mixtures. Unless high concentrations of the micro-organism are used (of the order of 12 mgm. dry wt./5 μM glutathione), detectable quantities of the new materials are not produced and only small quantities of the component amino-acids of glutathione are observed. The new material obtained when glycine is added to the incubation mixture was eluted and shown to behave like γ-glutamylglycine when compared chromatographically with authentic samples of the α- and γ-peptides. This material was obtained in chromatographically pure form, hydrolysed and shown to contain only glutamic acid and glycine.

Transpeptidation to foreign amino-acids added to the incubation mixture has been likewise observed. New materials corresponding to the γ-glutamyl peptides have been obtained with L-methionine, L-valine, L-phenylalanine, L-leucine and L-glutamine. As with the system from kidney, the quantities of new γ-peptides formed are dependent not only on the amount of acceptor amino-acids present, but also on the particular amino-acids in the system; thus, for example, phenylalanine is more active in transpeptidation than leucine as judged by the intensity of paper chromatographic spots. Using concentrations of acceptor amino-acids up to ten times the concentration of glutathione, increasing the amount of amino-acid increased the amount of γ-peptide formed. The abilities to hydrolyse glutathione and cause transpeptidation remain with the supernatant after centrifugation of the extract for 60 min. at 11,000 *g* and are lost on exposing the extract to temperatures of 55° for 10 min. Of the antibiotics known to interfere with protein synthesis in *Staphylococci*[8], terramycin, aureomycin and chloramphenicol had no effect on transpeptidation at levels of 100 μgm./ml.

These experiments demonstrate the presence in bacterial cells of enzymes catalysing transpeptidations of the same type as in mammalian tissues[3]. Although these exchange reactions appear to be widely distributed in Nature, their significance as a potential mechanism of peptide formation remains uncertain.

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Norvaline: a Growth Factor for Excised Tomato Roots

EARLY reports[1] that norvaline, a synthetic amino-acid, was detectable in protein hydrolysates have not been confirmed using modern techniques[2]. No reports are known to me of the detection of norvaline as a free amino-acid in tissues. It has, however, been reported[3] that on addition of α-ketovaleric acid and glutamine to extracts of rat liver, the α-ketovaleric acid was converted to norvaline. A number of other α-keto acids were converted to the corresponding amino-acid by the extract. The conversion to norvaline, therefore, could be attributed to low specificity of the postulated enzyme. In spite of this, it was decided to include DL-norvaline in a series of amino-acids tested for ability to replace pyridoxine in the nutrition of a clone of excised tomato roots. Some nutritional requirements of this clone and the experimental techniques are given elsewhere[4].

Replacement of pyridoxine by norvaline gave approximately 50 per cent of the growth obtained in the presence of pyridoxine. The best concentration was found to be 4×10^{-6} M of the free base. A representative result, using this concentration of norvaline, is shown in Table 1.

Table 1. FINAL LENGTH OF MAIN AXIS PER ROOT (MM.) OF EXCISED TOMATO ROOTS GROWN FOR SIX DAYS IN: MEDIUM (1) WITHOUT PYRIDOXINE; (2) WITH PYRIDOXINE; AND (3) WITH NORVALINE REPLACING PYRIDOXINE. MEANS ARE FOLLOWED BY STANDARD ERRORS AND NUMBERS OF REPLICATES IN BRACKETS

Medium	Length of main axis per root (mm.)
1. Minus pyridoxine, minus norvaline	23·1 ± 1·05 (9)
2. Plus pyridoxine, minus norvaline	97·6 ± 4·24 (9)
3. Minus pyridoxine, plus norvaline	62·0 ± 6·09 (9)

This result has been confirmed on separate occasions and using DL-norvaline from two different sources. Paper chromatography of solutions obtained on autoclaving norvaline, either in water or in the medium, did not reveal any substance with an R_F value, or colour (ninhydrin test), different from those of norvaline. The calculated amount of norvaline per spot on the chromatogram was 125 μgm.

The fact that norvaline may act as a growth factor provides tentative evidence that it is involved in 'normal' metabolism. Whether this is so, and the precise relation of vitamin B_6 to norvaline, is being examined.

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Succinoxidase Inactivation by a Lecithinase in Barley Seedlings

RECENTLY, several investigators[1–6] have isolated mitochondrial fractions from plant tissues which are similar to animal mitochondria in that they are capable of oxidizing all the known substrates of the Krebs citric acid cycle, concomitantly synthesizing adenosine triphosphate from adenylate and inorganic phosphate. However, the oxidative and phosphorylative capacities of mitochondria from different plant tissues vary considerably. For example, mitochondria from oats show much less activity in the oxidation of Krebs-cycle acids than do those from the mung bean; while mitochondria

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