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Investigating the role of Zn in glucose regulation using X-ray Fluorescence Microscopy and X-ray absorption near-edge structure spectroscopy

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Zinc plays an important function in glucose regulation, particularly within pancreatic islets, the anatomical home of the glucose regulating hormones insulin and glucagon. Glucose dysregulation is a significant contributor to the epidemic of metabolic diseases, including diabetes, that affect an increasing number of people. Zn is found in very high (mM) concentrations in insulin-secreting - cells, where it facilitates insulin synthesis and storage, and is co-secreted with insulin, subsequently acting as a signalling molecule. Zn dysregulation is often coincident with impairment of insulin secretion, but little is known about the nature of the changes. Since a subset of the pool of Zn in islets is labile, it is difficult to image in its in vivo situation using conventional techniques such as histochemistry. Not only do preparation steps such as washing displace Zn, but some forms in which it exists are not readily discernible using conventional microscopy techniques. X-ray fluorescence microscopy (XFM) and X-ray absorption near-edge structure spectroscopy (XANES) offer several advantages in that tissue preparation is minimal, facilitating the conservation of native states, and all forms of Zn are not only detectable, but are able to be discriminated by matching spectra against an existing library of Zn forms. Here we report the preliminary results from our study of Zn speciation and elemental mapping in murine islets from healthy or diabetes-prone animals in two age groups, 14 (denoted young) or 28 (old) weeks. This work uses a library of biologically relevant Zn forms created in our laboratory, and contributes to our understanding of the role of Zn in glucose regulation in health and disease, including aging.

Presenter Gender

Woman

Do you wish to take part in the Student Poster Slam

Condition of submission

Yes

Students Only - Are you interested in AINSE student funding

Level of Expertise

Early Career <5 Years

Pronouns

She/Her

Which facility did you use for your research

Australian Synchrotron

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