Genomic Sacrifice – Absorbed Dose vs. Second Event

Tony Boys

Background paper for 9/11 (JST 9/12,1300) discussion with Jeff Rense and Richard Wilcox

In a lecture given in Tokyo on radiation contamination from the disaster at the Fukushima No. 1 nuclear plant in July this year, Mr. Hobun Ikeya, a veterinary surgeon and president of the Ecosystem Conservation Society-Japan[1] caused an uproar by stating, "People in areas over which the radioactive plumes passed should not marry [...] If they give birth to children after getting married, the incidence of deformities may be very high."[2] This apparently included not only Fukushima, but also Tokyo and surrounding areas, inhabited by about 30 million people, roughly a quarter of Japan's population. He was asked by a number of Fukushima City councilors to retract the statement, but did not. Note that radiation in Fukushima City since March 11, 2011 has been high enough to warrant evacuation by children and pregnant women, but no such officially organized evacuation has been planned. Rather, the government has worked hard to try to keep the population in place.

The usual argument given for proclaiming that it is safe for all to live in Fukushima City is that an external dose of up to 20 mSv/yr [milli-Sieverts per year] (100 mSv/yr according to some)[3] is "not harmful to health." Chris Busby explained when he was in Japan in June 2011 that what 'establishment experts' who wish to play down the dangers of radiation exposure do not take into account is internal exposure, basing their judgments regarding safety on the International Committee on Radiation Protection (ICRP) external exposure risks only. These risk factors are partly the result of research into the health effects studied after the Hiroshima (and Nagasaki) A-bombs, basically an acute single dose of external radiation, quite different from radiation releases from nuclear power plant accidents or even normally functioning nuclear power plants. (It does also seem that the US-controlled Hiroshima research was "tilted" to arrive at certain conclusions by discounting internal radiation.)[4]

The European Committee on Radiation Risks[5] (ECRR, of which Chris Busby is the scientific secretary) estimates that the ICRP risk factors underestimate effects to human health by something like a factor of 200-600. What we generally hear is that if a small particle containing radioactive isotopes (like a hot particle containing Uranium or Plutonium) enters your body through inhalation or in food or drink, it may get lodged in some part of your body, e.g. your lung, or migrate preferentially to some organ that has an affinity for the isotope, such as Iodine-131 concentrating in the thyroid gland, and since, if the half life of the radioisotope is long, it may remain there, emitting radiation, for literally decades, the possibility of cancer arising in the irradiated tissue is therefore high. For the lay person, this is a reasonably easily acceptable notion, and to some extent explains why internal exposure is dangerous.

However, though the science is a bit more difficult, there is a much more convincing theory of how internal exposure causes cancers and other problems involving DNA mutation. This theory also explains why the isotopes present in natural background radiation are unlikely to result in cancers and other problems. The theory is called the Second Event Theory and was developed by Chris Busby in the late 80s.

Firstly, we have to talk a little about how cells work. Most cells in the living body are in a quiescent state. However, anything that can cause damage to the cell or the DNA within its nucleus, e.g. a "hit" by ionizing radiation, can cause the cell to become active and undergo a DNA repair and replication process followed by a cell division into two daughter cells. Simply, this is how evolution has prepared the cell to repair any DNA damage that might occur. This process of repair and replication of the cell's DNA keeps our DNA free of mutations that might occur from natural background radiation 99.99999% of the time. The process from the cell becoming active to division into two daughter cells takes roughly 10 to 12 hours.

Here comes the problem. Once the repair and replication process for the cell's DNA has begun, it cannot stop and will continue through to cell division. So if a second "hit" from ionizing radiation strikes the cell DNA during that 10 to 12-hour "window" the cell may suffer a mutation that gets passed on to its daughter cells and their descendants thereafter, and I think you can see how that might lead to a future cancer. ICRP risk factors do not account for this. For the ICRP, the external dose is averaged out over the whole body, each cell in your body receiving on average one radiation hit per year at a natural background dose rate of about 1 mSv/yr, making the possibility that a second hit will occur within the 10 to 12-hour window after the first event vanishingly small.

