0.5 cc of the test solution was added to 2.5 cc of soluble starch in diluted buffer solution with NaCl. The digestion period was two hours.

The above tests indicate that the method is at least twenty times as sensitive as the modification of Wolgemuth's method with which it was compared; it is capable of detecting at least one part in half a million of Merck's pancreatin.

Effect of Pyrex Glass

In connection with these experiments we should like to record an apparent inhibition of enzyme action obtained by extracting in pyrex glass. At a stage when the pancreas of *Amblystoma* embryos normally gives a strong amylase reaction, it was found that negative results were obtained if the extract was ground and kept in a pyrex mortar for some hours; similar effects were not obtained with ordinary soft glass nor with quartz. At the same stage the pancreas gives a strong trypsin reaction whether pyrex is used or not, but at an earlier stage when the presence of trypsin can first be demonstrated, negative results were obtained when pyrex was used in the preparation of the extract. It thus appears that pyrex glass has a definitely inhibitory effect on both trypsin and amylase.

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SPECIAL ARTICLES

OBSERVATIONS ON FUNCTIONAL INTERRELATIONSHIP BETWEEN THE ADRENAL AND PARATHYROID GLANDS

Earlier concepts of functional interrelations between the endocrine organs were based largely upon hypothetical assumptions. More recently, however, reliable experimental evidence has been accumulating to prove specific, more or less complex, functional interdependence of certain endocrine glands. While in no instance does the evidence warrant final conclusion or definite functional interpretation, in many cases it points the way to further investigation and to a better understanding of some phenomena observed in experimental animals.

In the case of the adrenal gland so little is known at present, in spite of the voluminous literature, that functional interpretations from experimental evidences should be made with caution. It is not the purpose of this communication to attempt to prove a definite correlation of function between the adrenal and parathyroid glands. Nevertheless, there are some experimental results that suggest very strongly that such a correlation exists. These have opened avenues for further investigation which is in progress.

Rogoff and Stewart[1] observed that in animals deprived of their adrenal glands symptoms commonly develop which are also seen associated with disturbances in calcium metabolism. Muscular twitching, spasms and tetanic convulsions often occur. This observation led us to study the calcium content of the blood in adrenalectomized dogs, with the very interesting results showing a decided hypercalcemia in most of the animals.[2]

In our previous studies on adrenalectomized dogs[1] a striking picture in the alimentary canal was revealed at autopsy. Profound congestion of the mucosa of the entire gastro-intestinal tract and severe hemorrhage into the intestine was commonly found. It is significant, in view of the present subject, that a similar picture was described by Collip and co-workers[3] as occurring in dogs following administration of excess of parathyroid hormone.

In the course of our investigations I have observed that animals deprived of both adrenal glands and those subjected to sub-acute or chronic adrenal cortical insufficiency (by sub-total ligations of adrenal blood vessels) show, at autopsy, a relatively high incidence of parathyroid enlargement. While this is quite obvious grossly it has not been possible, thus far, to detect any significant microscopic changes in the gland.

Recently, Schour and collaborators[4] have found very interesting disturbances in calcification of dentin in the rat incisor, following administration of parathyroid hormone. At Dr. Schour's suggestion we undertook to study the influence of removal of the adrenal glands. This investigation is still in progress, but the results thus far obtained show a remarkable resemblance between the changes which occur in teeth of white rats following administration of an excess of parathyroid hormone and those found after excision of the adrenal glands.

These significant observations indicate an accumulation of experimental evidence which supports the view that a functional correlation exists between the adrenal and parathyroid glands. Whether the cortex

[1] Rogoff and Stewart, *Am. Jour. Physiol.*, 78: 683, 1926.

[2] Rogoff and Stewart, *Am. Jour. Physiol.*, 86: 25, 1928.

[3] Collip, *Am. Jour. Physiol.*, 76: 472, 1926; Collip, Clark and Scott, *Jour. Biol. Chem.*, 63: 439, 1925.

