

Nuclear Weapon's Medical Effects

Hilde Karen Ofte and Kristin Alise
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Hiroshima, august 6th 1945

- 08.15 a.m.

"Little boy", Uranium bomb, 12,5
kilotons

118,661 casualties
ca. 78,000 wounded



Nagasaki, August 9th 1945

"Fat man", Plutonium bomb, 22
kilotons



73,884 casualties
74,909 wounded

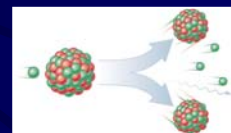
Fission reactions

Releases energy as:

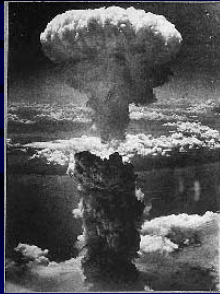
- Heat
- Blast
- Radiation

$$E = mc^2$$

Uranium-235
Plutonium-239



Detonation of the Bomb



- Blitz
- Heatwave
- Blast
- EMP
- Initial radiation
- Radioactive fallout
- Mass fires

The Blitz



Causes retinal burning and blinding

The Heat

- **Direct effect:**
Flashburns on exposed skin
From erythema to total nihilation

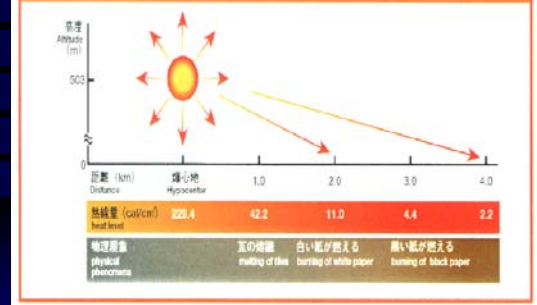


Keloide scars

- **Indirect effect:**
Massfires causing "ordinary" burns



熱線 (Heat rays)

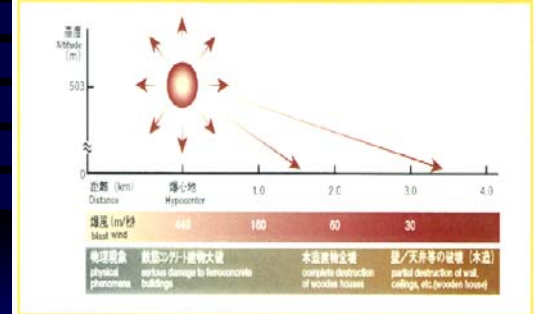


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Blastwave

- **Direct impact:**
Fractures, crushing of internal organs, skinwounds, damage to the inner ear
- **Indirect:**
Flying debris (glass) and buildings collapsing

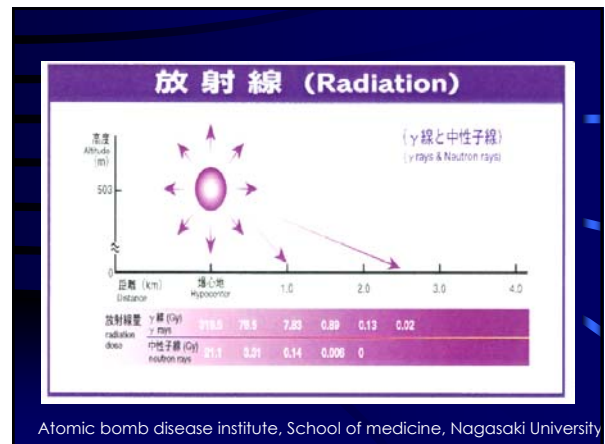
爆風 (Blast wind)



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Radiation

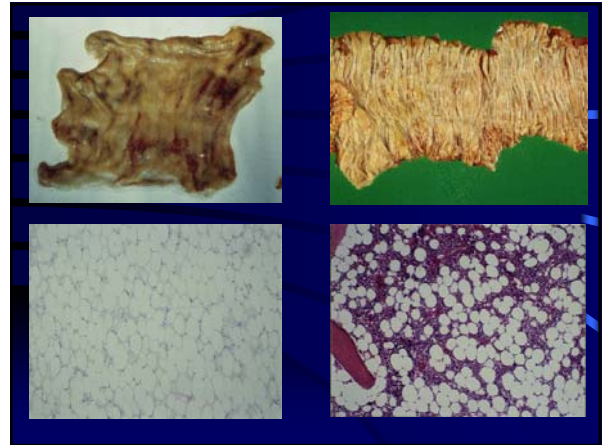
- Damages DNA
 - directly: chain breaking, base deletion
 - indirectly; free radicals and genomic instability
- Activation of protooncogenes and inactivation of cell repair system
 - abnorm cellgrowth (cancer) or celldeath



Initial effects of Radiation

Tissues with high cell turnover are most affected

- **Radiation Sickness:**
 - 2-6 Gy: Blood producing organs
Anemia, bleeding and prone to infections
 - 6-20 Gy: The gastrointestinal system
Nausea, diarrhoea and dehydration
 - 20 Gy: The central nervous system
ataxia, seizures, coma and death



- **Epilation**
Loss of hair



- **Purpura**
Skin bleeding



- **Ulceration**
in oral cavity and throat



Triage in the area

- Amount of wounded and casualties
- Communication
- Radiation zone
- Resources: equipment, medicins, personell
- Clean Water Supplies

Radioactive fallout

Long-term effects of radiation
Radiation is transferred to other materials

- Strontium-90:** Resembles Ca^{2+}
deposited in bone and teeth
- Cesium-137:** Resembles K^+ ,
deposited in cells and tissues
- Iodine-131** deposited in thyroidea

Damages in pregnancy

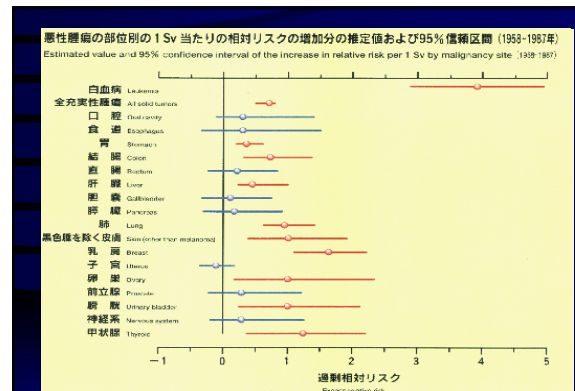
- **Increase of:**
Neonatal death
Accidental abortions
Microcephali
Mental retardation
Cataract of the eye



The fetus is most
vulnerable in the
8th to 15th week

Cancer

- Increased risk of almost all types of cancer
- Especially cancers of the thyroid, breast, lung, stomach and large bowel
- Age at exponation very important for increase in risk



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"Never has danger been more imminent.
An atomic war is not a far fetched
fantasy, as long as we can't agree on an
international system to control our
nuclear weapons and fissile material."

Mohammed ElBaradei
President IAEA
April 16th 2004

Today

- Probably over 30.000 warheads
equals about 200.000 Hiroshima bombs
or 11 billion tons of TNT
- About 5000 ready for immediate launch
- 95% in USA og Russland