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Contract No. W-7405-eng-48



# SUMMARY OF THE RESEARCH PROGRESS MEETING of May 18, 1950

Henry P. Kramer

September 18, 1950



Berkeley, California

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Information Division
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## Current Applications of $C^{14}$ to Organic and Biological Chemistry. B. Tolbert.

The Organic Chemistry Group at the Radiation Laboratory has concentrated its efforts on the use of $C^{14}$ in research in synthetic chemistry, biological investigations, and the examination of photosynthesis. Since photosynthesis has been discussed previously before this audience it will be slighted in the present report and attention will be focused on the efforts at synthesis of organic materials for employment in biological investigations.

$C^{14}$ comes to the group in the form of $\overset{*}{C}O_2$ produced as the result of pile operations. The methods that are available for the incorporation of this labeled atom in organic compounds are limited by the factors of high cost of the radioactive material and extreme purity desired in the organic compounds. The high chemical yield that is required in all reactions leading to the incorporation of $C^{14}$ restricts the number of syntheses that can be used to a few.

Three primary reactions are employed, each of which engenders a large class of substances that are useful in biological work:

$$\overset{*}{C}O_2 \begin{cases} \rightarrow \overset{*}{C}H_3I & (80 - 90 \text{ percent yield}) \\ \rightarrow CN^- & (80 - 90 \text{ percent yield}) \\ \rightarrow R\overset{*}{C}O_2H & (95 - 98 \text{ percent yield}) \end{cases}$$

$\overset{*}{C}H_3I$ is useful because of the many coupling possibilities that it offers. It is used, for example, in the preparation of acetylcholine. $R\overset{*}{C}O_2H$ is the intermediate for the production of amino acids. 11 amino acids have thus far been prepared with the $C^{14}$ label in various positions. Among these are glycolic acid, lactic acid, succinic acid, and tartaric acid.

In conjunction with the Pharmacology Division of the U.C. Medical School

studies are being carried out on the action of drugs labeled with $C^{14}$. To date, methadone, codeine, demerol, stilbamidine, and acetylcholine have been synthesized.

Work is also being carried out on possible isotope effects by studying the breaking up of malonic acid in the following reaction

$$\begin{array}{l} C\ O_2H \\ | \\ CH_2 \\ | \\ C\ O_2H \end{array} \longrightarrow CO_2 + CH_3CO_2H$$

It was found that when one of the formate radicals was labeled with $C^{14}$ 5 percent more $C^{14}$ was contained in $CH_3CO_2H$ than would be expected if the bonds $C^{14}$-$C^{12}$ and $C^{12}$-$C^{12}$ were of equal strength. Thus it appears that the bond $C^{14}$-$C^{12}$ is stronger than the bond $C^{12}$-$C^{12}$. Similar investigations are being planned with dephenyl malonic acid.

A good deal of work has been carried out in cooperation with J. Gofman's research on cholesterol. $H^3$ labeled cholesterol has been prepared and attempts are under way to tag it with $C^{14}$ as well. Labeled organic compounds are also obtained by feeding animals with $C^{14}$ and then removing the compounds synthesized by them. For example, "hot" eggs have been obtained by feeding $C^{14}$ to chickens.

Stilbadeine labelled with $C^{14}$ is of interest in connection with multiple myeloma, a cancer of the bone marrow. It has been observed that stilbadeine concentrates in the marrow. This fact opens the possibility of treating myeloma by means of the radiation from 14 labeled stilbadeine.

On the Crystal Structure of $UB_4$. D. Templeton.

The borides of heavy metals have attracted the efforts of investigators recently because of their great stability at high temperatures and their hardness.

$CeB_x$, $ThB_x$, and $UB_x$ were prepared by L. Brewer, etal by heating the metals in the presence of boron to about 1500°C. These compounds were examined and in them a new crystal lattice was observed by means of x-ray diffraction. The results of this work are reported in detail in UCRL-522 "The Crystal Structures of $CeB_4$, $ThB_4$, and $UB_4$".

LMB/9-18-50
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