Sharp decline in scrapie prevalence in The Netherlands after breeding for resistance: are we close to achieving eradication?

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In the Netherlands an ambitious programme to control scrapie in sheep was started in 1998, based on genetic selection of animals for breeding. From 2002 onwards EU regulations required intensive active scrapie surveillance as well as certain control measures in affected flocks. Here we use standard statistical methods as well as mathematical modelling to analyse: (1) data on genotype frequencies and scrapie prevalence in the Dutch sheep population obtained from both surveillance and affected flocks; (2) data on genotype frequencies in a random sample of flocks; and (3) postal survey results on between-flock differences in breeding strategy and flock management. Analysing the data (1) we find that the breeding programme has produced a steady increase in the level of genetic scrapie resistance in the Dutch sheep population. We also find that a few years later this was followed by a sharp decline in the prevalence of classical scrapie in tested animals. Notably, the estimated classical scrapie prevalence level per head of susceptible genotype declined significantly as well. This indicates that selective breeding has a disproportionate effect on infection prevalence, reminiscent of the well-known population effect of vaccination against a transmissible disease. The overall recent decline in classical scrapie prevalence in Dutch sheep suggests that eradication of the disease in The Netherlands may be within reach. However, a subset of farms may still continue to act as a core group for scrapie transmission for some time, as we show by analyzing between-flock heterogeneities using the data (2) and (3). In addition, genetic resistance levels may decline again in future as participation to the selective breeding programme has recently become voluntary.