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March 8, 1948

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by

W. H Bridges

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DIVISION OF
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ADMINISTRATIVE REPORTS

TID-13 UNITED STATES ATOMIC ENERGY COMMISSION RESEARCH AND DEVELOPMENT REPORTS
February 15, 1948 35 Pages (Secret)

ANL-4115 ADDITIONS TO THE LIBRARY REPORT FOR THE PERIOD JANUARY 26 TO FEBRUARY 6, 1948
H. D. Young February 9, 1948 15 pages (Secret)
(Argonne National Laboratory)

CHEMISTRY REPORTS

UR-3 POLAROGRAPHIC STUDIES OF THE URANYL-CITRATE COMPLEX
W. F. Neuman and J. R. Havill 2/1/48 (Restricted) 22 Pages

Citrate forms a soluble, complex ion, combining with uranium in a mole ratio of one. The complex probably exists in solution as a dimer with very little tendency to dissociate. It is stable over a wide range of pH. From the negativity of the half-wave potential, it appears unlikely that uranyl-citrate would be reduced in vivo.

ANL-4066 CHEMICAL METHODS FOR THE PURIFICATION AND ISOLATION OF NEPTUNIUM
L. B. Magnusson, et al October 10, 1947 35 Pages (Secret)

The best methods at the present time for separating neptunium from various types of source material are outlined. For the purpose of analytical classification neptumium may be grouped with uranium and plutonium since all three elements, mixed in an aqueous solution, can be oxidized to a characteristic + 6 state. An excellent separation from other metal ions is obtained by extraction of the + 6 states into diethyl ether. Methyl isobutyl ketone is also an effective extracting solvent although it is not as specific. All three elements in the + 6 state will precipitate with sodium as double acetates of the formula $NaXO_2(OCCCH_3)_3$. Neptunium may be separated from uranium and plutonium by solvent extraction or precipitation. Np (IV) forms a benzene soluble, chelate complex with thenoyl trifluoracetone. Under suitable reducing conditions Np(IV) can be extracted away from Pu(III) and U(VI). A separation method involving the precipitation of fluorides is essentially dependent on the relative rates of oxidation and reduction of uranium, neptunium, and plutonium.

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HEALTH AND BIOLOGY REPORTS

UR-1 URANIUM TETRACHLORIDE TWO ONE-YEAR INHALATION TOXICITY STUDIES OF ANIMALS AT 0.2 AND .05 MG U/M3
N. J. Ashenburg (Univ. of Rochester) January 30, 1948 60 pgs. (Restricted)

In conformity with other studies of chronic inhalation toxicity from uranium dust, animals were exposed daily for one year to UCl_4 distributed in an atmosphere equivalent to concentrations of 0.05 mg and 0.2 mg U/m3, for the purpose of determining "borderline" or safe levels of exposure for the duration of one year. At the 0.05 mg level, 21 dogs and 150 rats were exposed; at the 0.2 mg level, the same numbers of these two species were exposed, and in addition 20 rabbits and 30 guinea pigs. The customary period of one month prior to exposure was employed for acclimatizing the animals to chamber conditions and for the collection of control toxicologic data. UCl_4 differed from certain other uranium dusts employed in this series in that exposure was complicated by the formation of hydrolytic products, $UOCl_2$, UO_2Cl_2, UO_2 and HCl.

At the end of one year, some renal injury, attributable to uranium exposure, was seen in all species at both levels, but at the 0.05 mg level this was confined to 10% of the dogs and to 6% of the rats and was from slight to moderate in degree. At the 0.2 mg level, 50% of all dogs and 9% of the rats showed mild renal injury; rabbits showed 20% (2 of 10) and guinea pigs 10% (1 of 10). Injury was, for the most part, chronic in nature as seen in repeated serial histologic examination and as confirmed in a few instances by changes in certain biochemical criteria. There was evidence from bromsulfalein dye retention studies of possible liver injury in dogs at the higher level, although no histologic evidence for this was seen. There were changes of possible significance in the hemoglobin and reticulocyte count of rats, but not in dogs. No appreciable accumulation of uranium occurred at either level in the tissues of any species.

