little inflammatory reaction frequently resulted. In other cases, secondary infection with all of its complications occurred. Needless to say, there were many cases of blindness due to this entirely preventable deficiency. At one missionary hospital where I worked, they routinely prescribed vitamins for all the surgical cases, obviously with very good reason.

Trachoma was present in about 80 percent of the patients I examined. All of the typical stages were seen (figs. 4-A to G). The active infectious cases seemed to respond to any of the following medications: Sulfadiazine, penicillin, aureomycin, terramycin, and chloramphenicol. The cicatricial cases naturally required plastic procedures.

Leprosy with ocular involvement was also seen. Corneal involvement included superficial punctate keratitis, leproma (leprotic nodules) of the cornea, interstitial keratitis, loss of sensation due to fifth nerve impairment, and exposure of the cornea secondary to seventh nerve involvement (figs. 5-A, 5-B, and 5-C). Loss of eyelashes and typical cutaneous changes in the eyelids and adjoining skin were seen. Nodules were also seen in the sclera. Uveitis due to leprosy was also prevalent. Many of the patients suffering from leprosy were not isolated and we performed cataract extractions on some; the results were surprisingly good. Naturally, surgery was not performed in the presence of active uveitis.

Because vaccination is not universal in India and Pakistan, smallpox still exists. Corneal involvement, resulting in dense scars or perforation, frequently resulted so that this preventable disease is still an important cause of blindness in that part of the world (fig. 6).

Eye infections ranging from mild conjunctivitis to severe endophthalmitis and panophthalmitis seemed to be more common than in the United States. Glaucoma may have been more frequent due to the increase of untreated secondary types. Also the practice of couching of cataracts by some quacks resulted in patients being blind and suffering from glaucoma. It is noteworthy that no cases of retrolental fibroplasia were seen. This is one disease present in the United States but not present in India.

In summary, I have described the practice of ophthalmology as I found it in small villages of India and Pakistan. It may vary in the larger cities. However, since 85 percent of the population is concentrated in rural areas, I believe this report gives a more realistic picture of our specialty in that part of the world.

269 South 19th Street (3).

PREVENTION BY THYROXINE OF THE OCULAR CHANGES*

NORMALLY PRODUCED BY ββ′-IMINODIPROPIONITRILE (IDPN)

HANS SELYE, M.D.
Montreal, Canada

Earlier observations have shown that ββ′-iminodipropionitrile (IDPN), given subcutaneously, produces rather selective lesions in the eyes in several species of experimental animals (monkey, guinea pig, rat, rabbit, cat, dog, hamster). The character of these lesions varies according to the species. Thus, in the monkey, retinal changes are exceptional while retro-orbital and palpebral edema are always pronounced. In the rat, however, the most common lesions are: clouding of the cornea (often progressing toward severe keratitis), edema of the retina with degenerative changes in the inner and outer nuclear layers, and retinal detachment

* From the Institut de Médecine et de Chirurgie expérimentales, Université de Montréal.

