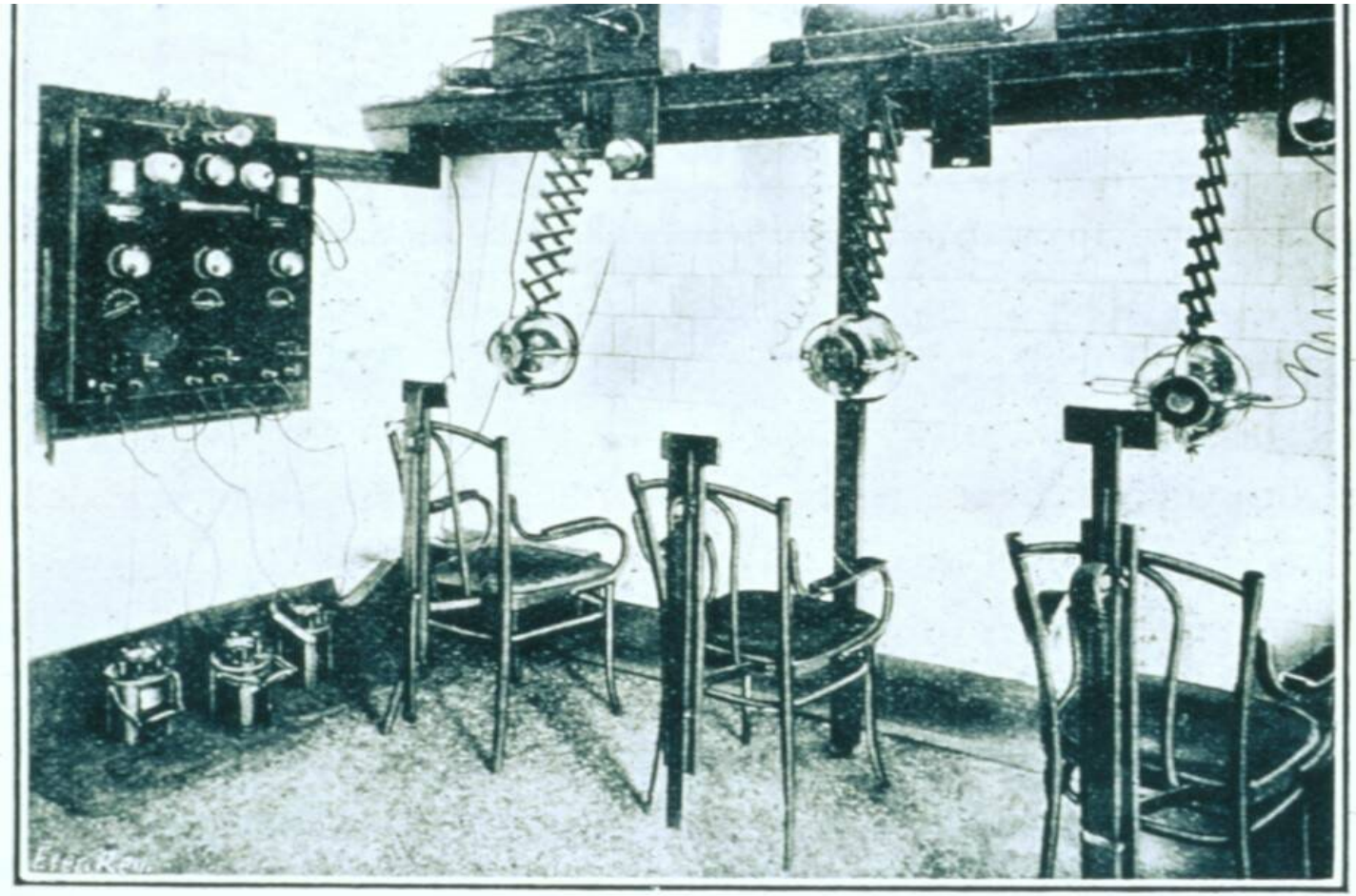
Public Health England

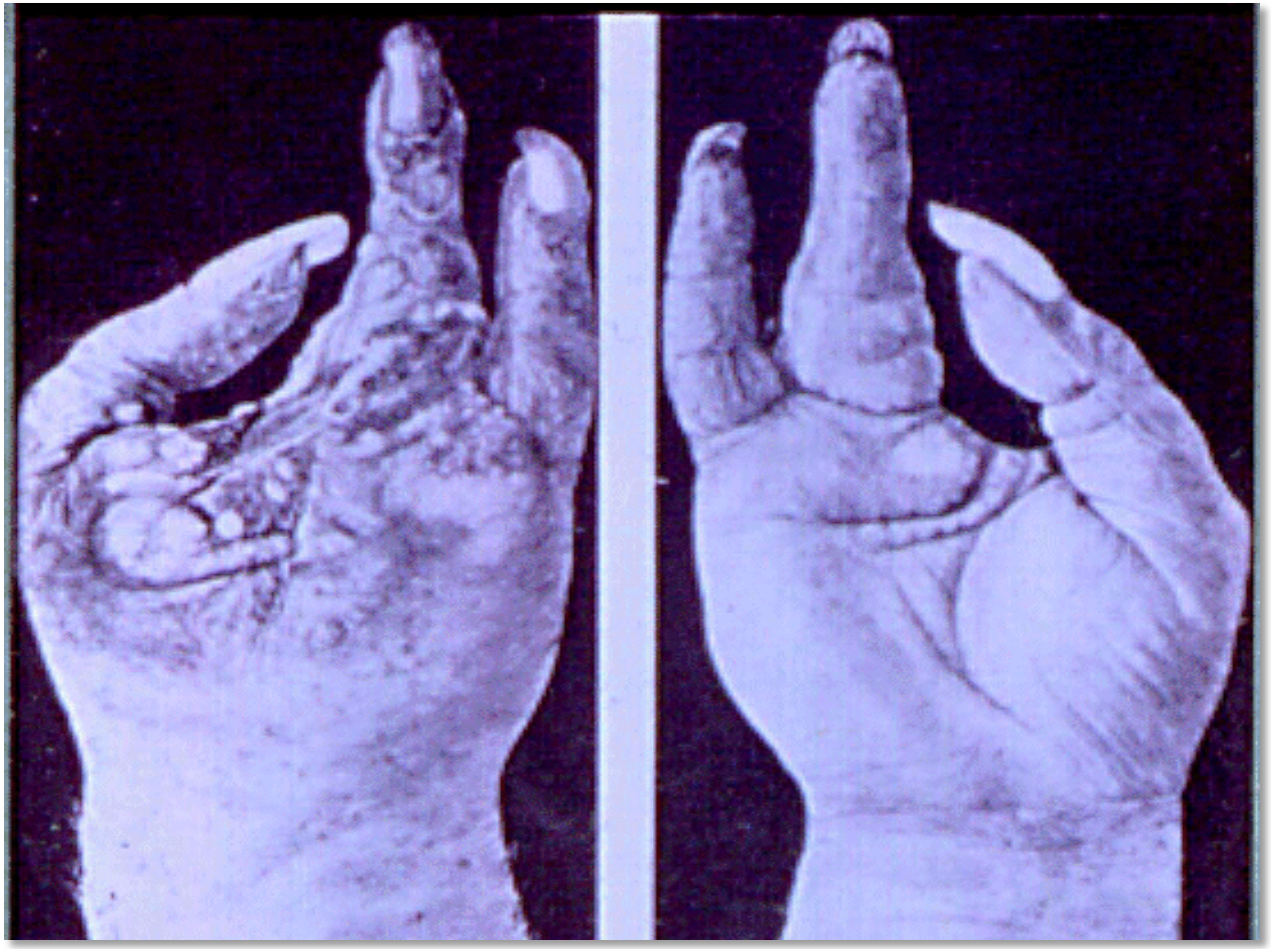
Health effects of radiation exposure

Image courtesy of www.dotmed.com

Image courtesy of Wellcome Images/Wikimedia



LONDON HOSPITAL : ROENTGEN THERAPY.



Cell damage

- Ionisation events occur, may be repaired, damage not always evident
- Damage may be evident in individual cells
- Cell can perform key functions
- Remains recognisable
- Cells lose ability to divide
- **Incapable of normal function**
- **Multiple cells ‘killed’**

Health effects

Tissue reactions

Effect is very likely to appear above a *threshold* level of dose but almost certainly will not appear below that threshold.

