

Center for Study of Gene Structure and Function,  
Hunter College of the City University of New York and  
The Clinical and Translational Science Center at Weill Cornell Medical College

# *The Neurobiology of Pain and Pain Control*

The molecular biology revolution has significantly impacted pain research, most notably in the molecular characterization of the primary afferent "pain" fiber (nociceptor), which expresses a host of molecules that are not found or are only minimally expressed elsewhere in the CNS. Among these molecules are subtypes of sodium channels, G protein-lined receptors, purinergic receptors and even water channels. Studies in mice with gene deletions established that at least some of these molecules are important contributors to the processing of pain messages. Another approach to the problem asks whether subtypes of nociceptor, which express a variety of these molecules, contribute to submodalities of pain (e.g. heat, cold, mechanical) or whether any given population is multimodal in its contribution to pain behavior. Recent studies in our laboratory indicate that the former appears to be the case, with the peptidergic population contributing only to heat pain sensitivity and the non-peptidergic population to mechanical pain. We have also asked whether these subsets of nociceptors can be differentially regulated. In these studies, we reexamined the distribution and function of the mu (MOR) and delta (DOR) opioid receptors in primary afferent nociceptors. Contrary to the prevailing view, which was based almost exclusively on immunocytochemical grounds, using a DOReGFP reporter mouse, we now show that the DOR and MOR are expressed by largely nonoverlapping populations of primary afferent. Peptidergic nociceptors express the MOR, and myelinated and non-peptidergic unmyelinated afferents express the DOR. This segregated receptor distribution is paralleled by a remarkably selective functional contribution of the MOR to the control of heat pain and the DOR to mechanical pain and injury-induced mechanical hypersensitivity. Thus, distinct pain modalities can be regulated by targeting subtype specific opioid receptor that are expressed by behaviorally relevant populations of primary afferent nociceptors.



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**Hunter College • 695 Park Avenue • Ida K. Lang Recital Center**  
**Room 424 Hunter North**

*(Enter on East 69<sup>th</sup> Street between Lexington and Park Avenue)*

**REFRESHMENTS WILL BE SERVED**

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