

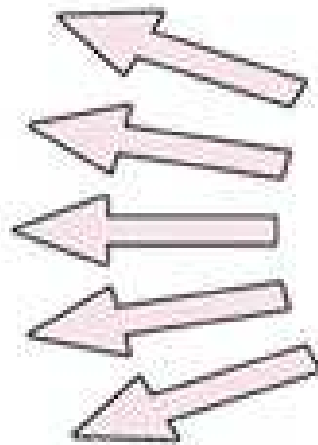
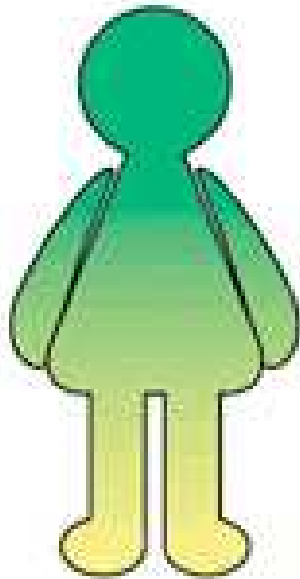
2. Effects of internal and external exposure to radiation

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Units of radioactivity

Bq indicates the number of collapses per second.
Sv indicates the estimated health effect to the body.

シーベルトSv



ベクレルBq

放射線



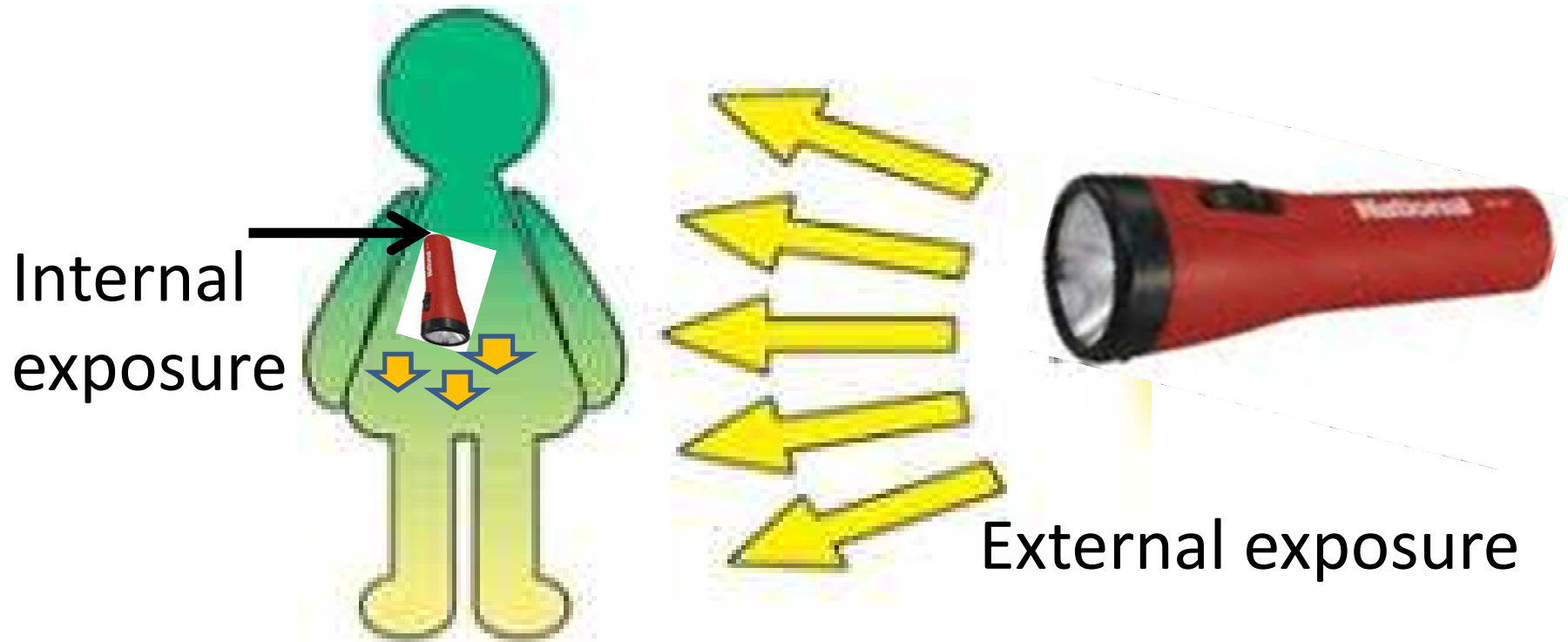
放射線によってどれだけ影響あるのかを表わす単位
[シーベルト(Sv)]

