

The effect of radiation on our body

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Context

- The physical property of radiation
- The effect of radiation on our body
- Q&A

Two types of radiation

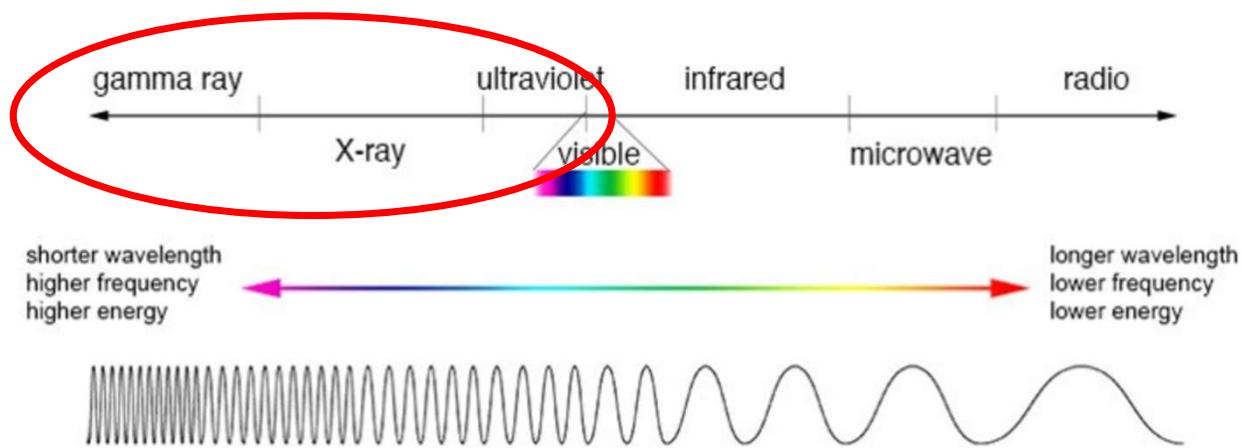
Ionizing radiation
(전리 방사선)

Nonionizing radiation
(비전리 방사선)

The physical property of radiation

Ionizing radiation (전리 방사선)

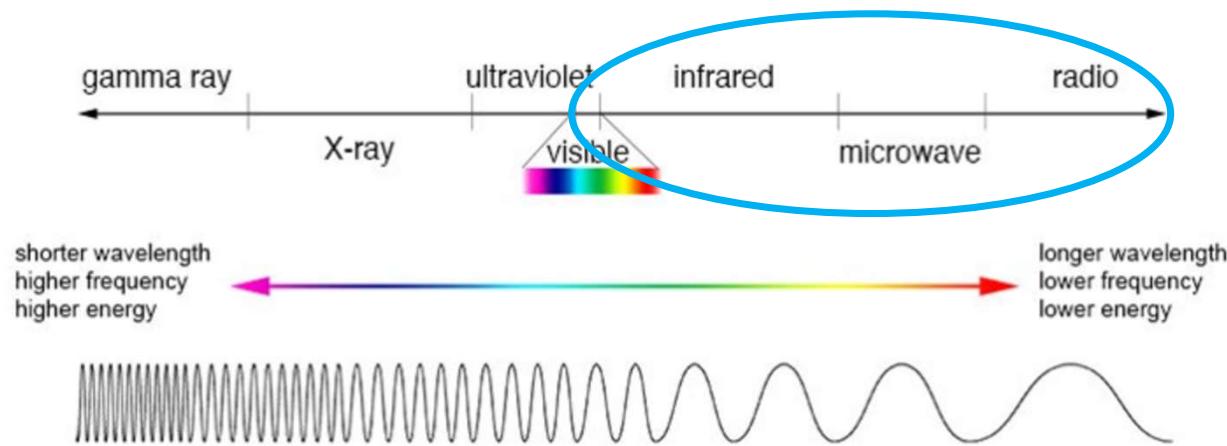
- Alpha ray
- Beta ray
- Gamma ray
- X ray



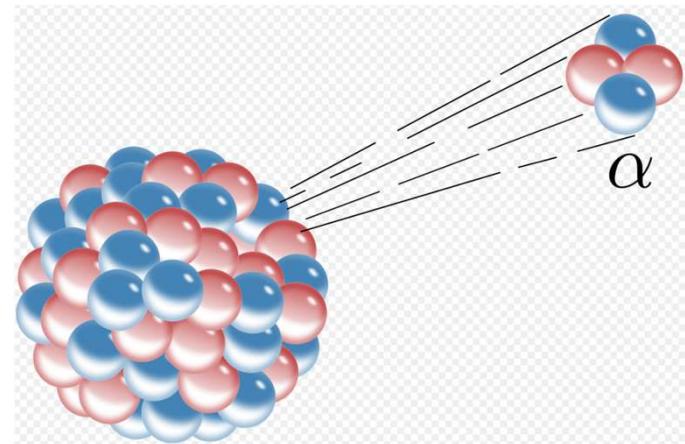
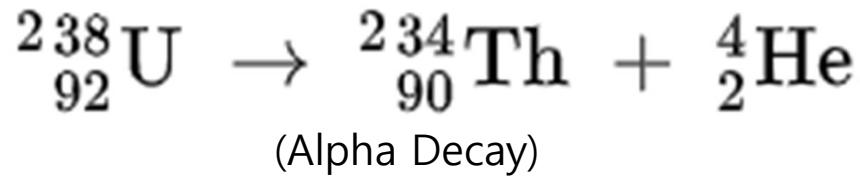
The physical property of radiation

