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A condition for regeneration of a cell chain based on *Dachsous:Fat* heterodimer system

Regeneration phenomena have been studied through various models. Taking cockroach leg regeneration for instance, it has been studied through the positional information model [6], the polar coordinate model [3], and the boundary model [5].

Beyond theoretical models, recent studies have led to models at the single cellular level [1]. Within a cell, Dachsous (Ds) and Fat molecules, and between cells, Ds:Fat heterodimers, are considered to facilitate regeneration. The Ds:Fat signaling system looks like an entity to realize the steepness hypothesis where the leg size and regeneration are regulated through a *gradient* across cells [4].

In this work we modeled a cell chain based on the Ds:Fat system. It has been said that the heterodimer is produced from free active Ds and Fat molecules within cells. Ds and Fat molecules are redistributed when a cell divides into two, so that Ds:Fat heterodimers become redistributed accordingly. Little is, however, known about the way they are redistributed because the metabolism of the Ds:Fat signaling and heterodimers remains obscure [2]. We hence modeled this redistribution and calculated a condition for regeneration. The derived equations show that some degenerated redistribution ratio of heterodimers provides a cell chain with the ability to regenerate.

References

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