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(listed in alphabetical order)

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Development of Advanced Mass Spectrometry Methods for Pharmaceutical Enantiomer Characterization

Drug enantiomers can have different effects on the human body, varying in bioavailability and potency. In the famous case of thalidomide, one enantiomer can alleviate morning sickness during pregnancy while its chiral counterpart causes birth defects during gestation. The thalidomide crisis highlights the tragic consequences of enantiomeric differences in drug biological activity and underscores the importance of developing rapid analytical techniques for enantiomeric discrimination. Popular methods for enantiomer differentiation are limited by high sample consumption, long analysis times, and low sensitivity. Ion mobility-mass spectrometry (IM-MS) enables rapid gas-phase separation of many isomeric and isobaric compounds, but small molecular enantiomers share many chemical and physical properties, making them a famously difficult class of molecules to separate. A potential avenue to overcome this challenge is the use of chiral shift reagents which can interact enantioselectivity with the two chiral forms of a drug to impart measurable structural differences. This noncovalent complexation can render the two forms directly resolvable using IM-MS. Our previous work explored copper-amino acid complexes as chiral selectors, and current work seeks to

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Wnt signaling inhibition promotes wound healing and inhibits fibrosis in chronic wounds

Wnt signaling is activated following acute cutaneous injury and promotes fibrotic wound healing. Topical application of Wnt signaling inhibitors promotes regenerative cutaneous repair following acute injury. However, there is a gap in our understanding of Wnt signaling activation in chronic non-healing human wounds. This work is focused on delineating the impact of canonical Wnt signaling modulation in chronic wounds. Preliminary studies in our lab have shown that full-thickness excisional wounds in Streptozotocin (STZ)-induced type I diabetic mice activated Wnt signaling in both dermal and epidermal layers identified by -catenin immunostaining and AXIN 2 transcript levels. Treatment with Wnt signaling inhibitors promoted regenerative repair following an excisional wound. Analysis of a panel of human chronic wound pathologies demonstrated differential expression of -catenin in different chronic wounds. To understand the cellular mechanism of Wnt signaling modulation in Wnt-