Calcium-mediated plasma membrane repair

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The plasma membrane isolates intracellular content from the environment and has the regulatory mechanisms to keep the cell homeostasis unperturbed. The membrane injuries destroy tight control over the cell metabolism and trigger a range of events varying from moderate stimulatory action to significant disorders in the homeostasis or even cell death. Membrane damages are a common threat to the life of the cells, especially for ones originating in the tissues exposed to mechanical or shear stress (muscles, lung, vasculature) or pore-forming toxins. In several medical applications (ultrasound or electroporation), impairing the plasma membrane barrier is a goal and used for drug delivery or tissue elimination.

The cells have healing machinery for efficient repair of the membrane damages. Just a few seconds are needed to reseal a membrane pore or remove a membrane tear. Several different models are proposed for membrane restoration. All of them consider the calcium ion as the critical trigger for the repair response activation. The lecture aims at reviewing different cellular and molecular mechanisms of membrane repair, with emphasis on its relevance to disease.