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**A theoretical analysis of the interactions between beta-catenin's adhesive and transcriptional functions**

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The international Integrative Biology Consortium is bringing together computer scientists, modellers and experimental researchers in order to build a multiscale model for the normal and aberrant intestine, integrating descriptions of all levels of organisation from molecule to tissue.

As a step towards characterising the subcellular level, we have developed a new deterministic model for the Wnt signalling pathway. The key player in our model is beta-catenin: it is essential for Wnt signal transduction and for cadherin-mediated cell-cell adhesion. In the absence of Wnt, most beta-catenin is located at the cell membrane, as part of adherens junctions. In response to Wnt, beta-catenin accumulates in the cytoplasm, binds to TCF and travels to the nucleus, where it induces changes in gene expression.

Two main hypotheses have been proposed concerning the interaction between beta-catenin's adhesive and transcriptional functions. The first supposes that TCF and E-cadherin simply compete for beta-catenin binding. The second suggests that the Wnt-stimulus induces the production of a molecular form of beta-catenin that binds preferentially to TCF. The experimental data supporting each hypothesis remain inconclusive. By incorporating both theories in our model, it is possible to predict their feasibility by performing appropriate numerical simulations. These include switching Wnt on, introducing APC-mutations and changing E-cadherin expression. The different responses predicted for systems operating under the two hypotheses allow us to discriminate between the two proposed mechanisms of beta-catenin interaction.