DEPARTMENT OF NUCLEAR MEDICINE
LEEDS GENERAL INFIRMARY
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BONE SCAN

What is the reason for doing the test?
We have been asked to look at the condition of your bones and joints. X-ray pictures can show their shape and their internal structures, but not how healthy they are. We shall be examining not so much the hard parts of your bones, but rather, the living tissues that are closely connected with them.

What will happen?
At your first appointment you will receive a small injection into a vein in your arm. This will contain a tiny amount of radioactive material, which will be picked up by the tissues of your bones. About 3 hours later, at your second appointment, we will first ask you to empty your bladder to get rid of any radioactivity that may have passed into your urine.
Then we will ask you to lie on a bed whilst a special machine, known as a Gamma Camera takes pictures of where the radioactive material has been absorbed. Alternatively, you may be asked to stand, or sit in front of the camera; but in either case the entire process should be completed in approximately three-quarters of an hour to an hour and half.

Will there be any side effects?
The radioactive material produces no side effects of any sort. You will be able to eat and drink, as you would usually do, before and after the test, and in the waiting time.

***Why the long wait*?**
Bones take a long time to absorb the material that is injected. Experience tells us that the best quality pictures are obtained after such a wait. We want the amount of radioactivity in your bones to be at a maximum and the amount left circulating in your blood to be at a minimum.

How soon will I know the result?
It is not usually possible to give any indication at the time of the test. This is because of the need to process the information collected by the Gamma Camera, and then to change this into pictures on photographic film. However, reports are sent out from the Department very quickly, and your doctor will receive your results in good time for your next appointment.

Are there any special preparations and precautions?
There an no special preparations and you will be asked to remove only your outdoor clothing and any large neck jewellery etc. Something loose, or with easily rolled-up sleeves to give access to your arms will, however, be a great help. The radioactive material will pass out in your urine, and after 24 hours, there should be virtually none left in your body. You will not notice anything different in your urine, nor anything different in the way you feel. The amount of radioactivity involved is so small it may

be safely disposed of in your toilet 9 or the ward toilets for hospital in-patients) with no more precautions than your normal hand rinsing.

Further information on Nuclear Medicine

What does "Radioactive" mean?

All materials – solids liquids and gases are made of atoms. Most of the atoms around us are perfectly stable, but it is possible to 'overload' some atoms with extra, smaller, particles called "neutrons", and such overloaded atoms are usually very unstable. They easily break apart. Any material which contains these unstable atoms is said to be "Radioactive".

There are tiny quantities of naturally occurring radioactive material such as Radium and Uranium – but the materials we use in this Department are all artificially produced in a Nuclear Reactor by bombarding stable atoms with large numbers of fast moving neutrons. These are produced when atoms of the fuel of the reactor – Uranium – split to form smaller atoms with the release of a great deal of energy.

What is 'Radiation'?

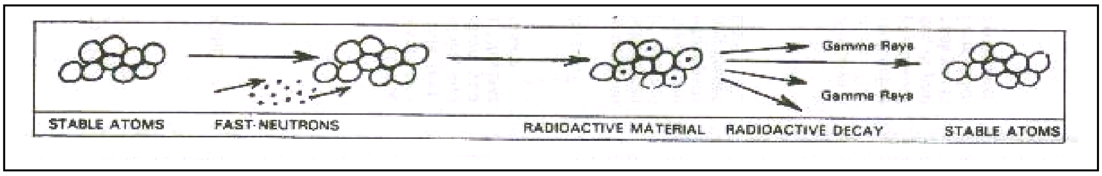
When an unstable atom breaks apart, it usually loses its surplus neutrons and reverts to a stable form. In the process, it gives off energy in a number of different ways, and this energy is known as 'Radiation".

The radiation we use in this Department is mostly in the form of Gamma Rays, which in many respects are just the same as X-rays.

The process of breaking apart is known as 'Radioactive Decay'.

