People of Futaba-machi and “Low Dose” Internal Radiation Exposure

Gifu Research Institute for Environmental Medicine
Matsui Eisuke
Radioactive particles flew 3 different directions over 200km apart and deposited in the soil

[Yukio Hayakawa, Gunma University]
Evacuation of People and Local Government
Futaba-machi

March 2011

[Funahashi Atsushi
Futabakara tooku
hanarete- hinanjo karamita
genpatsu to nihonshakai
(2012)
Iwanamishoten]
Population Futaba-machi ca. 7,000

- Population total 6971 (2012.09.18)
- ca. a half in Fukushima,
- another half Saitama prefecture etc.
External and Internal Radiation

- External: high dose
  - far
  - $\gamma$-ray
  - short time
- Internal: low dose
  - near
  - $\alpha$-ray, $\beta$-ray
  - repeat, long time
ICRP estimates radiation effects from the data of External $\gamma$-ray exposure of Hibakusha in Hiroshima and Nagasaki.

It calculates radiation risks as if human body homogenous.
Radiation Effects: Lymphocyte and Erythrocyte

図11 X線4Gy 8時間37℃孵育後のラット胸腺リンパ球と赤血球の走査電顕写真
（放射医研・山田 武先生提供）
Dividing patterns of bronchi unequal
Hot spots in the Lung
Structure of the Organ are not Homogenous
Small particles of Cs-137 in the heart irradiate γ-rays & β-rays.
Small particles of Sr-90 in the bone irradiate $\beta$-rays.
Small particles of Pu-239 in the lung irradiate $\alpha$-rays.
Structure of DNA: Double Strands
Thompson & Thompson: Genetics in Medicine
Cut off DNA
Bystandar Effects
図8.6 遺伝的不安定性の誘導の模式図
放射線被照射で生じた損傷が修復され生き残った細胞に細胞分裂に伴って新しい変異が次々と生ずる現象で、細胞は放射線被照射をなんらかの仕組みで記憶していることを示唆する。

Genomic Instability
佐渡敏彦、福島昭治、甲斐倫明著「放射線および環境化学物質による発がん—本当に微量でも危険なのか？」医療科学社、(2005)
Karl Ziegler Morgan
(Sep 27, 1907 – June 8, 1999)
American physicist, one of the founders of the field of radiation health physics.

Late in life, after a long career in the Manhattan project
1950 the first chairman of the Internal Radiation Committee ICRP

“ICRP not independent from nuclear companies”
ABCC and Unit 731

- **ABCC**: Atomic Bomb Casualty Commission
- **Radiation Effects Research Foundation**
- **Unit 731**: A covert biological and chemical warfare research and development unit of the Imperial Japanese Army (1937–1945)
To Save the Children

1）The Risk of Internal Radiation Exposure for Fetuses and Infants

2）Real Facts of Health Disorders Already Observed in the Contaminated Areas

3）Migration of Local Communities from Contaminated Areas
# Ultrasonography of Thyroid Gland

Children under 18yo in Fukushima Prefecture 2011-2013

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Thyroid Cancer*</td>
<td>10</td>
<td>22</td>
<td>1</td>
<td>33</td>
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<tr>
<td>Cytology **</td>
<td>4</td>
<td>28</td>
<td>9</td>
<td>41</td>
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<tr>
<td>Total</td>
<td>14</td>
<td>50</td>
<td>10</td>
<td>74</td>
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<tr>
<td>Examinee</td>
<td>41,561</td>
<td>139,239</td>
<td>88,554</td>
<td>269,354</td>
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</table>

* pathological diagnosis after surgery

** ultrasonography guided fine needle biopsy

Data until 2013.11.15.

Published to media on 2014.02.07 by Fukushima official
Totgeburtlichkeit in den hoch exponierten Präfekturen Ibaraki, Fukushima, Miyagi und Iwate

Von Masao Fukumoto, Kristina Voigt, Ralf Kusmierz, Hagen Scherb

Todesursachen bei Kindern bis zu 19 Jahren in Fukushima
März-November
Record children’s health damages

• It is important to record such children’s health damages and conduct survey on relationship with their exposed dose.

• In order to do that, examining and recording radionuclides and radiation level included in soil and foods in details is important and such survey should be carried out by the government and local municipalities.
Health Notebook
"live your own life in good health"
"Protecting your life from internal radiation"
Temporary houses for the evacuees from Futaba-machi & deposits of decontaminated mud waste in Koriyama city

3.8mSv/y in a room
2014-01-22 Koriyma-city Asumi General Community Center
On the street in front of the building  0.72 μ Sv/hr (6.31mSv/yr)
In the room  0.27 μ Sv/hr (2.37mSv/yr)
Sample

Sediment in school swimming pool

<table>
<thead>
<tr>
<th>Sample „Sediment in school swimming pool“</th>
<th>Cs137 (Bq/kg)</th>
<th>Cs134 (Bq/kg)</th>
<th>Sr90 (Bq/kg)</th>
<th>Pu238 (Bq/kg)</th>
<th>Pu239/240 (Bq/kg)</th>
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</thead>
<tbody>
<tr>
<td>CRMS (Fukushima)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>sieved sediment</td>
<td>78697 ± 67.0</td>
<td>40764 ± 46.3</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Senate department for urban development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(Berlin)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sieved sediment</td>
<td>79000 ± 4400</td>
<td>38000 ± 2200</td>
<td>76 ± 8</td>
<td>&lt; 0.017</td>
<td>0.19 ± 0.09</td>
</tr>
<tr>
<td>remaining sediment in s</td>
<td>97000 ± 5500</td>
<td>48000 ± 2800</td>
<td></td>
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</tr>
</tbody>
</table>
2013.11.19  Iitate village  Decontamination of rice fields
### Comparative data of Ukraine, Belarus and Japan on intolerance dose limits of radioactive materials in foods and drinks

