Journal of the Marine Biological Association of the United Kingdom Vol 31 No 3 1953

NOTE ON THE ABSORPTION OF ORGANIC PHOSPHORUS COMPOUNDS BY *NITZSCHIA CLOSTERIUM* IN THE DARK

H. W. Harvey, F.R.S.
The Plymouth Laboratory

It has been observed by Chu (1946) that the marine diatom *Nitzschia closterium*, in bacteria-free culture, grows in the light with inositol hexaphosphate as phosphorus source, and with glycerophosphate.

When this diatom is grown with inorganic phosphate as phosphorus source, after having used all the phosphate in the medium, further divisions take place, the cells becoming phosphorus-deficient. Then, on adding phosphate, this is rapidly absorbed by the deficient cells both in the dark and in light (Ketchum, 1939).

Experiments have been made to find whether phosphorus-deficient cells will also increase their phosphorus content in the dark rapidly, if supplied with inositol hexaphosphate or with glycerophosphate.

Absorption of Inositol Hexaphosphate

A bacteria-free culture of *N. closterium*, obtained by subculturing after successive growths in media containing penicillin and streptomycin (Spencer, 1952), was grown in artificial light. Two days after the phosphate in the medium had been used by the diatom cells, equal volumes were transferred to centrifuge tubes. To each tube was added a solution containing 31 μg. P as the sodium salt of inositol hexaphosphate together with inorganic phosphate present as impurity.

One set of tubes was centrifuged at once and the liquid drained from the deposits of diatom cells, whose phosphorus contents were determined.

A second set of tubes was stored for 3 hr. in darkness, before centrifuging and determining the phosphorus content of the cells.

A third set of tubes was illuminated for 3 hr.

	Micrograms P in cells	
	Exp. I	Exp. II
Cells separated by centrifuging immediately after addition of organic phosphorus*	13·5	19
After 3 hr. storage in darkness†	35	42
After 3 hr. illumination	40	45

* The centrifugate contained 10 μg. phosphate-P.
† The centrifugate then contained 1·5 μg. phosphate-P.

Hence the increase in cellular P after 3 hr. darkness was twice as much as could have been supplied by the inorganic phosphate in solution, and indicates that 10–12 μ of organic P had been absorbed. The experiment does not indicate whether the organic phosphate was absorbed as such or converted by extracellular enzyme action to inorganic phosphate before absorption. However, a subsequent experiment using cells which were not phosphorus-deficient indicated very little, if any, conversion of inositol hexaphosphate to inorganic phosphate during 3 hr. storage in the dark.

Absorption of Glycerophosphate

A similar experiment was made in which (synthetic) glycerophosphate containing 45 μg was added to each tube containing equal volumes of phosphorus-deficient *Nitzschia* cells in suspension.

	Micrograms P in cells
Cells separated by centrifuging immediately after addition of glycerophosphate*	7·5
After 3 hr. storage in darkness	18
After 3 hr. illumination	20

* The centrifugate contained 3·3 μg. inorganic phosphate-P derived from impurity in the glycerophosphate.

This experiment indicates absorption of glycerophosphate as rapidly as of inositol hexaphosphate.

The sodium salt of inositol hexaphosphate was kindly supplied by Messrs Ciba Ltd.

REFERENCES

Chu, S. P., 1946. Utilization of organic phosphorus by Phytoplankton. *Journ. Mar. Biol. Assoc.*, Vol. 26, pp. 285–95.

Ketchum, B., 1939. The development and restoration of deficiencies in the phosphorus and nitrogen composition of unicellular plants. *Journ. Cell. Comp. Physiol.*, Vol. 13, pp. 373–81.

Spencer, C. P., 1952. On the use of antibiotics for isolating bacteria-free cultures of marine phytoplankton organisms. *Journ. Mar. Biol. Assoc.*, Vol. 32, pp. 97–106.