Thresholds for tissue effects after localised exposure of skin

Reddening 5 000 mSv

Hair loss 7 000 mSv

Blistering 20 000 mSv

Tissue reactions and thresholds

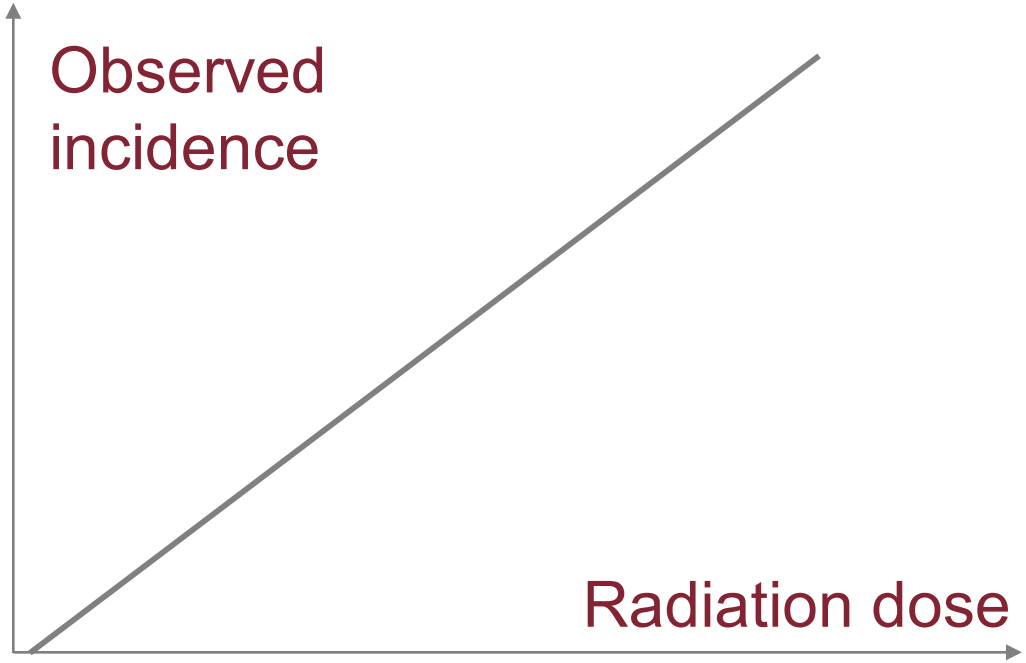
Whole body radiation exposure

Detectable chromosome changes	100 mSv
Blood count changes	1 000 mSv
Radiation sickness	1 000 mSv

Health effects

Radiation induced cancer

There is *no threshold* value. Probability of the effect occurring is proportional to the size of the dose received, but the severity of the effect is independent of the size of the dose.