<table>
<thead>
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<tr>
<td></td>
<td>セシウム137</td>
<td>ストロンチウム90</td>
<td>セシウム137</td>
<td>ストロンチウム90</td>
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<td>飲料水</td>
<td>2</td>
<td>2</td>
<td>10</td>
<td>0.37</td>
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<td>牛乳</td>
<td>100</td>
<td>20</td>
<td>100</td>
<td>3.7</td>
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<tr>
<td>粉ミルク</td>
<td>500</td>
<td>100</td>
<td>100</td>
<td>-</td>
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<tr>
<td>乳幼児食品</td>
<td>40</td>
<td>5</td>
<td>37</td>
<td>1.85</td>
</tr>
<tr>
<td>米</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>パン</td>
<td>20</td>
<td>5</td>
<td>40</td>
<td>3.7</td>
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<tr>
<td>ジャガイモ</td>
<td>60</td>
<td>20</td>
<td>80</td>
<td>3.7</td>
</tr>
<tr>
<td>野菜</td>
<td>40</td>
<td>20</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>果物</td>
<td>70</td>
<td>10</td>
<td>40</td>
<td>-</td>
</tr>
<tr>
<td>肉・肉製品</td>
<td>200</td>
<td>20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>魚・魚製品</td>
<td>150</td>
<td>35</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>卵</td>
<td>100</td>
<td>30</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>キノコ（生）</td>
<td>500</td>
<td>50</td>
<td>370</td>
<td>-</td>
</tr>
</tbody>
</table>

*But rice and beef are until September, 500Bq/kg*

*大豆 is until 2012, 500Bq/kg*
Temporary housing; Former Kisai High School Kozoku-cho Saitama Prefecture
In the temporary house Fukushima city 1.7mSv/yr
2013.03.14  Yamada’s house  ca.4km from TEPCO
88 μSv/h (771mSv/y, air)
2013.11.05  250 μSv/h (2190mSv/y, surface)
2013.11.05  well  250 μ Sv/h (2190 mSv/y, surface)
2013.11.05 Kindergarten Futaba 58 $\mu$ Sv/h (51.0 mSv/y)
Athletic Center Futaba

“Nuclear power, rich life with clear comprehension”
Healthcare Center Futaba  105 μSv/h (920mSv/y)
2012.11. Dr. Anand Grover (UN Human Rights Committee special reporter) was hearing from more than 50 persons.
Rights for Health

- 20mSv/y, dose limits for evacuation too high: Heath effect of low dose radiation estimated too small
- Human rights of pregnant and children are the most important task
- Return to contaminated area not recommended
- 1mSv/y, dose limits should be for the public
- Heath risk of low dose radiation should be taught in school
• We would comment that the highest immediate health priority for the affected population should be reducing radiation exposure as much as possible, especially for those more sensitive to its dangers – young children and pregnant women.
• This includes substantial areas of the cities of Fukushima and Koriyama, which have a combined population of about 600,000. We find it unacceptable that people are currently even being encouraged to return to some areas where they can be expected to receive up to 20 mSv in additional annual radiation exposure.
“radiophobia”

• We need to pay special attention to the fact that, in Fukushima, “radiophobia” is now cunningly used in ETHOS project, which had mislead the citizens and hampered their movement to protect children in Belarus.
## Criteria for identifying the zones of radioactive contamination

<table>
<thead>
<tr>
<th>No</th>
<th>Zones</th>
<th>Soil Contamination, kBq/m² (Ci/km²)</th>
<th>Annual dose mSv/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Cesium 137</td>
<td>Strontium 90</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Plutonium 239</td>
</tr>
<tr>
<td>1</td>
<td>Exclusion</td>
<td>n.d.</td>
<td>n.d.</td>
</tr>
<tr>
<td>2</td>
<td>Obligatory resettlement</td>
<td>&gt;555 (~5)</td>
<td>&gt;111 (~3)</td>
</tr>
<tr>
<td>3</td>
<td>Guaranteed voluntary</td>
<td>185~555 (<del>5</del>15)</td>
<td>5.55~111 (<del>0.15</del>3)</td>
</tr>
<tr>
<td>4</td>
<td>Enhanced radioecological control</td>
<td>37~185 (<del>1</del>5)</td>
<td>0.74~5.55 (<del>0.02</del>0.15)</td>
</tr>
</tbody>
</table>

Exclusion zone: Territories residents evacuated in 1986  
Defnition of Ukraine radiological contamination and annual dose and dose rate per hour were cited from p.48 “Legal Measures against the Consequences of the Accident in Ukraine” by Oleg Nasvit and Tetsuji Imanaka in “Radioactive Disaster by Chernobyl Accident-International Cooperative Studies” edited by Tetsuji Imanaka, P.47-8 “Legal Measures against the Accident in Ukraine”
Chernobyl law (1991)

• Zone of Resettlement Rights

\[ \geq 1 \text{mSv/yr} \]
\[ \geq 185 \text{kBq/m}^2 \]
Proposal to Enact “Collective Resettlement Right Law”

• In order to prevent further health hazards, what is most urgently needed now is to enact “Collective Resettlement Right Law.”