

# Radiation and health — a contradiction of terms?

David Bortz



## Curriculum Vitae

Dr David Bortz qualified in 1975 at UCT and did his internship at Groote Schuur (1976). He did 1 year Radiology and 1 year Cardiology overseas and then went to the army. During his army service he was also doing Radiology and this stimulated his special interest in Radiation and its effect on man. From August 1980 until January 1984 he was doing registrar training at Groote Schuur and has now commenced private practice.

## Summary

*The siting of the nuclear energy plant at Koeberg near Cape Town, is ill-conceived. The author discusses the reasons offered, the history of radiation and some of the implications for the people in that area. He then concerns himself with the GPs; their total lack of knowledge, training or facilities to deal with the dangers of radiation or any major accident.*

**KEYWORDS:** Radiation Effects; Radiation Monitoring, Radiation Protection; Radioactive Waste; Nuclear Energy; Accident Prevention; Emergency Service, Hospital; Disaster Planning; Civil Defence; Environmental Exposure; Radioactive Pollutants; Physicians, Family.

In the 1980's nuclear energy is a reality with the siting of Koeberg next to 1 000 000 people when the whole of the north-west coast, with abundant cold water supply, would have been adequate. The reasons given for this siting were:-

1. The cost; however, we now know that the cost of evacuation and/or casualties will cost much more than the original cost of the site.
2. In 1973 it was thought that 16 km was a safe distance but this is now known to be false.
3. It is more convenient for the Contractors to work in a place like Cape Town (I'd bet!).
4. Eskom felt why should other cities take the risk of being close to a nuclear power station — why indeed!

The question is not whether a nuclear station is wanted by Cape Town — not having been consulted, it is now a "fait accompli." The question of whether or not a tragedy will occur at the plant during working time is unanswerable — no one can guarantee that it will not. Certainly not the Medical Officer of Health, who has in fact moved to Gordons Bay for the sake of his children,

Dr David Bortz MB ChB(UCT) FCP (SA)  
41 Strathmore Road  
Camps Bay  
Cape Town  
8001



***The question is not whether Cape Town wanted a nuclear station — they were not consulted!***

and certainly not the insurance companies who do not cover you in the event of an accident.

You will hear the following pros about nuclear power being expressed by Escom:-

● **Nuclear power is cheap!** Escom was quoted as saying "it will be too cheap to meter". However, we have found out that it will be more expensive than coal — eg Transvaal coal costs are 1,9 cents per kilowatt hour whereas Koeberg will cost 5,6c per kilowatt hour<sup>1</sup>. This, of course, does not cover the cost of insurance and the cost of waste product disposal and reprocessing which will cost over 1 000 000<sup>2</sup>. Unfortunately, this announcement of the expense was made after Koeberg had been built!

● **Uranium is the fuel of the future:** so much of the future that no plants have been commissioned in the United States since 1978 and that the radio-active waste material will be a legacy for our *future* generations. In addition, the world energy reserve in uranium is very small and if a large share of the world's electricity were generated by reactors like Koeberg, the world uranium reserves would run out in about 30 years.

● **The nuclear industry has a good record** — this of course, does not take into account the Three Mile Island disaster nor the Windscale reactor in England where there has been an increase in incidence of leukaemia and death among children in towns around the Windscale (Sellarsfield) plant<sup>3</sup> (as well as accidents in the past, namely a fire some years ago with release of radio-active iodine). You will hear from Escom that the chance of an accident occurring at Koeberg is 1 in a million — figures taken from the Rasmussen report<sup>4</sup> which is a study into the safety of nuclear reactors. This report has now been declared, by the body which first published it — namely the US Nuclear Regulatory Commission, as incomplete, and underestimates the risk of nuclear power. In fact, after re-assessing the Three Mile Island disaster, they said that the chance of an accident occurring there, was, in fact, inevitable<sup>5</sup> because of the possibility of human error. In the United States, in one year, there were 850 abnormal occurrences, at a typical nuclear power station, which were the result of human error. A report in 1969 from another US Nuclear station said "a few kilograms of plutonium is unaccounted for"<sup>6</sup>. Later on I will discuss the dangers of this fact.

I would like, just briefly, to discuss the history of radiation. Madame Curie, having worked with radium, developed leukaemia, as did her daughter<sup>7</sup>. They certainly learnt the hard way of the dangers of radiation.

