Expert's Statement (excerpt)

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Chapter 2 Prediction of late damage by radiation in Koriyama City-Learning from Chernobyl nuclear accident

In this chapter, various kinds of potential health damage (late damage) are predicted in Koriyama City based on health damage surveys conducted in equally contaminated territories in Belarus and Ukrania after Chernobyl accident as in Koriyama City after Fukushima accident.

(2) Environmental Contamination and late damage on human by TEPCO's Fukushima I nuclear power plant disaster

The total amount of radioactive materials which contaminated vast areas of Fukushima prefecture by Fukushima nuclear power plant accident is said to go beyond the total volume of Chernobyl accident.

See the report presented to IAEA: Preliminary calculation of radioactive emission(Chart 2). The emission of strontium 90 (physical half life of 29.9 years) is 1.4×10^{14} Bq, which is approximately one hundredth compared to the emission of cesium 137 (30.0 years of half life)equivalent to 1.5×10^{16} Bq. However, the health risk by strontium 90 cannot be ignored since the impact of it is approximately 300 times more compared to that of cesium.

Also, the emission of plutonium 239 (half life of 24,065 years) is 3.2×10^{09} Bq, several orders less than that of cesium 137 and plutonium 90, but since its physical half life is 24,000 years, its accumulated dose in ecosystem and human bodies will be high.

Chart 2: Preliminary calculation of radioactive emission into atmosphere until March 16

(Nuclear and Industrial Safety Agency's Report to IAEA, announced on June 6, 2011)

nuclide	half-lif	Unit1	Unit2	Unit3	total
Xe-133	5.2 d	3.4×10^{18}	3.5×10^{18}	4.4×10^{18}	1.1×10^{19}
Cs-134	2.1 y	7.1×10^{14}	1.6×10^{16}	8.2×10^{14}	1.8×10^{16}
Cs-137	30.0 y	5.9×10^{14}	1.4×10^{16}	7.1×10^{14}	1.5×10^{16}
Sr-89	50.5 d	8.2×10^{13}	6.8×10^{14}	1.2×10^{15}	2.0×10^{15}
Sr-90	29.1 y	6.1×10^{12}	4.8×10^{13}	8.5×10^{13}	1.4×10^{14}
Ba-140	12.7 d	1.3×10^{14}	1.1×10^{15}	1.9×10^{15}	3.2×10^{15}
Te-127m	109.0 d	2.5×10^{14}	7.7×10^{14}	6.9×10^{13}	1.1×10^{15}
Te-129m	33.6 d	7.2×10^{14}	2.4×10^{15}	2.1×10^{14}	3.3×10^{15}
Te-131m	30.0 h	9.5×10^{13}	5.4×10^{10}	1.8×10^{12}	9.7×10^{13}
Te-132	78.2 h	7.4×10^{14}	4.2×10^{11}	1.4×10^{13}	7.6×10^{14}
Ru-103	39.3 d	2.5×10^{09}	1.8×10^{09}	3.2×10^{09}	7.5×10^{09}
Ru-106	368.2 d	7.4×10^{08}	5.1×10^{08}	8.9×10^{08}	2.1×10^{09}
Zr-95	64.0 d	4.6×10^{11}	1.6×10^{13}	2.2×10^{11}	1.7×10^{13}
Ce-141	32.5 d	4.6×10^{11}	1.7×10^{13}	2.2×10^{11}	1.8×10^{13}
Ce-144	284.3 d	3.1×10^{11}	1.1×10^{13}	1.4×10^{11}	1.1×10^{13}
Np-239	2.4 d	3.7×10^{12}	7.1×10^{13}	1.4×10^{12}	7.6×10^{13}
Pu-238	87.7 y	5.8×10^{08}	1.8×10^{10}	2.5×10^{08}	1.9×10^{10}
Pu-239	24065 y	8.6×10^{07}	3.1×10^{09}	4.0×10^{07}	3.2×10^{09}
Pu-240	6537 y	8.8×10^{07}	3.0×10^{09}	4.0×10^{07}	3.2×10^{09}
Pu-241	14.4 y	3.5×10^{10}	1.2×10^{12}	1.6×10^{10}	1.2×10^{12}
Y-91	58.5 d	3.1×10^{11}	2.7×10^{12}	4.4×10^{11}	3.4×10^{12}
Pr-143	13.6 d	3.6×10^{11}	3.2×10^{12}	5.2×10^{11}	4.1×10^{12}
Nd-147	11.0 d	1.5×10^{11}	1.3×10^{12}	2.2×10^{11}	1.6×10^{12}
Cm-242	162.8 d	1.1×10^{10}	7.7×10^{10}	1.4×10^{10}	1.0×10^{11}
I-131	8.0 d	1.2×10^{16}	1.4×10^{17}	7.0×10^{15}	1.6×10^{17}
I-132	2.3 h	4.5×10^{14}	9.6×10^{11}	1.8×10^{13}	4.7×10^{14}
I-133	20.8 h	6.5×10^{14}	1.4×10^{12}	2.6×10^{13}	6.8×10^{14}
I-135	6.6 h	6.1×10^{14}	1.3×10^{12}	2.4×10^{13}	6.3×10^{14}
Sb-127	3.9 d	1.7×10^{15}	4.2×10^{15}	4.5×10^{14}	6.4×10^{15}
Sb-129	4.3 h	1.6×10^{14}	8.9×10^{10}	3.0×10^{12}	1.6×10^{14}
Mo-99	66.0 h	8.1×10^{07}	1.0×10^{04}	6.7×10^{06}	8.8×10^{07}

Moreover, the ionizing effect of alpha ray from plutonium 239 is so that it can efficiently cuts water and protein molecules, which would frequently result in irreparable damage on DNA. This can be the cause of congenital damage, malignant tumors, immune deficiencies, diabetes I, cardiovascular diseases, and so on. It is unforgivable to ignore the effects of the strongest toxic materials created by human beings just by stating that the total volume of emission is relatively small.

