as well as those who make up the membership of this splendid gathering of investigators, that those of us who have the honor to represent the United States and its various scientific societies have come to Mexico with the hope that we may return to our homes with the satisfaction of having established more intimate personal ties with the intellectual investigators from the other American states here represented.

We earnestly desire to be colleagues in a very true sense. We look eagerly to this possibility for the interchange of ideas that grow out of the discussions of our respective investigations. We believe that in our strengthened friendships and in our exchange of scientific findings we are certain to build an understanding and a trust that will make for a finer and more effective cooperation between the leaders in learning in the Americas.

We can not overestimate the importance of the place or time of this congress. It is fine that our immediate and good neighbor, Mexico, has extended the invitation to the congress at this time. It seems peculiarly fitting that this country, which now is especially interested in the advance of scientific knowledge, and which has an understanding of both our continents, should be our meeting place. Whatever may be the contributions to knowledge made here, two things, over and above such contributions, will stand out: first, the furthering of understanding and good will among peoples of the western hemisphere; and second, the example in a community leadership for freedom.

This seventh American Scientific Congress meets at a period when the countries of Europe have cut themselves off in a large measure from intellectual intercourse, when, in fact, many of them have stifled thought within their own borders. The American republics must take again a leadership by furnishing an example of the maintenance of freedom of thinking and the free interchange of thought among nations. Just as the Americas in the nineteenth century championed the cause of democratic government, so, to-day, they must carry the torch of the republic of learning which is not a delimited preference having geographic or national boundaries, but rather a World State dedicated to the cause of the progress of mankind.

We are glad to have the privilege of meeting with you.

The congress was organized in fourteen sections, which were as follows: Physics and Mathematic Sciences; Geology; Engineering; Industrial Chemistry; Agricultural Sciences; Biological Sciences; Medical Sciences; Hygienical Sciences; Anthropological and Historical Sciences; Economical and Social Sciences; Educational Sciences; Bibliography; Indianism; Juridical Sciences. In addition to the scientific program the delegates were invited to a reception given by the Minister of Foreign Affairs, a visit to San Juan Teotihuacán, where luncheon was served, with the Minister of Public Education as host, a visit to the Cacahuamilpa Caves and to Cuernavaca, where luncheon was served, with the Minister of National Economy as host. A reception was held at the National Palace on the evening of September 15, to celebrate Independence Day on the 16th; the final hospitality offered was a luncheon at Xochimilco, with the chief of the Department of the Federal District as host.

The congress proved to be an important one in the annals of inter-American congresses. There was not a member of our delegation but who left with a higher appreciation of the scientific work that is being done in the Hispanic-American countries. More intimate personal ties were made between the several intellectual investigators of the various states. In this congress, more than any other that has been held up to this time, there was a definition of the contributions that could be made to science in common by the several nations. By common consensus this contribution is to be found in the fields surrounding archeology, ethnology, geography and history. Our appreciation of this position was emphasized by an official invitation tendered by Dr. Wallace W. Atwood on behalf of the United States Government when he invited to the second Pan-American Congress of Geography and History to be held in Washington, D. C., from October 14 to 19, delegates from Mexico and other Iberian American States.

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SPECIAL ARTICLES

EXPERIMENTAL DISSOCIATION OF THE EFFECTS OF ANTERIOR PITUITARY GLANDS OF VARIOUS SPECIES ON THYROID AND OVARY[1]

SUBSTANCES present in anterior pituitary glands of various species induce the following changes in ovary and thyroid gland of the immature guinea pig: (1) An intensified growth and maturation of follicles, which reach a very large size; this is associated with a diminution in the usual degenerative changes in the granulosa of other follicles. This process may be followed by a rupture of follicles and formation of normal corpora lutea in certain cases. (2) The opposite effect, a rapid and generalized destruction (atresia) of follicles, often associated with slight increase in the size of remnants of theca interna which normally constitute

[1] From the Department of Pathology, Washington University School of Medicine, St. Louis, Mo. These investigations were carried out with the aid of a grant from the International Cancer Research Foundation and with the aid of a grant for research in science made to Washington University by the Rockefeller Foundation.