JAEROより引用

Internal and External Exposure

Electromagnetic wave → γ ray, X ray

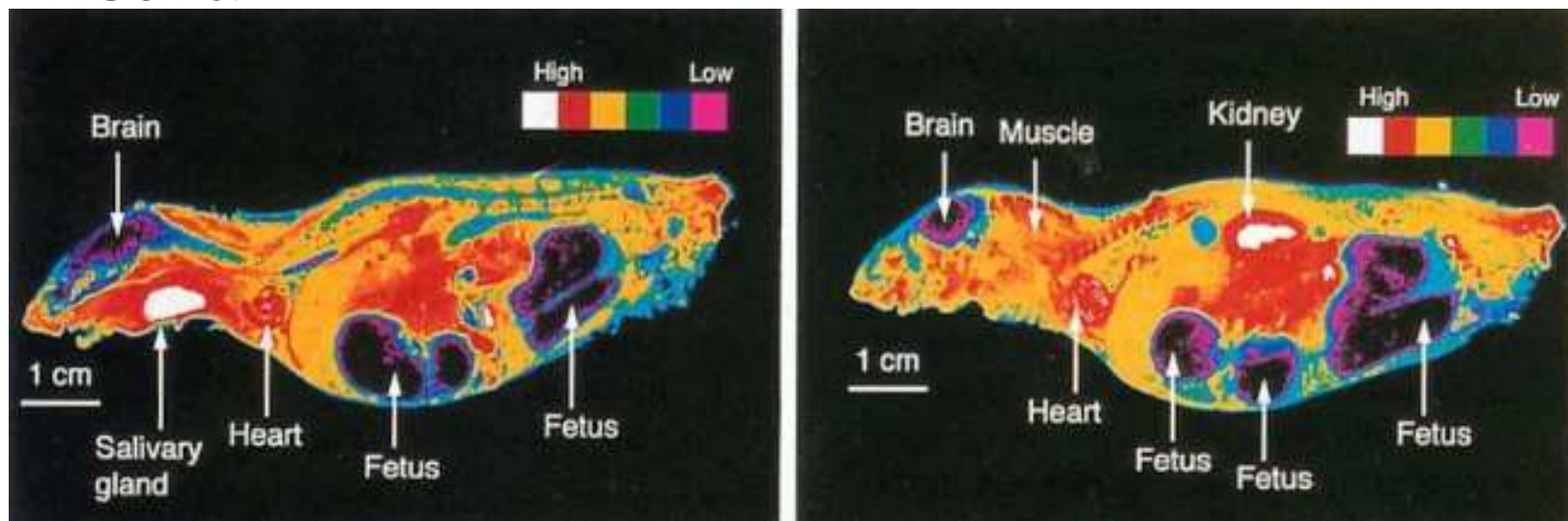
Radiation ↙ Particle beam → α ray, β ray