(3) Prediction of late damage by radiation in Koriyama city

Through the results of soil contamination survey in Fukushima prefecture announced by Ministry of Education, culture, Sports, Science and Technology (Evidence No. 50 from the applicant, "Result of Radioanalysis of soil"), reality of the serious contamination is prominent.

In Koriyama city, measurement was conducted in 118 spots. The cesium 137 simple average concentration figures was 99.7kBq/ m^2 which is equivalent to 2.7Ci / km^2.

Moreover, 19 spots around the seven schools to which the 14 applicants' children commute showed the cesium 137 average figure of 189.768kBq/m^2 =5.13Ci/km^2. (Please refer to Attachment 1 and Attachment 2 for more details.)

As for the definition of contamination in Ukraine, annual dose, and dose rate per hour, the following were used for reference.

"Radiation Disaster by Chernobyl Accident-International Joint Research Report" (edited by Tetsuji Imanaka, Gijyutu to Ningen, 1998) Chapter 1.4 " Legislation in Ukraine about the Radiological Consequences of the Chernobyl Accident " by Oreg Nasbit and Tetsuji Imanaka, p48, table 1

Table 1. Criteria for identifying the zones of radioactive contamination

No	Zones	Deposition, Ci/km^2			Calculated dose, mSv? /y
		137Cs	90Sr	Pu	
1	Exclusion	n.d.	n.d.	n.d.	n.d.
2	Obligatory resettlement	>15	>3	>0.1	can exceed 5
3	Guaranteed voluntary resettlement	5–15	0.15–3	0.01–0.1	can exceed 1
4	Enhanced radioecological control (monitoring)	1–5	0.02 – 0.15	0.005–0.01	exceeds 0.5

n.d.: not determined
exclusion zone – the territory from which the people were evacuated in 1986

Annals of the New York Academy of Sciences Volume1181(Dirctor and

Executive Editor Douglas Braaten). Based on these figures, through the survey and research results in Belarus and Ukraine where people came to suffer a number of late damages, various kinds of late effects by internal exposure in Koriyama city are predicted in this paper. For comparison and examination, some citations are extracted from Annals of the New York Academy of Sciences Volume 1181 (Director and Executive Editor Douglas Braaten) introduced in the 25 years After Chernobyl Accident International Conference.

(4) Prediction based on the research results shown in the 25 Years After Chernobyl International Conference

Making the 25th year after Chernobyl, an international conference was held in Berlin Germany from April 6th to 8th, 2011. The program and resume of that conference are in the following website.

http://www.strahlentelex.de/tschernobylkongress-gss2011.htm
http://www.strahlentelex.de/Abstractband_GSS_2011.pdf
http://www.strahlentelex.de/Yablokov%20Chernobyl%20book.pdf

Citing from Annals of the New York Academy of Sciences Volume1181 (Director and Executive Editor Douglas Braaten), some data of congenital damages, cancer, and other diseases are introduced to predict various late damages by internal radiation exposure in Koriyama city in the future.

(a) Increase of congenital damage

See the table 5.68 and table 5.69 (table 5.69 is an extraction from table 5.68).

In heavily contaminated district A (more than 5Ci/km^2 cesium concentration), ngenital anomaly went up almost double to 7.82 from 1987 to 1988, while the figure was 4.08 before the accident. In less contaminated district B (less than 1Ci/km^2) as well, with some latency, congenital anomaly went up to 8.00 from 1990 to 2004, while the figure was 4.36 before the accident. Both figures are statistically significant. As stated before, the average contamination around the school districts of applicants' children in Koriyama city is more than 5 Ci/km^2, so the data of District A: heavily contaminated area should be regarded as an important source to predict the future health damage inflicted upon children in the seven schools in Koriyama. Also, the data of District B: less contaminated area (<1Ci/km^2) is very important to know that congenital anomaly could be increased even in less contaminated area in Koriyama city.

In the above table 5.68, congenital anomaly is listed up by disease

TABLE 5.68. Incidence of Congenital Malformations (per 1,000 Live Births) in Heavily and Less Contaminated Areas of Belarus before and after the Catastrophe (National Belarussian Report, 2006: table 4.6.)

