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STUDY OF PURIC AND PYRIMIDIC COMPOUNDS IN URINE  
OF RABBITS AND RATS AFTER IRRADIATION

by

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Abstract:

A chromatographic technic is described to study the urinary excretion of nucleic acid catabolite after irradiation. The results obtained for those metabolites that the chromatographic method had shown to change after irradiation are presented for animals uric acid and hippuric acid.

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The urinary excretion of nucleic acid catabolite after irradiation has already been studied by several authors, most of them being interested in bases and nucleosides only.

We think, we are the first to have undertaken a comprehensive study of the whole of puric and pyrimidic metabolites and their variations following irradiation.

A chromatographic technique has been developed to that purpose and the results obtained for those metabolites that method has shown to change after irradiation are presented for many animals

The substances retained by the resin are eluted by a gradient of different molarities (HCOOH - HCOONa)

Twenty two hours' chromatograms of standard nucleotides have allowed to determine the elution time of some twenty compounds.

Elution time	peak
0 to 45 minutes	puric and pyrimidic bases nucleosides and desoxynucleosides creatinine
50 minutes	d. CMP
55 minutes	C.M.P.
1 h. 20	NAD
3 hours	5' AMP - 5' d.AMP
3 h. 15	2' AMP
3 h. 40	3' AMP
4 h.	3' 5' AMP
5 h.	hippuric acid
8 h.	G M P
9 h.	N A D P
10 h.	U.M.P.
12 h. 30	ADP - U. DPG
14 h.	FMN
16 h.	GDP - UDP
17 h.	ATP
20 h.	UTP
21 h.	GTP

The contours of the chromatograms of biological liquids are less sharply outlined than standard chromatogram contours.

After undoubtable identification of the peaks by specific methods, it is possible to say that there are noticeable quantitative differences between normal and post exposure condition

in rats and rabbits delivered supra-lethal dosis of  $^{60}\text{Co}$  gamma rays.

Compounds identified	Variations after irradiation	
	24 h.	48 h.
Puric and Pyrimidic Bases, nucleosids and desoxynucleosids. Amino-Acids.	↑↑↑	↑↑
Uric acid	↑↑↑	↑↑
?	↓	
3'5' AMP ?	↓	↑↑
Hippuric acid	→ ○	→ ○

On the basis of these results a few metabolites varying after exposure have been studied.

Measurements have been made on a large number of animals with the respective methods.

Uric acid is changed by the specific uricase enzym into allantoin which will reduce  $\text{H}_2\text{O}_2$  in presence of an indicator which can be detected at 440 n.m.

Acid hippuric is determined by fluorescence in sulfuric acid at excitation wavelength of 260 n m, and measurement wavelength 370 n m.

As early as 1904 an increase of urinary uric acid has been noticed after exposure in irradiated patients, dogs, rabbits and rats.

Our results are in a good agreement and our measurements on some 30 rats (L D 100%/10 D and L D 20%/30 D) are summarized in tables 3 and 4

L.D. 100% / 10 D

	Excretion uric acid mg/24 h.	$\sigma$	n
Normal	1.77	0.78	83
D + 1 post	2.48	0.05	5
D + 2 exposure	0.74	0.28	5
D + 3	1.24	1.07	5
D + 4	1.31	0.44	4
D + 5	0.95	0.47	4
D + 6	0.95	0.47	4
D + 7	3.22	2.41	3
D + 8	1.22	0.69	2

- Table 3 -

L.D. 20% / 30 D

	Excretion uric acid mg/24 h.	$\sigma$	n
Normal	1.7	0,76	234
D + 1 )	2.29	1.1	9
D + 2 ) fast	1.48	1.032	9
D + 3 ) time	0.87	0.39	9
D + 4 post	3.37	1.57	9
D + 2 exposure	2.27	0.59	9
D + 3	1.9	0.8	9
D + 4	0.98	0.39	9
D + 5	1.67	0.65	8
D+6 - D+7	1.45	0.51	9
D + 8	2.41	1.6	9
D + 9	2.09	1.34	9
D + 10	1.78	0.6	7
D + 11	2.09	0.7	7

- Table 4 -

A increase of uric acid is noticed on the 1<sup>st</sup> day after exposure (about 50%) followed by a decrease on the second day down to a level much lower than normal, then there occurs an increase to the initial value for lot II, and a very high value for animals dying from irradiation, usually on the preceding death.

A significant decrease of hippuric acid is noticed after exposure (by a factor 5). (Tables 5 and 6). The decrease of Hippuric acid can be compared with the decrease induced by a complete fast (table 6) (the animals do not want food after exposure).

L.D. 100% / 20 D

	excretion Hippuric acid mg/24 h.	$\sigma$	n
Normal	19.81	4.59	59
D+1 after expo- sure	4.10	3.59	5
D + 2	6.43	8.6	5
D + 3	7.88	10.55	5
D + 4	12.23	9.24	5
D+5 - D+6	25.05	17	4
D + 7	34.13	28	3
D + 8	28	6	2

- Table 5 -

L.D. 20% / 30 D

	excretion Hippuric acid mg/24 h.	$\sigma$	n
Normal	10	3,3	130
Fast time			
D + 1	6,1	3	5
D + 2	2,1	1,7	5
D + 3	0,6	0	2
After exposure			
D + 1	6,3	2,7	5
D + 2	6,4	0,8	5
D + 3	5,5	2,2	5
D + 4	5,2	1,1	5
D + 5	9,1	2,6	5
D+6 - D+7	9,6	4,4	4
D + 8	12,5	5,2	5
D + 9	9,9	3,4	4
D + 10	11,75	1,6	4
D + 11	12,8	5,2	3

- Table 6 -

However, excretion of Hippuric acid seems to be decreased by factor 2 in surviving rats, no secondary increase was observed in the fasting animals, as noticed in the animals dying after exposure.

The results on urinary excretion of Hippuric acid and Uric acid allow to conclude that, they are highly influenced by  $\gamma$  exposure.

Fasting plays in the same way as exposure for Hippuric acid (lower excretion) and in the opposite way for Uric acid (lower excretion in fasting rats increased excretion after exposure).

However these effects do not allow to predict the fate of the animals death or survivals.