Now some man-made radioisotopes, those being produced as fission products in nuclear power stations as well as in nuclear weapons explosions, Strontium-90 (St-90) being one of them, fit right into this second event theory pattern in a very surprising way. 1) When they decay to another isotope, the isotope thus produced is also an unstable isotope with a relatively short half-life (which means that it is decaying relatively quickly). So if only one atom of St-90 finds its way into a cell, it may decay, sending out a beta-particle, which can damage a DNA strand, and then there is some possibility that the resulting atom of Yttrium-90 (Yt-90) may decay, emitting another beta-particle within the next 10 to 12 hours, damaging the DNA again, only this time the damage will be irreparable and will likely result in a mutation. This is how serious health effects may occur at internal dose rates that are far, far below natural background radiation. The main isotopes from Fukushima No.1 that show this second event type of decay are Strontium-90/Yttrium-90, Tellurium-132/Iodine-132, and Uranium particles, which will also show a second event, but there are several others.[6]

2) Another surprising fact is that St has an affinity for the Phosphorus on the backbone chain of DNA. That means that an atom of St-90 can actually enter the cell and affix itself right onto the DNA, so that when the second decay of the Yt-90 occurs, it does not even have to "aim" very well to hit the DNA a second time! Another element that binds to DNA is Uranium.[7] Both Uranium and Plutonium (e.g. in the form of Uranium oxide from depleted uranium[8] or Plutonium oxide released from nuclear power plants and reprocessing plants) may enter the body through inhalation and from there enter the lymphatic system. Since the likelihood of absorption of another gamma-ray (or X-ray) is proportional to the *fourth* power of the atomic number (which is why lead is used to shield against radiation), in the case of Uranium (atomic number 92) or Plutonium (atomic number 94), the chance of a hit by an incoming gamma ray from some source either inside or outside the person becomes even higher.[9]

Another important characteristic of the interaction between radioisotopes and tissue is the bystander effect, through which genomic instability may be induced over an area of tissue. Briefly, "if a cell is damaged by radiation … there is some factor induced in the cell and its descendants that predispose them to general mutation increases, which may be manifested as chromosome aberrations or other more visible damage. The process is termed 'genomic instability'. And this is not all. It also turns out that it is not only the primary cell that is hit that manifests the genomic instability, but also about one third of the cells within a … radius of about 400 cell diameters which also exhibit this phenomenon. This is called the 'bystander effect'."[10] This also helps to explain why cancers can arise due to internal exposure with a much larger probability than predicted by such risk factors as those published by the ICRP and in other publications.[11] Furthermore, once the genome has been damaged, there is no way to repair it. Failing the elimination of the damaged genome from the population by death without issue (as Mr. Ikeya so kindly suggests) the genomic aberrations may be passed down through dozens of generations.

Let's compare what we have studied above with natural background radiation. The nuclear industry likes to point out that we are receiving doses of so many mSv of radiation from the environment and that these are much larger than the small amounts of radiation mentioned in low-level radiation studies. They also mention that there are places on Earth where the natural background radiation is relatively high, but that no especial health effects are seen in these

areas. The main sources of radiation from the environment (as well as cosmic rays from space) are Carbon-14, Potassium-60, and Radon gas (Radon-222) from the decay of Uranium found in granite and other rocks.[12] These can all enter the body through inhalation and ingestion. But they are not second event isotopes – i.e. when they decay, they result in a stable isotope, so the radiation they emit when they decay may activate a cell, but there is far less probability of a second decay striking the DNA of the same cell within the ensuing 10 to 12-hour time window. As noted above, that's how evolution has provided us and other life with a mechanism that prevents against DNA mutation from natural background radiation.[13]

So, are we likely to see cancers, birth irregularities (such as deformities, stillbirths, infant mortality or premature births, due perhaps to internal exposure of both male and female reproductive cells to ionizing radiation) in Fukushima, or as far away as areas just south of Tokyo? Given the evidence from Belarus and many other areas of Europe after the Chernobyl nuclear catastrophe, which the establishment (IAEA, WHO, UNSCEAR, the governments, the nuclear industry and pro-nuclear academia) have most assiduously attempted to hide, but which has been revealed by Yablokov et al.[14] and many other writers and filmmakers, and given the early evidence of hot particles in the air in Tokyo, and even on the west coast of the USA, last March/April from the examination of car filters and so on, and the ingestion of amounts of radioisotopes in food as revealed by Rick Wilcox's July 2012 article[15] on Japan's low-dose radiation disaster, it would seem very probable that problems *are* going to occur in the coming years and decades.

