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COVERING A BROAD DYNAMIC RANGE - INFORMATION PROCESSING AT THE ERYTHROPOIETIN RECEPTOR LEVEL

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Cell surface receptors convert extracellular cues into activation of intracellular signaling networks and thereby ultimately elicit specific cellular decisions. However, it is largely unknown how receptors process ligand-encoded information, especially if stimuli concentrations are varying over a broad range. To address this issue, we developed a data-based, non-linear mathematical model for a hematopoietic cytokine receptor, the erythropoietin receptor (EpoR). Model calibration with quantitative time-course data from BaF3-EpoR cells resulted in a fully identifiable model, thereby allowing for accurate model predictions. Both, model predictions and experimental validation revealed that rapid ligand depletion and fast recovery of receptor pools at the plasma membrane are hallmarks of EpoR signaling. These properties enable the EpoR to cope with both steady-state turnover and acute demand in the hematopoietic system.

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