and radiogaschromatography.

When injected intravenously in mice, the radioactivity accumulated in blood, liver, kidney and brain. The brain uptake was found to be about 2.5% of injected dose per gram tissue at 5 min after injection. This result suggests that $^{11}$C-caffeine may be a useful brain scanning agent.

## Large Scale Production of $^{11}$C-Methanol—Precursor for $^{11}$C-Labeled Organic Compounds

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Though $^{11}$C-labeled organic compounds are expected to be very useful for clinical diagnosis, their practical uses are often confronted with difficulties, most of which are attributed to a short half life of $^{11}$C (20.34 min). A large scale of precursors have to be produced for their synthesis, followed by the necessity of procedures rapid and remote-controlled techniques. We have made a try on a large scale production of $^{11}$C-methanol, one of main precursors, for the purpose of a practical use of $^{11}$C-labeled organic compounds.

$^{11}CO_2$ was produced by 9 MeV proton irradiation at 20 $\mu$A with the $^{14}N(p,\alpha)^{11}$ Creaction. Immediately after the end of irradiation, $^{11}CO_2$ was transferred in a current of a target gas of $N_2$ to the reaction apparatus. The synthetic procedures of $^{11}CH_3OH$ from $^{11}CO_2$ are as below. For an introduction of $^{11}CO_2$ into a $LiAlH_4$

$^{11}CO_2 \xrightarrow{(1)} LiAl(O^{11}CH_3)_4$ : (1) 19 mg $LiAlH_4$ in 0.5 m*l* diethyl carbitol (0°C)

$LiAl(O^{11}CH_3)_4 \xrightarrow{(2)} {}^{11}CH_3OH$ : (2) 0.7 m*l* carbitol (100°C)

solution, two methods were compared: (A) $^{11}CO_2$ was directly introduced into the $LiAlH_4$ solution from a target tube (100 m*l*/min), and (B) $^{11}CO_2$ was first collected in a silica gel trap at −78°C (500 m*l*/min), then released by heating to 170°C and carried by a current of $N_2$ into the $LiAlH_4$ solution. Carbitol was added to the solution and the temperature was immediately brought to 100°C. The resulting $^{11}CH_3OH$ was carried by a current of $N_2$ and collected in an acetone trap at −78°C. The purity was examined by radiogaschromatography.

For a large scale production, the method of (B) was superior to that of (A) in a $^{11}CH_3OH$ yield. The performance of the production was completed within 15 min after the EOB. The use of electric valves helped a rapid and remote-controlled synthesis of $^{11}CH_3OH$. The radiochemical yield of $^{11}CH_3OH$ was 74% and its radiochemical purity was more than 99.9%. It turned out that more than 800 mCi of $^{11}CH_3OH$ can be produced if a high pressure target (>10 atm) and a high incident energy (>15 MeV) are used.

## The Production of Pure $^{123}$I and the Possibility for the Clinical Application of $^{125}$Xe

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It is known that $^{123}$I has ideal characteristics for the diagnosis of thyroid gland. On the other hand $^{125}$Xe is not known so widely, although it seems to be useful for the clinical diagnosis.

Pure $^{123}$I without impurities other than <0.2% $^{125}$I was produced by the $^{127}$I (p, 5n) $^{123}Xe \xrightarrow{\beta^+, EC,\ 2.1\ h} {}^{123}I$ reaction with 60 MeV protons in 1.5 g/cm$^2$ NaI target. At the same time $^{125}$Xe was obtained as by-products. To increase the yield of $^{123}$I,