Docket #: S21-240

Quantifiable heavy metal detection in immune cells

Inventors at Stanford developed a method to leverage mass cytometry, a type of flow cytometry utilizing mass spectrometry, for the detection of heavy metals in leukocytes from individuals exposed to heavy metals in elevated air pollution. The method uses a cell-staining process with antibodies conjugated with heavy metals. These heavy metals, such as lanthides, are typically in low abundance in the environment and biological systems. By monitoring channels in the range of the cytometry time-of-flight (CyTOF) machine while running a standardized CyTOF experiment on cells from individual blood samples, the method can detect the heavy content of the cells for those "open" channels. These channels included, but are not restricted to, bromide, cadmium, antimony, tantalum, tungsten, mercury, and lead isotopes. The first-of-its-kind method that identifies immune cell types at the single-cell level and simultaneously quantifies cell surface or intracellular heavy metal content will facilitate the early detection of harmful metals and heavy metal exposure in the environment and how these metals interact with specific cell phenotypes.

Stage of Development
In Vitro Research

Applications

- Cell marker identification
- Metal isotope identification
- Cellular research and immunotoxicology tool applicable to:
    - Metal toxin inhalation (i.e., wildfires, air pollution)
    - Metal toxin ingestion (i.e., paints, contaminated water or soil, forensic cases)
    - Among other routes of exposure

Advantages

- First method to detect heavy metals in cells
- Compatible for all cell types
- Integrates with available flow and mass cytometers

Patents

- Published Application: WO2023049805
- Published Application: 20240393322

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