



Sandomierz, 5th–9th September 2016

A CELLULAR HEAT SHOCK RESPONSE MODEL AND SIMULATIONS

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ABSTRACT

One of the most important questions in cell biology is how cells cope with rapid changes in their environment. The range of common molecular responses includes a dramatic change in the pattern of gene expression and the elevated synthesis of so-called heat shock (or stress) proteins (HSPs). Induction of HSPs increases cell survival under stress conditions.

We present a mathematical model of heat shock protein synthesis induced by an external temperature stimulus. The model describes production of heat shock proteins in response to elevated levels of temperature-misfolded proteins. The misfolded proteins are refolded with assistance of the heat shock proteins. Our model consists of a system of nonlinear ordinary differential equations describing the temporal evolution of the key variables involved in the regulation of HSP synthesis. In order to estimate model parameters we minimise the sum of squared errors and we compare our model predictions with experimental data.

REFERENCES

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