A Morse code for human cells

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Morse code is a simple, effective and clear method of communication and now scientists believe that cells in our body may also be using patterns of signals to switch genes on and off. The discovery may have major implications for the pharmaceutical industry as the signalling molecules that are targeted by drugs may have more than one purpose. The number of 'dots and dashes' being used by each signal could have different purposes, all of which could be modified by a drug.

The researchers, funded by the Biotechnology and Biological Sciences Research Council (BBSRC) and working at the Universities of Liverpool and Manchester and the Royal Liverpool Children's Hospital, in collaboration with scientists at AstraZeneca and Pfizer, have studied transcription factors, the signalling molecules inside cells that activate or deactivate genes. They found that the strength of the signal is less important than the dynamic frequency pattern that is used.

Professor Michael White of the Centre for Cell Imaging at Liverpool and leader of the research group said, "The timing of the repeating signal is essential for its interpretation. It seems that cells may read the oscillations in level of transcription factors in a similar way to Morse code."

The researchers focused on the response of a transcription factor involved in controlling the crucial processes of cell division and cell death. They found that the dynamics of the signalling molecule resemble the changes in calcium levels that encode other messages in cells. The results suggest how common signalling molecules could convey different

messages through different frequencies.

Professor Douglas Kell, who sits on BBSRC Council and is a member of the research team, said, “This raises new challenges for drug designers. It appears that simply aiming to knock down signalling molecules with drugs, as many people are trying to do, may have weak or even undesirable effects as a range of signals could be cancelled out. It is going to be important in the future to decode the Morse-like messages from the molecules to make sure that only the desired effects are blocked.”

Professor Julia Goodfellow, BBSRC Chief Executive, said, “This research is an example of a multi-disciplinary approach producing vitally important results. By combining expertise in cell biology, chemistry, mathematical modelling and bio-imaging the research team have discovered this coded signal that is going to inform the development of better, more effective drugs.”

Source: Biotechnology and Biological Sciences Research Council