Nonionizing radiation (비전리 방사선)

- Visible light
- Infrared
- Microwave
- Radio



Alpha Ray (He^{2+})



<property>

- Easily absorbed
- Dangerous if it enters human body
- Used in fire alarm (${}^{241}\text{Am}$), unsealed source radiotherapy

Unsealed source radiotherapy

injecting radioactive substances called **radiopharmaceuticals** to treat medical conditions, particularly cancer

Radiopharmaceuticals

Generating Alpha ray : Radium (^{223}Ra)

Generating Beta ray : Calcium (^{47}Ca), Carbon (^{14}C), Strontium (^{89}Sr)

Generating Gamma ray : Chromium (^{51}Cr), Indium (^{111}In), Iodine (^{123}I)

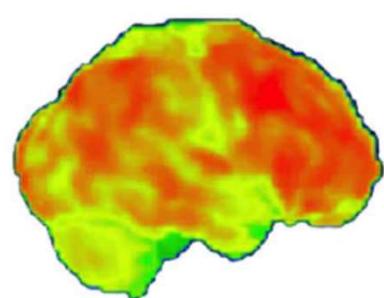
Beta Ray (e- / e+)



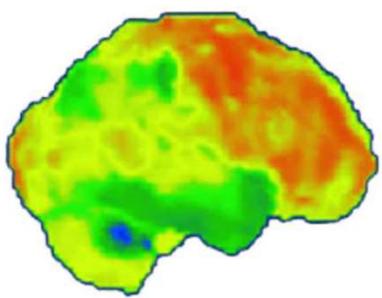
<property>

- Transmittance : greater than alpha, less than gamma
- Used in beta lightbulb(3H , **phosphor**), PET scan

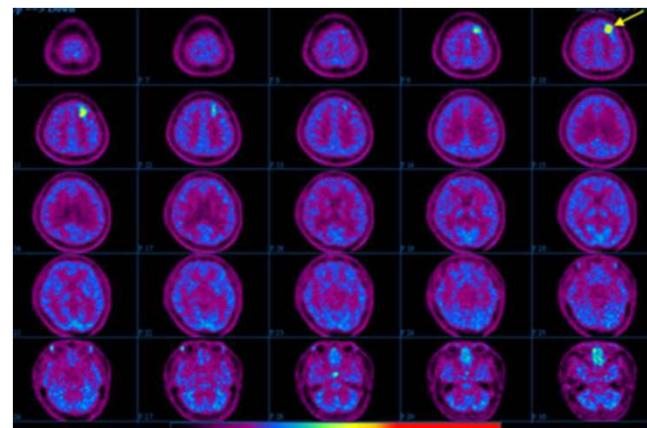
PET (Positron Emission Tomography)



Normal



Alzheimer's disease

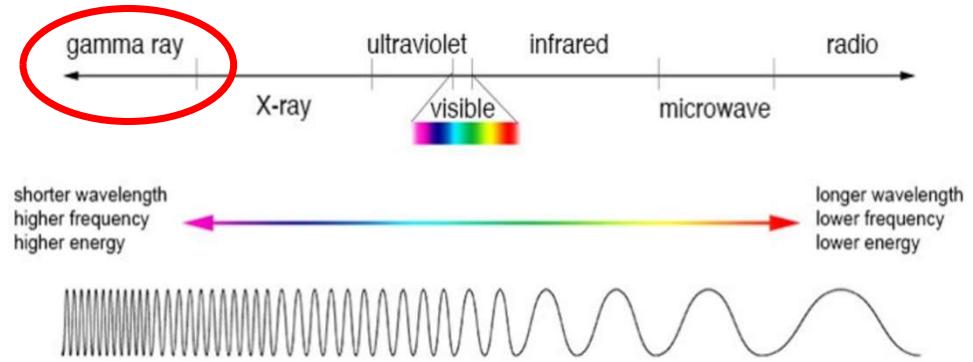
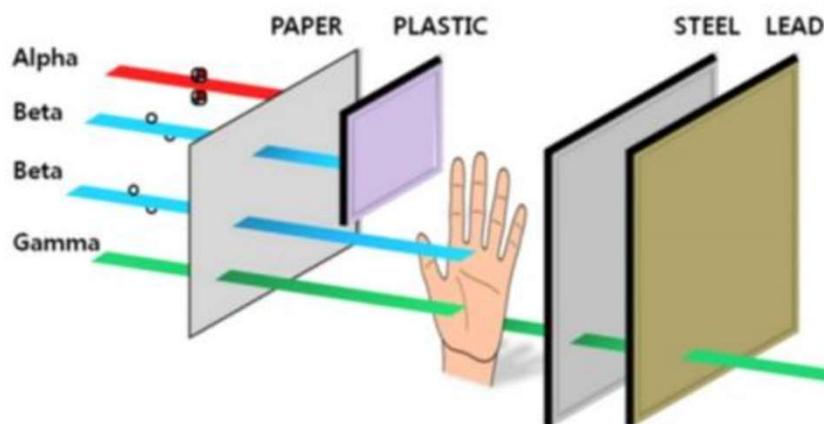


