Computer models helping unravel the science of life?

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Scientists have developed a sophisticated computer modelling simulation to explore how cells of the fruit fly react to changes in the environment.

The research, published today in the science journal *Cell*, is part of an on-going study at The Universities of Manchester and Sheffield that is investigating how external environmental factors impact on health and disease.

The model shows how cells of the fruit fly communicate with each other during its development. Dr Martin Baron, who led the research, said: "The work is a really nice example of researchers from different disciplines of maths and biology working together to tackle challenging problems."

The current phase of the study aims to understand how temperature interacts with cell signalling networks during development. Flies are able to develop normally across a wide range of temperatures and it is not understood how this is achieved.

The combined disciplines approach was undertaken because the complexity of development involves numerous components that are interconnected with each other in networks of cell to cell communication pathways, whose outcomes are difficult to predict without computer simulations.

The fruit fly is a commonly used in lab work because, although its

development is relatively simple, around 75% of known human disease genes have a recognisable match in the genome of fruit flies which means they can be used to study the fundamental biology behind complex conditions such as neurodegeneration or cancer.

Baron said: "it is exciting that the computer model was able to make predictions that we could test by going back to the fly experiments to investigate the effects of different mutations which alter the components of the cells. It shows us that the model is working well and provides a solid basis on which to develop its sophistication further."

The next phase will see the team research how the cell signalling network adjusts and responds to other environmental changes such as nutrition. Baron says "There is a lot of interest in how environmental inputs influence our health and disease by interacting with our genetic makeup. Our initial studies have already shown that changes to the adult fly's diet can also affect how cells inside a fly communicate with each other and produce responses in certain fly tissues. This is a promising avenue for future studies".

Baron explains that there are wider implications for understanding human health and disease: "Many different types of signal control normal development but when some of these signals are mis-activated they can result in the formation of tumours."

"What we've learnt from studying the flies" said Baron, "is that some communication signals can arise in different ways and this means that, in cancer, mis-activation of these signals can also occur by different routes. This is important because it can help us to understand how to stop mis-activation from occurring."

Provided by University of Manchester