with 8 papers). Obviously most of these publications contain many data on, and interpretations of, basic geology which are of great importance in scientific and economic investigations, whether for peace-time welfare or industrial activities under the urge of national defense programs.

Projects initiated during the past decade and still in various stages of progress toward completion for published bulletins may be briefly summarized as follows:

Basic geologic research primarily pertains to 14 projects, namely, Great Gossan Lead district in the southwestern Blue Ridge province,[3] geology of Frederick and Clarke counties (transverse of the northern Shenandoah Valley),[3] Natural Bridge district,[4] geology of Giles County,[3] Hot Springs district, Burkes Garden quadrangle (Tazewell County),[3] northwest front of Blue Ridge province in southwest Virginia, Eocene formations,[4] Lower Devonian, geology of Abingdon 30-minute quadrangle, Amherst quadrangle (15′), Buena Vista quadrangle (15′), Lexington quadrangle (15′), and Stony Man quadrangle (15′).[4]

Research involving chiefly industrial minerals includes 7 projects: Commercial granites,[4] diatomite, Valley limestones, southwestern Piedmont limestones, mineral industries, slates,[3] and talc and soapstone.[3] One project is concerned with fuels, namely, natural gas possibilities in southwest Virginia,[3] which is in cooperation with the U. S. Geological Survey.

Projects in progress that are in large measure educational, that is, for reports in non-technical language for use in schools and by laymen, and which in addition will afford considerable basic data are as follows: Common rocks and minerals, geology of Virginia, geologic history of Shenandoah National Park, natural wonders, physical features, rocks and land forms in state parks, guide-book of the Lee Highway (U. S. 11), and separate "Outlines" of the geology and mineral resources of Augusta, Bath, Frederick,[3] Scott,[4] Smyth,[3] Tazewell, and Wythe[3] counties.

Ground-water investigations in cooperation with the U. S. Geological Survey consist of two projects, namely, the southern Coastal Plain[6] and the middle Coastal Plain.

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[3] Field work completed.

[4] Manuscript report and geologic map completed for publication.

SPECIAL ARTICLES

ABSORPTION OF PELLETS OF CRYSTALLINE HORMONES

THE introduction of the pellet method by Deanesley and Parkes[1] has made possible a much more efficient administration of many of the crystalline hormones. Due to the present scarcity of available data on the relative absorption rates of hormones in pellet form, it seemed advisable to attempt to obtain such information.

Using a modification of the Hartman[2] apparatus, cylindrical pellets of various crystalline hormones were prepared; all these pellets had the same diameter and had been subjected to the same amount of compression. (The modified apparatus and the detailed results will be described in a later article.) The length of a pellet varied according to its weight (in these experiments, 1.6 mgm = 1 mm of length). The pellets used weighed 6 to 10 mgm each. They were implanted subcutaneously, under ether anesthesia, in the lower right abdominal quadrants of 97 normal, healthy, sexually mature male and female rats. One freshly made, full-sized pellet, after careful weighing, was implanted in each rat. Each rat and each pellet were used only once. After varying intervals had elapsed the pellets were removed, cleaned, dried to constant weight in a desiccator and reweighed. Each rat was also weighed when the pellet was implanted and when it was removed.[3]

The data reported below were obtained from the implantation and removal of 20 testosterone, 16 testosterone monopropionate, 12 methyl testosterone, 14 stilbestrol, 17 desoxycorticosterone and 18 progesterone pellets. The loss of weight of each of these pellets, expressed in terms of per cent., was plotted graphically against the number of days the pellet had been *in situ*. Such a graph showed surprisingly little scattering from a nearly linear curve. Pellets could be and were successfully removed and weighed until they were about 90 per cent. absorbed. Under the conditions of the experiment, it was found that 90 per cent. absorption of the pellets required the following amounts of time: desoxycorticosterone, 27 days; testosterone, 31 days; methyl testosterone, 36 days; stilbestrol, 51 days; testosterone monopropionate, 61 days; progesterone, 88 days. It is believed that the uniform technique employed makes these results directly comparable. The sex of a rat appeared to have no constant differential effect on the absorption rate.

The absorption curves were either linear or else showed with time only a slight gradual decrease in the absorption rates, a fact which agrees with theoretical

[1] R. Deanesley and A. S. Parkes, *Proc. Roy. Soc.*, Ser. *B*, 124: 279–298, 1937.

[2] C. G. Hartman, *Endocrin.*, 26: 449–471, 1940.

