will be double the initial excess density of susceptibles over the "threshold density" determined by critical sanitary ventilation. *Experimentum crucis:* Bactericidal irradiation of air provides an instrument for making the experimentum crucis, *i.e.*, the effect of air disinfection upon the incidence of contagion introduced into susceptible aggregations, first to determine whether the epidemic spread of childhood contagions through aggregations of susceptible children can be prevented by raising the sanitary ventilation above a critical value. For three successive years classes in irradiated rooms of the primary department of the Germantown Friends School have been spared the epidemic spread of mumps or chicken-pox suffered by comparable classes in unirradiated rooms in each of these years. *Conclusion:* We intend to pursue the theory to scientific proof but believe that enough is now known to warrant the recommendation that ultraviolet radiation apparatus be installed in buildings designed to house large companies of men.

Fat metabolism in diabetes mellitus: WILLIAM C. STADIE, JOHN A. ZAPP, JR., and F. D. W. LUKENS (introduced by D. D. Van Slyke). The current theories of fat metabolism in diabetes mellitus are: 1. Knoop's hypothesis of successive beta oxidation. 2. Hypothesis of obligatory coupled ketone body-carbohydrate oxidation. (3) Fatty acids are converted by the liver into carbohydrate. Evidence in the literature and our own experiments convince us that these hypotheses are no longer tenable. That ketone bodies are utilized by the peripheral tissue of the diabetic animal was shown by four independent methods in the depancreatized cat. Therefore the depancreatized cat must oxidize ketone bodies without coupling with carbohydrate oxidation. The multiple alternate oxidation hypothesis postulates that fatty acids are simultaneously oxidized along the entire length of the chain at alternate carbon atoms with the formation of four molecules of ketone bodies per molecule of fatty acid and no acetic acid. Further experiments conformed to the hypothesis of multiple alternate oxidation rather than the Knoop hypothesis. By means of the multiple alternate oxidation hypothesis the ketone utilization in human cases of diabetes was calculated. The calculations show an abundant utilization of ketone bodies independent of carbohydrate oxidation. A new hypothesis for the metabolism of fats in the diabetic was formulated: Up to a certain level of fat catabolism (about 2.5 gm. of fat per Kg per day) fats are utilized completely and there is no ketonuria. When total fat catabolism exceeds this amount only a part of the fat is completely oxidized. The balance is excreted as ketone bodies. There is no obligatory chemical coupling of fat and carbohydrate oxidation. In further experiments with liver slices from depancreatized cat the important oxidative reactions were measured. The results show that there was no oxygen available for the conversion of fat to carbohydrate. It was concluded that the overproduction by the liver of carbohydrate from fat does not occur.

Qualitative differences in the biological activity of adrenal cortical steroids: DWIGHT J. INGLE (introduced by A. N. Richards). Extracts of the adrenal cortex have a number of measurable physiologic properties. They are capable of maintaining life in adrenalectomized animals, effect the distribution of electrolytes in the body, the amounts of carbohydrates in the body; they will maintain the ability of the adrenalectomized animal to work, and when administered in large amounts to normal animals will cause the atrophy of the adrenal cortices. A large number of pure compounds have been isolated from extracts of the adrenal cortex. Some of these compounds are biologically inactive and the active compounds show qualitative differences in their biologic properties. Thus it is found that those compounds which are the most active in prolonging the life of adrenalectomized animals are incapable of maintaining normal carbohydrate metabolism. On the other hand, compounds which have the greatest effect upon the carbohydrate metabolism of normal or of adrenalectomized animals are only weakly active for maintaining life and in effecting the distribution of electrolytes.

(To be continued)

REPORTS

A NEW PAN AMERICAN TREATY

"WASHINGTON, October 12—American Republics Sign Convention on Nature Protection." Such was the heading of a news release sent out by the Pan American Union. This was the announcement of the inception of an International Nature Protection Treaty designed to meet the international wildlife problems of the twenty-one American Republics. This is the first treaty of its kind ever to be proposed on this continent. It is planned to include twice as many countries as the only other International Convention of a similar nature. I refer to the London-African Convention of 1933, which included no provisions for migratory bird protection.

This Pan American Convention marks the third great cooperative step taken by the United States to further wildlife protection by international treaty on the American Continent.

In 1916 we ratified the Migratory Bird Treaty with Great Britain with respect to Canada. This treaty became effective in 1918. In 1936 we ratified a somewhat similar treaty with Mexico. In addition to these treaties we have entered into international agreements regarding seals, whaling, and fisheries. The Pan American Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere covers a broad virgin field for international agreement.