	Heavily contaminated areas			Less contaminated areas		
Years	1981–1986	1987–1989	1990–2004	1981–1986	1987–1989	1990–2004
Incidence of all CMs	4.08	7.82*	7.88*	4.36	4.99	8.00*
Anencephaly	0.28	0.33	0.75	0.36	0.29	0.71
Spinal hernia	0.57	0.88	1.15	0.69	0.96	1.41
Polydactyly	0.22	1.25*	1.10	0.32	0.50	0.91
Down syndrome	0.89	0.59	1.01	0.64	0.88	1.08
Multiple CMs	1.27	2.97*	2.31	1.35	1.23	2.32
Newborn and stillborn total	58,128	23,925	76,278	98,522	47,877	161,972
Children and stillbirths with CMs	237	187	601	430	239	1,295

*$p < 0.05$.

accompanied by its number per 1000 birth. The disease column shows the total number of patients, followed by the percentages of anencephaly, spine hernia, polydactyly, down syndrome, multiple congenital anomaly, new born death. The number and percentage of congenital damage is increased both in District A Heavily contaminated districts: >5Ci/km^2 and District B Less contaminated districts:<1Ci/km^2.

TABLE 5.69. Incidence of Officially Registered Congenital Malformations (per 1,000 Live Born + Fetuses) in 17 Heavily and 30 Less Contaminated Districts of Belarus (National Belarussian Report, 2006)

Districts	1981–1986	1987–1988	1990–2004
A. Heavily contaminated	4.08	7.82	7.88**
B. Less contaminated	4.36	4.99*	8.00**

*$p < 0.05$, *A compared to B (1987–1988); **$p < 0.05$, 1981–1986 compared with 1990–2004.

The following chart 5.15 shows children with congenital damage on their legs, arms and torso.

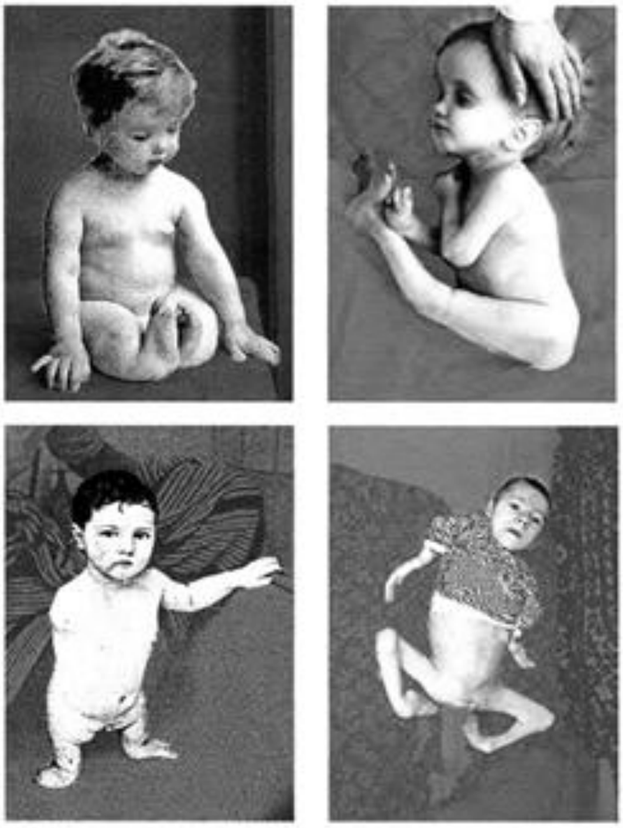

Figure 5.15. Typical examples of Chernobyl-induced congenital malformations with multiple structural deformities of the limbs and body (drawing by D. Tshepotkin from *Moscow Times* (April 26, 1991) and from www.progetto.humus).

The following table 5.72 shows comparison of the number of congenital malformations per 1000 live births and cesium 137 contamination levels annually. Even in the so-called clean area with less than 1Ci/km^2, increase of congenital deformation was observed with 5.85 in 1987-1992 compared with 4.72 in 1982-1985. In the areas 1－5Ci/km, equivalent to Koriyama city contaminated level, the increase was more prominent. In all the contaminated levels, the difference before and after Chernobyl was significant. Yet, in this table, there is no data for district with more than 5Ci/km^2, equivalent to school areas of Koriyama children of the applicants.

TABLE 5.72. Occurrence of Officially Registered Congenital Malformations (per 1,000 Live Births) and Different Levels of Contamination (Lazjuk *et al.*, 1996a; Matsko, 1999)

Level of contamination	Number of cases	
	1982–1985	1987–1992
<1 Ci/km^2	4.72 (4.17 – 5.62)	5.85 (5.25 – 6.76)
1–5 Ci/km^2	4.61 (3.96 – 5.74)	6.01 (4.62 – 7.98)
>15 Ci/km^2	3.87 (3.06 – 4.76)	7.09 (4.88 – 8.61)

*All differences are significant.

(b) Epidemic of malignant tumor

Next, see the table 6.1 for cancer data. This data shows the comparison of cancer incidence in three different Cs 137 contaminated districts in Gomel and Mogiref, Beralus before and after Chernobyl (the figures shows the number against the population of 100,000). In the districts with more than 15 Ci/km and 5～15 Ci/km^2, the cancer incidence shows significant increase after 1986. Moreover, in Mogiref, the cancer incidence increased significantly from 248.8 to 306.2 even in district less than 5 Ci/km^2.