Brain Tumor patient

Glucose digestion speed : Abnormal cells > Normal cells

1. Inject radioactive isotopes (tracer) (F-18-FDG) (F-18-불화디옥시포도당)
2. F-18-FDG moves to abnormal cells
3. **Beta+ decay & Pair annihilation** at abnormal cells -> create Gamma ray
4. Use Gamma ray detector

Gamma Ray



Nucleus : proton + neutron

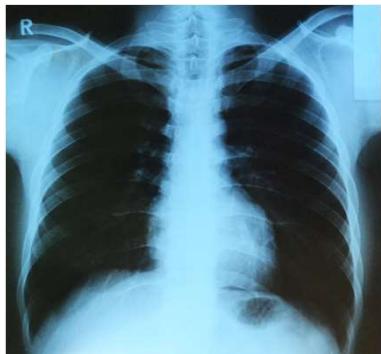
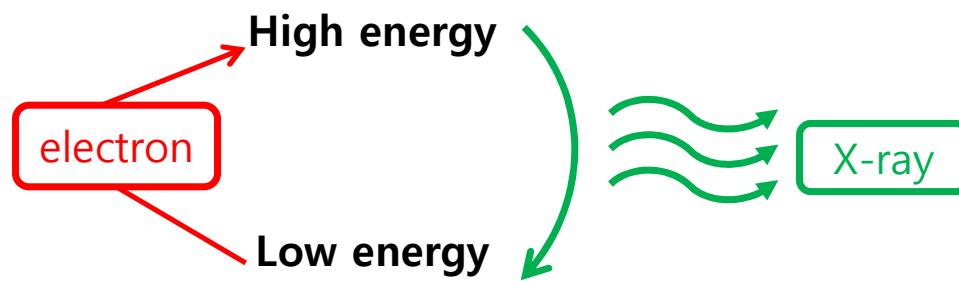
Repelling force between protons, **strong nuclear force** between proton and neutron

Unstable -> emit gamma ray and become stable

Usage

- Medical equipment sterilization
- Cancer treatment

X-Ray



X-ray photo

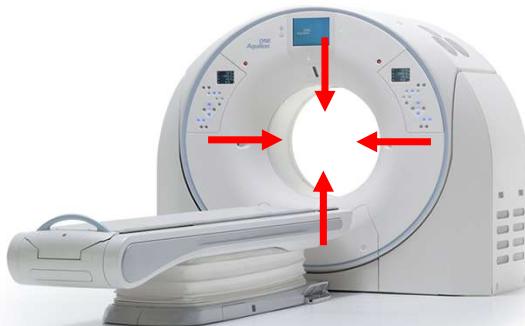


CT (computer tomography)

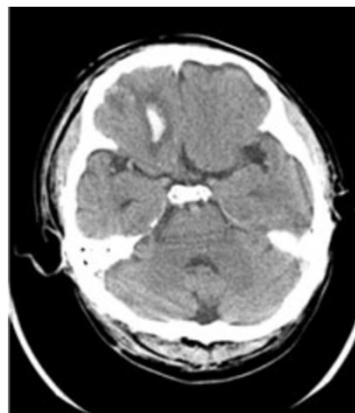


Luggage screening in airport

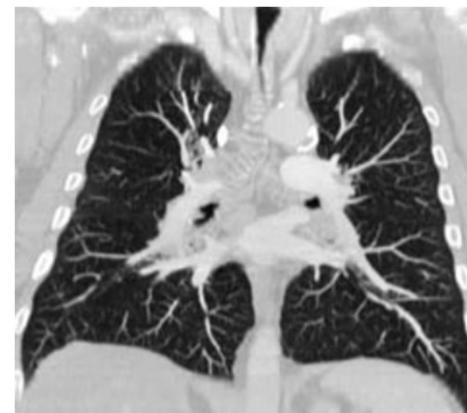
CT (Computer Tomography)



