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**Fallout: the Legacy of Chernobyl**  
**BBC Radio 4 programme broadcast on April 26 and May 1 2011**

**Comments by Dr IAN FAIRLIE**

The above radio programme suffers from five main defects and a number of factual inaccuracies.

The most serious defect is a lack of balance to the point of apparent bias. A balance of views is presented from eastern scientists (ie from Belarus and Ukraine) but not from western scientists. According to Mr Ross, the “great majority” of the (western) scientists whom the programme makers spoke to were in favour of nuclear power. The question naturally arises as to why did they not speak to other scientists? To my knowledge, the programme makers could have interviewed at least four distinguished UK professors who would have supplied more rounded views in this area. Two are renowned for having first discovered the large increases in childhood thyroid cancers arising from Chernobyl: not to have approached either of these scientists is an oversight.

The programme started inauspiciously with a chance meeting with the head of UKAEA at London airport. This rather set the tone for much of the rest of the programme: apparently all the UK and US scientists interviewed by Mr Ross had pro-nuclear views and were emphatic that Chernobyl’s radiation effects had been exaggerated. Lacking were more nuanced views from scientists with a less partisan take on these matters.

The programme makers omitted to refer to a recent major study of Chernobyl’s health effects by eastern scientists. Chernobyl: consequences of the catastrophe for people and the environment. Alexey V. Yablokov, Vassily B. Nesterenko, Alexey V. Nesterenko (Editors). Janette D. Sherman-Nevinger (Consulting Editor). Annals of the New York Academy of Sciences, Volume 1181, Number 1, November 2009.

<http://www.nyas.org/Publications/Annals/Detail.aspx?cid=f3f3bd16-51ba-4d7b-a086-753f44b3bfc1>

This lengthy book (347 pages) was mainly written by the former scientific advisor to Gorbachov and Yeltsin. It has sparked much discussion among western scientists: two lengthy and contrasting book reviews of this monograph were recently published in the peer reviewed journal, Radiation Protection Dosimetry. See

<http://rpd.oxfordjournals.org/content/141/1/97.extract?sid=f470848d-60c8-4e7f-a64f-c4a40f8a982a> and

<http://rpd.oxfordjournals.org/content/141/1/101.extract?sid=f470848d-60c8-4e7f-a64f-c4a40f8a982a> The programme makers would have benefitted immensely from reading these two reviews and the book itself.

The second defect is the mismatch between what interviewed scientists said and the programme's statements which followed. One example is after a series of statements by eastern scientists of increasing evidence of various cancer types, non-cancer effects such as cardiovascular diseases and increased ill health in general following Chernobyl. Mr Ross immediately dismissed these observations as not being accepted by "western scientists" as if this were the end of the matter. But it isn't: some western scientists do adopt superior or condescending attitudes when discussing eastern science but these attitudes are ill founded. Many western criticisms of eastern studies are found all too often in western studies as well. For example, Professor Thomas' criticisms of eastern epidemiology studies are all too common in western studies of nuclear effects as well.

Another example of mismatch occurred after Professor Cardis' statement that there was "mounting epidemiological evidence of small radiation risks even at low doses". Mr Ross then made a number of assertions to the opposite effect. He stated without substantiation that "... (radiation) risks for individuals were vanishingly small..." and were "far lower than those from ordinary smog". In fact, the risks of inhaling radioactive isotopes such as Cs-137 and Pu-239 would be much greater than inhaling the smoke-fog (smog) particles experienced in London during the 1950s, assuming similar air concentrations for both.

There is a spectrum of views about how dangerous low levels of radiation are, as explained by Dr Cardis. Although Mr Ross is entitled to his own personal view, he should have acknowledged these were at one extreme of the spectrum and that many distinguished radiation scientists in the UK and US would disagree with his view. These would include the 14 eminent UK and US radiation biologists and epidemiologists who authored a famous article in 2003 stating that the existing model for estimating radiation risks could be underestimating them. See Brenner DJ, Doll R, Goodhead DT, Hall EJ, Land CE, Little JB, Lubing JH, Preston DL, Preston JR, Puskin JS, Ron E, Sachs RK, Samet JM, Setlow RB and Zaider M (2003) Cancer risks attributable to low doses of ionizing radiation: assessing what we really know. (2003) PNAS Nov 25, 2003, vol. 100 no. 24. pp 13761–13766.

Third is the programme's failure to appreciate important distinctions in radiation risks, including those between deterministic and stochastic effects and between internal and external radiation. The risks from internal exposures to radiation from ingested or inhaled radionuclides at Chernobyl are quite different from the risks of external radiation exposures, a point which Mr Ross fails to grasp. This is important because the majority of the doses to people from Chernobyl's plume were (and are) from internal radiation. One would have also liked to have heard some balancing discussion of the important role of unreliable dose estimates; of the recent KiKK evidence of large risks near nuclear power stations in Germany; and of the hazards of radiation's new non-targeted effects.

