and stability were not affected by GSH, cysteine or mercaptoethanol (all at 1 mM). However, virtually complete loss of activity was effected by 0.1 mM *p*-chloromercuribenzenesulphonate (98% inhibition) and 1.0 mM *N*-ethylmaleimide (95% inhibition).

At pH 7.0 the rates of hydrolysis of the monobromo and moniodo homologues were 140% and 90% respectively of the rate with monochloroacetate.

The approximate molecular weight as determined by chromatography on Sephadex G-100 was 14500.

The enzyme was isolated from the cell-free extract by a six-stage purification. The final specific activity was 120 μ moles/min./mg. of protein. The purified enzyme ran as a single band on disc gel electrophoresis in two buffer systems a pH 9.5 and pH 8.5.

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Extracellular Nitrogen and the Control of Arginine Biosynthesis in *Anabaena variabilis*

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A general feature of the growth of blue-green algae is the liberation into the culture medium of significant amounts of peptides and amino acids (Fogg, 1962). In *Anabaena cylindrica* 30% of the total combined nitrogen was present as extracellular material and the rate of excretion was greatest in rapidly growing cultures (Fogg, 1952). The function of this extracellular material, representing as it does a considerable proportion of the biosynthetic activity of the micro-organisms, is uncertain, although a protective action against polymyxin B has been suggested (Whitton, 1965). We suggest that the widespread presence of extracellular peptides and amino acids may be a consequence of failure to exert control over amino acid biosynthesis. It has been shown that in *Anabaena variabilis* several examples of metabolic control by repression and de-repression of enzyme formation are absent (Pearce & Carr, 1967, 1969). There were a total of 18 amino acids in the supernatant after growth of *A. variabilis* with glutamate as the major constituent (23%); ornithine (3.6%) and arginine

(2.3%) were both present, the latter being entirely peptide-bound. When [U-¹⁴C]arginine (5 μ C; 1 mM) was included in the otherwise autotrophic growth medium, radioisotope incorporation was linear with growth and accounted for 5% of the total cell mass synthesized. Feedback inhibition of *N*-acetylglutamate phosphokinase by its end product arginine has been demonstrated in blue-green algae by Hoare & Hoare (1966), who also observed that *N*-acetylornithine was converted into ornithine by a transacetylase rather than by a deacetylase. Several of the enzymes necessary for the biosynthesis of arginine from glutamate, including *N*-acetylglutamate phosphokinase, *N*-acetylornithine transaminase, *N*-acetylornithine transacetylase, argininosuccinate and ornithine transcarbamoylase, have been measured in extracts of *A. variabilis*. Cell-free extracts prepared from *A. variabilis* grown in the presence and absence of arginine (1 mM) showed no significant differences in the enzymic activities listed above. The catabolism of arginine probably proceeds via citrulline in this organism, using arginine desiminase which is present equally in organisms from autotrophic and arginine-enriched cultures. No urea was detected when arginine was incubated with either type of extract, indicating the absence of arginase although this may be a result of the active urease present. The results presented are comparable with the results on the biosynthesis of branched-chain amino acids, in which end product inhibition but not control over enzyme synthesis was found in this photosynthetic micro-organism. The extent to which lack of control by enzymic repression occurs in other amino acid-biosynthetic routes is under examination.

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A Tyrocidine-Synthesizing Cell-Free Extract from *Bacillus brevis* A.T.C.C. 10068

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The composition of tyrocidine synthesized *in vivo* by *Bacillus brevis* A.T.C.C. 10068 (Mach & Tatum, 1964) or by extracts from *B. brevis* A.T.C.C. 8185 (Fujikawa, Sakamoto, Suzuki & Kurahashi, 1968) is altered by changing the amino acid content of the medium. We have obtained a cell-free extract from *B. brevis* A.T.C.C. 10068 that synthesizes tyrocidine.