ably resulted in higher thresholds than those obtained here.

Table 2 compares the two sets of data at the points where a comparison is possible. The wide discrepancy that exists for interruption rates of 20 and 40 cy/sec is in favor of the eye. It is hard to believe that the eye can beat the ear at its own game. Since the differences in method might explain this discrepancy, it is hoped to put the matter to the test soon.

References and Notes

1. This report was prepared under contract NOrd 7386 between the U.S. Navy Bureau of Ordnance and Johns Hopkins University. It was presented at the 62nd annual convention of the American Psychological Association [G. H. Mowbray and J. W. Gebhard, *Am. Psychol.* **9**, 436 (1954)].
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Communications

Explanation of the Effect of Feeding Desiccated Thyroid on the Incidence of Dental Caries in the Rat

Muhler and Shafer (*1*) have recently produced convincing experimental evidence that the feeding of desiccated thyroid has a marked anticariogenic effect in the rat. It is, in fact, as effective as the administration of sodium fluoride. They have also shown that there is an increased incidence of dental caries in rats when the level of thyroid hormone in the blood is lowered by "blocking" the thyroid with thiouracil. Their work leaves no doubt that thyroid activity is related in some manner to the incidence of dental caries in the adult rat.

We would like to suggest a possible explanation for this relationship. It has recently been postulated that the submaxillary and parotid salivary glands in the rat function to control the level of thyroid hormone in the blood stream by degrading it to iodide ion (*2–5*). The iodide ion is then recycled to the thyroid gland via the saliva and the gastrointestinal tract. This explains the long-known ability of the salivary glands to concentrate iodide and means that the concentration of iodide in the saliva will depend on the rate of thyroxine degradation if the dietary iodide does not vary.

A convenient explanation of the results of Muhler and Shafer would be that it is the increased concentration of iodide ion in the saliva and/or the increased saliva flow resulting from the stimulation of the degradative processes in the salivary glands that accounts for the effect of feeding desiccated thyroid. The increase in the incidence of dental caries noted when thiouracil was fed, may well have been caused by a decrease in the level of iodide in the saliva and a decrease in the rate of saliva flow associated with a diminished rate of degradation of the thyroid hormone. It is well established that a diminution in the rate of salivary flow has a marked effect on the incidence of dental caries in experimental animals (*6*) and it is possible that iodide ion, like a variety of other substances, has an anticariogenic action when it is in solution in the saliva.

There are many reports in the literature which indicate that hyperfunction of the salivary glands is associated with hyperthyroidism. Thus Moehlig, in a review (*7*), states that obvious swelling of the salivary glands is often associated with hyperthyroidism, and he quotes references to other workers who have observed the same phenomenon. Moehlig also states that hypersalivation is often a troublesome symptom in hyperthyroidism and quotes other workers who have also observed this. Hammerli (*8*) observed, in a study of 197 autopsies on goiter patients, a hypertrophy of the submaxillary salivary glands. The extent of hypertrophy was related to the size of the goiter. Albright, Larson, and Deiss have recently reported (*9*) transient swelling of the parotid and submaxillary salivary glands in a myxedematous patient after the administration of triiodothyronine.

In the rat, both thyroidectomy and the administration of thiouracil or thiourea result in marked atrophy of the submaxillary salivary gland (*10–12*). This atrophy, both in the case of thyroidectomized and thiouracil-fed rats, can be prevented by the administration of thyroid hormone (*10–12*). In view of the recent direct experimental demonstration that the salivary glands in the rat are concerned with the extrathyroidal metabolism of organically bound iodine (*4*), this atrophy is very probably the result of the cessation of the degradative function in the submaxillary gland. It would appear reasonable to assume that this would result in a diminution in the concentration of iodide ion in the saliva, along with a decreased saliva flow. The feeding of desiccated thyroid has been shown to result in an increase in the weight of the submaxillary gland of the rat (*12*). This is very probably caused by the increased degradation of the excess thyroid hormone, which would result in an increased concentration of iodide ion in the saliva and, perhaps, to an increased flow of saliva.

