Distribution of Monoamine Oxidase in Tissues of Skipjack

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Monoamine oxidase (MAO) [amino : oxygen oxidoreductase (deaminating, flavin-containing) EC 1.4.3.4] catalyzes the oxidative deamination of various amines in the presence of oxygen. In higher animals, it is firmly bound to the outer mitochondrial membrane and is thought to exist in many tissues in two functional forms, type A and B.1—3) Johnston1) and Squires2,3) have observed two types of MAO activity with differing sensitivities to inhibitors in intact mitochondria from several species. One activity (MAO-A) is sensitive to the harmala alkaloids and deprenyl; the other (MAO-B) is sensitive to pargyline and deprenyl. MAO-A has also been reported to be more active towards norepinephrine, dopamine, and serotonin, whereas MAO-B is more active with benzylamine as a substrate.3)

Mitochondrial MAO has been observed in a variety of mammalia,4—7) but there are few records about MAO in fish.

This paper reports the distribution of MAO in several tissues of skipjack.

Tissues of skipjack were homogenized with 3 volumes of 50 mm sodium phosphate buffer (pH 8.0) containing 0.2 mm EDTA. The homogenate was centrifuged at 28,800 × g for 30 min. The precipitate was dissolved in 3 volumes of 50 mm sodium phosphate buffer (pH 8.0) containing 1.0% (w/v) Triton X 100. After gentle stirring for 2 h, the solution was centrifuged at 225,000 × g for 1 h and the supernatant used as the source of the enzyme. Triton X-100 was removed from the supernatant by means of Bio-Beads SM-2 previously equilibrated in 10 mm sodium phosphate buffer (pH 8.0) containing 0.2 mm EDTA and 1 mm DTT. After the Bio-Beads were washed with the same buffer, the filtrate and washings were combined and this solution was used as a crude enzyme solution.

MAO activity was measured spectrophotometrically by monitoring the increase in absorbance at 314 nm on the oxidation of kynuramine with the formation of 4-hydroxyquinoline.8) The measurements were carried out at 25°C in 50 mm sodium phosphate buffer, pH 8.0 containing 0.2 mm kynuramine, 10 μM deprenyl or 10 μM clorgyline and 0.1 ml of the enzyme preparation in a total volume of 1 ml.

One unit of enzyme activity was defined as the activity which produces 1 nmol of 4-hydroxyquinoline per min under these assay conditions.

Table 1 shows MAO activity in 8 tissues of skipjack. In terms of the total MAO activity, the kidney and liver exhibited the highest activity, and the intestine displayed a comparatively high activity, while the stomach and pyloric caeca showed low activity. On the other hand, activity was not detected in the spleen. In MAO-A, the kidney showed the highest activity while the heart and pyloric caeca showed little activity. No MAO-A activity was found in the stomach or spleen. Although the kidney also showed the highest activity in MAO-B, no detectable activity was found in the heart.

In the present investigation, high MAO activity was detected in the kidney, while MAO-A activity was twice as much as the MAO-B activity in the liver.

Thus, MAO activity was detected in many tissues. It is necessary to separate the two MAO and to investigate their detailed characteristics.

References