PTCI summary

PTCI was initially founded to identify better compounds for topical analgesia to treat acute and chronic pain. The founders identified a market need illustrated by a combination of factors including the prevalence of chronic pain, the commercial success of Lidoderm® patches, and the need for alternative pain treatments created by the opioid crisis.

Initial efforts focused on molecule identification. Advances in understanding of the nine human voltage-gated sodium channels (Nav1.1-1.9) allowed investigators to model the channels of interest virtually while also modeling candidate molecule interactions with the sodium channels. For example, activity at Nav1.7 and Nav1.9 would be expected to have analgesic effects while activity at the Nav5 channel would affect cardiac conduction.

The team partnered with Southwest Research Institute in San Antonio, Texas, for the initial virtual modeling of the receptors and a docking and scoring assessment of a panel of candidate therapeutic molecules. After selecting a group of molecules, the team then performed patch-clamp in vitro testing to assess specificity of each molecule for individual sodium channel isoforms.

The result of the above work is a bank of molecules, each of which has been assessed for voltage-gated sodium channel subunit specificity, molecule lipophilicity, and PkA. PTCI then selected candidate molecules with the most potential for clinical efficacy.

PTCI now has obtained US patents for all the molecules of interest. Patents are pending in other countries. At this point, the molecules are ready for further development. Of import is that optimization of functional groups on the molecules has intentionally been limited to only one end of each molecule, thereby leaving room for further development on the other end if desired.

In addition, one divisional patent is still pending, allowing any further molecule development a straightforward path to patent protection.

As this work has progressed, more research has been published regarding inhibitors of the voltage-gated sodium channel. Of particular interest is that a large body of research has demonstrated efficacy in laboratory studies of cancer cell line responses to chemotherapy and potential for metastasis. Lidocaine analogues are emerging as possible therapeutics to sensitize cancer cells to chemotherapy and to decrease the chance of metastasis.

In summary, PTCI has 10 US patents granted and many foreign patents pending for a bank of lidocaine-analogue molecules with several potential clinical effects, including analgesia, antiarrhythmic effects, and cancer treatment.

Resources

1. SwRI packet with virtual and in vitro molecule data.
2. Patent documents including timelines.
3. Selected publications regarding sodium channel inhibition in cancer therapy.
4. Selected publications regarding lidocaine's utility in managing pain.
5. Selected publication regarding lidocaine's utility in treating arrhythmia.

References (anti-cancer)

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