Japan: Food and Evacuation

An article originally posted by Wade Allison on 7 Aug 2011 that asks critical questions about the accepted level of radioactivity in food and the criteria for evacuation following the Fukushima accident. It explained that an adult who ate two tonnes of meat condemned as unsafe over a period of four months would suffer no ill effect. Since consumption is impossible the meat is safe. (In April 2012 the accepted level for food was *tightened* still further to appease public concern.) Where do current safety regulations for ionising radiation come from? Are they sensible and are they in everybody's best interest?

In the 20th century most people learnt to think of ionising radiation as a quite exceptional source of danger to human health. They were two reasons for this. Firstly, during the Cold War there was very real concern about nuclear weapons. In addition to fear of their immediate explosive blast, fire and radiation impact, concern about radioactive fallout and radiation after-effects became rooted in opinion worldwide. Secondly, ionising radiation cannot be consciously felt, leaving people “in the dark” and easily worried. (Instruments to monitor the presence of significant radiation are still not widely available although the basic technology is similar to a simple domestic smoke alarm.)

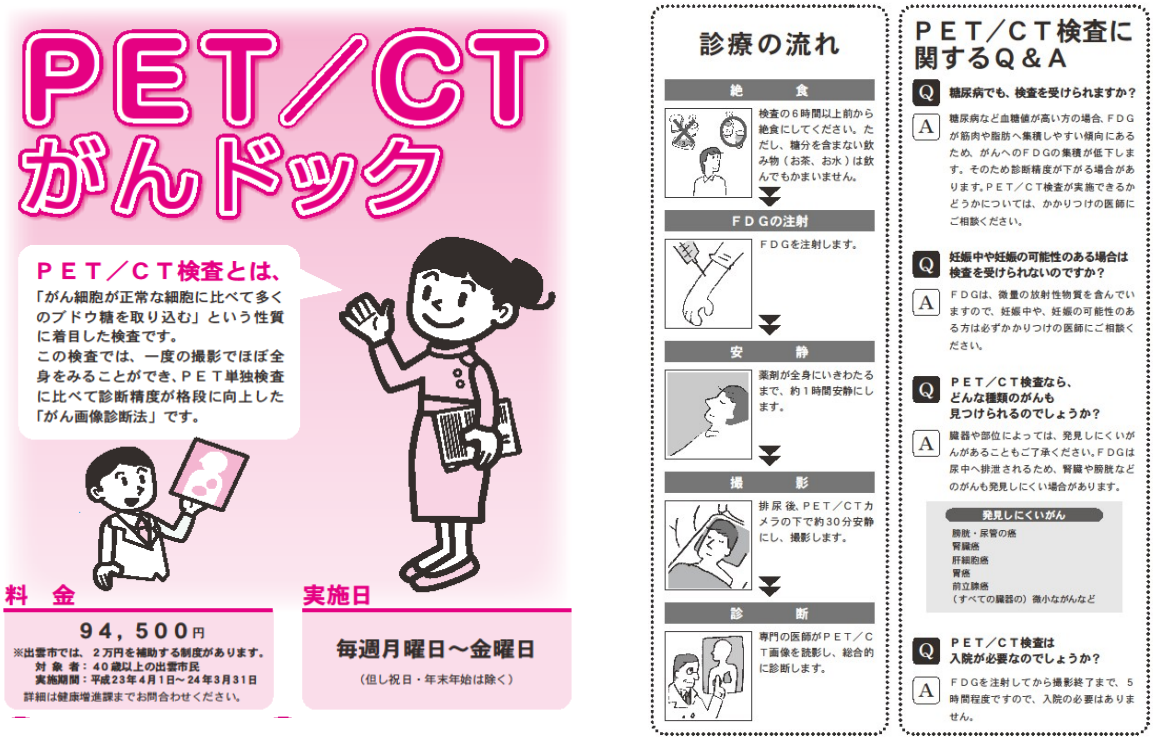
These concerns could not be answered in earlier decades because there was no adequate understanding of the biological effects of ionising radiation, and the various cellular repair and adaption processes were unknown. Also, there was inadequate human data with which to show whether fears were justified or not. An aversion to radiation meant that few people took more than a superficial interest in radiation science. The exception was in medicine where beneficial high radiation doses have been used for more than a century to cure cancer. The implanted radioactive sources and beams used are similar, sometimes identical, to those that cause consternation in the environment. It is public experience that this use of radiation in medicine when used carefully is good and so safe. Most people have a friend or relative who has benefited. Benefits are just as obvious with medical scans that use radiation, CT, SPECT and PET, where the radiation doses are a thousand times lower than for radiotherapy. So these are safe too.

From the early days the ever-possible unseen threat of nuclear radiation caused strong public reaction, particularly in first world democracies where annual marches and political movements expanded. Politicians, faced with a clamour for protection against radiation and anything called “nuclear”, readily endorsed regulations based on levels As Low As Reasonably Achievable (ALARA). The ICRP (the International Commission on Radiological Protection) drew up advice for all nations on this basis, although that was always a matter of acceptability rather than danger.

