

ETHIONINE AS AN INHIBITOR OF WOOL GROWTH

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Ethionine is an antagonist of the essential amino acid methionine (Meister 1965). Because the supply of sulphur-amino acids to the tissues is a major factor controlling wool growth (Reis 1979), and because mixtures of amino acids lacking methionine cause the growth of weakened wool (Reis 1979), the effects of ethionine on wool growth have been investigated. In addition, effects on hair growth in mice during the first cycle of growth have been studied.

Eighteen sheep were dosed intravenously with DL-, L- or D-ethionine given either as a continuous infusion over a period of 2 days, or as an injection. A further 7 sheep received other compounds intravenously with ethionine in an attempt to overcome the observed effects of ethionine on wool growth. Five groups of suckling mice were given subcutaneous injections of solutions of DL-ethionine once daily for 3 days; total doses ranged from 27 to 460 mg/kg^{0.75}. Each group consisted of 10 mice, of which 5 were uninjected controls.

DL-Ethionine was a potent inhibitor of wool growth but was toxic to sheep. The infusion of 20 mg/kg (c. 50 mg/kg^{0.75}) caused a temporary cessation of wool growth in 2 sheep, which subsequently shed their fleeces, and the growth of substantially weakened wool in a third sheep. Severe toxic effects were produced by a dose of 40 mg/kg and 120 mg/kg was lethal. Infusion of 10 mg/kg temporarily stopped wool growth in one of two sheep; smaller doses had no apparent effects. The cessation of wool growth was associated with a concentration of ethionine in plasma during infusion of at least 0.01 μ moles/ml. Intravenous infusions of either L- or D-ethionine indicated that both isomers are probably equally effective for stopping wool growth. Fibre growth also ceased after an injection of 40 mg/kg of DL-ethionine. This treatment maintained a concentration of ethionine in plasma above 0.01 μ moles/ml for 30 hours, with a concentration of 0.55 μ moles/ml 30 minutes after injection. Injections of 20 mg/kg in 2 sheep gave lower concentrations of ethionine in plasma and produced a band of substantially weakened wool. The effects of ethionine in mice were in marked contrast to those with sheep. Thus, with a dose of 460 mg/kg^{0.75} there was no observable loss of hair and no animals died. Body growth rate was retarded with the higher doses.

As well as being a constituent of proteins, methionine is involved in the chain initiation step of protein synthesis, is an important methyl group donor, and provides cysteine via the transsulphuration pathway. Ethionine could interfere with each of these functions. Preliminary experiments have shown that the provision of cysteine, choline or adenine does not prevent the inhibition of wool growth by ethionine. The concurrent infusion of methionine largely prevents the effects of ethionine on wool growth if a large excess is given (15 moles per mole of ethionine). These results are relevant to an understanding of the mechanisms by which methionine influences wool growth; such information may have application as a means of obtaining controlled inhibition of wool growth.

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