THE USE OF RADIONUCLIDE TRACERS IN THE DETECTION OF SEPSIS AND THROMBOSIS

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Leucocytes accumulate in centres of infection and inflammation, so leucocytes labelled with a γ-emitting radionuclide can be used to detect focal inflammatory lesions by imaging with a γ-camera. Leucocytes were obtained from venous blood and labelled with indium-111 using an indium-111-oxine solution. About 65% of the added activity was consistently incorporated into the cells, although up to 35% of this was associated with clumped leucocytes which were discarded. An indium-111 leucocyte study was performed in a patient with suspected Crohn's disease, the patient's own leucocytes being labelled and reinjected. On imaging, concentration of activity in the abdomen was detected at both 2 and 22 hours after injection in addition to the expected uptake in the liver, spleen and bone marrow.

The possibility of using technetium-99m for labelling leucocytes was also investigated. The advantages of this radionuclide are that it is relatively cheap and, in the form of technetium-99m pertechnetate, it is readily available in the hospital. Various technetium-99m preparations were tested as agents for leucocyte labelling. The most promising of these was found to be technetium-99m pertechnetate reduced with stannous chloride. Using this agent, about 30% of the added activity was found in the final leucocyte suspension after contaminating erythrocytes had been removed by lysis with 0.87% ammonium chloride solution and clumped leucocytes, containing 23% of the added activity, had been discarded.

Platelets labelled with a γ-emitting radionuclide can be used in the detection of deep vein thrombosis since they accumulate in blood clots. They can also be used to study platelet kinetics. A procedure was established for obtaining and labelling platelets with indium-111 and a labelling efficiency of about 53% was achieved. Aggregation studies with adenosine diphosphate demonstrated that the aggregation response of platelets could be maintained after labelling. Increasing the centrifugation speeds and times used in the procedure improved labelling efficiency but impaired the aggregation response, indicating that good control of centrifugation steps was essential.

An alternative method of clot detection was tested which employed technetium-99m. When the fibrinolytic enzyme, plasmin, was labelled with technetium-99m, its accumulation in blood clots, such as deep vein thrombosis, was detectable with a hand-held detector. A "kit" method was used for preparing some technetium-99m plasmin. Quality control of the preparation employed gel column chromatography scanning and this suggested a labelling efficiency of about 60%, although results were not very reproducible. Under correct storage conditions, the product appeared to be stable for 24 hours. The preparation was administered to two patients with suspected deep vein thrombosis. Abnormal uptake occurred in one leg of the first patient within 30 minutes, suggesting a deep vein thrombosis in that leg. In the second patient, there was no evidence to suggest a deep vein thrombosis as activity was found to be concentrated solely in the liver.

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