a part of the medulla of the ovary, so that rudimentary strands of so-called interstitial gland develop, and also associated occasionally with the formation of small pseudocorpora lutea. The latter are not caused by ovulation of mature follicles, but by the growth of connective tissue and capillaries from the theca interna into the granulosa, both these cell layers enlarging and becoming lutein-like. (3) Type I of luteinization, consisting in the ingrowth of connective tissue and vessels from the theca interna into the enlarged granulosa of mature follicles. Thus there develop at first pseudo-lutein bodies containing still a large cavity and pearls of granulosa cells enveloped by connective tissue cells; gradually these bodies become transformed into large pseudocorpora lutea. While the cells of the mature granulosa produce follicular hormone, the lutein cells produce lutein hormone. (4) Type II of luteinization. Here we find, in addition to a marked development in the medulla of the ovary of interstitial gland from remnants of theca interna structures, a premature maturation of the granulosa of smaller and medium-sized follicles. At the same time the theca interna luteinizes around the granulosa and sends connective tissue and vessels into the latter. Thus there develop either small pseudocorpora lutea or, if the granulosa is less advanced in luteinization than the theca interna, processes take place which may be designated as luteinizing atresia of follicles, in which the luteinization of the theca greatly preponderates over that of the granulosa. These changes may in the end lead to the formation of interstitial gland bodies consisting largely or almost entirely of completely atretic follicles surrounded by zones of lutein tissue.

The anterior pituitaries of cattle, pig and sheep produce in the ovary of the guinea pig, almost exclusively, process 2; they also induce marked hypertrophy of the thyroid gland. The anterior pituitary of the guinea pig induces preponderatingly process 1 and leads to formation of rudimentary interstitial gland in the medulla of the ovary; stimulation of the thyroid gland is lacking or very weak. The anterior pituitaries of rabbit, rat and cat induce processes 1, 3 and 4; they cause only a moderate stimulation of the thyroid gland. Human anterior pituitary acts similarly to this last group, but in addition it exerts usually a more marked stimulating effect on the thyroid gland, which is perhaps due to its large size. We also notice that the relative preponderance of processes 1, 3 and 4 may vary according to the condition of the individuals from whom this organ is obtained.

In a series of experiments with human and cattle anterior pituitaries—the former being obtained at autopsy—we have now been able to change experimentally the preponderance of the various effects, which the anterior pituitary glands of these different species exert, after implantation into the guinea pig and to make the action of the gland of one species like that of another species. For this purpose we placed under as sterile conditions as possible a human or cattle anterior pituitary gland into a certain solution, where it was kept at room temperature for variable periods of time, usually 3 or 7 days but in other cases only 1 day, and in one case as long as four weeks. Following this period the gland was cut into four pieces, which were implanted, one piece at a time, on four successive days into subcutaneous pockets of sexually immature guinea pigs. On the fifth day the thyroid gland and the sex organs of these guinea pigs were removed for microscopic examination, the ovaries being cut into complete serial sections.

Some of the principal results obtained so far may be briefly stated as follows:

(1) Many different substances, such as H_2O, 0.9 per cent. NaCl solution, alcohol, ether, glycerine, dilute solutions of formalin, abolish process 2 (injury to follicles), which cattle, pig and sheep anterior pituitaries normally induce in the ovary of the guinea pig. Pieces of cattle gland, thus deprived of their typical effects, act now on ovary and thyroid essentially like the anterior pituitary of one of the other species; the character of these changes varies in accordance with the nature of the solution to which the gland has been exposed.

(2) While thus 95 per cent. alcohol abolishes the action of the follicle-injuring substance, normally demonstrable in implanted pieces of cattle anterior pituitary, it can be shown that this substance is still present in the anterior pituitary tissue, although it is inactive after implantation. It can be extracted with alkali, but not with weak acid, and such alkali extracts of treated cattle anterior pituitary exert their usual effects, namely, follicular atresia in the ovary and hypertrophy in the thyroid of the guinea pig. Whether this substance, in general, which is present in pieces of anterior pituitaries of cattle, sheep and pig and which can be extracted from these organs, functions as a hormone in the living organism needs still to be determined.

(3) A solution of $\frac{1}{2}$ per cent. or 1 per cent. formalin, the optimum concentrations varying under different conditions, acting for from 3 to 7 days on human or cattle anterior pituitary, abolishes entirely or almost entirely effects 3 and 4 (luteinization types I and II) as well as the thyroid stimulating effect, whereas the follicular growth and maturation processes may be present in full strength. After having acted for only 1 day, these solutions have not yet abolished luteinization and thyroid stimulating effects. An excess of formalin may injure also the growth and maturation

processes. Even a solution of 1½ per cent. of formalin in 95 per cent. alcohol may exert these effects on human anterior pituitary. Solutions of formalin in H_2O or 0.9 per cent. NaCl solution, especially after addition of a small amount of alkali, act therefore in principle in about the same way on human and on cattle anterior pituitaries and make both similar in their action to the anterior pituitary of the guinea pig.

