

Studies on Urinary Steroids of Men Born and Living at High Altitude.* (26930)

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(Introduced by Alberto Hurtado)

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Sea level residents when exposed to high altitude conditions show a variety of physiological changes(1), among them elevation of the urinary steroids(2). It is not known whether high altitude natives, who also show many adaptative responses to hypoxia, likewise have changes in adrenal function. The present study was undertaken in an attempt to answer this question.

Methods. The urinary steroids of 2 groups of young, adult males were studied: one group was formed of medical students born and living at sea level, and the other of men born 10,000 feet above sea level and having lived for more than a year in Morococha, Perú (14,900 feet). Urinary determinations of steroids were performed as follows: 1)

without any medication; 2) after intravenous administration of 100 mg of cortisol (10 ml of Solu-Cortef, Upjohn) at 8 a.m.; and, 3) for 2 days in which dexamethasone was injected intravenously in a dose of 2 mg (8 a. m. and 8 p. m.). "Free" and conjugated 17,21-dihydroxy-20-ketosteroids were measured in the urine by the method of Silber and Porter(3), using ethyl acetate instead of chloroform for extraction and redissolving in ethanol prior to color reaction after evaporation to dryness(4). Beef liver B-glucuronidase (Ketodase Warner Chilcott) was used for hydrolysis. Urinary 17-ketosteroids were measured by the method of Vestergaard(5). In both methods, Allen's correction(6) was employed.

TABLE I. Urinary Excretion of 17-ketosteroids and 17,21-dihydroxy-20-ketosteroids in High Altitude and Sea Level Natives.

	17-ketosteroids, mg	17,21-dihydroxy-20-ketosteroids		
		“Free,” mg	Conjugated, mg	% of conjugated
Untreated subjects—24 hr				
Sea level (27)	12.87 ± 4.09†	.52 ± .25*	5.05 ± 2.28*	90.7 ± 3.16*
High altitude (27)	11.56 ± 3.03†	.50 ± .20*	5.09 ± 1.53*	91.2 ± 2.50*
0-12 hr after inj. of 100 mg cortisol				
Sea level (10)	7.69 ± 3.66*	3.76 ± .75*	24.82 ± 5.19*	86.4 ± 3.60*
High altitude (7)	8.11 ± 1.99*	3.74 ± .81*	24.16 ± 4.51*	86.5 ± 4.20*
12-24 hr after inj. of 100 mg cortisol				
Sea level (10)	6.73 ± 2.76*	.18 ± .09*	2.71 ± .75‡	93.7 ± 1.39*
High altitude (7)	6.49 ± 2.79*	.19 ± .02*	2.21 ± .88‡	93.2 ± 1.50*
1st day of Dexamethasone admin.				
Sea level (10)	8.72 ± 1.84†		2.84 ± .60*	
High altitude (13)	7.31 ± 2.31†		2.67 ± .61*	
2nd day of Dexamethasone admin.				
Sea level (10)	6.19 ± 1.55*		1.37 ± .42§	
High altitude (13)	5.88 ± 2.36*		1.21 ± .54§	

Figures are means ± stand. dev. No. in parentheses indicate No. of subjects in each experiment.

* P > .50.

† P < .20 > .10.

‡ P < .30 > .20.

§ P < .50 > .40.

|| Only values of conjugated 17,21-dihydroxy-20-ketosteroids are given because Dexamethasone is mainly excreted in the "free" form(7).

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Results and comments. There were no differences in urinary excretion of steroids between the unmedicated sea level and high altitude groups (Table I). These results agree with the findings of San Martin *et al.*(2). The quantitative similarities in the 2 groups of urinary excretion of 17,21-dihydroxy-20-ketosteroids indicated that the yields of these catabolites were identical, without, however, giving information about relative rates of production and catabolism of cortisol and cortisone in the 2 groups. The amount of injected cortisol appearing in the urine in the following 24 hours, as Porter and Silber chromogens, was the same in high altitude and sea level groups (Table I). These results and the equivalence in percent of steroid conjugation (Table I) suggested that the catabolism was the same in both groups. The similar steroid excretions reflected, therefore, similar production of cortisol by the adrenal cortex (It is assumed here that the administered cortisol is catabolized in the same manner as the endogenous one). Dexamethasone decreased urinary excretion of steroid, but did not differentiate the sea level and high altitude groups (Table I). These findings showed that rates of production of cortisol and cortisone of both groups were identical when endogenous ACTH was inhibited; and,

therefore that the similarities between both groups were not promoted by ACTH stimulation but rather depended upon the adrenal cortices themselves.

Summary. No differences were found in urinary excretion of steroids between sea level and high altitude natives. The data indicated further that the catabolism of cortisol was the same in both groups. Inhibition of endogenous ACTH by Dexamethasone did not affect urinary excretion of steroids differently in the 2 groups.

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Effect of Vitamin B₁₂, Unsaturated Fat and Hydrolyzed Glucosecycloacetate on Bile Acid Excretion in Experimental Hyperlipemia.* (26931)

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Many workers have reported that cholesterol administered to animals is metabolized and eliminated mostly as bile acids(1-3). The effect of different food fats on elimination of the bile acids has also been studied. Haust and Beveridge(4) demonstrated an increased output of bile acids in the feces of human subjects receiving corn oil in the diet as com-

pared to those receiving butter fat. Srikantia and Gopalan(5) have recently shown that fecal output of bile acids in human subjects receiving unsaturated fat is higher than in those receiving saturated fat. Recent work of Gordon *et al.*(6) supports the view that hypocholesterolemic effect of sunflower oil is associated with an increase in fecal output of bile acids. As the unsaturated fats are known to lower the higher cholesterol levels of the serum and tissues, it is reasonable to assume that unsaturated fat may lower serum

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