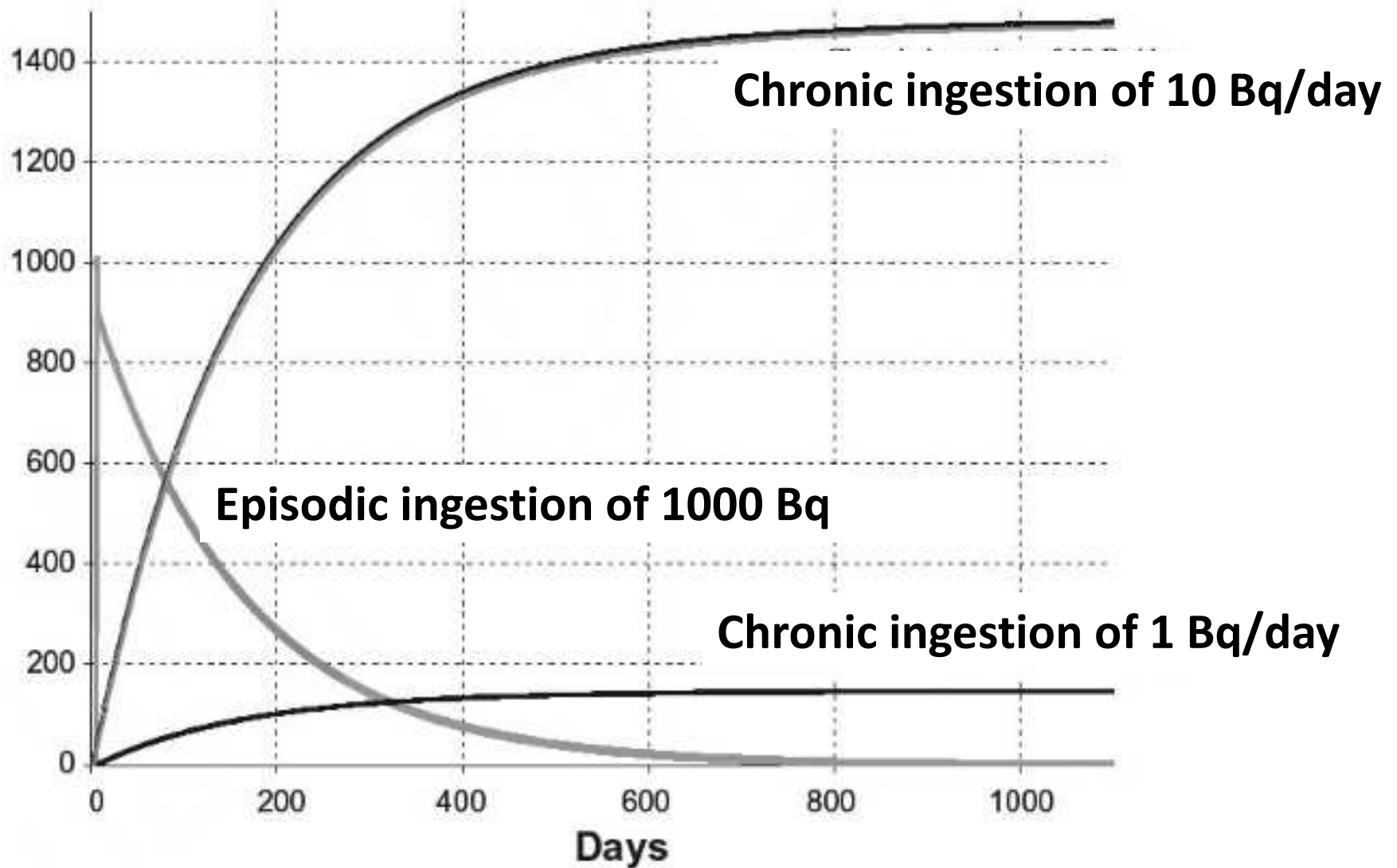
明るさを表わす単位 [ルクス (lx)]

Distribution of Cs137 in mice

- Cs137 is absorbed in a way similar to Potassium (K) .
- But, excretion is slow and Cs137 is accumulated in muscles, kidneys, and the heart.



