cytes. When the sperm contains a typical protamine (trout, pike), the ratio deoxyribonucleic acid/arginine is 1·6; in other cases (carp, tench) this ratio approximates to 5·0, just as in somatic nuclei.

A similar analytical study was performed with bovine species—on isolated calf thymus nuclei and on bull sperms; it was shown that the ratio 5·0 was found in the case of the somatic nucleus (thymus) and the ratio 1·48 in the case of sperm. This result led us to think that the bull sperm probably contains a protein rich in arginine, that is, a protein of the protamine type. The nature of the protein linked to the deoxyribonucleic acid in bull sperm, and that in the sperm of other mammals, is not known for certain, for the routine methods for the extraction of nucleoproteins cannot be applied to such material. We thought that an indication of the nature of the spermatogenetic modifications of the protein linked to deoxyribonucleic acid might be given (at least in many cases) by a simple determination of the deoxyribonucleic acid/arginine ratio. This method would need but minute quantities of biological material, and could be applied to small animals, for example, insects. In order to test the validity of this hypothesis, we applied our analytical procedure to a case recently studied by Daly *et al.*[3]. These authors isolated a nucleoprotamine from rooster sperm, and a histone from the nuclei of erythrocytes. Using our analytical method, we were able to confirm these data. Expressing our results per nucleus, we found for the rooster's erythrocyte, $2{\cdot}2 \times 10^{-6}\gamma$ of deoxyribonucleic acid and $0{\cdot}45 \times 10^{-6}\gamma$ of arginine. The ratio deoxyribonucleic acid/arginine is thus 4·88. In sperms, on the contrary, we found $1{\cdot}10 \times 10^{-6}\gamma$ of deoxyribonucleic acid and $0{\cdot}78 \times 10^{-6}\gamma$ of arginine per sperm, the ratio being 1·41. This result indicates the possibility of the presence in rooster sperm of a protamine rich in arginine, which is in a good agreement with the data of Daly *et al.*

Summarizing, the study of the ratio deoxyribonucleic acid/arginine could afford a rapid procedure for an extensive study in living species of the nature of the nuclear protein linked to the deoxyribonucleic acid in the nuclei, in order to determine whether a general process exists in the biochemistry of the formation of male gametes.

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Serotonin and Connective Tissue

Serotonin (= 5-hydroxytryptamine = enteramine) has been demonstrated in carcinoids of the small intestine as well as in the blood and urine of patients suffering from this disease[1]. The symptoms of these conditions are ascribed to the release of serotonin to the blood and tissues[2]. They consist primarily in cutaneous vasomotor signs (flushing), tachycardia, asthma-like dyspnœa and hyperperistalsis. Right-sided heart disease with tricuspid and pulmonal valvular lesions are noted in some but not in all cases. In prolonged cases pulmonary stenosis appears to be a fairly constant sign. Firm connective-tissue masses have been found to envelop the pelvic organs, as well as the iliac and hypogastric arteries. Considerable masses of connective tissue have also been observed deep to the cardiac valves, and microscopic examination has revealed connective tissue proliferation[3]. Articular swelling has been observed[2]. Hedinger and Gloor[3] mention the possibility that carcinoids and their metastases may secrete a substance stimulating connective-tissue formation.

It has been suggested that serotonin might act as a histamine-liberator substance, some of the clinical signs resembling a histamine effect[4]. Various histamine liberators are able to induce degranulation and disruption of tissue mast cells[5].

Since connective-tissue formation is invariably initiated by an accumulation of mast cells believed to produce important ground-substance components and to contain histamine, the effect of serotonin upon mast cells was studied.

Living connective tissue with intact circulation was studied in the cheek pouch of the hamster under nembutal anæsthesia by a method previously described[6]. Unstained living cells were studied in the phase-contrast microscope fitted with a water immersion lens and a warm stage. Mast cells stained with an aqueous solution of toluidine blue, 1 per mille, were studied in the bright-field microscope. By the last-mentioned method, the mast-cell granules stain metachromatically, indicating a content of mucopolysaccharides. Physiological saline was used as the immersion fluid.

Serotonin creatinine sulphate (National Biochemical Corp.), injected intraperitoneally in doses of 1 and 2 mgm., induced pronounced œdema of the connective tissue, and the animals showed signs of respiratory impairment as well as cyanosis of the muzzle and paws. A pronounced degranulation of the mast cells was observed within 10–20 min. When the metachromatic granular substance was no longer demonstrable in the mast-cell body, a basic structure resembling a sponge or a honeycomb was left in the cells, which were otherwise intact. Irreparable breakdown of the cells was observed only in exceptional cases.

The connective tissue formation caused by carcinoids and their metastases may be related to the degranulating effect of serotonin upon the mast cells. The tissue œdema induced by this agent is supposed to be primary to the release of water-binding mucopolysaccharides from the cells.

This work was aided by grants from Eli Lilly and Co., Indianapolis, Indiana, the Danish Anti-Cancer League, and the National Danish Association against Rheumatic Diseases.

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