A GASTROPOD MODEL IN PSYCHIATRY: DISSECTING THE MOLECULAR MECHANISMS INVOLVED IN ACTION SELECTION

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Background

Instinctive, goal-directed behaviour (GDB) is found in all animals including humans. Each of us has experienced the overwhelming need to withdraw from a crowded and noisy room; to seek and consume food; that we are in danger and need to protect ourselves; or a strong sexual attraction.

What seems to set us apart from other animals in this respect may be the degree to which we are able to modulate such behaviour when presented with other competing cognitive and affective stimuli. Whilst instinctive GDBs are part of the 'normal' repertoire of all animal behaviour, pathological extremes are found in both humans and other animals. In humans for example, disturbances in the modulation of instinctive GDBs are commonly associated with psychiatric disorders such as schizophrenia, bipolar disorder, major depression and personality disorders and may manifest themselves as cognitive and social withdrawal, excessive/minimal consumption of food, excessive checking, counting or arranging of items, excessive and ritualistic washing of hands etc.

Understanding the underlying neurobiological processes associated with these pathological changes in behaviour modulation would be an important step towards developing better treatment regimes for patients. Whilst the phenomenological characterisation of pathological changes in GDB observed in humans (and also in some animals) is relatively straightforward, determining what is happening at the cellular level is much more difficult. The interplay between the basal functions driving many instinctive GDBs and higher emotional and cognitive functions makes the human brain an extremely complicated system to study.

Hence we are in the first stages of developing a simple animal model to help us understand what takes place at a cellular level when instinctive GDB is modified.

The Model

Marisa cornuarietis is a large (up to 5 cm diameter) tropical freshwater snail originating from South America. Along with other gastropods, M. cornuarietis represents a relatively simple model organism for the study of neural development and behaviour. The neural tissue of M. cornuarietis comprises a series of ganglia arranged in a ring and individual neurones are easily identifiable. Ganglia and neurones remain viable long enough to conduct ex vivo electrophysiological a nd cell biological experiments, as well as in vitro, molecular biology.

Workshop Presentation

In our workshop presentation, I will briefly review our current understanding of instinctive GDB in humans and other animals and the various pathological manifestations of instinctive GDB commonly associated with psychiatric illness.

I will then describe the approaches we are developing with our animal (gastropod) model in order to understand the underlying mechanisms that modulate instinctive GDB. In particular, I will consider the potential of re-creating in vitro, networks of neurones responsible for very simple instinctive GDBs.

In the final part of our presentation, I will discuss how the research we are conducting relates and

contributes to the broader goal of understanding the aetiological antecedents of illnesses such as major depression, bipolar disorder, schizophrenia and personality disorders.