As stated before, the average contamination surrounding the school of applicants' children in Koriyama city is more than 5 Ci/km^2. Hence, the data showing the significant cancer incidence in more than 5 Ci/km^2 contaminated areas in Gomel and Mogiref would lead us to consider the potential risk of cancer epidemic among applicants' children and should be regarded as a very

TABLE 6.1. Occurrence of Cancers (per 100,000) in Belarussian Territories Contaminated by Cs-137 before and after the Catastrophe (Konoplya and Rolevich, 1996; Imanaka, 1999)

Contamination, Ci/km^2	Gomel Province		Mogilev Province	
	1977–1985	1986–1994	1977–1985	1986–1994
<5	181.0 ± 6.7	238.0 ± 26.8	248.8 ± 14.5	306.2 ± 18.0*
5–15	176.9 ± 9.0	248.4 ± 12.5*	241.8 ± 15.4	334.6 ± 12.2*
>15	194.6 ± 8.6	304.1 ± 16.5*	221.0 ± 8.6	303.9 ± 5.1*

*$P < 0.05$.

important source.

The chart 6.4 shows that thyroid cancer among Beralussian children and adults increased sharply compared with the original expected figures three years after Chernobyl.

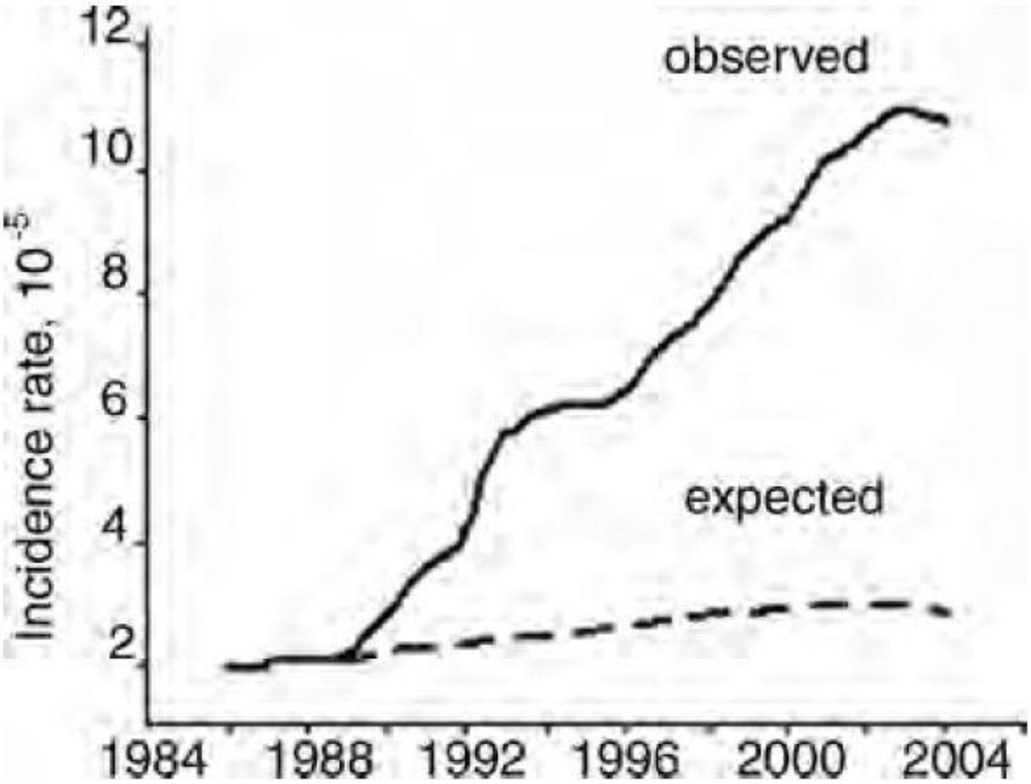

Figure 6.4. Prospective (by pre-Chernobyl data) and real data of thyroid cancer morbidity (per 100,000) for children and adults in Belarus (Malko, 2007).

Chart 6.6 shows the increase of thyroid cancer children from age 0 to 10 after 1990 through 2005 in Belaru.

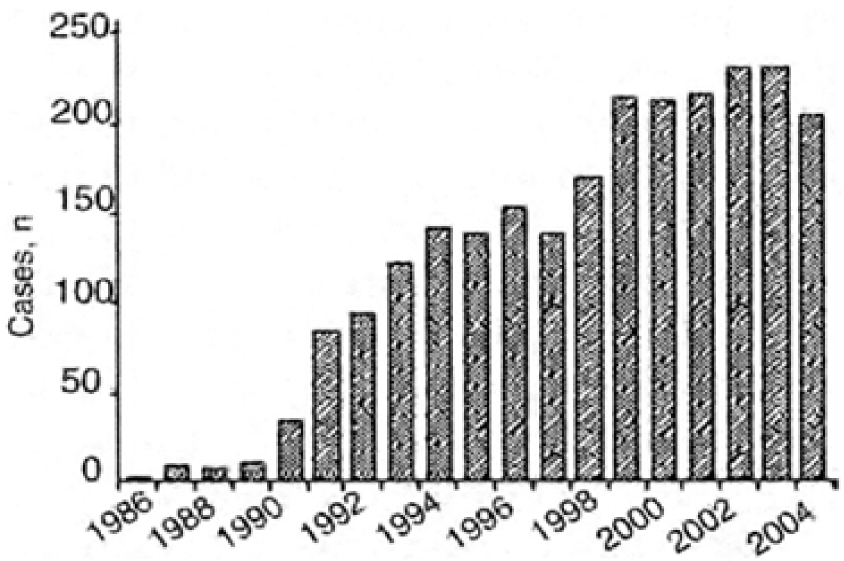

Figure 6.6. Primary thyroid cancer morbidity among those age 0 to 18 years in 1986 (National Belarussian Report, 2006: fig. 4.2).

