# Biological hydrogels: Selective Filtering and Self-mending


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Abstract:

Hydrogels are an integral part of biology. They provide spatial organization and mechanical toughness both inside and outside the cell membrane and regulate the selective exchange of molecules between biological entities (organelles, cells, or organisms) and their environment. Despite their importance as diffusion barriers, clear concepts of how selective filtering is achieved on a microscopic level are still missing.

I will discuss two biological hydrogels that serve as selective filters in the human body: mucus and the basal lamina. I will demonstrate that both gels suppress the diffusive motion of charged particles while allowing neutral particles to pass. This filtering process is efficient both for relatively large polystyrene particles (~1 µm) and small viruses (~ 50 nm). Thus, it constitutes a formidable mechanism to regulate the diffusion behavior of objects that are much smaller than the hydrogel mesh size. Besides their exquisite filtering properties, both mucus and the basal lamina possess another important material property: after they are forced to yield under mechanical load they are able to rapidly regain their initial elasticity, even after multiple yielding events. In the human body, both hydrogels are associated with wound healing processes where such self-mending abilities would be highly beneficial.

A replication of the filtering and self-mending properties of these biological hydrogels will be crucial for the design of synthetic materials in tissue engineering applications.


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## Room PH 127


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