In the 21st century much has changed. For a start, after 50 years of laboratory work, the radiation biology of cells is now fairly well understood. This shows that life

exhibits an extraordinary resilience to damage by radiation -- and this agrees with many large scale studies of the effect of radiation on humans (as well as animals) that are now available. Also, in spite of popular and media expectations to the contrary, the effect of all serious civil nuclear accidents has involved a very low loss of life, even though in each case the nuclear reactors themselves have been destroyed. Specifically, there was no loss of life at Sellafield (1957) or Three Mile Island (1979). At Chernobyl there were about 50 deaths as confirmed by the UN report of 28 February 2011. Further, it is very unlikely that there will be any loss of life at Fukushima due to radiation, even from additional cancer in the next 50 years [based on recorded doses to workers at Fukushima and cancer rates measured for survivors of Hiroshima and Nagasaki with similar doses].

Yet the effect of current ALARA-based ICRP recommendations have resulted in unreasonable consequences, sometimes with considerable suffering for the local population, at Fukushima as at Chernobyl. Public concern that the authorities have under-reacted and have something to hide, has caused further over-reaction with further damage to health and public trust. Evacuation and the safety of beef are two instances.



A recent advertisement for part-subsidised PET/CT screening scan

On 27 July 2011 the Japanese government issued instructions "Measures against Beef", about meat that exceeds their radioactivity limit of 500 becquerel per kg. But at the same time public subsidy is offered to encourage the public to have a PET/CT scan in a clinic, as shown in the above advertisement. This screening scan gives a whole-body dose of 15 milli-sievert and is safe, but gives the same dose as the consumption of 2000 kg of radioactive beef in four months. [On page 12 of the

Measures it says that eating 1 kg of beef containing 500 becquerel per kg of caesium-137 gives a whole-body dose of 0.008 milli-sievert, and this has been checked. Dividing 15 mSv by 0.008 mSv per kg shows that the scan is equivalent to 2000 kg, that is 2 tonnes of beef per person.] A similar argument can be applied for iodine. In medical imaging studies to determine the health of the thyroid the patient is injected with a dose of 3-7 million becquerel of radioactive iodine, the equivalent of eating 1.5 to 3 tonnes of spinach at the limit of 2000 becquerel per kg, although the iodine-123 used nowadays is considerably less harmful than iodine-131. Anyway, all such iodine has gone away having decayed in the weeks following the accident.

Condemning food at this level is unreasonable. The economic and personal hardship caused should not be accepted. At the time of Chernobyl the Swedish Radiation Protection Authority set the intervention level at 300 becquerel per kg and raised it a year later to 1500 becquerel per kg. In 2002 they admitted in the Swedish daily newspaper, Dagens Nyheter 24 April, that they had destroyed 78% of all reindeer meat unnecessarily, at great loss and causing much hardship. This error is now being repeated at Fukushima.

At Fukushima the guide-line for evacuation was set at a radiation level of 20 milli-sievert per year. But any patient on a course of radiotherapy to cure cancer gets a dose to the tumour of 2000 milli-sievert each day for 5 or 6 weeks; the dose to tissue and organs within 10-15 cms of the tumour is 1000 milli-sievert each day. Usually the body recovers from this high peripheral dose which is in excess of 20000 millisievert, total in a month, and the patient thanks his radiologist and goes home to enjoy more years of life. This is the same dose in one month as would be received in 1000 years at the edge of the Fukushima evacuation zone. The trauma of evacuation has a very serious effect on life, making for real hardship and personal misery, especially among the old and very young. The gross error of major evacuation-- a form of socio-economic surgery -- was acknowledged in the case of Chernobyl by the IAEA report of 2006 and the UN report of 28 February 2011. When it came to Fukushima just a few days later, this lesson had not been learnt. Of course, in the initial few days when it was still uncertain whether all nuclear fission had ceased and cooling of the reactors was not being provided, emergency evacuation was appropriate. Those days are now long gone and the people should be encouraged to return home.

In practical clinical terms the hardship of evacuation and the apparent threat of unseen radiation does itself generate ill health. Real illness may be psychologically induced through the *nocebo effect*, the malign counterpart of the beneficial *placebo effect*. It takes experienced doctors and health workers to separate the effects of fear from those of radiation.

To survive on Earth mankind needs to understand dangers rather than running away from them like an animal driven by unthinking fear. Education and trust in the action of authorities is essential. Then the dangers need to be compared and decisions taken. In particular, in the case of ionising radiation levels As High As Relatively Safe

(AHARS) should be allowed, where the meaning of “relatively” depends on the competing dangers, such as evacuation, having no electric power, shelter, food and water. It is time that radiation safety levels were changed to take the same care of society and the environment that is used in decisions made for individual personal health in consultation with doctors. In a world of other dangers -- earthquakes, global warming, economic collapse, shortages of jobs, power, food and water -- the current expensive pursuit of the lowest possible radiation levels is in the best interest of no one. The internationally recommended levels should be changed early and substantially.

Fossil fuels, the energy source of choice in the 20th century, are now acknowledged to pose a long-term global threat to human life on Earth, far in excess of any local accident. Nuclear technology offers a base-load power source that renewables in general cannot. Regulations designed to placate the irrational fear of radiation should not stand in the way of the future. Such fear is a matter for education.