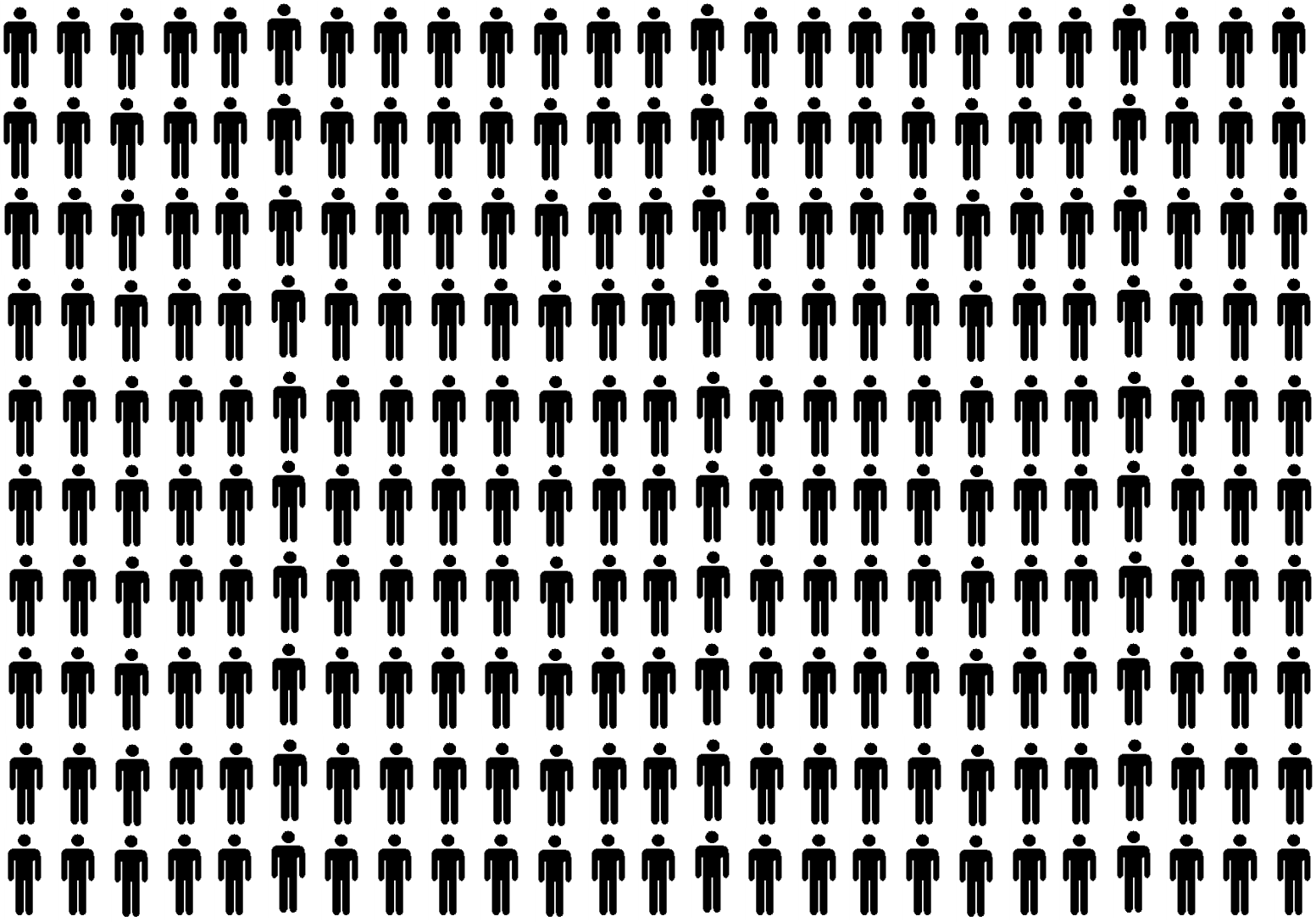


Radiation induced cancer

Risk of fatal cancer

4% per Sv

1 mSv	**1 : 25 000**
10 mSv	**1 : 2 500**
20 mSv	**1 : 1 250**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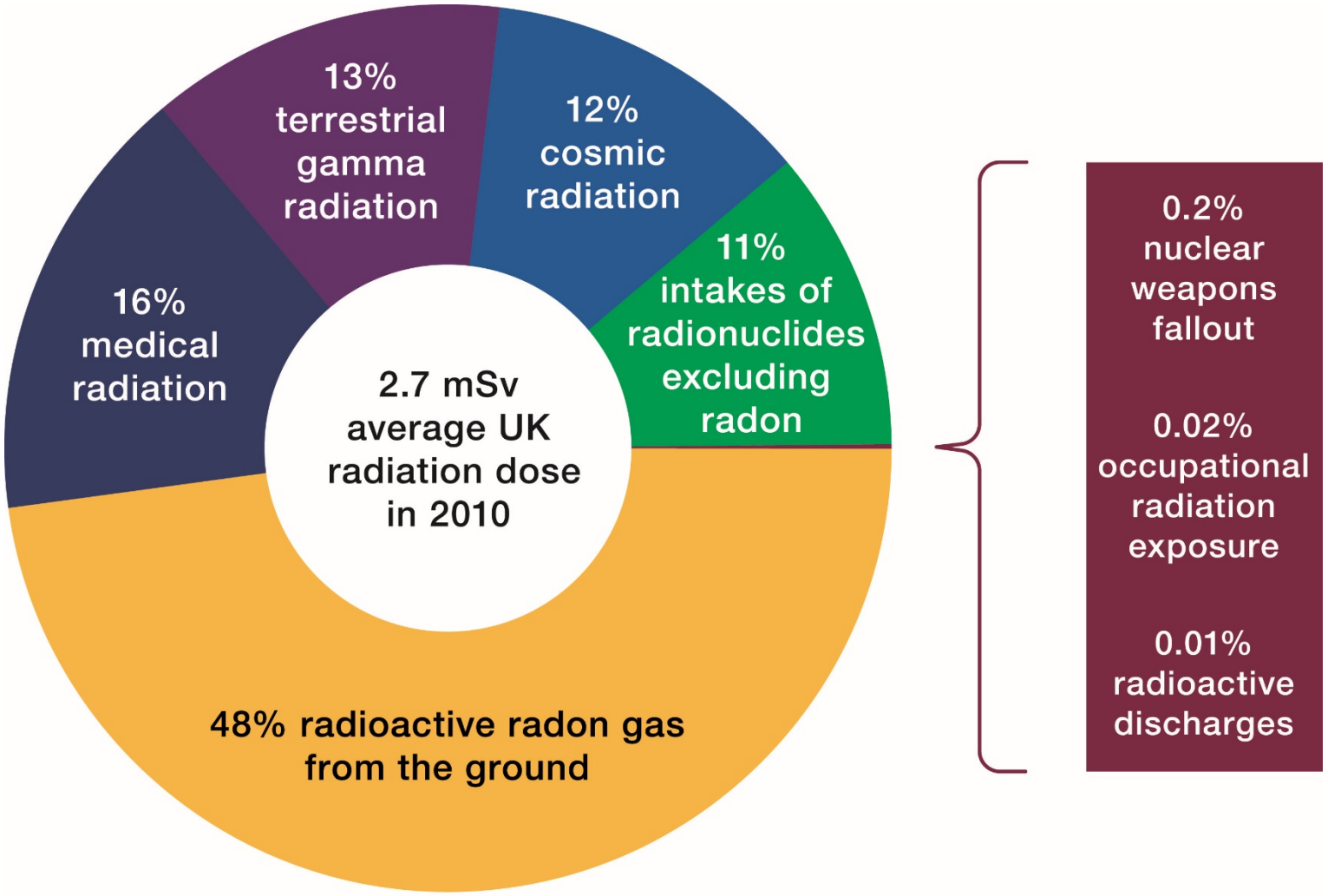
Public Health England

Doses in Perspective

Average annual radiation dose to a UK citizen



For more information please visit: goo.gl/OWBcV3

Typical effective doses to patients

Type of radiograph	Effective dose, milliSieverts (mSv)
Intra oral (bitewing/periapical)	0.0003 – 0.022
Panoramic	0.003 – 0.038
Lateral cephalometric	0.002 – 0.014
Dental cone-beam CT (small field of view)	0.011 – 0.214
Dental cone-beam CT (large field of view)	0.030 – 1.025

Table adapted from 'Selection Criteria for Dental Radiography' Third Edition, updated 2018 (courtesy of FGDP(UK))

Typical effective doses from other sources

Typical annual dose to an intra-oral X-ray set operator, assuming suitable protection measures	<0.1 mSv per year
Typical chest X-ray	0.02 mSv
Two hour flight to Spain	0.01 mSv
CT scan of the abdomen/pelvis	10 mSv
Spending 6 months on the International Space Station	160 mSv

Risk of death…

Immediate:

Accidents on the road	1 in 5 000
Accidents in the home	1 in 10 000
Accidents at work	1 in 20 000

Late onset:

Smoking 10 cigarettes per day	1 in 200
Single radiation exposure of 1 mSv	1 in 25 000

Summary

- X-rays are ionising radiation
- Depending on the level of radiation dose, exposure to X-rays may lead to:
  - tissue effects (if the dose is above a known threshold)
  - a risk of radiation induced cancer (no ‘safe’ threshold, risk increases with dose)
- Providing steps are taken to restrict radiation exposure, the risk of experiencing these health effects will be very low