I. Introduction

TRPV1, also known as a capsaicin receptor, is an ion channel that produces immediate and long-term pain by activating sensory neurons. Capsaicin, the compound that gives hot chili peppers their heat, has been proven to be an underlying cause of the pain and long-term pain by activating sensory neurons. Capsaicin (ligand) is a nociceptive ion channel activated by capsaicin (the spicy component of hot chili peppers), heat, and endogenous pain molecules. Therefore, creating an inhibitor that partially blocks TRPV1 could treat chronic pain. The amino acids in the active site of TRPV1 are Serine 512 (aqua), Serine 512 (blue), Serine 512 (orange), Serine 512 (blue), Serine 512 (green), and Threonine 550 (yellow). These amino acids are located in the active site of TRPV1. This is where capsaicin binds to TRPV1, in a hydrophobic pocket that is within the Selectivity filter (2), and RTX and capsaicin (pink ellipse) bind to open the channel; however, it is not visible from this view.

II. Methods

TRPV1, also known as a capsaicin receptor, is an ion channel that produces immediate and long-term pain by activating sensory neurons. Capsaicin, the compound that gives hot chili peppers their heat, has been proven to be an underlying cause of the pain and long-term pain by activating sensory neurons. Capsaicin (ligand) is a nociceptive ion channel activated by capsaicin (the spicy component of hot chili peppers), heat, and endogenous pain molecules. Therefore, creating an inhibitor that partially blocks TRPV1 could treat chronic pain. The amino acids in the active site of TRPV1 are Serine 512 (aqua), Serine 512 (blue), Serine 512 (orange), Serine 512 (blue), Serine 512 (green), and Threonine 550 (yellow). These amino acids are located in the active site of TRPV1. This is where capsaicin binds to TRPV1, in a hydrophobic pocket that is within the Selectivity filter (2), and RTX and capsaicin (pink ellipse) bind to open the channel; however, it is not visible from this view.

III. Experimental Results

A. Capsaicin Sensation

B. Modeling TRPV1 as a detector of thermal and chemical stimuli, producing pain


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IV. TRPV1 Model

Figure 1. TRPV1 model

Figure 2. Capsaicin

Figure 3. Capsaicin Water Experiment

Figure 4. Hot Plate Experiment

Figure 5. TRPV1 opening with Capsaicin

Figure 6. Gate mechanism of TRPV1

Figure 7. Model of TRPV1

As shown in the three-dimensional model of TRPV1, the opening of the ion channel is facilitated by the opening of the selectivity filter. The filter is composed of a series of hydrophilic gates (1), which allow ions to pass through the channel. The opening of the TRPV1 channel is triggered by the binding of capsaicin, which causes a conformational change in the channel, allowing ions to pass through.

VI. Conclusion

When TRPV1, the Transient Receptor Potential Vanilloid 1, undergoes exposure to capsaicin, it acts as a prototypical pain-relieving agent. Both thermal and chemical stimuli function to transmit the noxious signals to the sensory neurons at the onset of pain. Increased understanding of the complex activation patterns of TRPV1 upon exposure to capsaicin and associated amino acids may facilitate the discovery of a more effective pain-relieving drug. With further research, TRPV1 could hopefully be a gateway to relieving the pain that afflicts so many Americans today.

References


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