Cell Polarity and Directed Migration

Chemotaxis, or directed cell migration is essential for host defense, embryonic development, neurite guidance, and tumor invasion. Although initiation of chemotactic migration has been extensively studied, little is known about its termination. Here we report that two mitogen-activated protein kinases played opposing roles in neutrophil trafficking. The extracellular signal-regulated kinase (Erk) potentiated G protein-coupled receptor kinase GRK2 activity and inhibited neutrophil migration, whereas p38 MAPK acted as a non-canonical GRK that phosphorylated the formyl peptide receptor FPR1 and facilitated neutrophil migration by blocking GRK2 function. Therefore, the dynamic balance between Erk and p38 MAPK controls neutrophil “stop” and “go” behaviors, ensuring neutrophils precisely reach their final destination as the first line of host-defense.