

SHORT REPORTS

5-S-Cysteinyldopa, Dopa, and Dopamine in the Kidney and Some Other Tissues

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Abstract. 5-S-Cysteinyldopa, dopa, and dopamine levels were determined by HPLC and electrochemical detection in serum, urine, kidney, spleen, heart, and sympathetic ganglion of guinea-pig. The kidney showed high levels of 5-S-cysteinyldopa, but also of dopa and dopamine, thus demonstrating the role of the renal tissue in the excretion of these substances. The concentrations found in spleen and heart may indicate specific catechol-containing structures in these organs.

Key words: 5-S-Cysteinyldopa; Dopa; Dopamine; Kidney; Spleen; Heart; Sympathetic ganglion

5-S-Cysteinyldopa is an amino acid which is formed in the melanocyte by the addition of cysteine to dopaquinone produced by the oxidation of dopa. In contrast to dopa, 5-S-cysteinyldopa is not decarboxylated enzymatically in the body (2). Part of 5-S-cysteinyldopa formed in the melanocyte is used for pigment production, but another part is excreted from the cell and reaches the circulation. A sensitive method for quantitation of 5-S-cysteinyldopa in serum has recently been described (3).

Dopa is also a product of the melanocyte, but since this amino acid is formed in the nervous system and in the adrenals as well and since dopa is decarboxylated, it is more difficult to get an idea of melanocyte metabolism by studying dopa in serum or urine.

The renal plasma clearance of 5-S-cysteinyldopa is high (1) and the amount of 5-S-cysteinyldopa in the urine reflects the rate of dopa oxidation of the melanin-forming cells (4).

Since the kidney plays an important role in the excretion of 5-S-cysteinyldopa, an investigation into the renal concentration of this amino acid is of evident interest. For comparison, the levels of dopa and its decarboxylation product dopamine were also determined.

Certain other tissues not considered of importance in the metabolism of 5-S-cysteinyldopa were also analysed.

MATERIAL AND METHODS

Four guinea-pigs with red-yellow hair were used. They were killed by a blow on the neck and the blood was collected from the jugular vessels. Urine was obtained by pressure on the bladder. Kidneys, heart and spleen were taken from all animals and the cervical sympathetic ganglia from one animal.

Tissues were homogenized in 0.4 M perchloric acid and, after centrifugation at 15000 r.p.m. for 10 min, the extracts were filtered.

Serum and urine were precipitated with 1/10 volume 4 M perchloric acid, centrifuged at 15000 r.p.m. and then filtered.

5-S-Cysteinyldopa, dopa and dopamine were adsorbed to Al_2O_3 at pH 8.6, eluted with 0.6 ml M perchloric acid and then determined by HPLC and electrochemical detection (3).

RESULTS AND COMMENTS

Levels of 5-S-cysteinyldopa, dopa and dopamine are given in Table 1. It is evident that the kidney, in excreting 5-S-cysteinyldopa, also contains large amounts of this amino acid. The level of 5-S-cysteinyldopa in the kidney indicates a definite role for the tubular epithelium in the processing of this amino acid.

The concentration of 5-S-cysteinyldopa in the kidney is much higher than in serum, as also are the dopa and dopamine concentrations. Dopamine values in the urine are high, which may be explained by effective renal plasma clearance and also by renal decarboxylation of dopa.

The level of 5-S-cysteinyldopa in the heart is of the same order as in serum, but is somewhat higher in the spleen than in serum. This may reflect binding of 5-S-cysteinyldopa to special proteins or cells

Table 1. 5-S-Cysteinyldopa, dopa, and dopamine in tissues and body fluids (ng/g)

Guinea-pig	Kidney			Urine			Serum			Heart		
	5-S-CD	Dopa	DA	5-S-CD	Dopa	DA	5-S-CD	Dopa	DA	5-S-CD	Dopa	DA
1	230	3.0	2.1	63	4.9	17	7.2	1.6	0.0	0.0	6.2	9.4
2	130	3.0	3.5	120	1.0	71	2.6	0.7	0.5	2.5	7.9	13
3	100	17	3.8	23	2.6	14	2.1	0.6	0.3	2.0	4.6	22
4	140	6.9	6.2	-	-	-	3.9	0.5	0.5	4.1	4.6	17

in this organ. The possibility of some aberrant melanocytes should also be considered.

The levels of dopa and dopamine in heart and spleen are high compared with those in serum and here their localization to special structures that can decarboxylate dopa is the likely explanation for the concentrations observed.

The cervical ganglion analysed from one guinea-pig contained 25 ng dopa/g tissue, but no 5-S-cysteinyldopa or dopamine.

The results obtained illustrate the important role of the kidney in the excretion of 5-S-cysteinyldopa, having tissue levels of the same order as for the urine, and far above the serum levels. The concentrations of the different catechols in the spleen and in the heart indicate the presence of specific catechol-containing structures in these organs. The results obtained show that our method offers new possibilities of investigating dopa metabolism in the body.

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Nuclear DNA-Polymerase Estimation in Human Epidermal Cells

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Abstract. A new technique which detects the presence of DNA-polymerase and primer-template DNA by measuring the incorporation of ³H-thymidine-5'-triphosphate (³H-TTP) showed nuclear labelling of enzymatically liberated epidermal cells of human skin.

Key words: Nuclear DNA-polymerase; Human epidermal cells

Two different types of DNA-polymerase have been demonstrated (7), viz. one cytoplasmic of high molecular weight, 3S. Variations in both the high molecular weight and low molecular weight DNA-polymerase have been shown during the cell cycle, with an increase correlated to DNA synthesis (2, 10). Ooka & Dailie (9) found variations in both the nuclear and the cytoplasmic DNA-polymerase during the cell cycle in synchronized KB cells and suggested that the cytoplasmic 8.3S DNA polymerase may simply be a storage form of the enzyme from which the 3.4S DNA-polymerase can be formed when needed for DNA synthesis. These