The workers who licked paint brushes which had been used for painting luminous dials on watches, developed malignancy of bone<sup>8</sup>. It is well known that uranium miners have a high incidence of carcinoma of the lung<sup>9</sup>. From Hiroshima (Nagasaki) experience one knows that after a lethal dose of radiation, namely 200-500 rads, death often occurs following nausea, vomiting, diarrhoea, alopecia (the least of their problems!) and pancytopenia. In addition, at 200 rads exposure there was a high incidence of leukaemia which occurred at 10 years<sup>10</sup>. What is not so well known is that there was an increase in carcinoma at 30 years. At 25 rads exposure there was increase in foetal miscarriage and malformation (this is a more worrying statistic that is not commonly known). In addition, at an even lower dose of 12 rads, there was 100 times reduction in sperm count and this makes a point that there is no safe dose.

***The Koeberg reactor is a real "time bomb" for future generations.***

The United States Regulatory Commission says that the public is not allowed to be exposed to more than 0,17 rads per year. However we still do not know the correct dosage because, for example, if 100 rads to 10 000 people gives 400 cases of carcinoma, will not 1% of this dosage (namely 1 rad) to 100 times more people (ie 1 million, the population of Cape Town) also give the same 400 excess deaths from carcinoma<sup>11</sup>. Other evidence linking radiation and leukaemia has been leukaemia in ankylosing spondylitic patients treated with radiotherapy<sup>12</sup> and the link between radiation and pancytopenia was reaffirmed with cases in Japanese fishermen from the fallout after the Bikini Atoll explosion<sup>13</sup>.

The China Syndrome refers to overheating of the core leading to the melting of it and 2 tons of radioactive material buried hundreds of feet underground. These 2 tons should be contrasted to 2 lbs of radioactive material which were released at Hiroshima, Nagasaki.

***Nuclear power will be more expensive than coal — yet South Africa has abundant coal supplies.***

The main danger that I would like to point out is that of **waste products**. There are many waste products that are the final end-product of the nuclear cycle, eg iodine 125. This is the only one for which there is an antidote, namely the potassium iodate tablets that are available from the Clinics. These have a short shelf life and have some side-effects eg rash, and it is questionable whether they should be given to a pregnant female. The



## Radiation and health — a contradiction of terms?

potassium iodate gives 90% protection if you take it within about 2-4 hours after exposure. However, all the other radioactive waste products do not have an antidote, eg strontium which causes malignancy of bone, as does caesium. The danger of caesium is that its half-life is 2 million years, namely, it takes 2 million years for it to have gone just to half its original strength. It is commonly accepted that you need 25 half-lives for a

***No nuclear plants have been commissioned in the USA since 1978.***

product to be reasonably safe — namely **50 million years**. A very long time when one is only buying nuclear power for **29 years**. The most frightening of all the waste products is Plutonium 239 which has a half-life of 25 000 years. Before one gets too optimistic about this short half-life in relation to caesium, one must be reminded that **one millionth of a gram** leads to death if inhaled and 4kgs is needed to produce an atomic bomb. However, the Koeberg reactor will produce **400 kgs** per year ie a real "timebomb" for future generations.

Now for the more practical aspects of radiation that concern us as doctors. Actual monitoring of radiation will be done by the City Council and Escom using dosimeters. A point that worries one about this is that at Three Mile Island the dosimeter showed no radiation and that the high level of radiation was too high to be measured on the dosimeter<sup>4</sup>. The problem, of course, with radioactivity is that one cannot see, smell, taste or feel it. Another problem is the lack of public knowledge, and Mr Douglas (who is in charge of Civil Defence) has commented on the lack of public knowledge about radiation dangers.

However, it is very difficult to inform the public as Nuclear Energy Act No 2 of 1982 Clause 6 says specifically: "No person shall, without consent of the Corporation in writing, communicate or transmit, or make known to any one, or use or publish any information with regard to any investigation, or discovery related to the processing, re-processing or use of any material in the nuclear field". It doesn't leave us much scope for manoeuvre to inform the public.

***Solar energy should be a priority in a sunny country like ours.***

Another problem is the vested interest of Escom who monitors itself. The Medical Officer of Health, Dr Coogan, has said that the fact that Escom is in charge

of all aspects of evacuation is unacceptable and would be unacceptable overseas because of the fact that Escom has vested interests in the plant and is not qualified in the health aspects as, for instance, the state health officials would be.