UCRL-36 THE METABOLISM OF CARRIER-FREE RADIOACTIVE SILVER IN THE RAT
K. G. Scott January 1, 1948 48 Pages (Restricted)

The manner in which rats handle small amounts of silver is different from the findings reported on argyrism. After the administration of about 10^{13} atoms of silver, excretion is immediately and thoroughly accomplished. This is done principally by the liver. Owing to lack of absorption from the intestinal tract, the silver is found in the fecal contents. Silver administered by stomach tube was not absorbed within the limits of the sensitivity of the method but was less than 0.1% in these studies. The distribution of silver in the rat after intravenous injection is the same as that observed after intramuscular injection. When the dose of silver atoms per rat was increased from 10^{13} to 10^{18}, which is a concentration commonly used in therapy, a quite different distribution of the silver in the body was obtained. This was apparently

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due to the inability of the liver to excrete this larger amount of silver with the efficiency it demonstrated with smaller doses. Because of this there was observed a 10 to 100 fold increase in the concentration of silver observed in such organs as liver, kidney, spleen, skin, bone, and muscle. The deposition in these tissues was proportioned to the total amount of silver administered.

It has been shown that animals whose livers have been damaged with three hours of light chloroform anesthesia are unable to excrete a dose of silver containing as few as 10^{13} atoms efficiently. The reduction in capacity to function in this manner is enormous. It was reduced to a value of about 10^{-4} of normal. The damage is transient with recovery occurring in several days. The distribution of silver in the other tissues of the chloroform treated rats resembles that obtained when doses of silver, larger by a factor of about 10^{4}, are administered. The above results point the way for a development of a liver function test.

If the normal route of excretion of silver is cut off by bile duct ligation, large amounts of silver pile up in the liver and other tissues of the body. Some silver is excreted in the feces after bile duct ligation, suggesting a mechanism secondary to the liver although the rate of excretion is much lower.

Silver atoms in concentrations of about 10^{13} atoms per cc. of blood are combined primarily on blood proteins although measurable amounts are found on the red cell membrane and in the hemoglobin. The silver was not dillyzable through cellophane. The primary carrier of silver in the blood is the blood gloubulin fraction although some is carried on the albumin fraction. The relative distribution of silver on the various fractions of the blood is regulated by the blood itself, since purified gloubulin containing silver redistributes the silver to the other protein fractions of the blood in vitro when it is added to whole blood.

Silver combined with gloubulin is rapidly taken from the globulin in the intact animal and excreted by the liver.

HW-8549 THE TREND OF CONTAMINATION IN THE AIR, THE COLUMBIA RIVER, RAIN, SANITARY WATER, VEGETATION, AND WASTES, AT THE HANFORD WORKS, FOR THE PERIOD JULY, AUGUST, SEPTEMBER, 1947
W. Singlevich December 28, 1947 30 pages (Secret)

This report is divided into topic sections:

Section I Meteorological - Wind conditions
Section II Extent of beta contamination in air and radiation level in air.

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Section III Extent of contamination in the Columbia River
Section IV Extent of beta contamination in rain
Section V Extent of alpha and beta contamination in sanitary water
Section VI Extent of beta contamination on vegetagion
Section VII Extent of contamination in Hanford wastes.

An appraisal and review of all the results is considered in detail for each section.

CRC-341 PRELIMINARY NOMOGRAMS FOR CALCULATING SHIELDING FROM GAMMA RADIATION
C. M. Nicholls and I. Wells (Chalk River) October 22, 1947
(Unclassified)

The object of the nomograms presented in this report is to provide rapid, easy and reasonably accurate methods for carrying out design calculations connected with plants handling γ emitting fission products. Tenth thickness value vs Mev is plotted for lead, iron, concrete and water, and the nomographs relate these to dosage.

LAMS-567 PLUTONIUM FAST REACTOR AT LOS ALAMOS
Jane Hall May 7, 1947 45 Pages (Secret)

A description of the design and construction and operation of a fast Pu reactor cooled by mercury. It was calculated that the central flux would be about 5×10^{12} n/cm^2 and a power level of 10 kw. It will be possible to irradiate in a flux of 3×10^{12} n/cm^2 sec. and an average energy of 300 kev.

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