

## Equine grass sickness in Scotland: a case-control study of environmental geochemical risk factors

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### Summary

**Reasons for performing study:** We hypothesised that the apparent geographical distribution of equine grass sickness (EGS) is partly attributable to suboptimal levels of soil macro- and trace elements in fields where EGS occurs. If proven, altering levels of particular elements could be used to reduce the risk of EGS.

**Objectives:** To determine whether the geographical distribution of EGS cases in eastern Scotland is associated with the presence or absence of particular environmental chemical elements.

**Study design:** Retrospective time-matched case-control study.

**Methods:** This study used data for 455 geo-referenced EGS cases and 910 time-matched controls in eastern Scotland, and geo-referenced environmental geochemical data from the British Geological Survey Geochemical Baseline Survey of the Environment stream sediment (G-BASE) and the James Hutton Institute, National Soil Inventory of Scotland (NSIS) datasets.

**Results:** Multivariable statistical analyses identified clusters of three main elements associated with cases from (i) the G-BASE dataset – higher environmental Ti and lower Zn, and (ii) the NSIS dataset - higher environmental Ti and lower Cr. There was also some evidence from univariable analyses for lower Al, Cd, Cu, Ni and Pb and higher Ca, K, Mo, Na and Se environmental concentrations being associated with a case. Results were complicated by a high degree of correlation between most geochemical elements.

**Conclusions:** The work presented here would appear to reflect soil- not horse-level risk factors for EGS, but due to the complexity of the correlations between elements, further work is required to determine whether these associations reflect causality, and consequently whether interventions to alter concentrations of particular elements in soil, or in grazing horses, could potentially reduce the risk of EGS. The effect of chemical elements on the growth of those soil microorganisms implicated in EGS aetiology also warrants further study.

**Keywords:** horse; equine grass sickness; equine dysautonomia; epidemiology; soil geochemistry; trace elements