In summary, there is evidence both from the clinical literature and from work on experimental animals that there is hyperfunction of the salivary glands in hyperthyroidism and hypofunction of the salivary glands in hypothyroidism. We feel that the anticariogenic action of desiccated thyroid may well result

from an increased flow of saliva and/or increased concentration of salivary iodide. The cariogenic action of the antithyroid substances is the result of the reverse conditions. This concept, should it prove to be true, is of considerable theoretical and practical interest. It provides a possible explanation for the predisposition to dental caries in certain individuals and opens the possibility of providing a new method for the control of dental caries. For these reasons we feel that this idea should be drawn to the attention of interested workers.

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New Antiarthritic Steroids

At a recent meeting of the American Rheumatism Association (*1*) the clinical effectiveness of two new, potent antiarthritic steroids, metacortandracin (Meticorten) (*2*) and metacortandralone (Meticortelone) (*3*) was described. The structures of these compounds are, respectively, $\Delta^{1,4}$-pregnadiene-17α, 21-, diol-3, 11, 20-trione (I) and $\Delta^{1,4}$-pregnadiene-11β, 17α, 21-triol-3, 20-dione (II).

Meticorten (I) melted at 233° to 235° dec., $[\alpha]_D^{25}+172°$ (dioxane), $\lambda_{max.}^{methanol}$ 238 mμ (ε = 15,500), $\lambda_{max.}^{Nujol}$ 3.04μ (OH), 5.84μ (11- and 20-carbonyls), 5.98, 6.16 and 6.21μ ($\Delta^{1,4}$-diene-3-one) (*4*). (*Anal.* found: C, 70.35; H, 7.45). Its 21-acetate derivative melted at 226° to 232° dec., $[\alpha]_D^{25}+186°$ (dioxane), $\lambda_{max.}^{ethanol}$ 238 mμ (ε = 16,100), $\lambda_{max.}^{Nujol}$ 2.98μ (OH), 5.73 and 5.80μ (20-carbonyl, 21-acetate interaction) 5.85μ (11- and 20-carbonyls), 6.02, 6.16, and 6.20μ ($\Delta^{1,4}$-diene-3-one), 8.10μ (21-acetate). (*Anal.* found: C, 68.82; H, 7.13).

Meticortelone (II) melted at 240° to 241° dec., $[\alpha]_D^{25}+102°$ (dioxane), $\lambda_{max.}^{methanol}$ 242 mμ (ε = 15,000), $\lambda_{max.}^{Nujol}$ 2.96μ (OH), 5.82μ (20-carbonyl), 6.04, 6.19, and 6.25μ ($\Delta^{1,4}$-diene-3-one). (*Anal.* found: C, 70.24; H, 8.13). Its 21-acetate derivative melted at 237° to 239° dec., $[\alpha]_D^{25}+116°$ (dioxane), $\lambda_{max.}^{methanol}$ 242 mμ (ε = 15,000), $\lambda_{max.}^{Nujol}$ 3.0μ (OH), 5.71 and 5.78μ (20-carbonyl, 27-acetate interaction), 6.04, 6.13, and 6.22μ ($\Delta^{1,4}$-diene-3-one), 8.12μ (21-acetate). (*Anal.* found: C, 68.62; H, 7.78).

Adrenocortical activity of I and II measured by the eosinopenic response in adrenalectomized mice (*5*) was 3 to 4 times the activity of cortisone or hydrocortisone. The enhanced "gluco-corticoid" activity of the new steroids was confirmed by assays employing the liver glycogen deposition method in adrenalectomized rats (*6*) and the thymus involution method in intact mice (*7*).

Further details of synthesis, proof of structure, and biological activities of I and II will appear elsewhere.

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The beginning of wisdom is found in doubting; by doubting we come to the question, and by seeking we may come upon the truth.—PIERRE ABELARD.