

Introductory Remarks: The Thyroid Gland

by Edmund B. Flink*

The thyroid gland is particularly susceptible to environmental influences and, therefore, is unique among the endocrine glands as far as direct environmental impact. The thyroid gland becomes hyperplastic and a goiter develops when there is severe nutritional iodine deficiency. This is the reverse of the usual meaning of toxic effects of a substance on an organ. In fact, the abnormality occurs when there is an insufficient amount rather than an excess of one of the important chemicals needed for that particular gland. It had been known since ancient times that goiter occurred in persons who lived in high mountainous areas. This was intensively studied in the Alpine region of Switzerland in the late nineteenth century. Marine and Kimball in Cleveland, Ohio, conducted epidemiological studies and recognized a goiter belt and iodine deficiency in the Great Lakes area and the upper Midwest of the United States. This work was done in the period just before World War I. Recognition of the importance of iodine in the function of the thyroid gland was important in the final isolation and analysis of the structure of thyroxine. In the middle of the 20th century, recognition and study of iodine deficiency and endemic goiter in the high mountainous areas of South America, Africa, Nepal, and New Guinea have identified the broad geographical scope of this problem. In the language of the Incas the word "coto" was synonymous with goiter and means a mound or protuberance. This was very common among the Indians of the Andes at the time of arrival of the Spaniards. Dr. Roderigo Fierro-Benitez of Quito, Ecuador, found a small statue with a prominent goiter in the Ecuadorian area. The statue is 50 cm high, the lower body segment is distinctly shorter than the upper seg-

ment, suggesting cretinism, and the goiter is so big that it protrudes almost as far as the chin in profile. It certainly is Pre-Columbian; in fact, it is estimated that this statue is at least 800 years old. Furthermore, in the 18th and 19th centuries, many statues of people in the Andean region depict a goiter. I am very pleased to say that Dr. Fierro, who is currently at the University of Chicago on sabbatical leave, is present at this conference.

The tragedy of severe iodine deficiency which occurs in high mountainous areas is that endemic cretinism is very common and has serious consequences for the individual. These brief remarks have emphasized the fact that the absence of an important nutrient, namely iodine, in the diet and/or in the water has serious pathological effects and toxicological effects on the thyroid gland. On the other side of the coin, an excess of iodine can produce a goiter in certain people. This is particularly true in patients who are given large amounts of iodine for the treatment of asthma and other chronic pulmonary diseases. When iodine is supplied to subjects who have lived in an area of serious iodine deficiency, they can become severely toxic because of the sudden production of a large amount of thyroxine. This is so-called Jod-Basedow. This was recognized in the late nineteenth century.

Another aspect of toxicology of the thyroid is the fact that when the normal regulatory mechanisms with the usual feedback control of thyroxine secretion fail, very high levels of thyroxine develop with resultant hyperthyroidism or, more appropriately for this Conference, thyrotoxicosis.

Another environmental hazard which affects the thyroid gland uniquely is the factor of external radiation of the region of the thyroid gland during infancy and childhood. The common practice of giving radiation therapy to the region of the thymus gland in infants has resulted in the occurrence

*Department of Medicine, West Virginia University Medical Center, Morgantown, West Virginia 26506.

of cancer of the thyroid gland in greater number of young people than could be expected from chance alone. Radiation therapy for lymphoid tissue in the tonsillar region of the nasopharynx and for acne also contributes to an increased incidence of cancer.

Radioactive iodine fallout (^{131}I) occurred at the time of nuclear bomb explosions and resulted in many instances of thyroid ablation and of thyroid pathology. The effects of radiation of various kinds will be discussed by Dr. Barsano.