But does that mean we should counsel people not to get married? No, I don't think so. What I think we should do, although now possibly too late (though it may actually never be too late) is encourage young people to do what they can to avoid internal exposure and to attempt to detoxify themselves if they think they are seriously internally exposed (and if they are within 250 km of the Fukushima nuclear disaster site then it is quite possible that they are). There are ways of doing this, and the one way to avoid exposure is to leave the area, though the Japanese government is making this problematical by implementing the burning and storage of radioactive earthquake and tsunami rubble all over the country. The other thing is to warn young people of the possible dangers they face so that they are aware of the risks when they decide to get married and start a family. They may then make their own choices, including what to do when they see the results of pre-natal screenings.

The Japanese government and the nuclear establishment has told the nation nothing of these risks, preferring to deceive their gullible population with ICRP risk factors, which are little more than simplistic lies. Thus Mr. Hobun Ikeya and the Fukushima City councilors can engage in polemics through the pages of newspapers and on the Internet while neither they themselves nor the general public have any idea of what the real situation might be. Now that we know quite a lot more of what the mechanisms of internal exposure to man-made radioisotopes are likely to be, and that it certainly does look as if the risk factors *are* 200-600 times greater than those given by ICRP calculations, we can only see the actions of the government and the nuclear establishment in concealing the realities of internal exposure as a horrendous human rights crime against their own people and the people of other countries who are also receiving some of the fallout from the Fukushima nuclear catastrophe. It seems that this is what they have to do in order to justify the restart of nuclear power stations in Japan for the purposes of "protecting the people's livelihoods," for protecting Japan's economy and for protecting the nuclear industry as well as for some clumsily disguised national security reasons,[16] *despite* the clear and well-understood seismic dangers, the mounting spent nuclear fuel waste issue, and the huge public majority in favour of a total nuclear phaseout. And let's not pretend that the government and the nuclear establishment can claim innocence regarding the effects of internal exposure; they know of Chris Busby's work as well as I do, and spend enormous amounts of time, effort and money in the attempt to refute, exclude, and otherwise keep his work and the work of others from public attention.

I think we and the Japanese people should be asking the following questions: Can "we" really put the genome of

the people on the same balance as “protecting livelihoods, the economy and the nuclear industry?” What exactly is this national security that coerces potentially a quarter to a third of the nation to carry a compromised genome? What is it that is so important to protect that even the genome of the Japanese nation can be thrown down onto the sacrificial chopping-block with a shrug of the shoulders and a look in the other direction? Why are we seeing the government become the enemy of the people in so many countries now? What are we missing here? Is there some important secret we’re not being told, some crucially imperative necessity we’re unaware of? It feels like there’s some large, evil monster secreting itself in a dark corner of the room. Perhaps it will not be too long before we begin to perceive its true form.

References

Material for this article was drawn from three books by Dr Chris Busby:

Chris C. Busby, Radiation and Cancer in Wales: The biological consequences of low-level radiation, Green Audit (Wales) Ltd., 1994. [Referred to below as “R&CinW”]

Chris Busby, Wings of Death: Nuclear pollution and human health, Green Audit Books, Green Audit (Wales) Ltd., 1995. [Referred to below as “WoD”]

Chris Busby, Wolves of Water: A study constructed from atomic radiation, morality, epidemiology, science, bias, philosophy and death, Green Audit, 2006. [Referred to below as “WoW”]

A scientific paper on the Second Event Theory has also been published:

Busby, C. C. (1998), ‘Enhanced mutagenicity from internal sequentially decaying beta emitters from second event effects.’ In ‘Die Wirkung niedriger Strahlendosen- im kindes-und Jugendalter, in der Medizin, Umwelt ind technik, am Arbeitsplatz’. Proceedings of International Congress of the German Society for Radiation Protection. Eds: Koehnlein W and Nussbaum R. Muenster, 28 March 1998 (Bremen: Gesellschaft fur Strahlenschutz)

