THE FUNCTION OF D-ARABOASCORBATE IN THE DIRECT OXIDATION OF GLUCOSE

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It could be deduced from the results of McNAIR SCOTT AND COHEN[1] that D-araboascorbate (possibly as the phosphorylated derivative) might be a long sought intermediate in the oxidative decomposition of D-gluconate-6-phosphate into pentose phosphate, this reaction mechanism being largely unknown.

We have studied the oxidation of D-araboascorbate by testing cells of a strain of *Aerobacter sp.*, possessing the enzyme system for the direct oxidation of glucose[2,3].

Fig. 1 demonstrates that these bacteria oxidize D-araboascorbate only extremely slowly and to a limited extent (about 10% of the theoretical maximal oxygen uptake), which is probably due to some impurity. In phosphate buffer the auto-oxidation proceeds with uptake of 1 mole O_2, beyond the formation of dehydro-D-araboascorbate (curve *D*). This auto-oxidation is greatly inhibited by the presence of heat-inactivated cells (30 minutes at 100° C) (Curve *E* and *F*). These results make it highly improbable that D-araboascorbate or its phospho-derivative is an intermediate for this part of carbohydrate metabolism. Curve *A* shows the vigorous respiration of a substrate (gluconate) which gives rise to intermediates of the direct oxidation scheme.

When supplied as sole carbon source to a synthetic culture medium, D-araboascorbate hardly provokes growth of several *Aerobacter* strains and one *Klebsiella*.

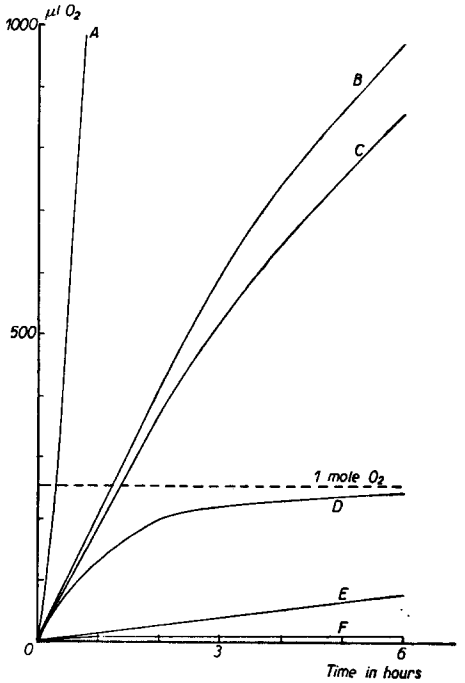

Fig. 1. D-araboascorbate as a substrate for respiration by *Aerobacter sp.* Each Warburg flask contains: 0.5 ml *M*/15 phosphate buffer pH 7; 1.4 ml bacteria (25 mg dry weight), heat-inactivated bacteria or water, as stated below; 0.1 ml *M*/10 substrate or water as stated below.

Curve *A*: buffer, bacteria, Na gluconate
Curve *B*: buffer, bacteria, Na D-araboascorbate
Curve *C*: buffer, bacteria, water
Curve *D*: buffer, water, Na D-araboascorbate
Curve *E*: buffer, heat inactivated bacteria, water
Curve *F*: buffer, heat inactivated bacteria, Na D-araboascorbate.

The metabolism of dehydro-D-araboascorbate is more complex. At pH 7 the lactone ring is opened, yielding a reducing substance which is theoretically 2,3-diketomannonate. Chromatographic analysis according to MAPSON AND PARTRIDGE[4] shows in addition the presence of a substance, reducing cold silver nitrate-ammonia, with an R_F of 0.54, representing an unidentified reduction. This mixture of at least three substances is respired by the bacteria with uptake of about 1 mole O_2, followed by a further slow oxygen uptake. These results point to a pathway of dehydro-D-araboascorbate metabolism which is seemingly quite unrelated to the direct oxidation system.

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REFERENCES

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