BACTERIAL ACCUMULATION OF RIBOSE AND RIBOSE-5-PHOSPHATE

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Comparatively little is known about the accumulation of ribose or ribose-5-phosphate (R-5-P) in broth cultures of microorganisms.

In the fermentation broth of an unidentified bacterium using a medium containing glucose, yeast extract, urea and minerals, a significant accumulation of R-5-P or ribose was observed. As shown in Table 1, R-5-P is accumulated in the broth as much as 7 g per liter. Ribose or R-5-P was

Table 1. Production of ribose and ribose 5-phosphate.

		3rd day		5th day	
Metal concentration %	%	Ribose mg/ml	R-5-P mg/ml	Ribose mg/ml	R-5-P mg/ml
None	—	—	4.8	—	7.4
Fe ⁺⁺	0.05	0.7	—	1.2	—
Mn ⁺⁺	0.0005	1.5	—	1.9	—
"	0.005	2.4	—	3.8	—
"	0.05	3.6	—	5.2	—
"	0.1	3.0	—	3.4	—
"	0.5	—	—	—	—
Co ⁺⁺	0.05	—	—	—	—
Cu ⁺⁺	"	—	—	—	—
Zn ⁺⁺	"	+	—	+	—
Mo ⁺⁺	"	—	—	—	—
Pb ⁺⁺	"	—	—	—	—
Hg ⁺⁺	"	—	—	—	—
Ni ⁺⁺	"	—	—	—	—

Medium composition:

glucose 10%, yeast extract 1%, urea 0.6%, KH₂PO₄ 1.0%,

K₂HPO₄ 1%, MgSO₄·7H₂O 1.0%, CaCl₂·2H₂O 0.01%.

Ribose and R-5-P were determined by the modified method of J. B. Pridham (1), and also by the orcinol-HCl method after the treatment by anion exchange resin.

identified by conventional analytical methods and compared with authentic samples of the Nutritional Biochemical Corporation. The following characteristics were examined: Rf values by several paper chromatograms, colorimetric determination of ribose and phosphorus, optical rotations, melting points of ribose and its *p*-bromophenylhydrazone and the release of ribose and phosphate by 5'-nucleotidase of wheat germ.

In order to promote the efficiency of R-5-P production, the effects of heavy metal ions in the medium were examined. These experiments showed that most metal ions tested were markedly inhibitory to R-5-P production. However, in the presence of Mn^{++} ion, ribose instead of R-5-P accumulated in amounts reaching to ca. 5 g per liter. These results are summarized in Table 1. Heavy metal ions such as Fe^{++} and Zn^{++} exhibited actions similar to Mn^{++} , but they were less effective.

On the other hand, when Mn^{++} was added after 24 hr of cultivation, R-5-P accumulated instead of ribose. These results suggest that Mn^{++} ion affects the sugar metabolism at a comparatively early stage of the fermentation. However, much remains to be studied on the function of Mn^{++} in the sugar metabolism of this organism.

Furthermore, another phosphoric acid ester of ribose was detected in the fermentation broth in the absence of Mn^{++} and identified as phosphoribosyl pyrophosphate (PRPP) by paper chromatography.

It is, therefore, presumed that R-5-P production may have a close relationship to PRPP which is a key intermediate in nucleotide biosynthesis.

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REFERENCE

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