

Concentration of Thiocyanate and Ionizable Iodine in Saliva of Smokers and Nonsmokers

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A total of 27 smokers and 92 nonsmokers were analyzed for salivary thiocyanate and ionizable iodine concentrations. Smoking statistically increased the amount of thiocyanate and decreased that of iodine in the saliva samples significantly. Male smokers had significantly more thiocyanate and less ionizable iodine in saliva than female smokers.

Fischmann and Fischmann¹ analyzed the thiocyanate content in the saliva of smokers and nonsmokers. They found a slight increase in favor of smokers, but the ranges observed overlapped to such an extent that no significant differences could be established. Armenio, LaForgia, and Buonsanto² found that habitual smokers clearly had higher values of thiocyanate in saliva than moderate smokers. The effect was strongest in cigarette smokers compared to other smokers. Courant³ has observed significantly higher concentrations of thiocyanate in the saliva of smokers. The increase in the thiocyanate concentration led to an increased ability of the lactoperoxidase-thiocyanate-H₂O₂ antibacterial system to inhibit the growth of *Lactobacillus acidophilus*. This communication provides information about the concentration of thiocyanate and iodine ions in the saliva of 27 smokers and 92 nonsmokers.

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Materials and Methods

Human whole saliva was collected by paraffin stimulation between 8 AM and 3 PM. Each person provided a 10-ml sample that was chilled to +4 C immediately after collection and centrifuged within 1 to 2 hours for ten minutes at 23,500 × g in the cold (+4 C). The supernatant fluids were stored at +4 C until used. The measurements of thiocyanate and ionizable iodine were made within a day after collection.

Thiocyanate ions were measured by using a colorimetric method according to Powell.⁴ Ionizable iodine was measured electrometrically with an iodine ion electrode.^a Ages of the 119 volunteers ranged from 15 to 60 years. Eighty were females of which 16 were smokers, and 39 were males of which 11 were smokers.

Results

The results of the measurements of thiocyanate and ionizable iodine are given in Table 1. The thiocyanate concentration was significantly higher in the saliva of smokers than in that of nonsmokers. The amount of thiocyanate seemed to get higher as the habit of smoking increased (Table 2). The concentration of ionizable iodine was opposite to that of thiocyanate. The iodine content was clearly lower in the group of smokers

^a Beckman iodine ion electrode, no. 39606, Beckman Instruments, Fullerton, Calif.

TABLE 1
CONCENTRATION OF THIOCYANATE AND IODINE IONS IN THE SUPERNATANT FLUID OF WHOLE MOUTH SALIVA OF SMOKERS AND NONSMOKERS

	SCN ⁻		<i>P</i> < 0.001	I ⁻		<i>P</i> < 0.001
	mg/liter	<i>M</i> × 10 ³		mg/liter	<i>M</i> × 10 ³	
Smokers (N = 27)	159 ± 75.5	2.6 ± 1.3		1.1 ± 0.4	8.8 ± 3.3	
Nonsmokers (N = 92)	72 ± 38.4	1.2 ± 0.7		1.8 ± 1.1	13.8 ± 8.5	

TABLE 2
EFFECT OF THE NUMBER OF DAILY CIGARETTES ON
THE SALIVARY THIOCYANATE AND IONIZABLE
IODINE CONCENTRATIONS

Cigarettes per Day	SCN ⁻ (mg/liter)	I ⁻ (M × 10 ⁶)
0-5 (N = 8)	95.0 ± 50.0	9.9 ± 2.4
6-10 (N = 5)	163 ± 69.9	10.9 ± 5.8
10 (N = 14)	194 ± 61.7	7.6 ± 1.1

compared to nonsmokers. The content seemed to be dependent on the number of cigarettes smoked daily.

The concentration of thiocyanate ions was significantly higher in the saliva of males compared to that of females (Table 3). The iodine content was opposite to thiocyanate also in this respect, the iodine content being lower in males than in females. Although there appear to be sex differences, the effect of smoking on both ions was clear.

Discussion

The role of thiocyanate as an oxidizable cofactor in the lactoperoxidase-thiocyanate-H₂O₂ antibacterial system is the only known function of this ion in human saliva. The oxidation products of thiocyanate, that is, cyanate, sulfate, and ammonia, can be antibactericidal.⁵ Thiocyanate also stabilizes lactoperoxidase activity in saliva.⁶ Nash and Morrison⁷ have stated that the administration of iodine will cause the complete disappearance of thiocyanate from the saliva. This agrees with the results obtained in this study and, therefore, the higher concentration of thiocyanate in the saliva of smokers may be

a consequence of the lower content of iodine in this group.

Saliva flow rate may increase with smoking. The alterations in iodide content observed may be, at least in part, due to an altered flow rate. However, Myant⁸ did not detect any alterations in the excretion of iodide into saliva although the flow rate increased from 0.2 to 0.5 ml/min.

Myant⁸ assumed that the transport of iodide into the saliva is the primary, if not the only, pathway for metabolism of iodine in the salivary glands. However, the iodine accumulation is inhibited by thiocyanate⁹ both in the thyroid and in the salivary glands.⁸ Lactoperoxidase is known to be able to catalyze the iodination of tryptose and thyroglobulin to give thyroxine and its iodinated derivatives.⁹ The present study indicates that smoking may have a quenching effect on this nonthyroidal metabolism of iodine but an increasing effect on the antibacterial action of lactoperoxidase-thiocyanate-H₂O₂ system.³

Conclusions

The concentration of thiocyanate and ionizable iodine was determined with saliva samples from two test groups, smokers (N = 27) and nonsmokers (N = 92). The contents of both ions were also compared as to sex and the amount of cigarettes smoked. The concentrations of the ions studied were dependent on each other—the less iodine, the more thiocyanate in the samples. Females had significantly more iodine and less thiocyanate concentrations than males. Smoking had an increasing effect on the concentration of thiocyanate and a decreasing effect

TABLE 3
EFFECT OF SEX ON THE CONCENTRATION OF SALIVARY THIOCYANATE
AND IODINE IONS

	SCN ⁻ (mg/liter)		I ⁻ (M × 10 ⁶)	
Smokers (N = 27)				
Males (N = 11)	210 ± 75.0		7.2 ± 0.9	
Females (N = 16)	124 ± 46.3	P < 0.01	10.1 ± 3.6	P < 0.01
Nonsmokers (N = 92)				
Males (N = 28)	91.8 ± 43.7		13.4 ± 9.7	
Females (N = 64)	61.7 ± 31.6	P < 0.01	13.9 ± 8.0	P < 0.2

Note: P < 0.001 for SCN⁻ between male smokers and nonsmokers; P < 0.001 for SCN⁻ between female smokers and nonsmokers; P < 0.01 for I⁻ between male smokers and nonsmokers; P < 0.05 for I⁻ between female smokers and nonsmokers.

on the content of ionizable iodine in the saliva of the volunteers. The lower amount of iodine ions in the saliva of smokers may restrict the nonthyroidal metabolism of the thyroid hormone in humans.

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