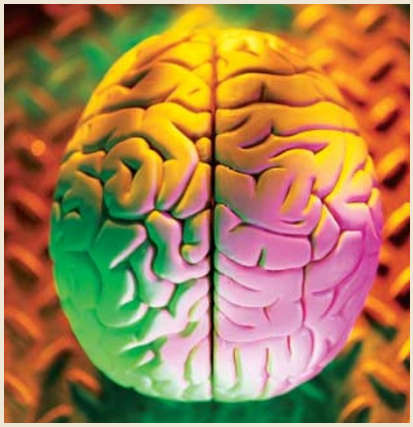
New cattle TSE identified

Researchers in Italy have discovered a new transmissible spongiform encephalopathy (TSE) in cattle, according to a recent publication in *Proc. Natl Acad. Sci. USA*.

The TSEs or prion diseases are progressive neurodegenerative disorders that are associated with the accumulation in the brain of an insoluble, protease-resistant form (PrP^{Sc}) of the prion protein (PrP^{C}). Until now, only one TSE — bovine spongiform encephalopathy (BSE) — has been known in cattle, and a single agent, that is, a single strain of PrP^{Sc}, has been associated with BSE and the equivalent human infection, variant Creutzfeldt–Jakob disease (CJD).

In this study, Casalone *et al*. analysed the brains of Italian cattle that had tested positive for BSE after routine slaughter. In the eight cattle brains sampled, Western blot analysis revealed that there were two distinct forms of PrP^{Sc} present — in two of the cattle samples, the molecular mass of both the predominant PrP^{Sc} glycoform and the protease-resistant fragment were lower than those found in the other six cattle, which showed a typical molecular signature for BSE. In these two cattle, the distribution of PrP^{Sc} was also altered — the protein accumulated within the olfactory bulb and thalamus, rather then in the brainstem as with BSE PrP^{Sc}. Additionally, PrP-immunopositive plaques, a feature not found in typical BSE, were detected in the brains of these two animals.

Casalone *et al*. propose that this pathology represents a new form of cattle TSE that they have named bovine amyloidotic spongiform encephalopathy, or BASE. Somewhat ominously, Casalone *et al*. report that the neuropathology, and PrP^{Sc} distribution and glycotype that are characteristic of BASE are very similar to that associated with a particular subtype of sporadic CJD. As the two cattle in which BASE was present were healthy at the time of slaughter it is possible that BASE could be a sporadic cattle TSE. Until more research is completed, however, the authors urge caution in assessing any link between the two conditions in different species.



Sheilagh Clarkson

References and links

ORIGINAL RESEARCH PAPER: Casalone, C. *et al*. Identification of a second bovine amyloidotic spongiform encephalopathy: molecular similarities with sporadic Creutzfeldt–Jakob disease. *Proc. Natl Acad. Sci. USA* (17 Feb 2004) doi:10.1073/pnas.0305777101

BACTERIAL ECOLOGY

Killing the messenger

Many commensal bacteria produce antibiotics to gain the upper hand over their competitors in a shared environment. Lian-Hui Zhang and colleagues now reveal a new mechanism for this, in which some bacteria inhibit quorum-sensing signalling by other species to reduce their virulence.

Quorum sensing using *N*-acyl homoserine lactones (AHLs) is widely used in communication between related bacteria to coordinate gene expression. Other species produce AHL-degrading enzymes, indicating that these could be used to compete against bacteria that rely on AHL signalling. However, until now, no evidence for this intriguing theory has been found.

Bacillus thuringiensis, which is widely used in the biocontrol of insect pests, expresses the AHL-degrading enzyme AHL-lactonase. Zhang and colleagues tested whether this species could interfere with the growth of the plant pathogen *Erwinia carotovora*, which signals using AHLs. Co-culture of the two species blocked the accumulation of *E. carotovora* AHLs, although this had no effect on the growth of the pathogen. To test whether inhibition of AHL signalling affected *E. carotovora* pathogenesis, potato slices were co-inoculated with both species. The soft-rot symptoms caused by *E. carotovora* were strongly reduced, indicating that *B. thuringiensis* suppresses the virulence of the pathogen.

To confirm this, the authors inoculated potato slices with *E. carotovora* transformed with a plasmid expressing green fluorescent protein (GFP). When slices were pre-treated with a *B. thuringiensis* suspension, the number of GFP-expressing bacteria was only slightly reduced in comparison with control slices that were pre-treated with water only. However, a more marked effect was seen on virulence. *E. carotovora* spread substantially on control slices and caused soft-rot symptoms. But, after pre-treatment with *B. thuringiensis*, the pathogen was confined to the site of inoculation and failed to cause infection.

To verify that AHL-lactonase is required for the suppression of *E. carotovora* virulence, Zhang and co-workers made *B. thuringiensis* mutants that do not produce this enzyme. These bacteria were unable to prevent the soft-rot symptoms caused by *E. carotovora*.

This study demonstrates a novel mechanism for antagonistic bacterial interactions, which the authors term 'signal interference'. It also has exciting implications for biocontrol, as *B. thuringiensis* and other species that express AHL-degrading enzymes might well prove useful in the control of bacterial plant pathogens.

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References and links

ORIGINAL RESEARCH PAPER Dong, Y.–H. *et al*. Insecticidal *Bacillus thuringiensis* silences *Erwinia carotovora* virulence by a new form of microbial antagonism, signal interference. *Appl. Environ. Microbiol*. **70**, 954–960 (2004)

WEB SITE

Lian-Hui Zhang's laboratory: http://www.imcb.astar.edu.sg/research/research_group/infectious_diseases/6000000128_article.html