It establishes a basic pattern for a scheme of parks and reserves throughout the Americas which our own experience has taught us is thoroughly sound. It

provides for appropriate protective laws for flora and fauna where inadequate ones exist. It favors cooperation in scientific field studies, the protection of migratory birds, the protection of vanishing species listed in a special annex, and the control of contraband fauna or flora protected by the laws of another country.

The following are the definitions of four categories of parks and reserves under the terms of the convention:

1. The expression *National Parks* shall denote:

Areas established for the protection and preservation of superlative scenery, flora and fauna of national significance which the general public may enjoy and from which it may benefit when placed under public control.

2. The expression *National Reserves* shall denote:

Regions established for conservation and utilization of natural resources under government control, on which protection of animal and plant life will be afforded in so far as this may be consistent with the primary purposes of such reserves.

3. The expression *Nature Monuments* shall denote:

Regions, objects or living species of flora or fauna of esthetic, historic or scientific interest to which strict protection is given. The purpose of nature monuments is the protection of a specific object, or a species of flora and fauna, by setting aside an area, an object or a single species, as an inviolate nature monument, except for duly authorized scientific investigations or government inspection.

4. The expression *Strict Wilderness Reserves* shall denote:

A region under public control characterized by primitive conditions of flora, fauna, transportation and habitation wherein there is no provision for the passage of motorized transportation and all commercial developments are excluded.

There follow several articles dealing with the establishment of these parks and reserves.

The brief history of this convention takes us back to Resolution XXXVIII of the Eighth International Conference of American States, at Lima, Peru, in December, 1938, which provides for the establishment by the Pan American Union of a Committee of Experts, to study the problems of nature protection and wildlife preservation in the American Republics, and to formulate a Draft Convention for the preservation of the flora and fauna in the Western Hemisphere.

The Governing Board of the Pan American Union, in accordance with this resolution, called a meeting of the Committee of Experts for May, 1940, in the city of Washington.

The following countries were represented on this committee: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, Haiti, Mexico, Panama, Paraguay, Peru, the United States, Uruguay and Venezuela.

The committee held meetings from May 13 to 16 inclusive, at which it carefully considered material assembled in answer to a questionnaire sent out by the Pan American Union, and in accordance with this and with other information available prepared a draft of a convention which covers the important basic requirements for nature protection and wildlife preservation on a broad international basis for the American Republics. The draft of this convention received the unanimous approval of the above-mentioned committee of experts.

On October 12, the day on which the convention was opened for signature at the Pan American Union, representatives of the following countries affixed their signatures: Cuba, Ecuador, El Salvador, the United States, Nicaragua, Peru, the Dominican Republic and Venezuela. Other countries have signified their intention of signing in the near future.

Science, art and literature have forged strong ties between the American Republics. This convention should add still another tie through its parks, reserves and monuments, which will help to bring about a common interest in great masterpieces of creation in the Americas.

The signing of the convention was hailed by the Minister of El Salvador, Dr. Hector David Castro, in the following words:

> In affixing their signatures to the Convention on Nature Protection and Wildlife Preservation in the American Republics, the representatives of the nations of the Western Hemisphere have to-day pledged their countries to adopt measures for the protection of useful, harmless and ornamental species of plant and animal life. They have thus given formal recognition of the fact that many such species know no national boundaries, and that true conservation of the gifts of nature should begin before these resources have been dissipated by thoughtless or selfish destruction.
>
> This action brings together and thus strengthens all the unselfish efforts of individuals and governments throughout the countries of the New World. I am highly gratified that in a world so occupied with questions of grave political and military consequence a body of independent nations thus voluntarily agree upon a program aimed only at the peaceful end of protecting the endowments of a bountiful nature.

The spiritual value of the "natural beauty" that we hope to preserve for future generations in these great New World Continents can be most perfectly described in the following words of G. M. Trevelyan:

> By the side of religion, by the side of science, by the side of poetry and art, stands natural beauty, not as a rival to these, but as the common inspirer and nourisher of them all, and with a secret of her own besides. . . . It alone makes a common appeal to the sectaries of all our

religious and scientific creeds, to the lovers of all our different schools of poetry and art, ancient and modern, and to many more besides these. It is the highest common denominator in the spiritual life of to-day.

Let us hope that all the American Republics will sign, ratify and pass enabling laws to get the greatest benefit from this International Convention as soon as possible. We also hope that our Government, which stands first in conservation measures in the Americas, will lead the way by being the first to ratify.