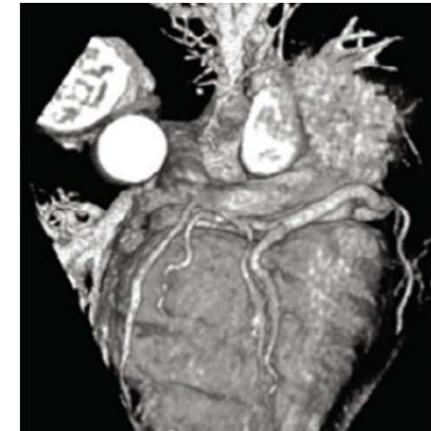
CT (computer tomography)



Brain CT



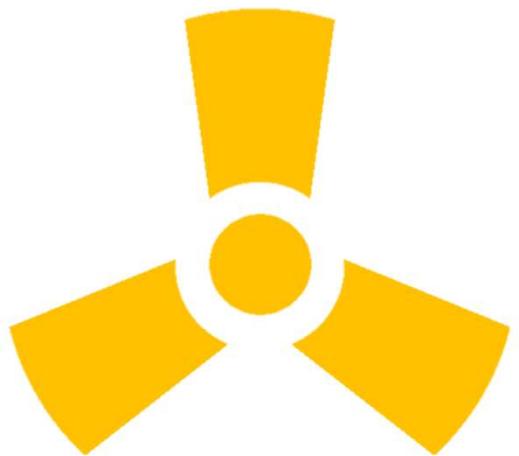
Chest CT



Heart CT

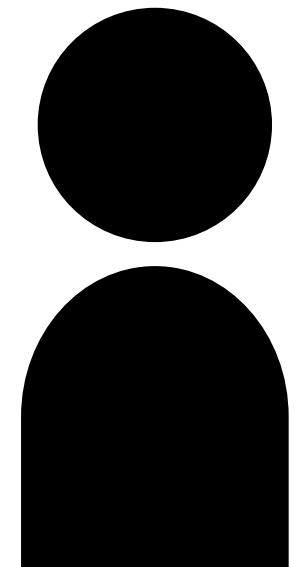
- Transmit X-ray through human body in multiple angles
- X-ray detectors on the other side collect data about transmitted X-ray
- Create an image in 2D or 3D by using computer program

The effect of radiation on our body



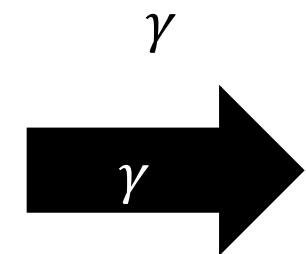
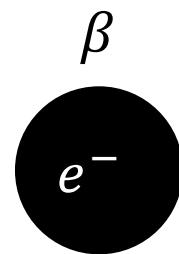
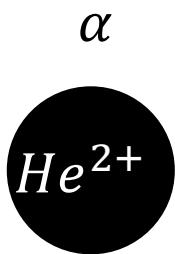
Ionized → Kinetic E

Nonionized





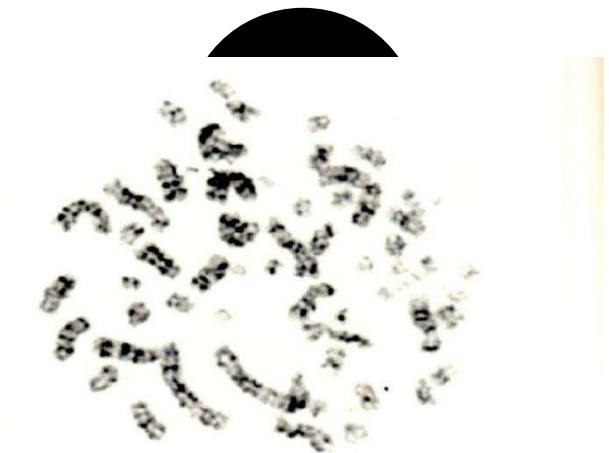
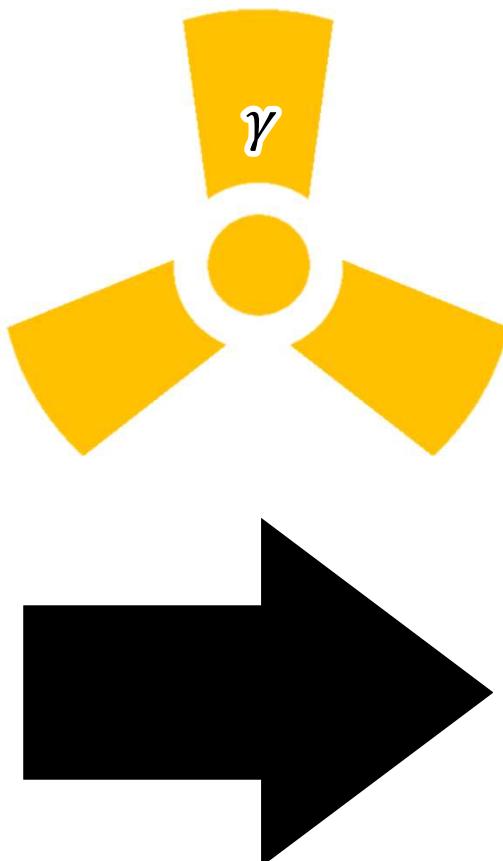
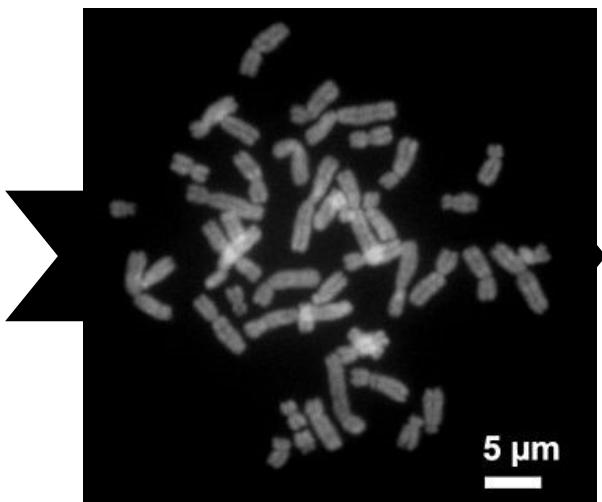
Ionized



