

The Hole Story: The AFM and Cellular Conversations.

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-12.15pm-

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-Abstract-

Operation of a system, such as that of our muscular, glandular, reproducing, hungry body requires tissues in distant parts to know what other tissues are doing, so that activities can occur in synchrony. Secretion of compounds from within a biological cell to its exterior is a process that is fundamental to the exchange of biochemical information between tissues and cells, and as such is at the centre of physiological functioning. One of the most common means by which compounds, such as proteins, are delivered from inside the cell to the extracellular space is exocytosis.

Exocytosis is an essential cellular process in which secretory granules containing protein from within a cell fuse with the cell's outer membrane, a pore results and the contents of the granule are expelled. The granule contents, being biological compounds with hormonal or neurotransmitter activities, can be transported in the blood and is thus a means of transmitting information from cell to cell and between tissues.

Despite intensive study on exocytosis the structures of the fusion pores are poorly understood, although they are basic to physiological function. In this research micro-fabrication techniques were integrated with biology to facilitate the study of fusion pores from cells in the anterior pituitary gland. We used the atomic force microscope (AFM) together with the SEM and the TEM to investigate membrane topography with nanometre resolution. A diverse range of pore structures were revealed. These included simple structures that were consistent with the traditionally-described fusion pores. Narrow pores were also seen. Other structures suggested that sequential docking of underlying granules at a previous secretion site had occurred to form a compound structure. The variety may be a consequence of different mechanisms being required to respond to a multiplicity of physiological requirements.

These observations illustrate the power of the AFM in delineating the topographical characteristics of the cell membrane. Exocytosis is becoming recognised as a process of many phases and mechanisms, each being associated with characteristic structures. Further functional studies are expected to increase our understanding of the complexities.

Venues

- Rankine Brown 106, Victoria University of Wellington-
- Video Conference Room, C-Block, IRL, Gracefield Site, Lower Hutt-
- Level-3 lecture theatre (A309), ELEC Dept Building, Canterbury University-
- Turitea R1.07, Massey University-
- Conference Room 2, Otago University-

