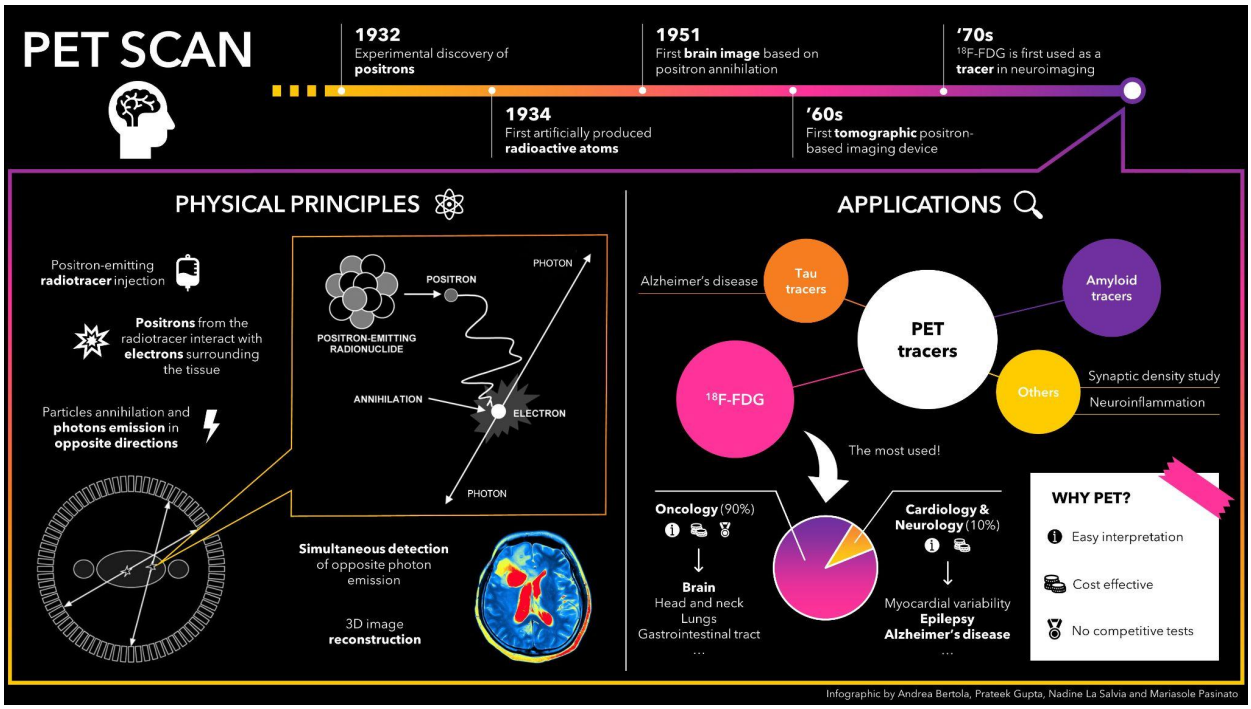

PET (Positron Emission Tomography)

Infographic Challenge

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History

We can trace back the origins of PET to **1932** when **Anderson** proved the existence of **positrons**, the 'anti-electrons'. After only two decades, **Brownell** and **Sweet** were the first to use positron annihilation radiation for **medical imaging** (**1951**).

Physical principles

The basic principle of PET is the detection of photons emitted from the body after the administration of a **radiotracer**, which undergoes radioactive decay and emits **positrons**. The positron travels a short distance before interacting with an **electron** in the surrounding tissue. This results in the **annihilation** of both particles, producing two **photons** traveling in opposite directions.

A ring of **detectors** surrounds the patient: the detectors are typically **scintillation crystals** coupled to **photomultiplier tubes** (PMTs). The photon-crystal interaction produces a burst of light, detected by the PMTs. This **coincidence detection** of opposite photons allows the localization of the annihilation event along the line connecting the two detectors involved.

Applications

Fluorodeoxyglucose (^{18}F-FDG), the most used PET tracer, allows the assessment of **glucose metabolism**. Glucose exhibits different behavior in the presence of cancerous cells, which explains the importance of FDG in **oncology**. Glucose investigation plays a key role in **cardiology** and neurology as well: it helps diagnose **Alzheimer's disease** and locate seizure foci in **epileptic patients**.

Other commonly used types of tracers are Amyloid tracers and Tau tracers, especially in the early detection of **Alzheimer's disease**.

Resources

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