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Protein-based Molecular Temperature Switch

TRPM8 is a membrane protein ion channel that primarily functions as the main cold temperature sensor in higher organisms and is involved in a number of types of cancer. More recent research has shown that it is an excellent target for neuropathic and inflammatory pain. Currently, neither the domain nor the mechanism of temperature modulation has been identified. Identification of this region could prove highly useful in protein regulation and screening of drugs that target TRPM8.

Researchers at the Biodesign Institute of Arizona State University have isolated a protein domain of the human TRPM8 gene product that changes structure conformation as a function of temperature. This protein domain has been engineered into a pET21b expression vector to produce milligrams of the pure protein. The protein could be used for development of artificial ways to regulate biology, such as in synthetic biology. It could also be used to form the basis of a platform for novel therapeutic screening against specific conformations of TRPM8, which could increase both affinity and specificity to a given state of potential compounds.

This novel domain has great potential not only as a temperature switch in synthetic biology but also for screening novel compounds against specific TRPM8 conformations.

Potential Applications

- Regulate other proteins and signaling cascades in vitro and in vivo, especially in synthetic biology - fusing the domain with other proteins or biomolecules
- Therapeutic target for intervention in pain (neuropathic and inflammatory) and cancer (prostate and some others)
- Drug screening - this protein domain offers a simplified platform that is conformation specific which could allow for development of enhanced compounds

Benefits and Advantages

- High production levels - 2-3 mg of pure protein per liter of bacterial culture
- The protein domain maintains function even when isolated from the entire protein
- Doesn't require screening of the entire channel - the known conformations can be isolated and used to screen compounds
- Fine tuning the conformational state of the target will lead to increased efficacy of screening and development

For more information about the inventor(s) and their research, please see [Dr. Van Horn's departmental webpage](#)[Dr. Van Horn's laboratory webpage](#)

