Inhibitor(s) of prostaglandin biosynthesis in extracts of oat (*Avena sativa*) seeds

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It has been claimed that a colloidal oat fraction (Aveeno; Knox Laboratories Ltd.) is useful for relieving itch, sunburn and other inflammatory conditions of the skin. Since prostaglandins are known to be involved in skin inflammation due to burns, contact eczema and exposure to u.v. radiation (Angaard *et al.*, 1970; Greaves & Søndergaard, 1970; Greaves *et al.*, 1971), we have evaluated to what extent extracts of oats inhibit prostaglandin biosynthesis. We report below that extracts of *Avena sativa* possess strong inhibitory activity of this type.

Oat seeds (*Avena sativa*) were ground (with a Moulinex grinder) into a fine powder. Batches of powdered oats (20g each) were macerated 1:10 with 50mM-phosphate buffer, pH7.4, or 96% ethanol, and stirred for 2h at room temperature. The resultant buffer or alcoholic extract was centrifuged at 2500*g* for 30min, and the supernatant was tested on bull seminal-vesicle prostaglandin synthase, prepared and assayed as described previously (Collier *et al.*, 1976).

Table 1 shows the inhibitory activity of buffer (boiled and unboiled) and alcoholic extracts of *Avena sativa* on prostaglandin biosynthesis. The buffer extract showed strong inhibitory activity, which was unaffected by boiling for 10min. Likewise the alcoholic extract was also inhibitory.

In other experiments the molecular weight (relative molecular mass, M_r) of the inhibitor(s) in aqueous extracts was determined by ultrafiltration through Diaflo membranes [XM-50 ($M_r > 50000$), PM-10 ($M_r > 10000$) and XM-2 ($M_r > 1000$)]. The active fraction had an M_r of 1000–10000.

The detection of an inhibitor(s) of prostaglandin biosynthesis in *Avena sativa* may explain the anti-inflammatory effects of oats on certain inflammatory conditions of the skin. Studies are required to define further the nature of the inhibitor(s); preliminary experiments show that it is dialysable ($M_r < 10000$) and not destroyed by boiling.

Table 1. *Effect of Avena sativa extracts on prostaglandin synthase of bull seminal vesicles*

All values are means of two or three replicates. *Avena sativa* extracts were prepared as described in the text. Abbreviation used: NA, not active.

Extract [buffer (B) or ethanol (E)]	Dose	Mean percentage inhibition of prostaglandin biosynthesis
Avena sativa (B) (unboiled)	100μl	NA
	1000μl	85.0 ± 1.0
Avena sativa (B) (boiled)	100μl	73.6 ± 12.4
	1000μl	78.3 ± 12.7
Avena sativa (E)	100μl	91.5
Indomethacin	0.26μM	38.8 ± 2.4
	13.20μM	96.8 ± 0.28

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A study of the copper and zinc sites in native, high-pH, azide- and cyanide-bound forms of superoxide dismutase by X-ray-absorption spectroscopy

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X-ray absorption spectra from about 600eV below to about 600eV above the copper and zinc K-edges of native and high-pH, azide- and cyanide-bound forms of bovine superoxide dismutase, and synthetic analogues for these sites, have been recorded by using Synchrotron radiation. In each case, the extended X-ray absorption fine structure (e.x.a.f.s.) observed contains back-scattering contributions from atoms ≤5Å (0.5nm) from the copper and zinc centres, as is evident from the Fourier transformations of the spectral data. Although the spectral details obtained indicate some similarities between the copper environments of these four enzyme systems, the individuality of the e.x.a.f.s., particularly ≤200eV above the edge, indicates that the detailed environment of the copper is different in each case. Less significant changes are apparent between the spectra for these zinc sites.

The e.x.a.f.s. for the copper sites have been interpreted by using an *ab initio* approach. In each case, the interpretation necessitated the consideration of back-scattering from C and N (and O) atoms within a sphere of radius about 4Å (0.4nm) centred at the copper, consistent with the co-ordination of this atom by four imidazole groups plus one additional ligand. Detailed structural information has been obtained which, when correlated with the X-ray-crystallographic data, provides an improved perspective of the copper site of superoxide dismutase.