

Development of Artificial Ion Transporters as Therapeutic Agents to Combat Cancer

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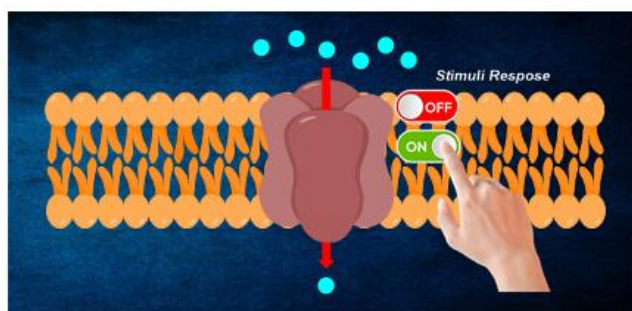
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Abstract:

The ion transport process across the cellular membranes is essential for various biological functions, such as maintaining ion balance within cells, sensory transduction, cell growth, and responding to osmotic stress. Recent findings reveal that the perturbation to Na^+ , K^+ , Ca^{2+} , Cl^- , etc. homeostasis leads to cellular apoptosis.¹ Cancer cells are recognized for their ability to circumvent the apoptosis process, leading to uncontrolled proliferation. Therefore, synthetic ion transporters have emerged as intelligent tools for disrupting the ionic balance in cancer cells, triggering apoptosis, and ultimately causing their demise. We have developed various ion carriers and channels that are capable of transporting Cl^- or MCl ($\text{M}^+ = \text{Na}^+$ and K^+) or HCl selectively. These synthetic ion transport systems have been used to target cancer cells by altering their ion balance. Our studies have shown that this induced ion transport leads to either cellular apoptosis or, the inhibition of autophagy, or both.²⁻³ Moreover, we have developed various protransporter molecules that respond to specific stimuli like light,⁴⁻⁵ glutathione,⁶ enzymes,⁷⁻⁸ pH,⁸⁻⁹ etc. These stimuli-activated ion transport systems effectively disturb the ionic homeostasis of cancer cells, leading to their demise. These inventive methods have created fresh opportunities for developing strategies to treat cancer.

Figure 1:



References and Notes:

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