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The rate of entropy model for irreversible reactions in living systems

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An analytical model to compute the rate of entropy in living systems is developed basing on the equations of heat and mass diffusion. The model is applied to the most interesting case of the metabolic network, the glucose catabolism in normal and cancer cells. This is done treating the cell as an open thermodynamic system. It is shown that the rate of internal entropy is mainly due to irreversible chemical reactions and that the rate of external entropy is mostly correlated to the heat flow towards the intercellular environment. It is found that the ratio between the rates of entropy associated with respiration and fermentation processes has a space and time dependence for diffusion of chemical species and is invariant for heat and irreversible reactions. Analytical and numerical results show that in a cell Prigogine's minimum dissipation principle is fulfilled in agreement with the local formulation of the second principle of thermodynamics. The applications of these results could be important for cancer detection and therapy.

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