The chart 6.20 with tied squares show the transition of breast cancer incidence in cesium 137 highly contaminated areas (more than 555kBq/m^2). Rapid increase since around 1997, 10 years after the accident, is eminent.

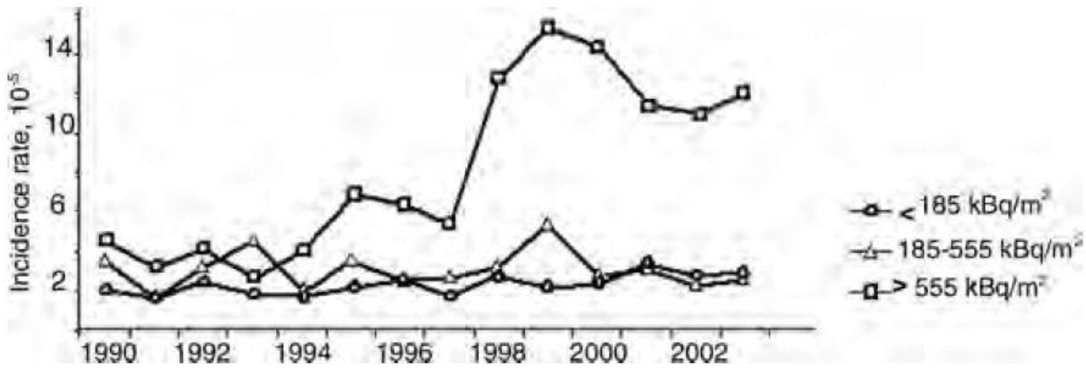

Figure 6.20. Breast cancer morbidity (women, per 100,000) in Gomel Province with various levels of Cs-137 contamination (National Belarussian Report, 2006).

(c) Increase of diabetes I

The table 5.21 below looks at the occurrences of type-I diabetes per 100,000 children and teenagers in heavily and less contaminated territories in Belarus. In the heavily contaminated area (15-40 Ci/km^2), the number is increased significantly after Chernobyl. In less contaminated territories as well, the increase was observed though it was not significant. This data should be regarded important to expect future occurrences of type-I diabetes among Koriyama children.

TABLE 5.21. Occurrence of Type-I Diabetes per 100,000 Children and Teenagers before and after the Catastrophe in Heavily and Less Contaminated Territories in Belarus (Zalutskaya *et al.* 2004)

Years	1980–1986	1987–2002
Heavily contaminated (Gomel Province)	3.2 ± 0.3	7.9 ± 0.6*
Less contaminated (Minsk Province)	2.3 ± 0.4	3.3 ± 0.5

*$p < 0.05$.

(d) Lenticular opathy and cataract

Radiation exposure has been getting attention as a cause of cataract. The number of children who were diagnosed as lenticular opathy and cataract has been increasing in the Chernobyl contaminated areas equivalent to the vicinity of Koriyama schools of the applicants.

The table 5.52 shows the degree of contamination and frequency of lenticular opathy occurrences. The frequency in Brest state, a highly contaminated territory with cesium 137 (137－377kBq/m^2) was higher than that of Vitevsk state, less contaminated territory (3.7kBq/m^2).

As stated before, the average contamination level surrounding the schools of applicants' children in Koriyama city is 189.768 kBq/m^2, and thus the data which shows the higher occurrences of lenticular opathy in in Brest state (137－377kBq/m^2) than that of Vitevsk state (3.7kBq/m^2) needs to be considered as of high importance.

TABLE 5.52. Incidence (%) of Opacities in Both Crystalline Lenses among Children Living in Territories with Various Levels of Contamination, 1992 (Arynchin and Ospennikova, 1999)

	Incidence of opacities, %		
	1–5	6–10	>10
Brest Province, 137–377 kBq/m^2 ($n = 77$)	57.5	17.9	6.7
Vitebsk Province, 3.7 kBq/m^2 ($n = 56$)	60.9	7.6	1.1

The chart 5.11 shows that high occurrences of opacities (lateral axis) were observed among children whose internal cesium 137 concentration (vertical axis: Bq/kg) were high. In the future, by examining the cesium 137 concentration in Koriyama children, we can predict the occurrences of opacities/cataracts of their eyes.

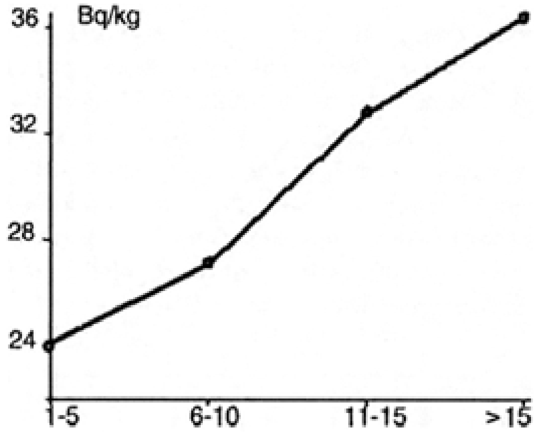

Figure 5.11. Number of bilateral lens opacities and level of incorporated Cs-137 in Belarussian children (Arynchin and Ospennikova, 1999).

