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RESEARCH AREA

In vitro (neuropharmacology) and vivo pharmacology of analgesic agents.

The complex pharmacology surrounding analgesic agents encompasses opioids, glycinergic pathways, and a variety of novel compounds, thereby offering a comprehensive strategy for managing pain effectively.

TECHNIQUES AVAILABLE IN THE LAB

In Vivo Pain Models

Currently, there is no satisfactory way to model pain in vitro, making in vivo animal experimentation indispensable for investigating analgesic substances and procedures.

- Acute Nociceptive Tests:
 - Tail-flick test
 - Hot-plate test (traditional and ramped-temperature variants)
- Inflammatory Models:
 - Acute: Formalin test, acetic acid-induced writhing test (duration: 1 hour)
 - Subacute: Carrageenan-induced inflammatory hyperalgesia (duration: 3–5 hours)
 - Subchronic: Complete Freund's Adjuvant (CFA)-induced hyperalgesia (duration: 3–7 days)
- Neuropathic Models:
 - Seltzer's partial ligation of the sciatic nerve, resulting in mononeuropathy (duration: 1–3 weeks)
 - Diabetes-induced polyneuropathy (duration: 6–12 weeks)

Ex Vivo (Isolated Organ) Measurements

One classic ex vivo method for screening opioid analgesics involves experiments on isolated organs. Three tissue types are commonly used:

- Mouse vas deferens (containing δ and μ opioid receptors)
- Rat vas deferens (expressing few μ receptors; only highly intrinsic activity ligands are effective)
- Guinea pig ileum longitudinal strip (κ and μ receptors)

This approach enables cost-effective screening of new (putative) opioid ligands and can also be used to study drug interactions or to model tolerance.

In Vitro Assays

From animals assessed in various pain models, we isolate tissues after the in vivo measurements to determine receptor density and transmitter levels. We use both quantitative methods (capillary electrophoresis, PCR, Western blot) and semi-quantitative techniques (RNAScope, immunohistochemistry). Depending on the specific research focus, we concentrate primarily on central nervous system regions that are critical for pain transmission.

SELECTED PUBLICATIONS

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