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Receptor clustering: delicate balance between beneficial signal amplification and detrimental noise amplification. GERARDO AQUINO, ROBERT ENDRES, Imperial College London — The bacterial chemotaxis pathway allows cells to sense minute changes in chemical concentration, implying highly accurate sensing. This accuracy is believed to arise from signal amplification by receptor clusters, formed predominantly at the bacterial cell poles. However, receptor clustering should also have detrimental affects on the accuracy of sensing. First, random fluctuations in chemical concentration are amplified in addition to the signal. Second, due to the proximity of receptors in clusters, previously bound (and sensed) ligand molecules are likely to rebind the same or a nearby receptor, increasing the measurement uncertainty. Here, we investigate both the beneficial and detrimental effects of receptor clustering on the accuracy of sensing. Our preliminary findings suggest an optimal complex size, amplifying signals but avoiding saturation by noise. Our findings may help explain the recently proposed receptor cooperativity of 10-20 receptors based on in vivo FRET data.

Gerardo Aquino
Imperial College London

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