The specific activity of these ^{18}F-compounds was high enough to apply to clinical use. The compound (1) and (2) were synthesized as kidney scanning agent, and (3) and (4) as pancreas scanning agent, (5) as tumor affinity agent, (6) as adrenal gland scanning agent.

Fundamental Studies on Production and Quality of ^{201}Tl

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Thallium(I)-201, having good biological and physical properties as a myocardial imaging agent, is now an object of interest in nuclear medical field in Japan.

With the intention of routine production of ^{201}Tl for medical use, we have investigated the nuclear reaction, chemical processing and testing method. Natural mercury and thallium were tried first as target material in expection of possible ^{201}Tl producing nuclear reactions; ^{202}Hg (p, 2n) ^{201}Tl and ^{203}Tl (p, 3n) $^{201}Pb \xrightarrow{EC} {}^{201}Tl$. Thus the target were bombarded with proton accelerated to 26 MeV with the cyclotron of model CS-30 (Tcc). When mercury was used as target material, number of (p, xn) reactions seemed to occur to produce non-separable radionuclidic impurities such as ^{200}Tl and there were some problems and difficulties related to target material treating and chemical processing. On the other hand, thallium target, by bombardment with 26 MeV proton, gave the intended ^{201}Pb in a satisfactory yield and then radionuclidic and chemical purities of final product (^{201}Tl, daughter of ^{201}Pb) were expected to be good after chemical separation. Thus the thallium target system was examined further, using ^{203}Tl-enriched target material. After bombardment, by solvent extraction method, ^{201}Pb was separated from ^{203}Tl target material which would be recovered for the next bombardment. Thallium-201, which has been born from ^{201}Pb was re-extracted from ^{201}Pb-^{201}Tl mixture about 30 hrs after first separation when its radioactivity reached maximum. Separated ^{201}Tl was purified by passing through an ion exchange column to obtain the pure monovalent ^{201}Tl. And the final product was examined by paper chromatography in n-BuOH saturated with 1 N HCl. And it was proved to be consist of exclusively monovalent ^{201}Tl and to contain no radiochemical impurities. No more than 2 ppm of Tl and Cu were detected by chemical test and average radionuclidic purity of recent 10 lots at calibration time was $99.76 \pm 0.03\%$ with $0.24 \pm 0.03\%$ of ^{202}Tl.

The Production of ^{13}N Labelled Ammonia

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The nitrogen-13 labelled ammonia, which is useful for the liver function studies, has been produced using a remote control system at NIRS medical cyclotron facility.

When a sterilized water was irradiated with 10 uA protons (15 MeV) for 20 minutes, over 90% of radio-activity was determined as NO_2^- NO_3^- and 3% of that was the ammonia in the irradiated water with the impurities as ^{18}F which was produced by the $^{18}O(p, n)^{18}F$ and ^{48}V (from titanium target cell).

These ^{13}N labelled nitrogen oxides were reduced to ^{13}N labelled ammonia by the action of Devalda's alloy and sodium hydroxide. Finally, the reduced $^{13}NH_3$ was distrillated into the 5 m*l* of 1% NH_4Cl solution which is useful for the study of liver function by the administration from a large intestine. The 80 mCi/5 m*l* of the final product has been obtained with 99.7% of radiochemical purity.

All of these procedures were operated remotely from the outside of the hot-cell using the specially designed control system.