There is a research data on 512 children aged 7 to 18 in four villages in Ivankyv, Ukrane in 1991 (Fedirko and Kadoshnykova,2007). These four villages have different cesium 137 contamination levels in soil.

(i) Village 1

Average 12.4Ci/km^2(High 8.0 Ci/km^2; 90% of the village 5.4Ci/km^2)

(ii) Village 2

Average 3.11Ci/km^2(High 13.8Ci/km^2; 90% of the village 4.62Ci/km^2)

(iii) Village 3

Average 1.26Ci/km^2(High 4.7Ci/km^2; 90% of the village 2.1Ci/km^2)

(iv) Village 4

Average 0.89Ci/km^2(High 2.7Ci/km^2; 90% of the village 1.87Ci/km^2)

51% of the children had typical lenticular symptom (opacity). In the villages with high contamination, the rate of lenticular opacity was high. Atypical symptoms (opacity at the bottom tissue of rear membrane, unclearness and small blebs in mottled and punctuate structure between rear membrane and nuclear part) showed a high coefficieny (r=0.992) with the average and high figures of soil contamination. In 1995, in village 1 and village 2 (average figure of the soil contamination is 2Ci/k m^2), a prominent increase of 34.9% was observed. Two girls who showed early symptom of membrane tissue opacity in 1991 were diagnosed with bleary eyes cause by the progression of regressed cataract.

The table 5.78 shows the comprehensive incidence rate (per 100,000) for various diseases for children under 18 in Gomel Province. Compared to before the accident, in 1997, cardiovasucular (heart) disease went up 13.3 times, respiratory disease 108.8 times, urinary diseas 48.0 times,

TABLE 5.78. Incidence (per 100,000) of Juvenile Morbidity in Gomel Province, Belarus (Pflugbeil *et al.*, 2006 Based on Official Gomel Health Center Data, Simplified)

Morbidity group/Organ	1985	1990	1995	1997	Increase
Total primary diagnoses	9,771	73,754	127,768	124,440	12.7-fold
Blood and blood-forming organs	54	502	859	1,146	21.2-fold
Circulatory diseases	32	158	358	425	13.3-fold
Endocrinological, metabolic, and immune systems	3.7	116	3,549	1,111	300.0-fold
Respiratory system	760	49,895	81,282	82,689	108.8-fold
Urogenital tract	25	555	961	1,199	48.0-fold
Muscle and bones/connective tissue	13	266	847	1,036	79.7-fold
Mental disorders	95	664	908	867	9.1-fold
Neural and sense organs	645	2,359	7,649	7,040	10.9-fold
Digestive system	26	3,108	5,879	5,548	213.4-fold
Skin and subcutaneous tissue	159	4,529	7,013	7,100	44.7-fold
Infectious and parasitic illnesses	4,761	6,567	11,923	8,694	1.8-fold
Congenital malformations*	51	122	210	340	6.7-fold
Neoplasm**	1.4	323	144	134	95.7-fold

*High estimation of unreported cases through abortions; **1985 only malignant neuroplasms.

gastrointestine disease 213.4 times, congenital disorder 6.7 times, neoplastic lesion 95.7 times.

The table 5.79 shows the disease incidence rate per 100,000 population of adults and teenagers in Northern Ukrane. Compared to 1987, the year after the accident, in 1992, the number of endocrine disease went up 25.8 times, mental disorder 52.8 times, nervous system disorders 5.7 times, cardiovascular (heart) disease 44.0 times, alimentary disease 60.4 times, skin and hypodermal tissue disease 50.5 times, muscular bone disease 96.9 times.

TABLE 5.79. Incidence (per 100,000) of Morbidity among Adults and Adolescents in Northern Ukraine, 1987–1992 (Pflugbeil *et al.*, 2006)

Illness/Organ	1987	1989	1991	1992	Increase
Endocrine system	631	886	4,550	16,304	25.8-fold
Psychological disturbances	249	576	5,769	13,145	52.8-fold
Neural system	2,641	3,559	15,518	15,101	5.7-fold
Circulatory system	2,236	4,986	29,503	98,363	44.0-fold
Digestive system	1,041	2,249	14,486	62,920	60.4-fold
Skin and subcutaneous tissue	1,194	1,262	4,268	60,271	50.5-fold
Muscles and bones	768	2,100	9,746	73,440	96.9-fold

(e) Annals of the New York Academy of Sciences Volume1181 (Director and Executive Editor Douglas Braaten)

In Chapter 15 “Consequences of the Chernobyl Catastrophe for Public Health and the Environment 23 Years Later,” there are some valuable hints to know the degree of contamination in Koriyama city and late damage and to think about the future countermeasures as in the following.