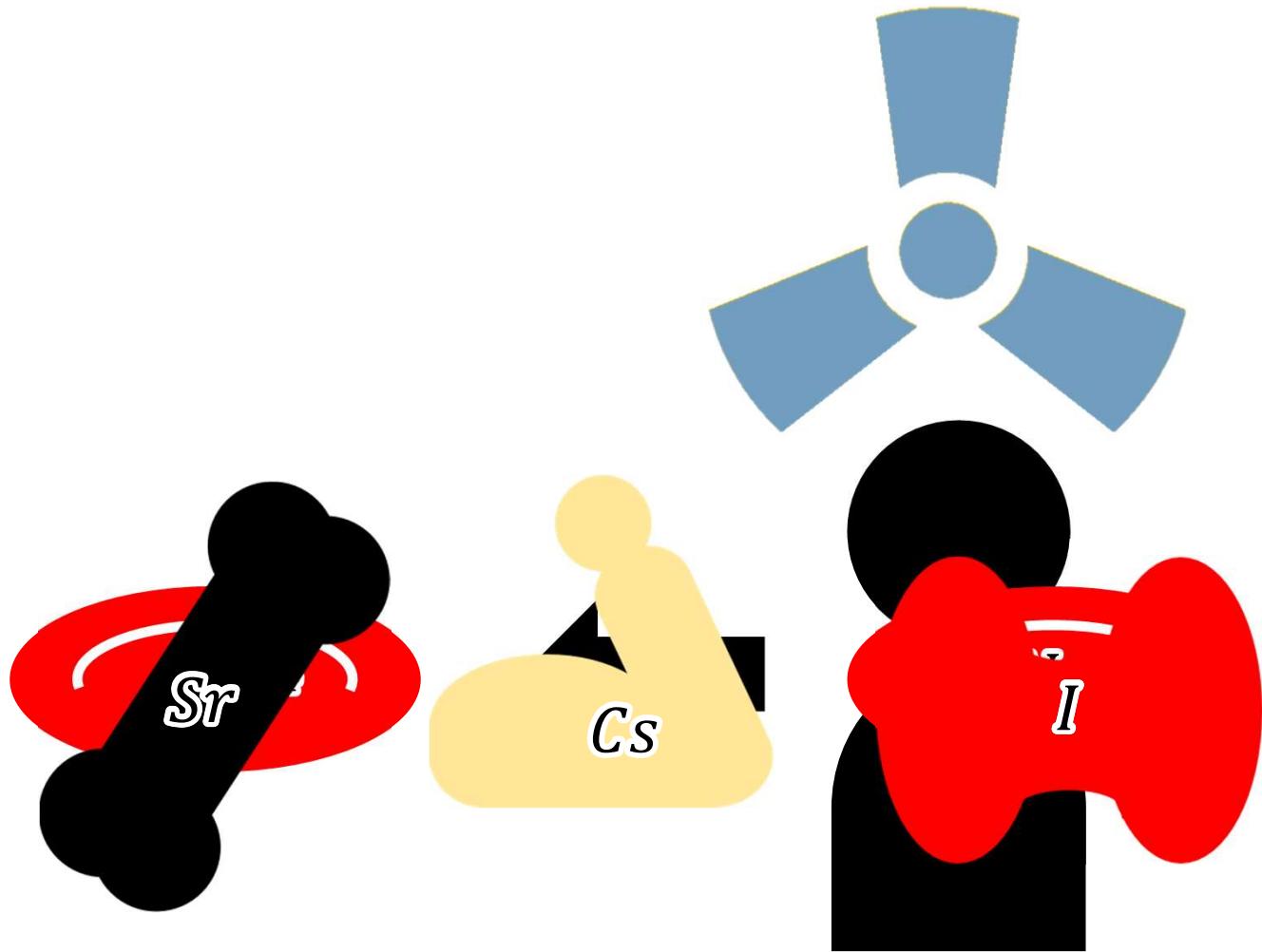
Paper

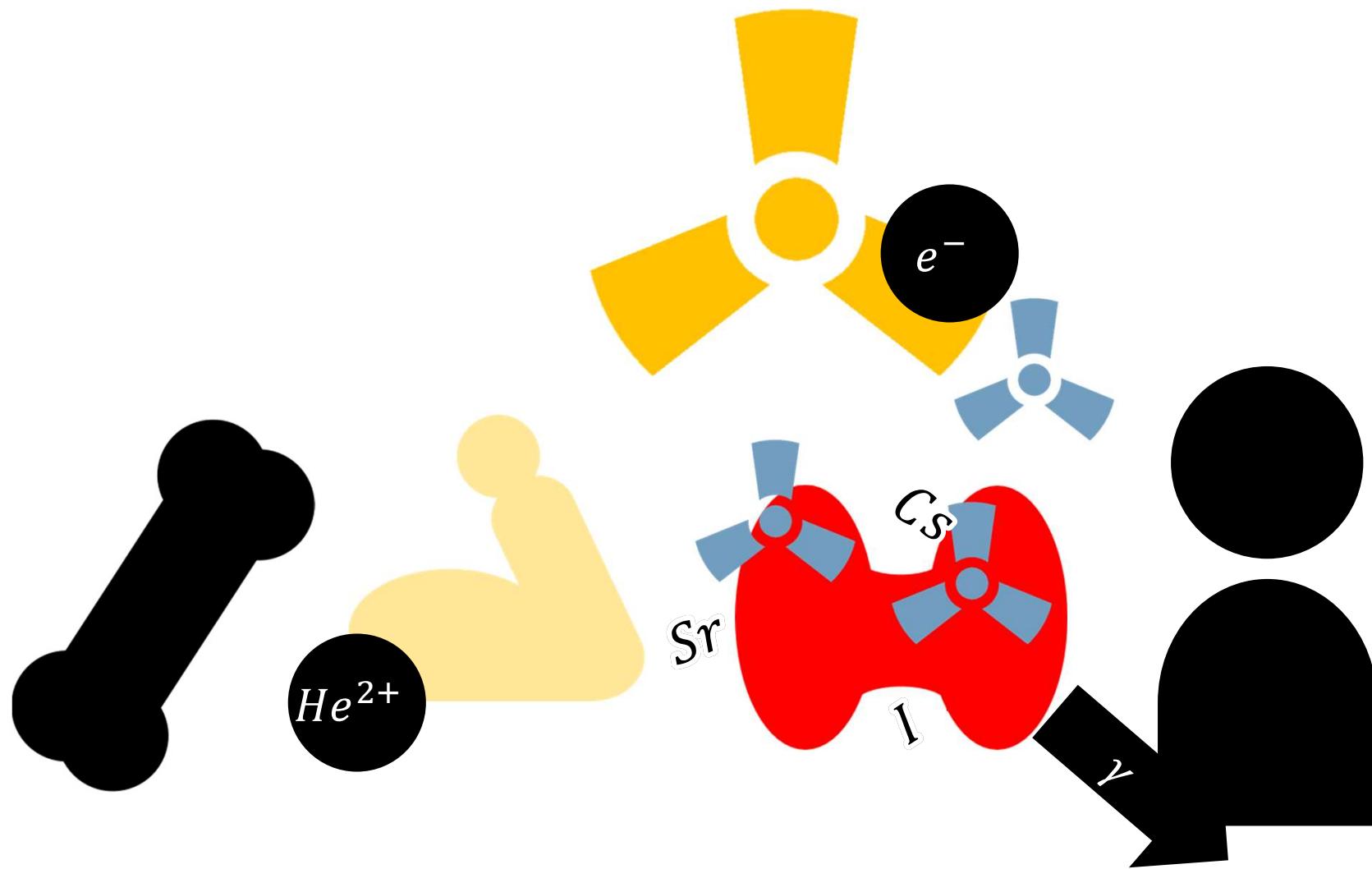