How can radiation be harmful?

X-rays and Gamma rays can either pass straight through your body, and have no effect whatever, or they can collide with your atoms and pass on their energy to your tissues. This can affect the way your tissues behave, but large quantities are needed before harmful changes are produced. The sort of quantities we use are very tine in comparison.

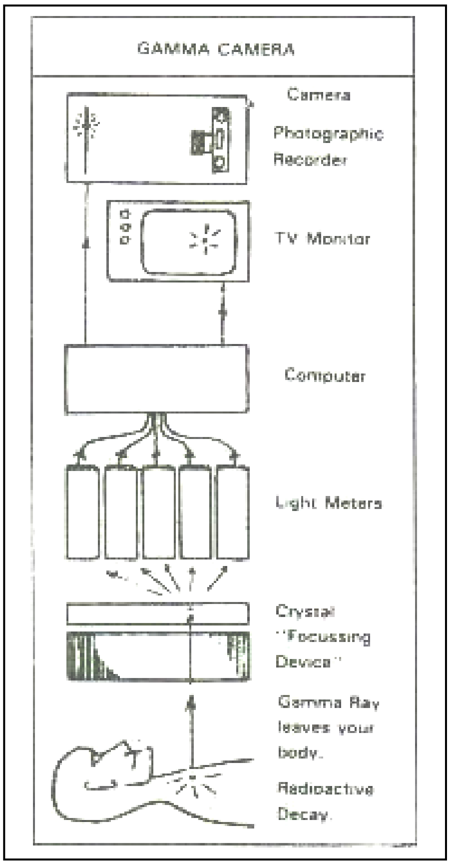


What kind of Radioactive Substance is used?

For most of our tests, we use a substance called 'Technetium', which does not occur in nature, but is made in a nuclear Reactor. We chose this because it gives off gamma rays with a very useful power of penetration through tissues, because its 'half-life' is very short (only 6 hours) and because it easily combines with a number of other substances which are specifically absorbed by different organs of the body. This enable us to use the best agent to "target" any particular organ we may have been asked to investigate, which has the added advantage that your other, non-target organs receive the very minimum of Radiation dosage.

How is the Radiation Measured?

A Gamma Camera is a very complex machine, but its principle is easy to understand. Every Gamma ray that leaves your body is “focussed” onto a disc-shaped crystal, which absorbs it, and gives off a very faint light-ray instead. Behind the crystal, there are 72 light detectors – rather like the light meters in a camera but much more sensitive.



These all detect the light ray, and pass on their signals to a computer, which is able to pinpoint the exact spot in the crystal from which the light ray originated. The computer can then cause a TV monitor to produce a bright spot of light of its screen, and this can also be used in a photographic recorder by being focussed onto a photographic plate. The spot of light is produced in a position which corresponds to the position in the body from where the Gamma Ray originated.

If many thousands of such processes occur – a spot on the film for every gamma ray – after a few minutes, a picture of your radioactive areas will be built up. The computer can later refine the picture or create a kind of ‘cine’ film showing any quick changes that may be happening.

Why is the word ‘Nuclear’ used?

The processes described above all take place deep inside the atoms in a region known as the “Nucleus”. The Gamma Rays we measure come form this nucleus – hence, “Nuclear”.

How much Radiation is involved?

To give a rough comparison, every year everyone receives about 2 units* of radiation from natural sources 9but this may be as high as 5 units in regions of the country where there is a lot of granite). The procedures in this department will give patients between 1 and 6 units, which compares very closely with these natural or so-called ‘background’ annual levels. The law requires that people who wark with radiation should never receive more than 50 units in a year, though the staff in this department would rarely expect to receive more than 2 or 3 units in 12 months.

* The “unit” is called the milliSievert abbreviated to mSv. It tells us how much energy has been picked up by your tissues from the radiation. Your body will not distinguish between the radiation your receive from natural background radiation and us).