From ICRP Publication 111



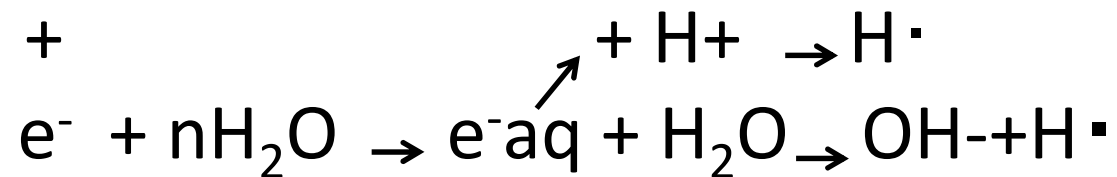
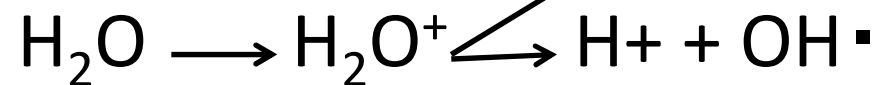
Evolution over a pluri-annual period (1000 days) of whole-body activity(Bq) associated with an episodic intake of 1000Bq and daily intake of 1 and 10Bq of Cs 137.

Ionization and excitation

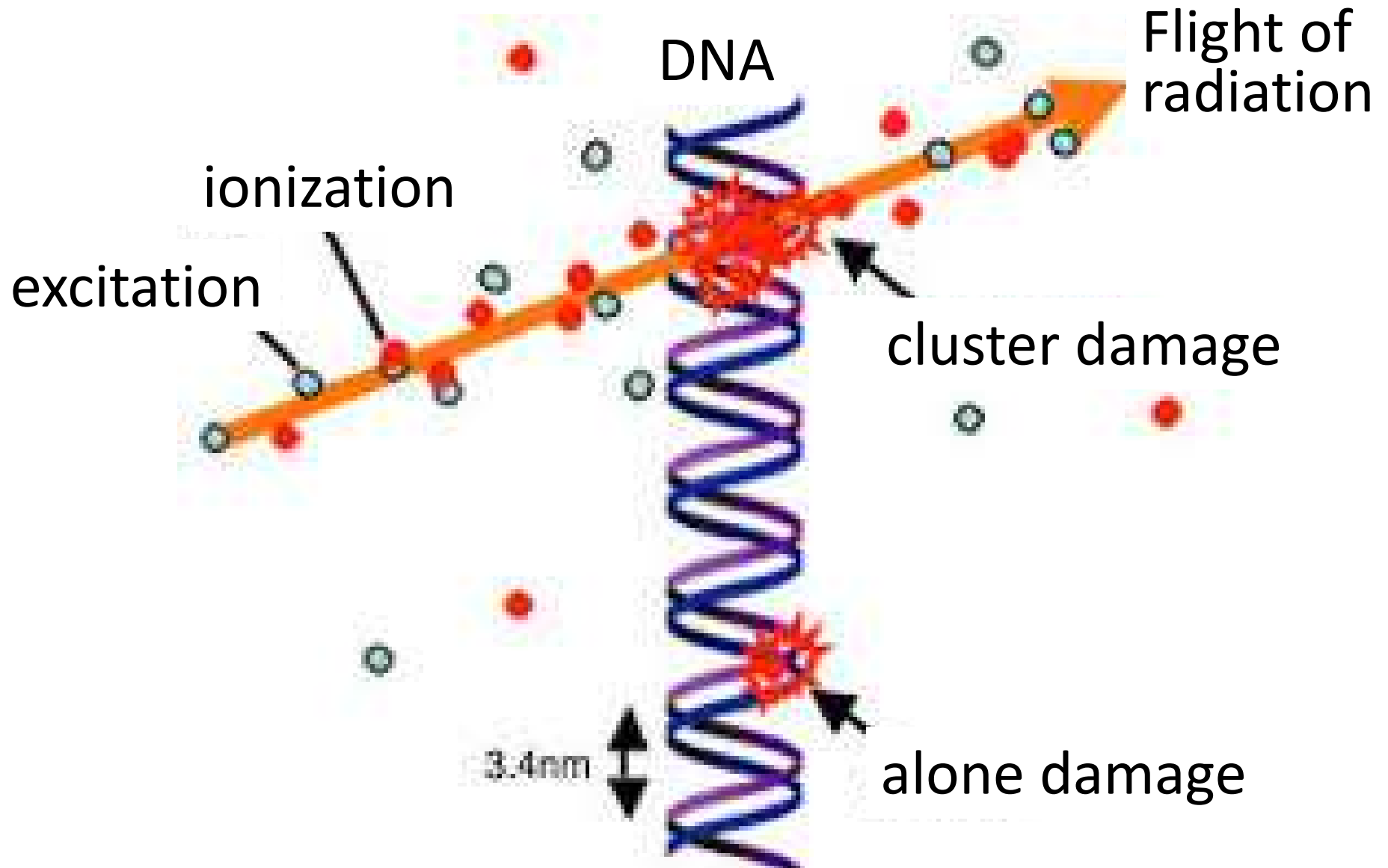
- Our body is consisted of 60 trillion cells and more than 60% of water.
- Intracellular fluid accounts for two-thirds of the water.
- Therefore, a large number of water molecules are ionized and excited as follows.
- Excitation of water



