Table 2. Effect of Various Fractions of Ox Pituitary Growth Hormone on the Uptake of Glucose and Incorporation of Glycine into Protein by Isolated Diaphragm from Hypophysectomized Rats

Fraction added to incubation medium	Uptake of glucose (mg/g wet wt./h)	Radioactivity in protein (c.p.m./mg)
No addition	3·17±0·13	16·4±0·35
(3) *A* (50 μg/ml.)	4·95±0·31	21·9±1·3
(3) *B* ,,	5·20±0·64	22·8±2·6
(3) *C* ,,	5·50±0·58	21·4±2·0
No addition	3·12±0·18	14·3±1·4
(3) *A* (5 μg/ml.)	5·10±0·28	17·4±1·6*
(3) *B* ,,	4·35±0·28	17·3±1·8*
(3) *C* ,,	5·18±0·46	17·8±1·9*
No addition	2·60±0·13	11·1±0·69
(1) B_2 (1μg/ml.)	4·28±0·27	14·1±1·00
(1) *C* ,,	3·31±0·12	11·0±0·66*
(2) *C* ,,	3·39±0·15	12·7±0·42
No addition	2·47±0·29	11·3±0·44
(3) *A* (0·1 μg/ml.)	3·08±0·58*	10·9±0·82*
(3) *A* (1 μg/ml.)	4·40±0·41	15·0±1·43

Each figure is the mean ± *S.E.* of the mean of six observations. Except for (*) the value of *P* for the stimulation due to each fraction is at least <0·05. Incubation was for 1·5 h, initial concentration of glucose was 2·5 mg/ml.

Table 3. Effect of Various Fractions of Ox Pituitary Growth Hormone on the Release of Unesterified Fatty Acids by Epididymal Fat Pads of Normal Rats

Fraction added to incubation medium	Fatty acids released (μmole/g tissue/3 h)
No addition	5·2±0·51
(3) *A* (25 μg/ml.)	12·4±1·00
(3) *B* ,,	10·0±0·81
(3) *C* ,,	11·5±1·20

Each figure is the mean ±*S.E.* of the mean of six observations. The value of *P* for the stimulation due to each fraction was <0·001. Incubation was for 3 h in a medium containing 5 per cent ox serum albumin.

which also possess good growth-promoting activity does not provide any evidence of the possibility of a separation of the agents responsible for the *in vivo* and *in vitro* actions[8,15,16], though it is not completely excluded. Although the *in vitro* actions of growth hormone remain a fascinating problem in mechanism it is doubtful whether at the present time they provide a very helpful guide to the means by which growth hormone promotes growth.

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Control of Cellular Differentiation in Plants by the Distribution of Enzymes in a Lipid-bound System

In analysis of the sequence of enzyme differentiation it was found that several enzymes are lipid-bound and that tissue differentiation is determined by the distribution of enzymes in a lipid-bound system. During an investigation of unsaturated lipids and the hæmatin enzymes in the endodermis and phloem of plants it was found that there is a functional relation between unsaturated lipids and the enzymes which determine differentiation and development[1]. Lipotropic agents applied to growing plants changed the pattern of enzyme distribution with resultant changes in tissue differentiation. Ethylene, in concentrations ranging from saturation in water to only a few parts per million, induced changes in lipoprotein. Associated with these changes it was found that the location of the lipids, and associated enzymes that give rise to the endodermis, were changed from normal distribution to new locations.

Ethylene at high concentrations induced a change in unsaturated lipid material in the endodermis and phloem, and negative reactions were obtained for cytochrome oxidase, peroxidase, and some dehydrogenases and esterases. Leaves of narcissus bulbs grown in an ethylene atmosphere had a redistribution of sudanophilic and osmophilic lipids. Lipid materials either moved to or were induced to form in the outermost cells of the leaf under the lower epidermis; and there was an associated change in the distribution of enzymes, particularly the hæmatin enzymes. A redistribution of lipids and enzymes to one side of the leaf appeared to be responsible for the asymmetrical growth associated with ethylene.

By growing plants in lipotropic substances (ethylene, etherized water) the endodermis and hypodermis, notable for their localizations of unsaturated fatty acids and peroxidase[2], were blocked in their normal topographic development. Under ethylene, the lipid–hæm systems that normally impregnate the walls of the endodermis are deposited elsewhere and apparently move outward to the surface of the plant. In roots and stems of castor beans, changes in enzyme pattern and tissue differentiation occurred in the endodermis adjacent to phloem; the endodermis between the vascular bundles contained some unsaturated lipids and associated peroxidase and cytochrome oxidase.

Lipid-bound enzymes of the phloem are apparently in the mitochondria of the sieve tubes and companion cells, but there appears to be a lipid–hæm peroxidase system free in the sieve tubes and not localized in mitochondria. It has been postulated that phospholipids hold functional groups of enzymes[3]; unsaturated lipids apparently hold in close association groups of enzymes that determine the differentiation and location of the endodermis in plants.

The general effect of ethylene and etherized water on plant tissues has been observed[4–7] and an interpretation is now presented of the influence of ethylene on the distribution of lipids, lipid-bound enzymes and resultant tissue differentiation. The breaking of cambial and bud dormancy by ethylene has been supposed to affect the concentration and distribution of auxin; but detection of unsaturated lipids, and microtitration to determine iodine numbers, reveal changes in distribution of unsaturated lipids. Ethylene must be applied prior to the appearance of lipid carbonyl compounds and in advance of normal lipid condensation and polymerization in protoplasts, walls and cellular membranes. The heat-stable lipid-bound peroxidase system of the endodermis may be changed in its differentiation if ethylene is applied in the formative stages of tissue development.

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