**P.E.T. METALLOMICS – USING RADIOACTIVITY TO TRACK ESSENTIAL TRACE METALS IN THE BODY**

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- **P.E.T. metallomics** uses radioactive isotopes of metals to track metals in the human body without the need for invasive biopsies.

- Metals such as copper (Cu), zinc (Zn) and manganese (Mn) are found naturally in our body and are essential to human health. Too much of these metals, from environmental exposure, or too little, from nutritional deficiency, can have detrimental effects.

- An abnormal balance of these metals has been associated with diseases including Alzheimer’s disease, prostate cancer and diabetes. However these changes are poorly understood.

- We have developed methods to produce an exciting range of radioactive metals. This allow us to study metals in humans and animals by P.E.T. imaging to improve our understanding of their role in health and disease.

### Following intravenous injection, metals localise to organs that require them to function

#### Zinc
- Allows the imaging of diabetes, arthritis, prostate and breast cancer.

#### Copper
- Allows the imaging of prostate cancer, Wilson’s and Alzheimer’s disease.

#### Manganese
- Allows the imaging of Dementia, lung cancer, manganism and breast cancer.

#### What happens to the normal regulation of metals in disease?
- Many diseases have been associated with altered transport and excretion of trace metals (see “Metals in health and disease” above).

- The prostate gland is associated with the one of the highest concentration of zinc in the body, but in prostate cancer zinc levels are significantly lower and copper levels are increased. Whereas Alzheimer’s disease is thought to have an increase in both zinc and copper levels compared to healthy brain tissue.

- These changes are poorly understood. With **P.E.T. metallomics** we can now dynamically track metals in models of disease over time. It also allows us to see what happens to these metals following treatment regimes.

- For example, **P.E.T. imaging** with $^{64}$Cu shows altered distribution of copper in models of Alzheimer’s disease (right) and prostate cancer (far right). Tumours are grown on the back of the mouse using prostate cancer cells.

### The future of P.E.T. metallomics is in improving patient outcome

- **Locate** disease
- **Diagnose** and stage disease
- **Predict** response to therapy
- **Monitor** response to therapy

1. Imaging copper in patients with prostate cancer (Righi et al)
2. Imaging zinc in patients with Alzheimer’s disease (Degrado et al)