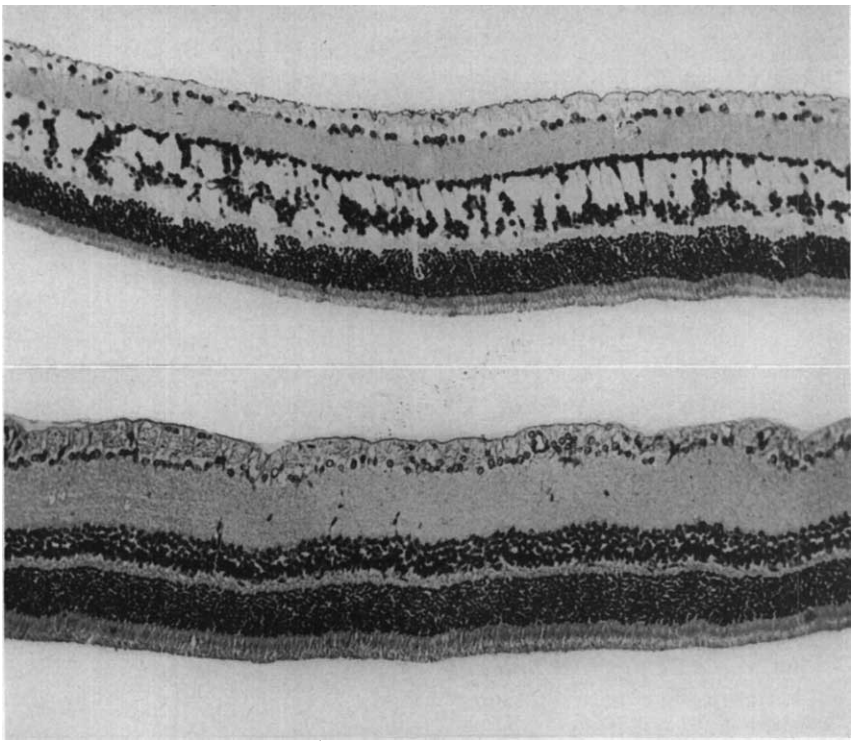

Fig. 1 (Selye). Retinal edema and the degenerative changes, which affect particularly the inner nuclear layer of the IDPN-treated animal (top). These changes are completely absent in the retina of a rat simultaneously treated with IDPN and thyroxine (hematoxylin-eosin, ×100).

(sometimes accompanied by hemorrhages into the aqueous humor).[1]

It is the object of this communication to demonstrate that treatment with thyroxine can completely prevent the ocular lesions that are normally produced by IDPN in the rat.

Materials and Techniques

Twenty female Sprague-Dawley rats, weighing 97 to 111 gm. (average 102 gm.), were subdivided into two equal lots: Group I received only IDPN; Group II, IDPN and thyroxine.

IDPN (ββ′-iminodipropionitrile, also known as aminodipropionitrile, or bis-[β-cyanoethyl]-amine) was administered subcutaneously, at the daily dose of 30 mg. in 0.2 ml. of water during 10 days. Then 100 mg. in 0.2 ml. of water were given during the next two days. On the 12th day of treatment, IDPN administration was discontinued, since all the animals of the group that received no thyroxine showed pronounced neurologic disturbances (excitation, choreiform movements, and "circling behavior") which are also characteristic consequences of intoxication with IDPN.

Thyroxine was administered in the form of its sodium salt at the daily dose level of 250γ in 0.2 ml. of water. Subcutaneous injections were begun four days prior to the IDPN administration and were continued until the fifth day after cessation of treatment with the nitrile. Pretreatment with the hormone was thought to be advisable, since many of the actions of thyroxine develop slowly and, therefore, marked thyroid hormone effects could not be expected for several days.

Results

During the five days following the interruption of the IDPN treatment, the usual

neurologic manifestations of IDPN-intoxication became extremely evident in the animals of Group I, and all 10 of these rats (treated with IDPN alone) eventually succumbed. On the other hand, in Group II (treated with IDPN plus thyroxine), the neurologic manifestations of IDPN intoxication were mild, and none of the animals died.

The eyes of all 20 rats were embedded in paraffin and examined on sagittal sections stained with hematoxylin-eosin. No evident histologic change was observed in any of the rats treated with thyroxine in addition to IDPN, while all the animals given IDPN alone showed keratitis, degenerative changes in the retina, and retinal detachment (fig. 1). In addition, four animals in this latter group exhibited marked hemorrhages into the aqueous humor.

These findings indicate that thyroxine is extremely effective in counteracting the toxic effects that IDPN normally exerts upon ocular structures. The mechanism of this protective effect remains to be elucidated. It is well known that changes in the thyroid hormone content of the blood can exert rather selective effects upon the eyes as exemplified by the exophthalmos of Graves' disease. Yet, it is unlikely that in our experiments thyroxine antagonized the effect of IDPN through some such selective action upon ocular structures, because the mortality as well as the systemic neurologic manifestations of IDPN were also inhibited by the hormone. It is more probable that thyroxine interferes with the effect of IDPN upon its chemical substrate in all tissues or that the thyroid hormone increases the rate at which the nitrile is detoxified within the body. In any event, these observations demonstrate, in the case of yet another experimental disease, the validity of the thesis[2] according to which hormones can play a decisive role in the genesis of nonendocrine diseases, that is, of maladies not primarily caused by an excessive or deficient function of an endocrine gland.

Summary

Experiments on albino rats indicate that keratitis, with degenerative changes and detachment of the retina, can be produced by ββ′-iminodipropionitrile (IDPN) with great regularity. All these changes are completely prevented by simultaneous treatment with thyroxine.

Case Postale 6128.

Acknowledgments

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Ophthalmic Miniature

Spectacles. I don't use them. All I ask is a large, fair type, a strong daylight or gaslight, and one yard of focal distance, and my eyes are as good as ever.

Oliver Wendell Holmes,
The Autocrat at the Breakfast Table, 1858.