In 1986, approximately 400 million people were living in the area more than 4000 Bq/m^2 (0.1Ci/ km^2) with cesium 137, strontium 90, plutonium and americium (See the note). Moreover, even today (23 years after Chernobyl), approximately 5 million people are exposed to more than 4000 Bq/m^2 in Ukrane, Belarus, Europe and Russia. In all these contaminated areas, increase of diseases, early aging, and genetic anomaly were investigated and examined.

The increase of total death was 3.75% in Europe and Russia and 4.0% in

Ukrane in the first 17 years after the accident. The level of internal exposure kept increasing due to absorption into plants and circulation of cesium 137, strontium 90, plutonium and americium in the environment. …

(f) Epidemics of heart disease in Belarus

The following data is regarding heart disease in Beralus extracted from Dr. Bandazhevsky's thesis titled, "Non cancer illnesses and conditions in areas of Belarus contaminated by radioactivity from the Chernobyl Accident (Nykolas Romeris University, Vilnius, Lithuania)" reported at 2009 ECRR Conference held in Lesvos, Greece.

According to the statistics of Belarus, heart cardiovascular is 52.7% of all the death cause, more than 50 % of entire population of death.

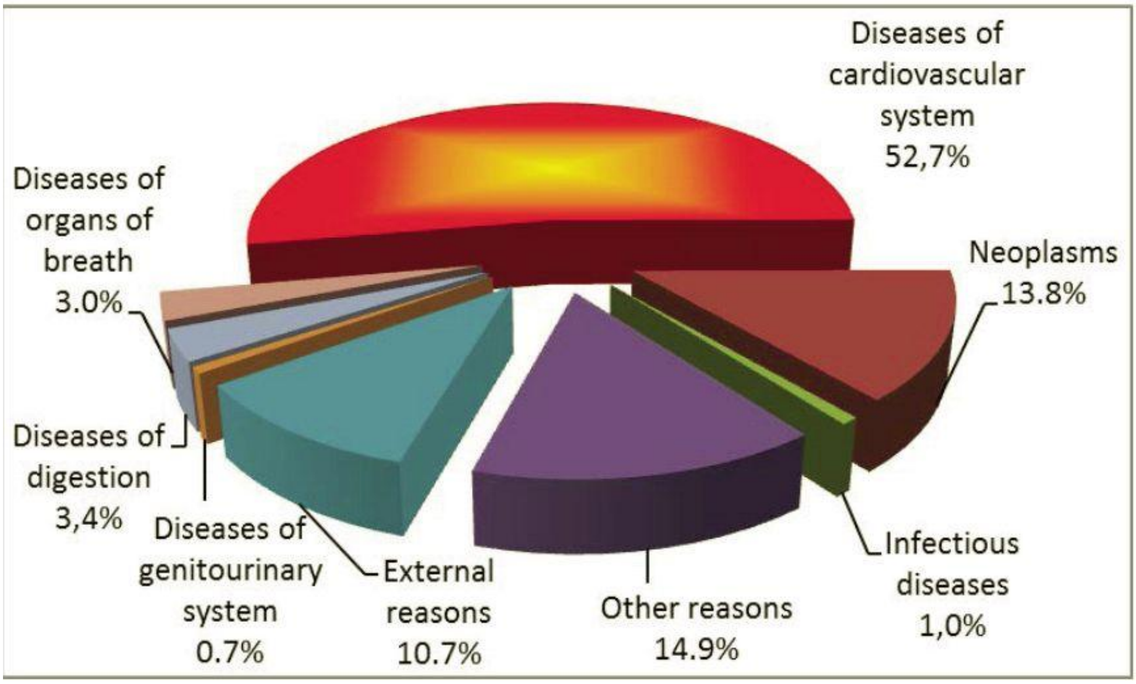

Chart 2.8: Cause of death in Belarus, 2008 (Note: External cause means accident, crime, etc.)

The chart 2.12 shows the concentration of cesium 137 by organ based on pathological autopsy on Gomel residents. 1 ; cardiac muscle, 2 ; brain, 3 ; liver, 4;thyroid, 5;kidney, 6;spleen, 7;skeletal muscles, 8;small intestine

For children, concentration of cesium 137 is highest in thyroid, which shows that the cause of thyroid disease is not solely coming from iodine

131. Next to thyroid, high concentration was observed in the order of musculus skeleti, intestinum tenue, cardiac muscle. The epidemic of heart disease among Beralussian children can be possibly attributed to the high concentration of cesium 137 in their cardiac muscle.