Aluminum

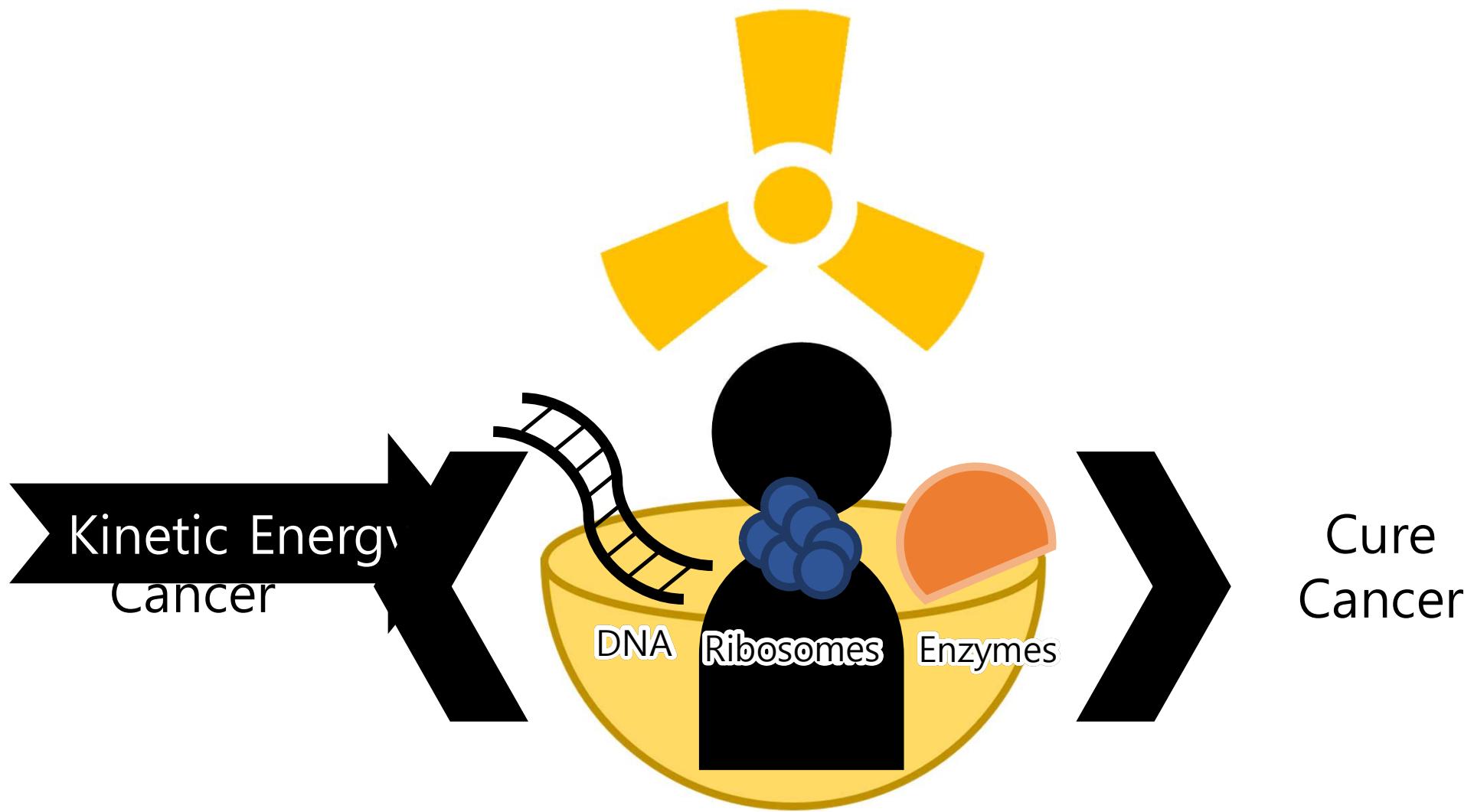
Concrete