Fourth is the programme's downplaying of radiation risks by stating that findings of increased cancer incidences by the 2005 WHO/IAEA report are mere "predictions", as if they were not real. However all official estimates of increased cancer rates are estimates. This is because radiation's effects are stochastic, because cancers occur after lengthy latency periods and because cancers due to radiation cannot be distinguished from ordinary cancers. Therefore we can only estimate and not state precisely how many cancer deaths will occur after radiation exposures. Nevertheless, a large body of scientific evidence makes it abundantly clear that radiation exposures - even at low doses - will result in increased incidences of cancer.

This attempted undermining of the scientific evidence on radiation effects is similar to the statements in the 1970s and 1980s by tobacco companies that lung cancer deaths were only "predictions" and not real. Nowadays, estimates and predictions for cancers arising from smoking are accepted without demur. In fact, the scientific evidence for radiation risks is more robust than that for tobacco risks.

Finally, there is the lack of evidence for the programme's main point that fear of radiation and distrust of official statements are more damaging than radiation risks themselves. Essentially, this argument depends on the contentions that radiation risks are very low and that radiation did not cause the array of observed ill health effects in Belarus and Ukraine. Contrary to Mr Ross' statements, neither contention is established from the evidence presented in the programme. For example, the eastern scientists interviewed failed to support either of these contentions, and the selected western scientists simply refused to accept the eastern scientists' evidence - with little explanation for their refusal.

The truth of the matter is that, given the lack of a major health study, we are unlikely to know the precise numbers of cancers and other health effects resulting from Chernobyl. But it is clear - even from official studies - that many thousands of people have died and will die in the future from exposures to Chernobyl's radioactivity. To deny this fact and to allege that the main problem is fear of radiation is regrettable. If nothing more, it reveals a lack of humanity towards the continuing plight of many people in Belarus and Ukraine who continue to be exposed to Chernobyl's contamination.

Below is a list of inaccuracies or misleading statements in the programme.

Ian Fairlie

<b>Radio 4 programme stated</b>	<b>Comment</b>
Mr Ross states "Chernobyl accident contaminated 75,000 square miles of Europe" (ie ~200,000 sq km)	According to the EU, the Chernobyl plume in fact contaminated 3,800,000 sq km of Europe. See table 3.1 of the independent TORCH report at <a href="http://www.chernobylreport.org">www.chernobylreport.org</a>
Dr Thomas alleges that "we weren't exposed to radiation from Chernobyl"	Yes, we were. See the map of exposures throughout Europe in figure 3.2 of the TORCH report. Chernobyl fallout resulted in restrictions

	on the movement of contaminated lambs in thousands of UK farms. Today, these restrictions remain on 334 farms particularly in Wales.
Mr Ross states the 2005 IAEA/WHO report said 4000 deaths from Chernobyl	It was the IAEA Press Release which incorrectly stated 4,000 deaths. The full IAEA/WHO report stated nearly 9,000 deaths: this incorrect citation was later acknowledged by WHO.
Sir David King alleges that the radiation dose from one transatlantic flight (~0.05 mSv) would be greater than the doses received from walking around near Fukushima	This statement is incorrect and inconsistent with the following: 6,000 sq km near Fukushima is a no entry area for all civilians which is enforced by military troops: 200,000 people have been evacuated from near Fukushima: the maximum allowed dose for workers has been increased from 50 mSv to 250 mSv per year: several workers have received life-threatening doses of radiation: the radiation limit for children in schools and playgrounds in Fukushima prefecture has been increased from 1 mSv to 20 mSv per year. The UK Government has evacuated all UK nationals from Tokyo - 200 km from Fukushima
Mr Ross refers to 25 years as a long time for radiation effects ("even after 25 years")	Latency periods for solid cancers can extend over many decades. For example, significant numbers of cancers are still arising among the Japanese survivors of the atomic bombs, who were exposed 65 years ago.
Dr LiVolsi states "No expert opinion finds increases in any other sort of cancer"	Ivanov et al (1995) and others have reported increased incidences of several solid cancers. The 2005 WHO/IAEA report pointed to increased breast cancers among exposed women under 45 years old at the time of the disaster.
Professor Tuttle states "we haven't seen a <u>big</u> increase in other cancers" (ie apart from thyroid cancer)	As stated above, there are small, but statistically significant, increases in other cancers.
Mr Ross states "the Chernobyl (exclusion zone) is now a wildlife park"	This is due to the exclusion of man and agriculture from the zone and the resulting influx of new species, and not to the absence of radiation effects implied by the programme. The programme makers appear unaware of the studies by Professor Mousseau and others on genetic mutations in birds, small mammals and plants within the zone.
Mr Ross states "...like a broken steam pipe ...as at Fukushima..."	Not to mention three major explosions, partial meltdowns, burning of spent nuclear fuel, and extensive releases of radioactive materials.