HAROLD J. COOLIDGE, JR.,
Chairman, Pan American Committee of the American Committee for International Wildlife Protection
MUSEUM OF COMPARATIVE ZOOLOGY,
CAMBRIDGE, MASSACHUSETTS

SPECIAL ARTICLES

UPTAKE OF RADIOACTIVE PHOSPHORUS BY NUCLEI OF LIVER AND TUMORS

MICE carrying 10- to 15-day lymphoma[1] transplants were given 0.1 cc of isotonic Na_2HPO_4 containing 6–10 microcuries of P_{32} by intravenous injection. At intervals afterwards the livers were cleared of blood by perfusion with saline, immersed in ice cold 5 per cent. citric acid for one-half hour, and the nuclei isolated by centrifugation of the pulped tissues. Tumors were removed from the same animals and similarly treated to obtain nuclei. Haemacytometer counts were made on all samples of nuclei, and contamination by fragments of cytoplasm was found to be negligible.

Fig. 1 shows the microcuries of P_{32} per cm^3 packed

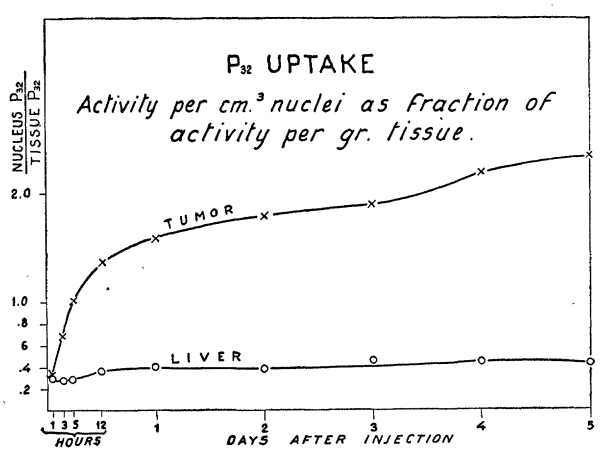

FIG. 1.

nuclei as a fraction of the P_{32} activity per gram wet weight of whole tissue plotted against time after injection. Whereas the fraction of the liver P_{32} bound by the nuclei remains constantly at .3–.4, the relative concentration in the tumor nuclei rises to more than twice that of the tumor tissue. Similar results have been obtained with sarcoma 180 in the mouse.

Isolated nuclei suspended in isotonic Na_2HPO_4 containing P_{32} take up only one tenth the *in vivo* nuclear activity, and most of the *in vitro* activity can be shown to be adsorbed phosphate. Nuclei from liver slices shaken at room temperature in isotonic Na_2HPO_4 have less than one hundredth of the *in vivo* concentration of P_{32}. The uptake of P_{32} can not therefore be attributed to simple chemical exchange.

After extraction with alcohol-ether and trichloracetic acid 60 to 70 per cent. of the P_{32} of the liver nuclei is in the residue (nucleoprotein) and 70 to 95 per cent. of the P_{32} of the tumor nuclei is in the same fraction at all intervals from one hour to five days after injection.[2] The data indicate that P_{32} may be built into the nucleoprotein directly from the inorganic phosphate or that the rate of turnover in the more labile forms of organic phosphate is very rapid. Since the metabolic rate is lower in the rat than in the mouse, it is expected on the latter hypothesis that for comparable tissues (*e.g.*, liver) the relative P_{32} concentration in the nuclei of the rat will be lower than for the mouse. From one-half hour to two days after injection of P_{32} into 150-gram rats, the concentration in the liver nuclei is approximately 0.1 per cent. of the injected dose. The second alternative, therefore, seems the more probable.

To determine whether the greater concentration of P_{32} by tumor nuclei is characteristic of the tumor *per se* or is to be attributed to mitotic activity, three 150-gram rats were partially hepatectomized and given P_{32} intravenously 36 hours later. Three normal rats of the same weight, and three rats carrying bilateral carcinoma 256 implants were injected at the same time. Two days later livers and tumors were removed. The ratios of nuclear P_{32} to tissue P_{32} were .345, 1.02 and 1.08 for nuclei from normal liver, regenerating liver and tumor, respectively. With rats injected four days after partial hepatectomy and nuclei removed three days after P_{32} injection, the ratios for nuclei from normal and hepatectomized animals were .28 and .32, respectively. Very few of these nuclei were found in mitosis, while of the liver nuclei removed in the first experiment 3.7 per cent. were in anaphase or metaphase and a much larger per cent. in prophase. The

[1] J. H. Lawrence and Gardner, *Am. Jour. Cancer*, 33: 112–119, 1938.

[2] The data are insufficient as yet for determining whether the difference in nucleoprotein P_{32} of tumor and liver nuclei is significant. (71, 67, 64, 68, 53, 72 per cent. in liver nuclei at one hour, 1, 2, 3, 4, 7 days after injection and 98, 95, 94, 70 per cent. in lymphoma nuclei at 1, 3, 5, 7 days.) Preliminary data show no difference in nucleoprotein P_{32} of rat liver and carcinoma nuclei.