

Reprinted from Pakistan Journal of Biochemistry, Vol. V, No. 2, December, 1972

Relative Constancy of Urinary Creatinine and Urochrome

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Published by:

THE PAKISTAN SOCIETY OF BIOCHEMISTS, LAHORE

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(Received 16 June, 1972)

The daily urinary excretion of creatinine and urochrome has been examined in 25 normal subjects over a period of 6 days. The excretion of both creatinine and urochrome do not seem to show any constancy in the same individual or among subjects.

It is difficult to obtain with certainty a 24 hour urine sample for analysis. Since the daily excretion of creatinine is regarded as being constant, the estimation of urinary constituents is often related to the creatinine output. Folin¹ established that the amount of creatinine in urine is an index of muscle mass, constant per individual and independent of diet. Shaffer² concluded that the amount of creatinine excreted is constant not only from day to day but also from hour to hour and the amount is independent of the total volume of urine and total nitrogen. However, recent work showed wide variation in mean creatinine output in urine. This may be attributed to the diet, physical activity, emotional state and other factors (Young & Scrimshaw,³ Paterson,⁴ and Fisher⁵).

Urochrome, the chief pigment in urine, has been shown to be constant per individual, a measure of basal metabolism, and independent of protein intake (Drabkin⁶ and Dombrowski⁷). The colorigenic foods like chocolate, coca etc. may affect the amount of urochrome in the urine (Mitchell *et al.*⁸).

The present experiment was designed in an attempt to find out whether the excretion of urochrome is more constant than that of creatinine.

MATERIALS AND METHODS

Twenty-five subjects 19 females and 6 males were chosen for the experiment. The food pattern for the duration of the experiment has been on a normal regimen. Their 24 hour urine samples were collected over a period of 6 days. The urine was filtered to remove turbidity. Creatinine was estimated by Jaffe's picrate method and urochrome was determined by comparison of depth of colour with an arbitrary standard of potassium chromate.

RESULTS AND DISCUSSION

Values of creatinine and urochrome output of 25 subjects are expressed as mean, lean body mass and body weight to the power $\frac{3}{4}$ (Table 1). The means of all the co-efficient of variation of all the 25 subjects give a measure of the daily variations of each subject. The mean values of body weight to the power $\frac{3}{4}$ & lean body mass give a measure of the variation between subjects. Table 2 gives the comparative figures of variations of absolute mean of three different experiments with their *S.D.* and *C.V.* of creatinine output per minute in milligrams.

Doubt has arisen about the validity of the classical concept of the constancy of 24 hour creatinine output. In an investigation

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TABLE 1.—Mean Values of Creatinine and Urochrome Output of 25 Subjects.

	Value	Lean body mass/ Kg. body weight	Body weight $\frac{3}{4}$
Creatinine	Amount (mg)	1145	53.8
	S. D.	± 335	± 14.6
	C. V.	29	25
Urochrome	Amount (units)	293	13.5
	S. D.	± 58	± 2.7
	C. V.	20	20.6

S. D.=Standard Deviation.

C. V.=Co-efficient Variation

TABLE 2.—Urinary Creatinine Output per minute in 24 hour Sample.
(Values expressed in milligrams).

	No. of subjects	Sex	Mean	± S.D.	C. V.
Arroyave ⁹	24 adults	12 ♂	1.13	0.12	10.6
		12 ♀	0.68	0.09	13.2
Edward, <i>et al</i> ¹⁰	4 adults	♀	0.80	0.09	11.2
This experiment figures	25 adults	6 ♂	1.06	0.15	14.0
		19 ♀	0.67	0.11	16.4

tion into the relative constancy of 24 hours creatinine and urochrome output in urine, the results proved a marked variation in the daily output of both creatinine and urochrome and the pattern of excretion for all the subjects seem to vary widely from day to day. Though the study was done only for 6 days, it nevertheless supports the view expressed by Paterson⁴, and Edwards *et al.*¹⁰ who concluded that the 24 hour urinary creatinine is not sufficiently constant. The amount of creatinine formed and excreted by an individual in 24 hours is probably the result of various factors such as Lean Body Mass, normal balance, mental state, exercise and the fluid and salt balance of the tissues. Variations or alterations of any of these factors mentioned may bring about a big change in the amount of creatinine excreted. In the case of urochrome this experiment clearly contradicts the theory put forward by Drabkin⁶ & Dombrowski⁷ regarding the constancy of urochrome in

any individual. The findings of this experiment also do not agree with Ostow and Philo¹¹ who showed that hourly urochrome excretion is fairly constant in a given subject. More work should be done especially on urochrome before a conclusive evidence, that both creatinine and urochrome are not constant or one is more constant than the other, can be put forth. At the present time there is no agreement as to the constancy of both creatinine and urochrome.

It may be concluded that in any one subject creatinine output is less variable than urochrome, though both do not seem to show any definite constancy during the 6 day collection period. As a general measure for any individual, urochrome seems to be more constant than creatinine. The results provide information on the likely error involved in basing analysis or urinary solutes in random samples of urine on creatinine or urochrome.

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