Short report

Serum vitamin E concentrations are normal in Friedreich's ataxia

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SUMMARY Serum vitamin E concentrations and vitamin E:cholesterol ratios in 31 patients with Friedreich's ataxia were not significantly different from values obtained from either disabled or ambulant control subjects. Although the clinical features of Friedreich's ataxia are similar to those associated with severe vitamin E deficiency, there are subtle but important clinical and neurophysiological differences between the two disorders.

A progressive neurological disorder comprising limb and gait ataxia, areflexia, and distal loss of proprioception and vibration sense occurs in abetalipoproteinaemia,¹ and has also been described in association with acquired causes of chronic fat malabsorption such as biliary atresia, cystic fibrosis, and following extensive intestinal resection.²⁻⁶ There is good evidence that this spinocerebellar syndrome is caused by severe and prolonged deficiency of vitamin E.⁷ More recent reports have described patients with an identical neurological disorder associated with very low or undetectable serum concentrations of vitamin E in the absence of generalised fat malabsorption or hypolipoproteinaemia.⁸⁻¹¹ It is possible that this apparently selective defect of vitamin E absorption is genetically determined.¹¹

The neurological features of vitamin E deficiency are similar to those seen in Friedreich's ataxia, an autosomal recessive disorder in which no consistent underlying metabolic defect has been identified.¹² Barbeau and colleagues¹³ reported slightly reduced serum concentrations of vitamin E in 15 patients with Friedreich's ataxia but these were not significantly different from controls. This paper reports a study of serum vitamin E concentrations in 31 cases of Friedreich's ataxia, which were compared to those in

both able bodied and disabled control subjects. Vitamin E concentrations are also expressed as a proportion of serum cholesterol concentrations, as it has been suggested that this ratio is a more reliable index of vitamin E status.¹⁴

Patients, methods, and results

Thirty one patients with Friedreich's ataxia were studied, all of whom fulfilled the diagnostic criteria given by Harding.¹² Their ages ranged from 8 to 59 years, and 23 of them were either wheelchair dependent or had considerable difficulty in walking. There were two groups of age and sex matched control subjects. The first comprised 31 individuals who were healthy or had neurological disorders which did not give rise to physical disability, and the second group consisted of 23 patients who had long-standing neurological disability of comparable severity to that seen in the 23 disabled cases of Friedreich's ataxia. The majority of these disabled controls had multiple sclerosis; cases of hereditary or degenerative ataxic disorders were excluded. Relatives of patients with Friedreich's ataxia were not used as controls, and none of the individuals studied had knowingly received vitamin E supplements within the last two years.

Vitamin E concentrations were estimated 'blindly' in non-fasting samples of serum using a colorimetric method.¹⁵ Serum cholesterol concentrations were measured enzymatically. For statistical analysis, the 23 disabled Friedreich's ataxia patients were ran-

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Fig Serum vitamin E concentrations and vitamin E:cholesterol ratios in 31 cases of Friedreich's ataxia (triangles), 31 ambulant (filled circles) and 23 disabled (open circles) control subjects. — denotes mean, and — — — 1 standard deviation.

Table Serum vitamin E and cholesterol concentrations in 31 patients with Friedreich's ataxia and control subjects

	Ambulant controls (n = 31)		Friedreich's ataxia (n = 31)		Disability matched controls (n = 31)
Vitamin E (μmol/l)	19.7 (11.4–28.2)	p > 0.05	22.1 (11.5–38.4)	p > 0.1	19.6 (12.5–32.5)
Cholesterol (mmol/l)	4.89 (3.26–7.25)	p > 0.3	5.16 (3.2–9.0)	p > 0.7	5.05 (3.28–8.8)
Vitamin E:cholesterol ratio (μmol/mmol)	4.10 (1.73–5.58)	p > 0.2	4.40 (2.84–6.5)	p > 0.25	4.06 (1.81–7.5)

domly paired with two control subjects without knowledge of the serum vitamin E concentrations. One was matched for age and sex, and the other for age, sex, and degree of physical disability. The eight patients who were only mildly disabled were paired twice with ambulant age and sex matched controls.

Serum vitamin E concentrations, and vitamin E:cholesterol ratios in the three groups are shown in the figure. These, and the serum cholesterol concentrations, were compared using Student's *t* test for paired data (table). No significant differences were observed between patients and either disabled or ambulant control subjects.

Discussion

The neurological disorder associated with vitamin E

deficiency is clinically similar to Friedreich's ataxia, but proprioceptive loss tends to be more prominent in vitamin E deficient patients. There are also important neurophysiological and pathological differences between the two syndromes. "Dying-back" of sensory axons occurs in both Friedreich's ataxia and vitamin E deficiency, but in the latter this appears to affect centrally directed axons preferentially,¹⁶ and there may be preservation of peripheral sensory nerve conduction in the presence of delayed somatosensory evoked potentials.¹¹ Even in young children with Friedreich's ataxia there is always a marked loss of large myelinated fibres in the peripheral nerves, associated with small or absent sensory action potentials.¹⁷ Degeneration of the spinocerebellar and corticospinal tracts is more marked in Friedreich's ataxia than in vitamin E deficiency.^{3, 18}

Our failure to demonstrate a systemic deficiency of vitamin E in Friedreich's ataxia does not exclude the possibility of relative deficiency at a cellular level. This might, for example, result from selective defects of cellular incorporation or utilisation of the vitamin which could be compatible with the pathophysiological differences which exist between Friedreich's ataxia and the neurological syndrome associated with reduced serum concentrations of vitamin E.

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