What about evacuation? Escom will pay for any evacuation (which is obviously not a very strong motivating factor for them!). They have tested a plan for evacuation, but, unfortunately, no people were involved. A minor detail! Evacuation, of course, will only mean people within **16 kilometers** of the plant (the poor Atlantic suburbs house dwellers!). Those people will be transported to the Goodwood Showgrounds by a bus (I wonder who the driver is going to be!) and small children in the area will also be transported to the Goodwood Showgrounds — just imagine the scene! Those who live a bit further from the area are advised to shut all their windows and go into their home and stay<sup>15</sup>, and if possible, breathe through several layers of cloth<sup>16</sup> to minimise the amount of radiation — if one doesn't succumb from radiation one would succumb from hypoxia in the summer time.

### ***What do we as doctors have to offer?***

1. **Training:** We have no training in this so there is nothing to discuss.
2. **Facilities:** For approximately 2½ million Capetonians going to be living here by the year 2 000 (with a quarter million people living around the Koeberg site) there are approximately 4-6 beds at Tygerberg Hospital! In the parliamentary season I wonder how the six will be chosen!

***Radio-active waste material will be our legacy for our children.***

### ***3. What do we tell our patients:***

- a) We can reassure them — however, if they know the full facts, this will be hard to achieve.
- b) We could prescribe an anxiolytic for the patient — and the doctor!

One doctor said flippantly that if anything happened he would run for it because:

1. There is no prophylaxis for radiation.
2. There is no antidote or treatment.
3. There are no facilities even if there were an antidote.

He may be right but I think a boat would be quicker than running!

On a more serious note. What can we do? Well, the City Council does put out a pamphlet explaining some of the dangers of radiation and this is freely available at Clinics as are the potassium iodate tablets and every household should have a supply of these (not forgetting the shelf life of less than 2 years). One should conserve



## Radiation and health — a contradiction of terms?

electricity — it is estimated that at least a third of our energy means could be supplied just by conservation of electricity. We should encourage the authorities to spend more money on searching for alternative sources of energy as we are a very sunny country with an abundant supply of solar energy as well as abundant coal supplies. A nuclear reactor, anyway, usually has a life of approximately 29 years.

In conclusion, I have not presented a very optimistic and practical approach to this problem. In an effort to be more constructive, I once asked an Escom official about Three Mile Island, as I was worried whether this could occur here. He, in an effort to put my mind at rest, said that this could not occur here because "Three Mile Island was a human error". As we don't seem to employ humans here, that may be the one bright, non-radioactive light in an otherwise dim horizon!

### REFERENCES:

1. Shock cost disclosure. *Cape Times* 1984 Feb 24: 9 (col 2 & 3).
2. Milne R. Sizewells reprocessing bill could quadruple. *New Scientist* 1984; 101.
3. Pearce F. Not in my backyard. *New Scientist* 1983; 100 (1382): 346-51.
4. US Atlantic Energy Commission. Reactor Safety Study Washington/1400. Washington, 1974.
5. Report of the Keminy Commission. The accident at Three Mile Island. *Atom* 1980 (280): 38-42.
6. US Union of Concerned Scientists. Booklet.
7. Hall EJ. Radiation and Life. London: Pergamon, 1976: 23.
8. Hall EJ. Radiation and Life. London: Pergamon, 1976.
9. Hall EJ. Radiation and Life. London: Pergamon, 1976.
10. Oughterson A, Warren S, eds. Medical effects of the atomic bomb in Japan. New York: McGraw-Hill, 1956. (National Nuclear Energy Series Div 8 vol 8).
11. Hall EJ. Radiation and Life. London: Pergamon, 1976.
12. Court Brown WM, Doll R. In: Hall EJ. Radiation and Life. London: Pergamon 1976: 75.
13. Tsuzuki M. Peaceful uses of Atomic Energy. Geneva 1956, 11: 132.
14. *New York Times* 1980, Nov 28.
15. Pamphlet from the Cape Town City Council.
16. Pamphlet from a US Nuclear Plant.


# When nature overdoes it

The uterus is the only part of the body designed to bleed once a month. When bleeding is excessive, prescribe Cyklokapron.

**S4** CYKLOKAPRON. Tranexamic Acid  
0,5 g Tablets Reg. No. H/8.1/807; Ampoules 500 mg in 5 ml  
Reg. No. H/8.1/806; Oral Solution 500 mg per 5 ml  
Reg. No. F/8.1/151 (Act/Wet 101/1965)

## Cyklokapron

Stops excessive uterine bleeding.

 50 Commando Road, Industria 2092. Tel. 673-4000

