

## SPECIAL ARTICLES

## THE SENSITIZING PROPERTIES OF THE NUCLEIC ACIDS AND THEIR DERIVATIVES

THE chemical relationships between the nucleic acids and their physiological degradation products have been intensively studied; the part that these compounds may play in immunological phenomena, however, has never been investigated. Preliminary studies indicate that they may bear a fundamental relationship to pollen sensitization. The authors have found that individuals who gave positive skin reactions, when injected intradermally with ragweed pollen extract, likewise gave positive reactions when similarly tested with dilute solutions of nucleic acids and many of their derivatives. These reactions, so far demonstrated in a series of fifty ragweed pollen-sensitive human beings, appears to parallel the sensitivity of these individuals to ragweed pollen, regardless of the occurrence of symptoms of hay-fever. Only an occasional reaction has been observed in a group of forty non-allergic control cases, most of whom were normal individuals but some of whom were patients suffering from a variety of unrelated diseases. Likewise, five cases who gave positive reactions to animal danders, dust and foods, but not to ragweed pollen extract, also failed to react to the nucleic acid group of compounds.

The skin reactions elicited by the nucleic acids and their derivatives were the typical, immediate, wheal-erythema type. Such reactions were obtained uniformly upon the intradermal injection of 8  $\gamma$  (.008 mg) of either thymus or yeast nucleic acid (neutralized before injection). Three crystalline nucleotides prepared from yeast nucleic acid, namely, adenine, guanine and cytosine nucleotides, gave positive reactions in doses of 2  $\gamma$  (.002 mg). Likewise, crystalline adenine nucleotides prepared from beef heart muscle, beef pancreas and tea leaves reacted in the same manner. The simple purine salts, adenine sulfate, guanine chloride, hypoxanthine nitrate, xanthine nitrate and sodium urate all gave positive reactions in doses of 1  $\gamma$  (.001 mg), as did also the simple pyrimidine uracil. Allantoin, the chief end product of purine metabolism in most mammals except man, likewise gave positive reactions. The simple compound urea has also given typical reactions.

The compounds mentioned above, with the exception of urea, are all concerned in the metabolism of the nucleic acids and all contain a purine or pyrimidine ring structure. The alkaloid caffeine (which contains the purine ring) and the amino acid d.l. histidine mono-hydrochloride (which contains the imidazole ring) gave consistent reactions, but the amino acid l. proline (which contains the pyrrolidine ring) reacted less frequently.

A skin-sensitizing antibody to yeast nucleic acid,

muscle and yeast adenine nucleotides, caffeine, allantoin, histidine and urea has been demonstrated so far in the serum of ten individuals reacting to these compounds.

Severe constitutional reactions were produced in two patients, when only 0.02 mg of two adenine nucleotides, prepared from yeast nucleic acid and from beef muscle, respectively, were used. For this reason only the small doses described above were employed in skin testing sensitive individuals.

WALTER L. WINKENWERDER

MARY V. BUELL

JOHN EAGER HOWARD

THE JOHNS HOPKINS UNIVERSITY

## A POSSIBLE RELATION BETWEEN MANGANESE, SUNLIGHT AND WINTER HATCHABILITY OF HEN'S EGGS

It has been observed at this station (unpublished data) that slipped tendon occurs more frequently in the heavy breeds of chickens that are raised in batteries in contrast to those that are raised out-of-doors on wire screens. Since the discovery of the relation of manganese to slipped tendon, little attention has been given to the effect of sunlight on this condition. Evidence that the manganese requirements of laying hens may be increased in the absence of sunlight is indicated by hatchability records obtained during the past two years.

It was found that a mash consisting of 45 parts of yellow corn, 15 of wheat bran, 15 of middlings, 5 of alfalfa leaf meal, 1.5 of granite grits, 1.5 of limestone grits, 1 of cod liver oil and 16 parts of soy-bean oil meal was improved for egg hatchability by the addition of 85 parts per million of manganese. This ration contained adequate amounts of vitamin D; however, during the fall and winter months (September to April) the average per cent. of hatchability of the fertile eggs laid by the hens fed this ration without added manganese was 48.1. The corresponding groups which received added manganese produced eggs having an average hatchability of 62 per cent. When there was adequate sunlight during the late spring and early summer, there was little significant difference in the egg hatchability between these two groups. The increase in hatchability of the eggs from the group on the basal ration appears to be correlated with increased sunlight. Hatchability of these eggs increased to an average of 70 per cent. as compared to 75 per cent. hatchability of the eggs from the manganese-fed group. The effect of sunlight on the hatchability of the eggs from the basal group is shown very clearly in Fig. 1.

The bi-monthly hatchability of eggs laid by the first group (low manganese) was compared with the corresponding variations in temperature and hours of