- Ionization of water



Damages on DNA

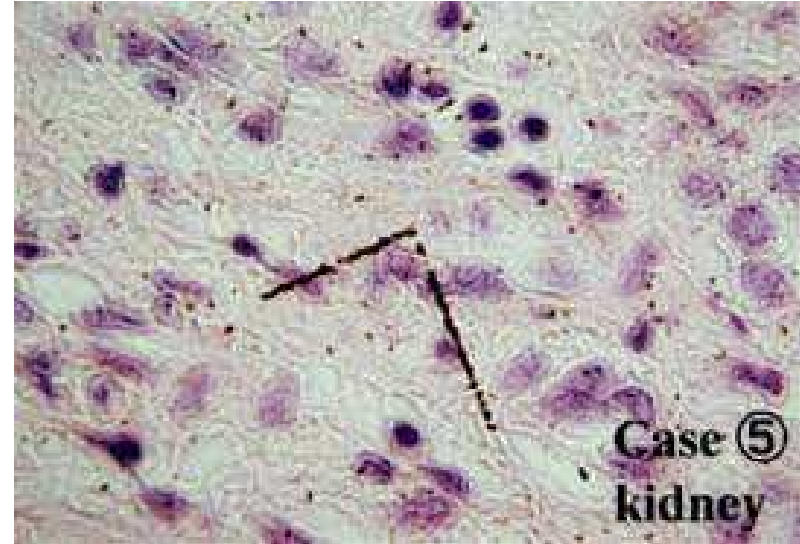


Fear of internal exposure-1

- Cs137, emitting β -rays and γ -rays, has the half-life of 30 years.
- Cs137 behaves like K and accumulates in muscles (especially heart muscles) and kidneys. It increases the risks of heart attacks.
- Sr90, emitting β -rays, has the half-life of 29 years.
- Sr90 behaves like Ca and accumulates in bones, destroying the bone marrow. It increases the risks of blood disorders (such as leukemia, etc.)

Fear of internal exposure-2

- Pu239, emitting α -rays, has the half-life of 24,000 years.
- Pu239 accumulates in lungs through breathing.



Plutonium emission in a kidney of a Nagasaki victim.

- Radiation causes a decline in immune function.
- Radiation causes energy shortage disease (such as general malaise) due to damages to mitochondria.

Conclusion

- Many types of damages are known to be caused by external and internal exposure to radiation.
- Especially, health effects of internal exposure are complicated and difficult to reproduce in animal experiments.
- Experiences in Chernobyl are very important in understanding long-term health effects on individual human body as well as on a whole population.