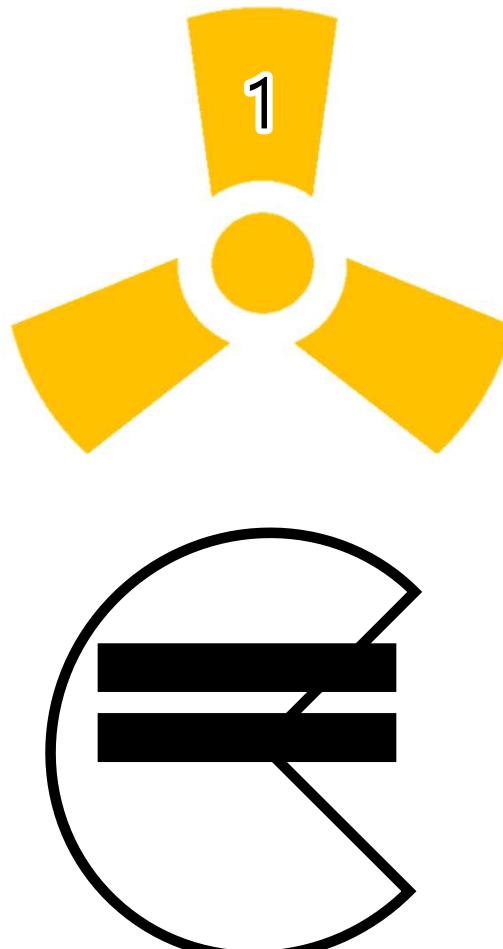
染色体の顕微鏡写真（鶴骨の骨髄細胞）。ばらばらに破壊され、同定できない。
採取日：1999年10月31日（被曝4日目）