1. Ecosystem Conservation Society-Japan website: http://www.ecosys.or.jp/eco-japan/language/english.htm
2. Japanese Veterinary Physician: Rate of deformed babies in Tokyo area will skyrocket from Fukushima disaster — “People who were there should not marry at all costs,” http://enenews.com/japanese-veterinary-physician-rate-of-deformed-babies-in-tokyo-area-will-skyrocket-people-who-were-there-should-not-marry-at-all-costs, and Asahi: Fukushima gov’t trying to stamp out ‘harmful rumors’ — Officials target group leader who discussed deformed babies, http://enenews.com/asahi-fukushima-govt-trying-to-stamp-out-harmful-rumors-targets-group-leader-who-discussed-deformed-babies (both August 30, 2012).
3. School as usual up to 20 mSv/yr – 13 schools in Fukushima Prefecture restrict outdoor activity – school safety criteria, http://www.asyura2.com/11/genpatu9/msg/579.html (April 19, 2011, in Japanese), and Complaints pile up against radiation advisor Prof. Shun’ichi Yamashita, who says “up to 100 mSv/yr is safe,” http://www.ourplanet-tv.org/?q=node/1037 (May 6, 2011, in Japanese).
4. Chris Busby, WoD, pp.105-110.
5. See The Low-Level Radiation Campaign, http://www.llrc.org/
6. Especially Barium-140/Lanthanum-140. Both Strontium and Barium are in the same chemical family as Calcium, and therefore bind to chromosomes as well as being incorporated into bones (WoW, p.60-61; see WoD, p.203, Table 7-3, and R&CinW, p.41-42, Table 3-1). Tritium is also dangerous as it freely exchanges with the Hydrogen atom on DNA, the two events being delivered by different atoms, as with Uranium or Plutonium particles (WoW, p.61), and

also with Iodine-131, which has a very short half life of 8 days, and which concentrates in the thyroid resulting in large amounts of radiation in a small volume of tissue.

7. Chris Busby, WoW, p.61.
8. For reproduction health effects attributed to Uranium, see Samira Alaani, Mohannad A.R. Fallouji, Christopher Busby, and Malak Hamdan, Pilot Study of Congenital Anomaly Rates at Birth in Fallujah, Iraq, 2010, Journal of the Islamic Medical Association of North America, Vol.44, No 1, http://jima.imana.org/article/view/10463
9. Chris Busby, WoW, p.49, 61
10. Chris Busby, WoW, p.67-8
11. E.g. Committee on the Biological Effects of Ionizing Radiation (BEIR) VII: Health Risks from Exposure to Low Levels of Ionizing Radiation, BEIR VII Phase 2, *Committee to Assess Health Risks from Exposure to Low Levels of Ionizing Radiation, Board on Radiation Effects Research, Division on Earth and Life Studies, National Research Council of the National Academies,* The National Academies Press, http://www.nap.edu/openbook.php?isbn=030909156X
12. Chris Busby, WoW, p.53 (natural background radiation), and WoD, p.82 (on Radon-222 gas)
13. Radium-226, naturally present in some environments, does undergo a sequential decay process, but the DNA mutation hazard of this is thought to be almost zero for reasons set out by Chris Busby in WoD, p.205-206.
14. Alexey V. Yablokov et al., Chernobyl: Consequences of the Catastrophe for People and the Environment, Annals of the New York Academy of Sciences, Volume 1181, http://www.strahlentelex.de/Yablokov%20Chernobyl%20book.pdf; also see Rosalie Bertell, Victims of the Nuclear Age, The Ecologist. November 1999 (Volume 29, No. 7), pp. 408 to 411, http://iicph.org/victims_of_the_nuclear_age
15. Richard Wilcox, No Safe Dose - Japan's Low-Dose Radiation Disaster, http://rense.com/general95/no-safe-dose.htm
16. “Protecting the people’s livelihoods” was one of the reasons given by PM Noda when he decided on the restart of Ohi nuclear power plant reactors 3 and 4 in June 2012 (e.g. http://www.kantei.go.jp/jp/noda/statement/2012/0608.html - in Japanese). “Protecting the Japanese economy” is a standard phrase often used with reference to nuclear power stations in business circles, e.g. by Keidanren Chairman Yonekura. As an example see http://blog.livedoor.jp/shatisoku/archives/53676112.html (15 June, 2012, in Japanese). “Protecting the nuclear industry” is what ordinary Japanese people believe PM Noda and the government are trying to do. Regarding “national security reasons,” several important politicians have mentioned the need for Japan to keep nuclear power plants running in order to maintain the façade of the capability of building nuclear weapons. On August 28, 2012, PM Noda stated, “Since it is interconnected with national security, we cannot simply say ‘zero nuclear power’.” (http://headlines.yahoo.co.jp/hl?a=20120828-00000161-jij-pol). On the very day I am writing this article (September 6, 2012) p.1 of the Tokyo Newspaper is criticizing the current Defense Minister Morimoto for a statement made in January this year, before he became Defense Minister, to the effect that “nuclear power stations are not simply for generating electricity; they are performing a very important deterrent function from the viewpoint of surrounding countries.”