#### Research Reports: 1952

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# The Nutrition of the Apical Region of the Pea Root

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Isolated four millimeter root tips excised from germinating pea seeds show good growth on a relatively simple synthetic medium composed of inorganic salts, thiamin and nicotinic acid, and 4% sucrose<sup>1-2</sup>. Although the longer tips usually develop normally on this medium, tips one millimeter or less in length seldom develop on the simple medium. Recent work by R. Brown of England<sup>3</sup> has suggested that, in pea roots, the apical meristem itself is dependent upon metabolites provided by the more mature tissues of the root.

Attempts were made to culture 0.5 millimeter root tips of the pea, **Pisum sativum**, variety Alaska, using a complex nutrient medium. Four millimeter root tips were excised aseptically from pea seeds after 48 hours germination and were transferred to control medium containing 0.5% agar in Petri dishes. After one week of culture in the dark at 25 degrees C., the terminal 0.5 millimeter tip of each root (including approximately 300 microns root cap and 200 microns of the apical meristem) was excised with a sharpened needle under a dissecting microscope. Tips were transferred by needle to modified Syracuse dishes, 27 mm. diameter, containing 1 ml. of the medium to be tested. Eight such dishes were placed in each Petri dish and returned to the culture chamber.

On the control medium, the 0.5 millimeter tips did not grow, but each tip became a rounded mass of small undifferentiated cells. Increasing the concentration of sucrose (6%) or agar (0.5-2.0%) in the medium had no effect on tip

### Research Reports: 1952

growth. The addition of yeast extract (Difco) at a concentration of 1 gram per liter resulted in good growth of these tips during the first week. Preliminary attempts were made to discover the active fraction of the yeast extract. None of the following substances were effective in eliciting tip growth at the concentrations tested: thiamin, nicotinic acid, pyridoxine, riboflavin, calcium pantothenate, biotin, and indoleacetic acid. Preliminary experiments testing the effectiveness of amino acid mixtures were inconclusive. It is anticipated that identification of the substances essential for root tip growth provided by the yeast extract will broaden materially our knowledge of the nutrition of the apical region of the root.

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## Tubular Transport of Phenol Red in the Flounder Kidney\*

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The technique of Forster<sup>1</sup> as modified by Puck et al<sup>2</sup> was used to study 1) self-depression of phenol red as induced by high load/Tm ratios and 2) the influence of carbonic anhydrase inhibitor on acid secretion by the renal tubule.

Teased fragments of winter flounder, Pseudopleuronectes americanus were immersed in an oxygenated, temperature controlled (25°-28°C) electrolyte medium containing the following salts, (mM/L): NaCl 134, KCl 2.5, CaCl<sub>2</sub> 1.5, MgCl<sub>2</sub> 1.0, NaH<sub>2</sub>PO<sub>4</sub> 0.5, NaHCO<sub>3</sub> 40, phenol red 0.056 (2 mg%),

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