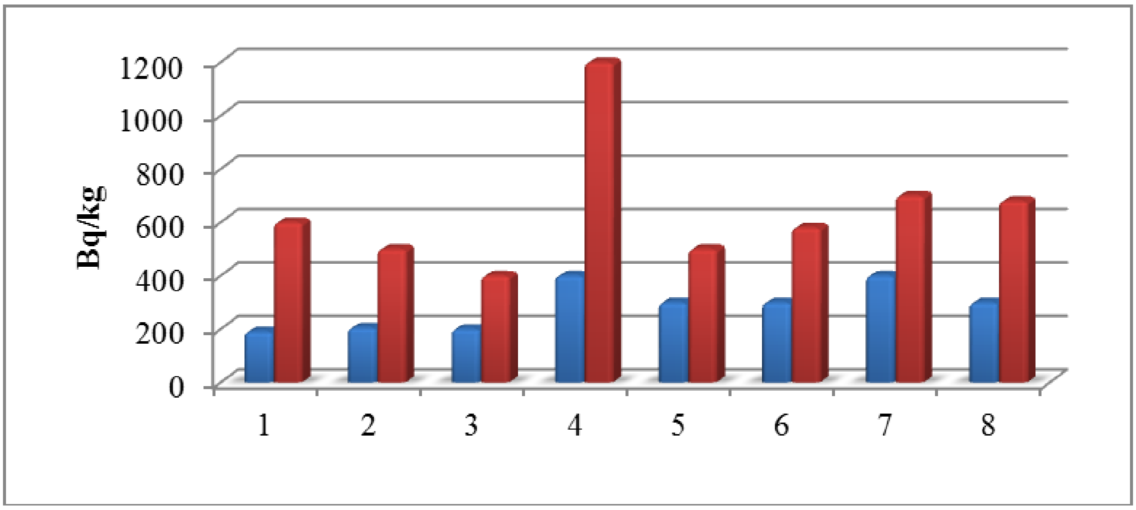

Fig 2.12 Cs-137 contents in adults' and children's viscera according to the data of radiometric measurements of the autopsies of inhabitants of Gomel region in 1997 and 1998 (Red: children, Blue: adults) 1 – myocardium, 2 – brain, 3 – liver, 4 – thyroid gland, 5 – kidneys, 6 – spleen, 7 – skeletal muscles, 8 – small intestine

As for the data of accumulated internal cesium 137 concentration and cardiogram anomaly rate, children with 0－5Bq/kg concentration had 17% anomaly, while children with 12－26 Bq/kg concentration had anomaly rate as high as 62%. This shows the dependency of high occurrences of cardiogram anomaly on internal cesium 137 concentration. (The chart 2.15 Bandazhevsky&Bandazhevsky)

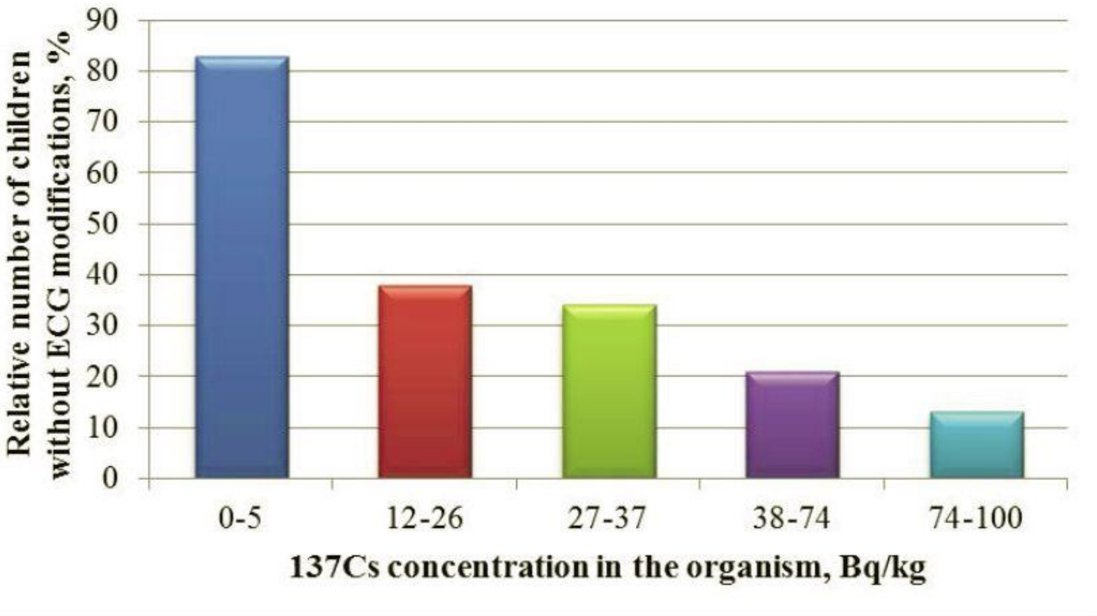

Fig 2.15 Number of children without ECG modifications as a function of Cs-137 concentration in the organism (Bandashevsky and Bandashevsky).

(g) Children' s group evacuation is urgently needed

The volume of radioactive material emitted in the environment by Fukushima accident is considered to be more than that of Chernobyl. The reason is that the number of reactor that had the accident was one in Chernobyl while there are four reactors in Fukushima. While the Chernobyl reactor had its accident shortly after its operation, there were vast amount of spent fuel and nuclear waste in Fukushima reactors, which is also acknowledged by TEPCO. Moreover, Fukushima accident caused not only air pollution, but also sea pollution, which made this accident even more serious in regard to the late damage. Half a year has passed since the accident, and the accident is far from ending, and contrary to it, various radioactive nuclei have been emitted into the natural environment and human habitats even at present

Various health hazards that struck children in Belarus or Ukrane that were contaminated with radioactive materials after Chernobyl would imply various potential diseases that might be inflicted upon residents, especially children in Koriyama city and moreover in Fukushima prefecture and its surrounding areas contaminated by TEPCO accident. Seven months have passed since TEPCO Fukushima accident, but it is not too late to initiate an action even now. As a clinical doctor, it is my strongest recommendation that children's group evacuation be conducted as expeditiously as possible.