[4] Schour, Tweedy and McJunkin, *Am. Jour. Path.*, 10: 321, 1934.

or medulla of the adrenal (or both) are concerned can not be known from the available information. Among the animals that were subjected to vascular ligations there were some in which only the cortex degenerated, the medulla remaining intact. Whether or not functional integrity of the adrenal medulla may be altered yet present a normal appearance histologically is not known. However, the studies that are in progress may yield more definite information concerning the part played by the cortex or the medulla in the apparent interrelationship between the adrenal and parathyroid glands.

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HISTOLOGICAL CHANGES IN THE BONE MARROW OF THE DOG FOLLOWING AMIDOPYRINE ADMINISTRATION

THE suggestion that amidopyrine administration is causative of acute agranulocytosis of human beings has been advanced by Kracke,[1] Madison and Squiers,[2] Watkins,[3] Sturgis[4] and others. Attempts to cause granulopenia by administering amidopyrine to animals have not been attended by consistent results. Even the prolonged use of relatively large amounts of the drug has, in many instances, failed to cause perceptible evidence of disturbed granulopoiesis. From experiments of this type grave doubt has been cast upon the etiologic rôle of amidopyrine in acute granulopenia in man.

Experiments involving the oral administration of amidopyrine to dogs have been made. A 5 per cent. solution in water (Metz and Company, lot 1433) was employed and 0.3 gram per kilogram of the drug was given daily by stomach tube.

In a series of sixteen animals studied no instance of marked decrease of circulating granulocytes was encountered, although treatment was continued for four weeks or more. Erythropenia of varying degree occurred.

Histological study of the femoral bone marrows of the treated animals, however, revealed striking changes, which gave evidence that the drug does affect the formation of granulocytes, even though not to a degree which is reflected in a materially decreased number of granular leukocytes in the circulating blood. A well-defined suppression of maturation of the hematopoietic elements occurs. Granulocytes are decreased in numbers or almost completely absent. The number of young, relatively undifferentiated cells is increased. Many erythroblasts and myeloblasts are present, as are cells of an even more primitive type; more adult forms are rare. In certain more advanced cases the orderly arrangement of the bone marrow structure into hematopoietic islands has been disturbed.

From the observations reported it appears that amidopyrine orally administered may exert a toxic effect upon the bone marrow, with little or no evidence of the fact in the circulating granular elements of the blood.

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[1] R. R. Kracke and F. T. Parker, *Jour. Lab. and Clin. Med.*, 19: 799, 1934.

[2] F. W. Madison and T. L. Squier, *Jour. Amer. Med. Asso.*, 102: 755, 1934.

[3] C. H. Watkins, *Proc. Staff Meet, Mayo Clinic*, 8: 713, 1933.

[4] C. C. Sturgis, *Proc. Asso. Am. Phys.*, May, 1934.

INSECTICIDALLY INDUCED IMMUNITY IN PLANTS TO SUCKING INSECTS

THE word immunity has been used in different ways and given various meanings by many workers. A recent article by Kenneth S. Chester[1] summarizes what is known in this field regarding plants and he defines immunity in plants as "the capability of withstanding infection acquired by the host either through the introduction of protective chemical substances of biological origin (passive) or through the elaboration of such protective substances in the host as a result of stimulation by the parasite." He states further: "It must be understood that the same principles as apply to the host-parasite relationship apply also to the relation between two symbionts or between a plant and introduced substances of a stimulative nature such as toxins or proteins which if not counteracted or inactivated would have a deleterious effect upon the plant."

Insecticides have been considered until very recently as materials which contained physical or chemical properties which produced toxic effects upon insects directly. It has been a common belief that in order to kill insects which obtain their food by sucking plant juices it is necessary to use insecticides which are known as "contact" materials and which have a direct insecticidal action upon the insect by the liberation of gases or other corrosive and penetrative effect upon the body of the insect. Such materials as nicotine sulfate and pyrethrum are known to produce toxic effects in this way. The plant has not been considered as a factor in insect control and has been given consideration only as it might be injured by chemical materials which were applied in attempting to control insects.

In 1926 experiments were undertaken to control the potato leafhopper (*Empoasca fabae* Harris) on bean and potato. Field experiments soon indicated that certain materials when applied to these plants in

[1] *Quart. Rev. Biol.*, 8: 131, June, 1933.