[3] The author wishes to express his indebtedness and gratitude to Mr. Bruce Valentine for construction of the pellet press, to the staff of the Edward Martin Biological Laboratory of Swarthmore College for providing facilities and animals to begin the experiment and to Dr. Erwin Schwenk, of the Schering Corporation, for donating the hormones used.

calculations and which should be of importance in the experimental and clinical use of pellets. Theoretical considerations indicate that the absorption rate may have decreased rapidly after 90 per cent. absorption had occurred.

Within a week after implantation each pellet became closely invested with a thin, non-adherent tissue capsule. Histologically, the capsules consisted of circumferentially and compactly arranged connective tissue cells and fibers. The capsules were of fairly uniform structure but varied in thickness roughly according to their age. In a few instances, perhaps as a result of local infection, the capsules were markedly thickened and vascular; in these cases the absorption rate showed after the first 10 days either moderate increase or a moderate decrease.

Stilbestrol invariably caused losses in body weight; such losses ranged from 0.3 to 3.6 gm (average) for each day the pellet was *in situ*. Weight losses occurred in some but not all of the other rats.

The results of additional observations, now in progress, on the relative absorption rates of several other steroid hormones indicate that estrone and alpha-estradiol show relatively very slow absorption and that, like testosterone propionate (see above), esterified alpha-estradiol and desoxycorticosterone are absorbed more slowly than the corresponding free forms.

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ANTAGONISTIC ADRENAL AND PITUITARY EFFECTS ON BODY SALTS AND WATER*

IN a number of papers published during the past four years we have described important related effects on electrolyte and fluid balance brought about through adrenal and hypophyseal activities.[1,2,3,4,5,6] In 1938 it was shown that a hormone contained in our cortico-adrenal extracts acted as a diuretic agent and antagonized the anti-diuretic hormone of the posterior lobe of the pituitary.[4,5] The conditions proposed by Smith[7] for a diuretic factor were shown in our experiments to be fulfilled in every respect by the cortico-adrenal hormone.[4] Recently we have extended our experiments and tested the more specific adrenal substance, desoxycorticosterone, in its possible relationship to water intake and urinary chloride and fluid output under different conditions. Some experiences with this crystalline factor reported recently by other workers[8,9] confirm our earlier results obtained with whole extracts of the adrenal cortex.

Observations have been made in the present experiments on normal, adrenalectomized and hypophysectomized rats, amplifying our previous work on opossums. Operated animals were allowed several days for recovery before metabolism tests were run, and then studied at intervals for periods up to 30 days (adrenalectomized rats) and 80 days (hypophysectomized animals) after operation. Two to four "rest" days were given between runs. Adrenalectomized animals were occasionally given weak saline and small amounts of cortico-adrenal extract on off-test days, sufficient to keep them in a state of chronic insufficiency; hypophysectomized rats also were observed in the chronic condition, *i.e.,* when showing only slight diabetes insipidus. The 12-hour tests were made with water allowed *ad. lib.,* usually without previous fasting; in a few series in which runs were carried out after a 6-hour fast, no significant differences were observed. Results and other experimental details are shown in Table 1.

TABLE 1

EFFECTS OF DESOXYCORTICOSTERONE† AND POST-PITUITARY EXTRACT‡ ON WATER INTAKE AND URINE AND CHLORIDE OUTPUT IN RATS UNDER DIFFERENT CONDITIONS

Experimental conditions	No. of cases	Water intake cc/100 gm rat	Urine cc/100 gm rat	Urinary chlorides mg/cc
Unoperated rats, no treatment	34	1.7	1.5	2.78
Unoperated rats, desoxycorticosterone-treated	12	2.9	1.9	1.50
Unoperated rats, post-pituitary extract	10	0.6	1.1	16.20
Adrenalectomized, untreated	10	3.4	2.1	3.30
Adrenalectomized, desoxycorticosterone-treated	11	7.8	5.0	1.11
Adrenalectomized, post-pituitary extract	6	0.9	1.3	8.25
Hypophysectomized, untreated	26	2.3	1.9	2.12
Hypophysectomized, desoxycorticosterone-treated	52	5.9	5.2	0.38
Hypophysectomized, post-pituitary extract	10	0.8	1.7	6.40
Hypophysectomized, desoxycorticosterone and post-pituitary extract	12	1.9	1.9	6.09

† Desoxycorticosterone acetate ("Cortate"), kindly supplied by the Schering Corporation.
‡ Post-pituitary extract ("Solution," U.S.P.), kindly supplied by Squibb and Sons.
Metabolism tests in each case extended over 12 hours. Small doses of the above preparations were administered every two hours.

It is clear at a glance that in all groups of animals, normal, adrenalectomized and hypophysectomized, the effects of desoxycorticosterone are of opposite sign to those of post-pituitary extract. Desoxycorticosterone invariably increased water intake and urine output,

* Aided by a grant from the National Research Council.
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