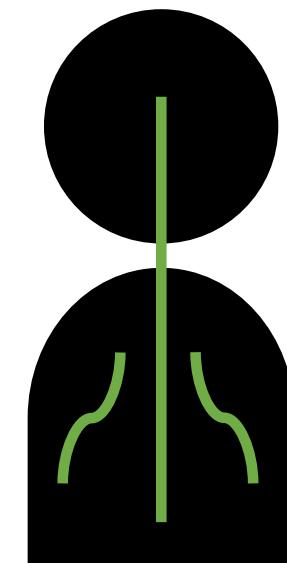




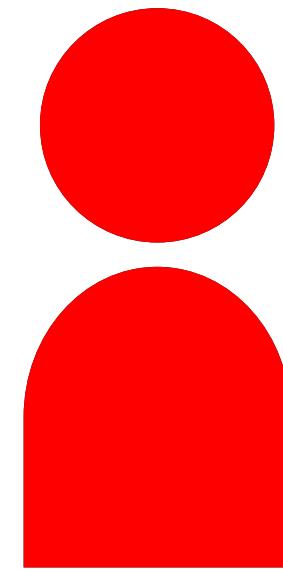
Kinetic Energy



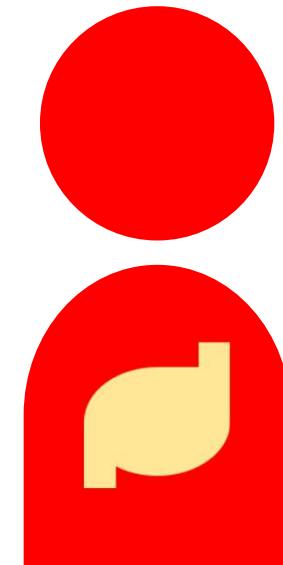
White Blood Cell



Lymph

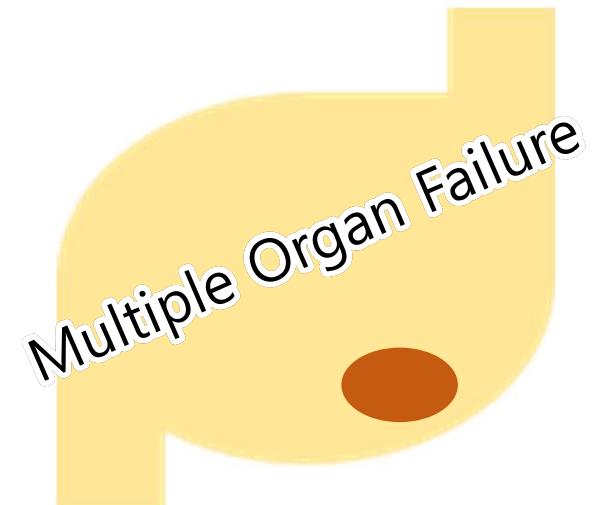


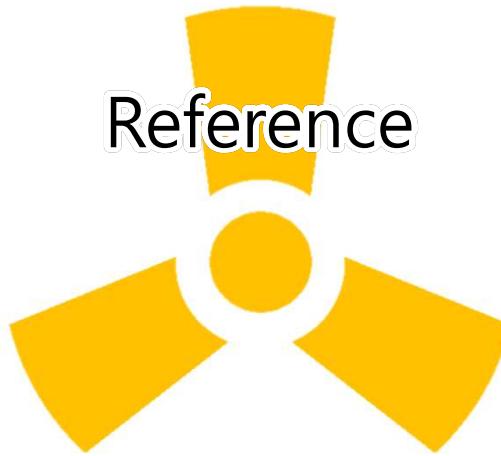
No Food
No digestion





Death By





<https://ko.wikipedia.org/wiki/%EC%97%BC%EC%83%89%EC%B2%B4>

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<https://ko.wikipedia.org/wiki/%EA%B8%89%EC%84%B1%EB%B0%A9%EC%82%AC%EC%84%A0%EC%A6%9D%ED%9B%84%EA%B5%BD>

Q&A