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ON THE MEASUREMENT OF STABLE HEAVY ELEMENTS IN HUMAN TISSUES BY RADIOACTIVE IMPLANT INDUCED X-RAY EMISSION TECHNIQUE.
R.Amano, A.Ando,T.Hiraki,N.Tonami and K.Hisada. Schools of Allied Medical Professions and of Medicine, Kanazawa University, Kanazawa

A new technique, radioactive implant induced X-ray emission spectrometry was proposed to mesure the *in vivo* heavy elements in human tissues. In this work we first examined the volume effect of X-ray emission of Pt, Hg and Pb by Tc-99m implant source, and compared with other effective pairs,I-Tl-201, Cd-Xe-133 and Cd-I-123 in terms of effective excitation efficiency,$\eta eff=Nc/(Na \times Nd)$ where Nc was the number of counts in characteristic X-ray, Na was the number of atoms of interest in the sample,and Nd was the total number of decays of the radioactive implant source in the counting interval. Photo attenuation in the range of low energy was second examined by using of polyacrylate phantoms. KX-rays of heavy elements (Pt,Hg,Pb) were confirmed less attenuation and not difficult to detect after 3-4cm polyacrylate phantom. In addition, the detection limit of heavy element was calculated using Currie's criterion for Pb, I, Cd and Cd by Tc-99m, Tl-201, Xe-133 and I-123 implant source, respectively. We discussed the posibility of noninvasive measurement of heavy element in human shallow-seated tissue by the radioactive implant induced X-ray emission technique.

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Radiation Control of a cyclotron laboratory in Gunma University Hospital.
T. Ishihara, T. Nagai and Y. Sasaki°.
Dept. of Radiology and Nuclear Medicine°, Gunma University Hospital, Maebashi, Gunma.

A cyclotron had carrying in the cyclotron building at Feb.]983. The cyclotron laboratory had completed on May]983. Since clinical study have started at Jan.]984, about 450 patients study of O-]5 oxygen and carbon dioxide with continuous inhalation have made. This report is discribed about distribution of radiation dose rate in the laboratory within study, radioactive waste gases and waste water, external exposure of workers in the laboratory and internal exposure of patients.

]. Distribution of natural radiation dose rate was about 5.5uR/hr in the laboratory. As a patient study of O-]5 with continuous inhalation, distribution of radiation dose rate have increased 4.5-5.] mR/hr around the patient in positron CT room. It is necessary to do shortening the time of blood sampling.

2. Our cyclotron building have separated from other radioisotopes laboratory,and supplied positron emitters(O-]5,N-]3,C-]] andF-]8) from the cyclotron are very short half life. therefore we can waste radioactive gases and water after one or two days to keep it in tanks.

3. External exposure of the workers in the laboratory were about 0 - 400mrad/month with film badges. A high level exposure in the laboratory workers were occured to do maintenance of the cyclotron and make labeled compound.

4. Internal exposure of patients for whole body were about 200-300mrad/study.

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REDUCED RADIATION DOSE TO HANDS BY PROTOTYPE OF SIMPLIFID SYSTEM FOR RADIOPHARMACEUTICAL PREPARATION.
Y.Miyazaki,H.Inoue,J.Shiozaki,Y.Higuchi,M.Fujioka,K. Kawaguchi,M.Miynaga and T.Aburano*. Dep.of Nucl.Med., Noto General Hospial and Kanazawa University*.

Radiation dose to the hands in preparing the radiophamaceutical and in aspirating it into the syringe should have been noticed since the number of nuclear medicine studies increased. The commercially avilable lead shield for the aspiration and the automatic system for the preparation of radiophamaceutical have some disadvantages such as the high cost,the dead volume and the insufficient shielding. In order to reduce the radiation dose to the hands in preparing and aspirating the radiophamaceutical, we made a prototype of simplified manually-operated system, in which the syinge and the vial shieled with lead were setted in the box made of lead and lead glass.And the manual operation could be done outside the box.

The result shows that our system allowed substantial reduction of radiation dose to the hands and rapid prepration of radiophamaceutical compared with the lead shield, and allowed closer operation, smaller dead volume and lower cost compared with the conventional automatic system.

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IRRADIATION DOSE FOR THE STAFFS ATTENDED TO A NUCLEAR MEDICINE UNIT WITH A CYCLOTRON AND POSITRON CT (PET).
T.Hachiya, Y.Aizawa, Y.Shoji, E.Hagami, K.Uemura. Research Institute for Brain and Blood Vessels-Akita, Akita.

This paper presented the results of measurement of γ, β ray distribution in the PET room during PET study and of irradiation dose for the attending staffs.

(1) <u>γ, β ray distribution in a PET room</u>: Dose rate were measured point to point using an ion-chamber-survay meter (Aloka ICS-151) and a calibrated β scintillation detector. As expected, dose rate was the highest (γ 12 mR/H, β 22 mrem/H) in a subject's head and neck zone. Dose rates outside the PET room (wall thickness 30 cm) were within background level.

(2) <u>Irradiated doses of the working staffs</u>: Those were estimated by a γ, β film badge (Nagase-Landauer) and by a TLD ring badge (Nagase-Landauer). Measured doses were averaged during the past three years for an each profession as a unit of mrem/ month.

The highest doses were noted in the chemists, (body dose 116 mrem/M), but those were within the accepted dose for professional peoples with the Japanese regulation for radiation protection.

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