OIST | Innovation

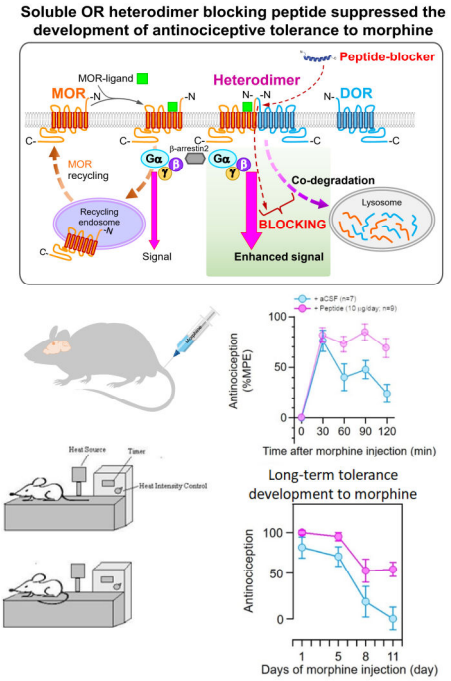
Peptide Drug for Reduced Morphine Tolerance and Enhanced Pain Relief

Summary

Opioids are essential for clinical pain management, especially in treating terminal cancer patients. However, long-term opioid therapy can lead to serious clinical and social problems, such as tolerance, dependence, abuse, and fatal overdose. Although numerous attempts have been made to diversify treatments to increase efficacy and mitigate undesirable side effects, reliable solutions remain elusive. A team of OIST researchers, led by Prof. Kusumi, has developed a series of peptides that not only enhance opioid analgesia but also suppress the development of tolerance. This technology represents a significant step toward more effective and safer pain management.

Technology

The technology originates from the discovery that a class of peptides can modulate the dimerization of opioid receptors (ORs), which are a group of inhibitory G protein-coupled receptors (GPCRs) with opioids as ligands. ORs play crucial roles in the central nervous system, regulating pain perception, hedonic homeostasis, mood, and well-being. Single-molecule imaging and analysis have revealed that peptide-induced suppression of OR dimerization affects the cellular signals and receptor decomposition triggered by opioids, introducing a novel approach to enhancing opioid therapy. This has resulted in enhanced short-term efficacy and suppressed tolerance development in mice, without apparent toxicity. The present peptides act on ORs from outside the cell, impacting signaling regulation without competing with agonists or inhibiting kinases, thereby facilitating successful drug delivery and minimizing side effects. Furthermore, these peptides, when modified, can traverse the blood-brain barrier (BBB). Simple delivery solutions such as nasal sprays are also being developed.



Regulation of MOR-DOR dimerization and in vivo experiments with mice

Applications

- Long-term pain management
- Enhancement of analgesia

Advantages

- Minimal or no toxicity
- Validated through in vivo studies in mice
- Allows modification with D-amino acids
- Crosses the BBB with modifications

Category:
Medical & Healthcare

Lead Researcher:
Prof. Akihiro Kusumi

Intellectual Property:
Patent Pending

For more information:
Technology Licensing Section
Okinawa Institute of Science and Technology
tls@oist.jp or +81-(0)98-966-8937