

Breathing Easy: A New Mechanism for a Common Problem

Cheyne-Stokes respiration is a common form of breathing disorder that occurs during sleeping. A person who has the condition experiences cycles where their breathing rates first increase and then decrease. This is followed by periods of breath-holding for up to 30 seconds at a time. This form of breathing is seen in people with a variety of medical conditions including heart failure and neurological disorders, and it can also occur in babies and in healthy people at high altitude.

Dr Alona Ben-Tal from the Institute of Information and Mathematical Sciences at Massey University has been awarded a Fast-Start Marsden grant, to learn more about this puzzling condition. The Fast-Start programme is an initiative to give promising, early-career researchers the opportunity to explore an innovative idea, helping them to develop their skills and establish their careers.

The central nervous system is thought to be responsible for Cheyne-Stokes respiration, but the exact cause of the condition is not known for certain. Although several mechanisms have been suggested, the phenomenon is still not well understood.

One of the mysteries is what happens during the transition from normal breathing to the characteristic breathing patterns of Cheyne-Stokes respiration. Mathematical models for this process have been suggested in the past, but these have taken averages over the breathing cycle, and ignored the actual mechanics during a single breath. Dr Ben-Tal will extend this previous work, building a new and more realistic mathematical model. Her new model is likely to discover new mechanisms which cause this disorder.

Understanding the mechanism for the onset of Cheyne-Stokes respiration could potentially help in the development of new methods of treatment and diagnosis of patients who suffer from it, including those with cardiovascular disease.

Total Funding: \$140,000 over 2 years

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