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Can the distribution of cases of equine grass sickness in Scotland be explained by geochemical parameters?

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Equine grass sickness (EGS) is a frequently fatal neurological disease, which affects horses grazing fields in certain geographical locations. The aim of this study was to determine whether the geographical distribution of EGS cases referred to the Royal (Dick) School of Veterinary Studies, Edinburgh, Scotland was associated with the presence or absence of particular geochemical parameters in the environment.

A spatially referenced database of all EGS cases diagnosed at Edinburgh vet school since 01/01/1990 (n=455) and two time-matched controls (n=910) was produced (n=1365). The database contained the signalment of the horse, clinical diagnosis of acute/subacute or chronic grass sickness, outcome (euthanasia or home), and location of the owner. Environmental geochemistry data were obtained from 2 sources - the British Geological Survey (BGS) Geochemical Baseline Survey of the Environment (G-BASE) project stream sediment dataset for: calcium, chromium, cobalt, copper, gallium, iron, lead, magnesium, manganese, molybdenum, potassium, titanium and zinc and average soil geochemical concentrations from The Macaulay Institute for each soil lithotype: aluminium, barium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, phosphorus, potassium, selenium, sodium, strontium, titanium and zinc. Initial statistical interpretation compared the total geochemical concentrations at each location between the cases and controls. Comparative analyses of the two different datasets were also undertaken.

Consideration of the biological and environmental significance of the statistical results suggested that further detailed, field scale investigation should concentrate on areas with: low cadmium ($p<0.001$), low cobalt ($p<0.001$), low copper ($p<0.001$), low manganese ($p<0.001$), low phosphorus ($p<0.001$) and high selenium ($p<0.001$). Statistically significant results were obtained for gallium ($p=0.017$) and nickel ($p<0.001$), and although it was considered they were unlikely to have a biological role further investigation may reveal a role in identifying other environmental risk factors. Further investigation was justified for calcium, potassium and sodium, which all play a biological role in the horse but the results from this study were inconclusive.

This scoping study provided a preliminary interpretation of possible relationships between the distribution of equine grass sickness in Scotland and the distribution of geochemical parameters in an attempt to identify factors worthy of further investigation. No previous study of this magnitude has been performed to investigate the role of geochemical parameters for equine grass sickness within the United Kingdom.

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