

The formation of spermidine from spermine by serum amine oxidase

The naturally occurring polyamines, spermine and spermidine, are known to be oxidized by an amine oxidase present in beef or sheep serum¹. The oxidation products obtained by the action of amine oxidase on spermine or spermidine are known to inhibit the growth of *Mycobacterium tuberculosis*². The mechanism of the oxidation of polyamines by serum has not yet been elucidated, and different assumptions exist as to the nature of the growth-inhibiting products. TABOR *et al.*¹, using purified enzymic preparations, suggested that spermine is first converted into spermidine, which is then further oxidized. CARVAJAL AND CARVAJAL³ proposed a different mechanism, in which spermidine does not appear as an intermediate in spermine oxidation.

During our studies of the inhibitory effect of spermine on the growth of *M. tuberculosis* we were able to show that an amine with an R_F value of 0.13, corresponding to that of spermidine, was formed by the action of serum amine oxidase on spermine. Quantitative determinations of spermidine and spermine were carried out⁴ at different time intervals. Results illustrated in Fig. 1 show that after 120-min incubation of

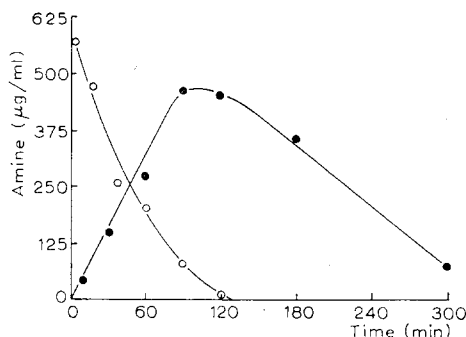


Fig. 1. Formation of spermidine from spermine. 20 μ moles spermine tetrahydrochloride were incubated with 2.4 ml sheep serum and 8.6 ml tris-(hydroxymethyl)aminomethane buffer, pH 6.8. Aliquots were analyzed by quantitative paper chromatography at various time intervals. ○, spermine; ●, spermidine.

spermine with sheep serum, almost all original spermine disappeared. A close correlation was found to exist between the rate of spermidine formation and spermine oxidation, pointing to the possibility that spermine is converted to spermidine during the initial steps of polyamine oxidation by serum amine oxidase. If this is correct, a marked similarity exists between the mechanism of polyamine oxidation by serum amine oxidase and polyamine degradation by bacteria, for both *Pseudomonas aeruginosa*⁵ and *Mycobacterium smegmatis*⁶ convert spermine into spermidine at the initial step of the oxidation.

Department of Clinical Microbiology,
Hebrew University-Hadassah Medical School, Jerusalem (Israel)

U. BACHRACH
RUTH BAR-OR

¹ C. W. TABOR, H. TABOR AND S. M. ROSENTHAL, *J. Biol. Chem.*, 208 (1954) 645.

² J. G. HIRSCH, *J. Exptl. Med.*, 97 (1953) 327.

³ G. CARVAJAL AND E. J. CARVAJAL, *Am. Rev. Tuberc. Pulmonary Diseases*, 76 (1957) 1094.

⁴ K. V. GIRI, A. N. RADHAKRISHNAN AND C. S. VAIDYANATHAN, *Nature*, 170 (1952) 1025.

⁵ S. RAZIN, I. GERY AND U. BACHRACH, *Biochem. J.*, 71 (1959) 551.

⁶ U. BACHRACH, S. PERSKY AND S. RAZIN, in preparation.

Received January 8th, 1960