(4) If human or cattle anterior pituitaries are placed for several days in H_2O, 0.9 per cent. NaCl or glycerine, effects 3 and 4 (types I and II of luteinization) are accentuated, while process 1 (follicular growth and maturation) is weakened. Anterior pituitaries thus treated also stimulate the thyroid gland. After an immersion lasting 1 day in these solutions, the maturation effect may still be present.

(5) Likewise, 50 per cent. or 95 per cent. alcohol and ether, acting for 3 to 7 days on cattle or human anterior pituitaries, cause a predominance of the I and II luteinization processes in the effects exerted by these glands; also the thyroid gland is stimulated. In some cases growth-maturation processes may be combined with luteinization processes and occasionally even an injurious action on follicles may be noticeable. Human anterior pituitary kept for four weeks in 95 per cent. alcohol may still produce strong luteinization effects of type II. If the anterior pituitary is exposed to the action of 95 per cent. alcohol for only 1 day, growth-maturation processes may be marked. There was observed usually an inverse relation between the hypertrophy of the thyroid gland and the intensity of the growth-maturation process in the ovary.

(6) Of the other substances tested we shall mention only 50 per cent. alcohol saturated with Na_2SO_4; the effects of this solution on human anterior pituitary may be similar to those which weak solutions of formalin exert, although they are not so pronounced in the former solutions as in the latter.

(7) While thus, as a rule, there was a definite correlation between thyroid hypertrophy and luteinization processes, especially of type II or with injury (atresia) of the ovarian follicles, and an inverse correlation between thyroid hypertrophy and growth-maturation of follicles, it was possible, as we have seen, to separate experimentally the thyroid-stimulating hormone from the substance producing atresia of follicles; the former was still active in cattle anterior pituitaries which no longer injured the ovarian follicles. In some cases it was also possible to disassociate experimentally the thyroid-stimulating hormone from the hormone or hormones causing luteinization processes types I and especially II. Furthermore, the previously untreated anterior pituitary gland from a woman who had died during the period of lactation produced only very marked follicular growth-maturation effects but no luteinization processes and still it exerted a strongly stimulating action on the thyroid gland.

We may therefore conclude that while usually the thyroid-stimulating hormone is in some way associated with the luteinizing hormone and with the follicle-injuring substance—a relation to which we called attention several years ago[2]—this connection is not a necessary one, an experimental dissociation between these various effects of the anterior pituitary being possible and occurring also under natural conditions in certain cases. The thyroid-stimulating hormone is therefore in all probability not identical with the luteinizing or follicle-destroying substance.

(8) These experiments have shown that it is possible to transform the action of the anterior pituitary of one species into that of another species and that the presence of one substance in the anterior pituitary may cover up the presence of other substances which become manifest after experimental removal of the first substance.

(9) The data obtained may be interpreted by assuming that the effect of these various hormones depends upon the presence of certain amino-acids, which form part of one or several polypeptid or protein molecules. The amino-acids, responsible for the stimulation of the thyroid and for the luteinization processes, especially of type II, would be very similar in constitution and, therefore, would be affected by formalin in a similar manner. On the other hand the chemical group responsible for growth-maturation processes would be more resistant to the action of formalin. We consider this interpretation merely as a suggestion, which may perhaps be serviceable in explaining the results of these investigations.

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TRAVERTINE DEPOSITING WATERS NEAR LEXINGTON, VIRGINIA

THE travertine depositing waters of the lower, cascading part of Wilson Falls Creek, 18 miles northeast of Lexington, Virginia, are supersaturated with $Ca(HCO)_2$ throughout the year, the excess ranging from about 68 to 76 parts of $CaCO_3$ per million. Not counting high-water periods, the largest excess appears in winter. These conclusions are based on monthly analyses of the creek and of a feeder spring over a span of one year. The creek was sampled at 4 stations. The first and last stations are about a mile

[2] Leo Loeb and R. B. Bassett, *Proc. Soc. Exp. Biol. and Med.*, 27: 490, 1930; Leo Loeb, *Endocrinology*, 16: 129, 1932; *Proc. Soc. Exp. Biol. and Med.*, 29: 642, 1932.