Monoamine neurotransmitters and mood swings: a dynamical systems approach.  

Loulou, R.; Monteiro, L. H. A.


Summary: Serotonin, dopamine and norepinephrine are monoamine neurotransmitters that modulate our mood state. Hence, imbalances in the levels of these neurotransmitters have been linked to the incidence of several psychiatric disorders. Here, a mathematical model written in terms of ordinary differential equations is proposed to represent the interaction of these three neurotransmitters. It is analytically and numerically shown that this model can experience a Hopf bifurcation. Thus, by varying a parameter value, the neurotransmitter levels can change from a steady state to an oscillatory behavior, which may be at least a partial explanation of the mood swings observed in depressed people.

MSC:
92B20 Neural networks for/in biological studies, artificial life and related topics
34C23 Bifurcation theory for ordinary differential equations

Keywords:
dopamine; dynamical system; Hopf bifurcation; mood instability; norepinephrine; serotonin

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References: