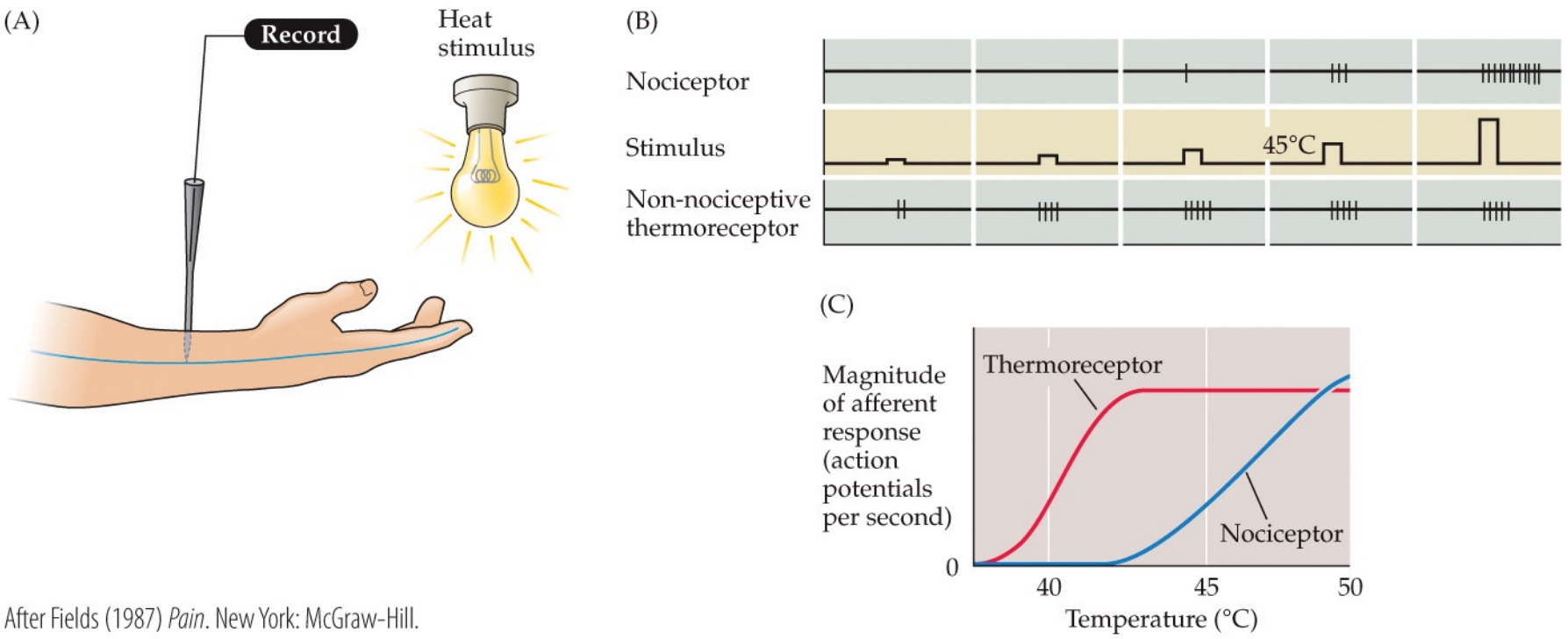


Pain

2022\_v3

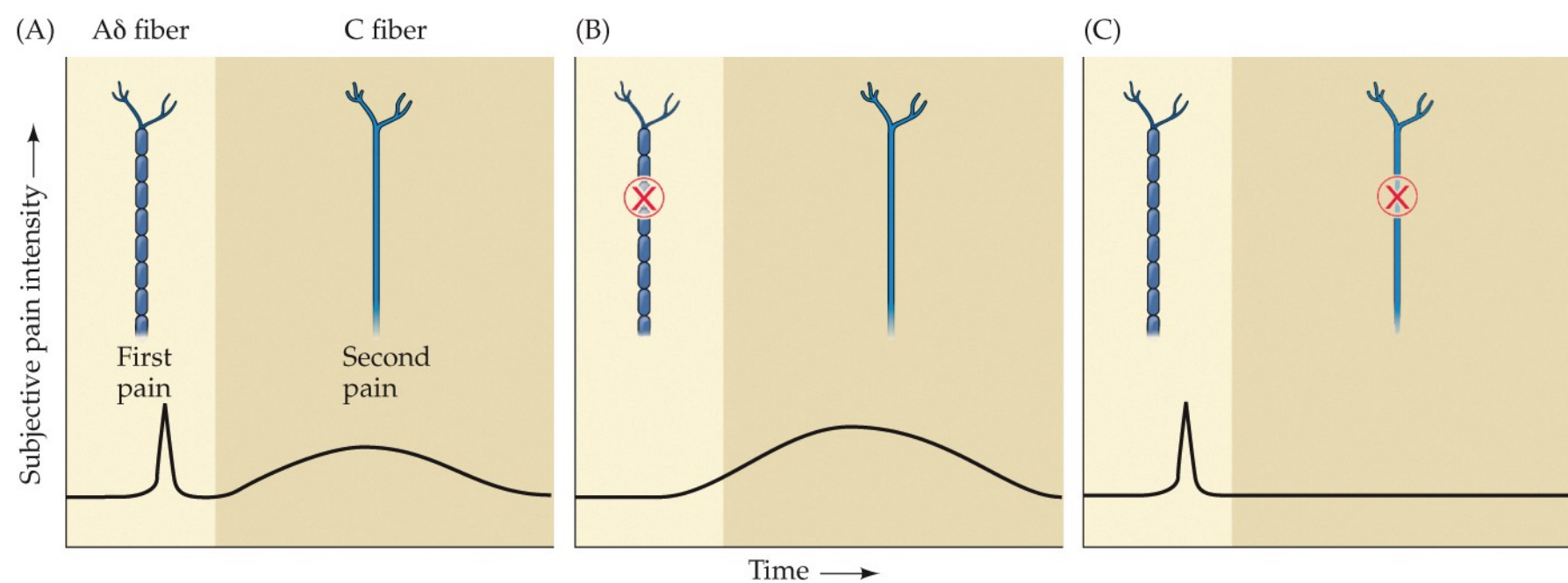
Professor Malcolm MacIver

FIGURE 10.1 The neuronal basis of pain



After Fields (1987) *Pain*. New York: McGraw-Hill.

FIGURE 10.2 First and second pain



After Fields (1990) *Pain Syndromes in Neurology*. London: Butterworths.

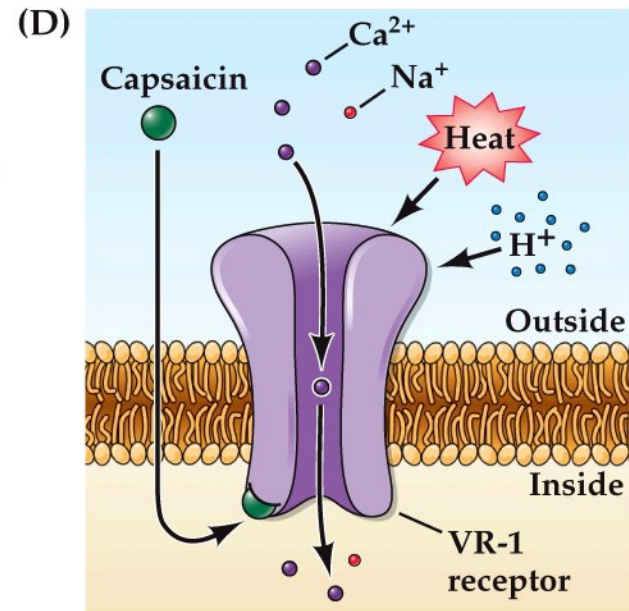
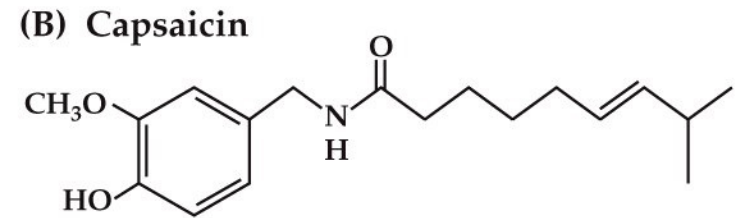
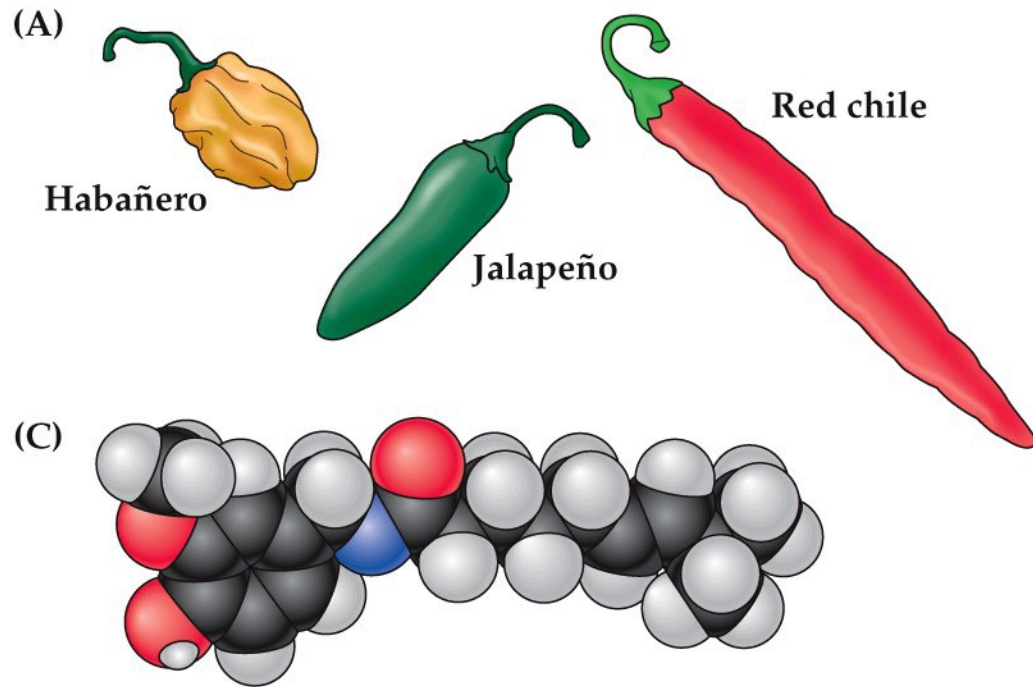
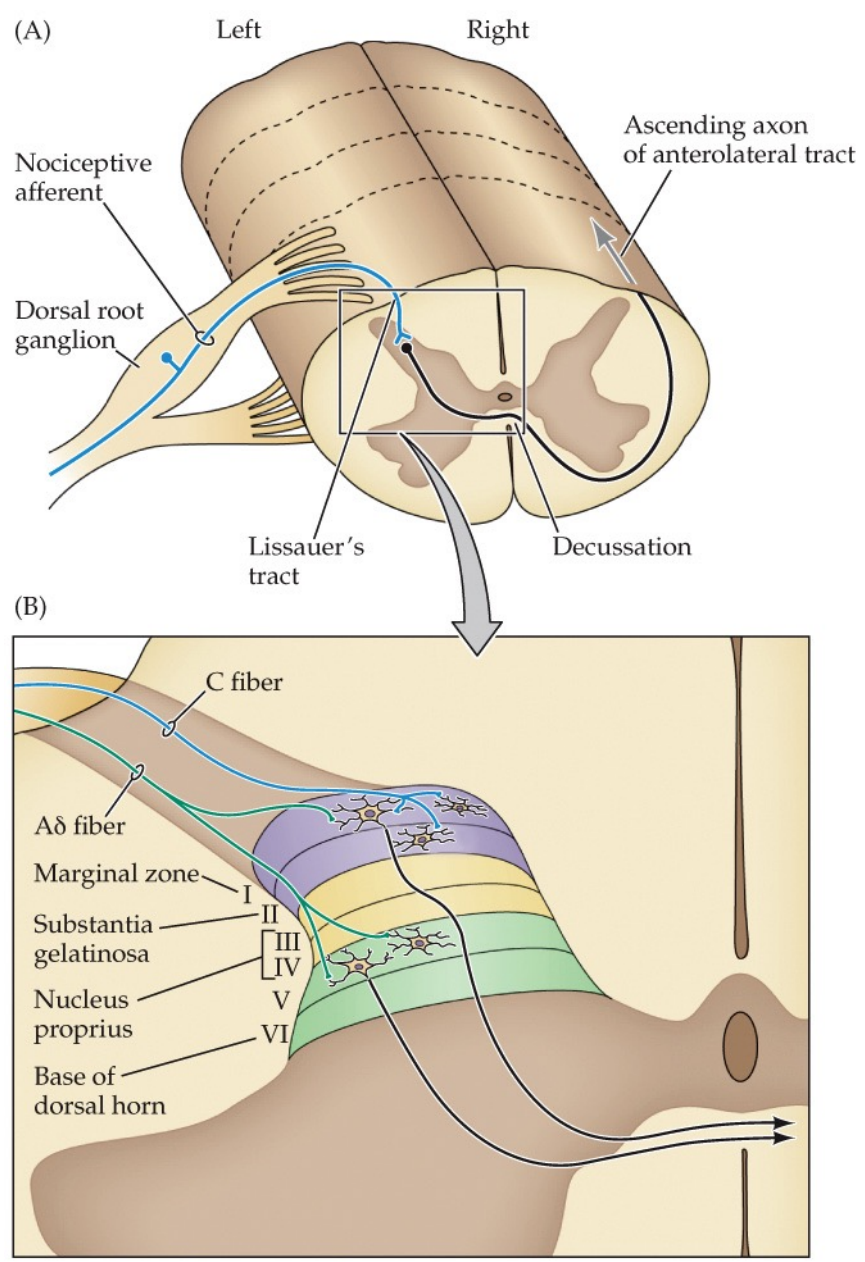
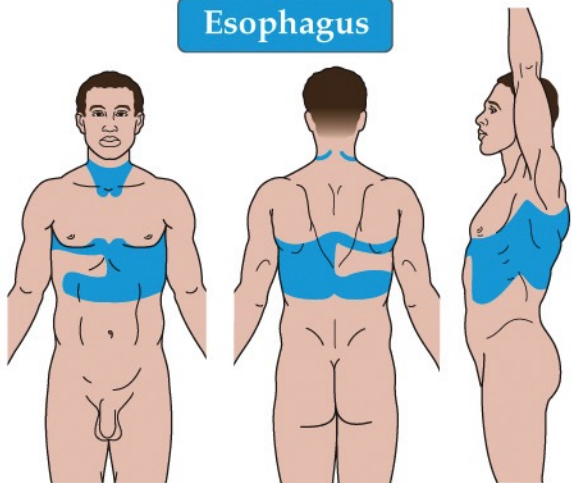


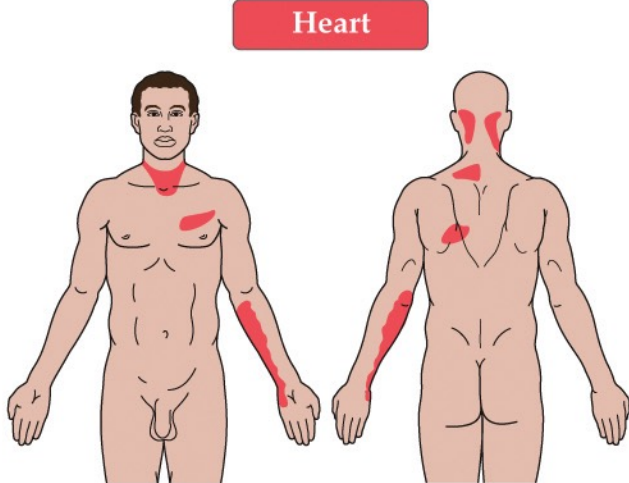
FIGURE 10.3 The anterolateral system



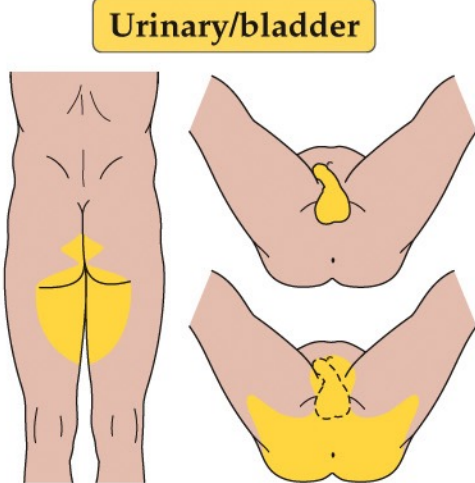
Esophagus



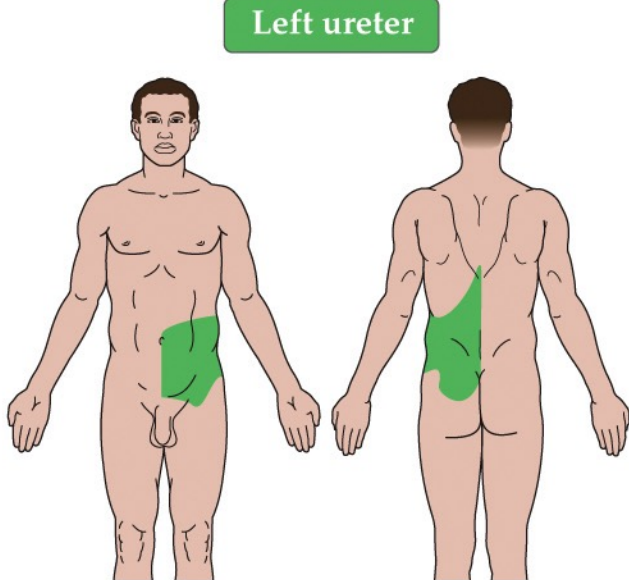
Heart



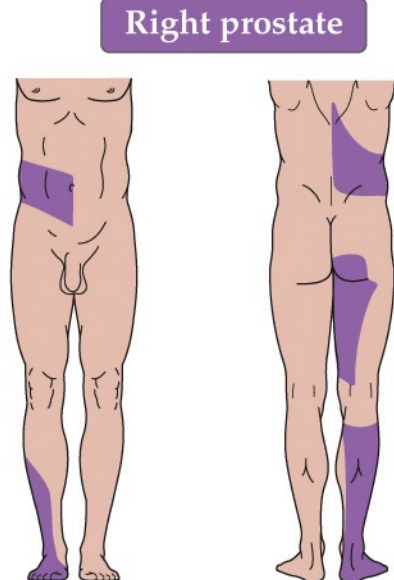
Urinary/bladder



Left ureter



Right prostate





## The convergence of nociceptor input from the viscera and the skin.

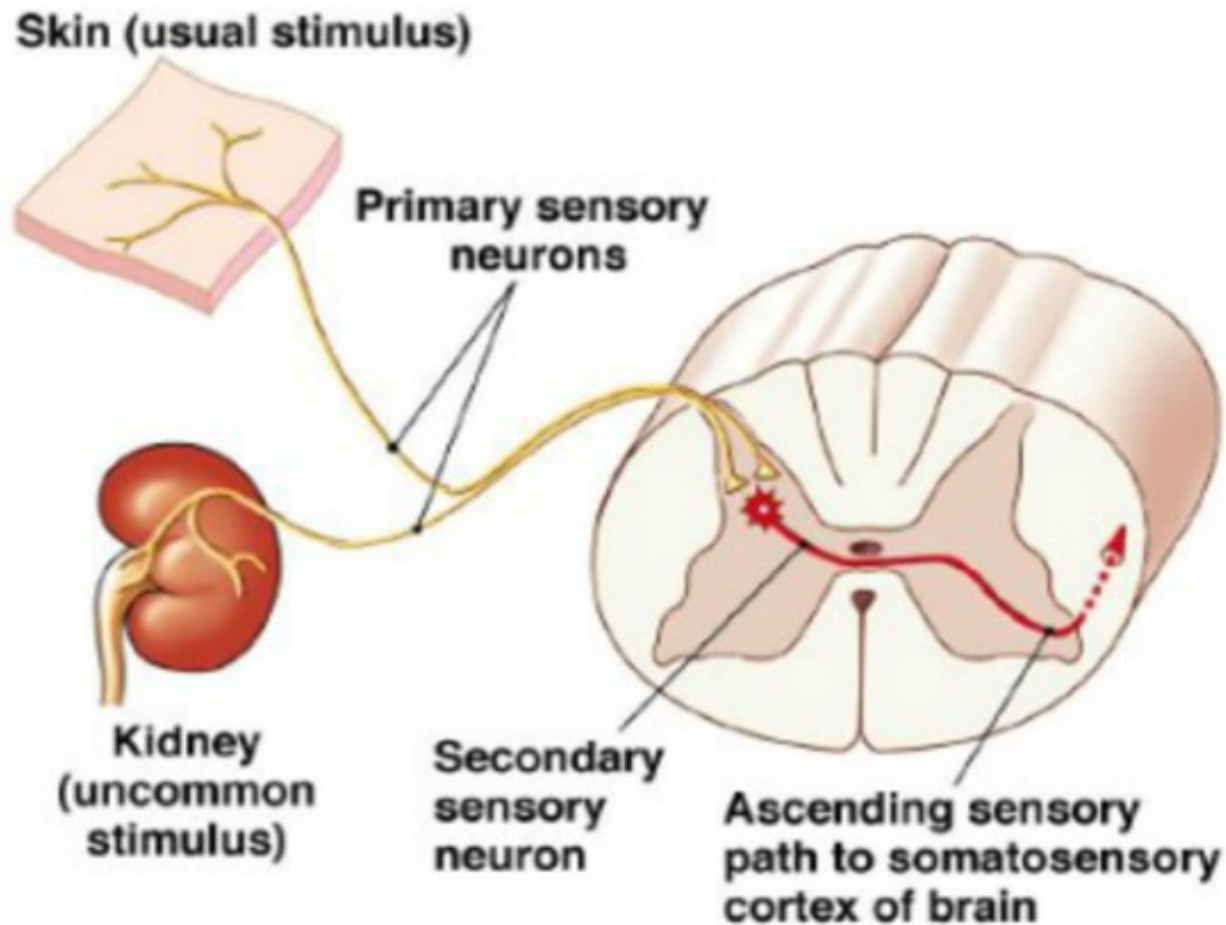
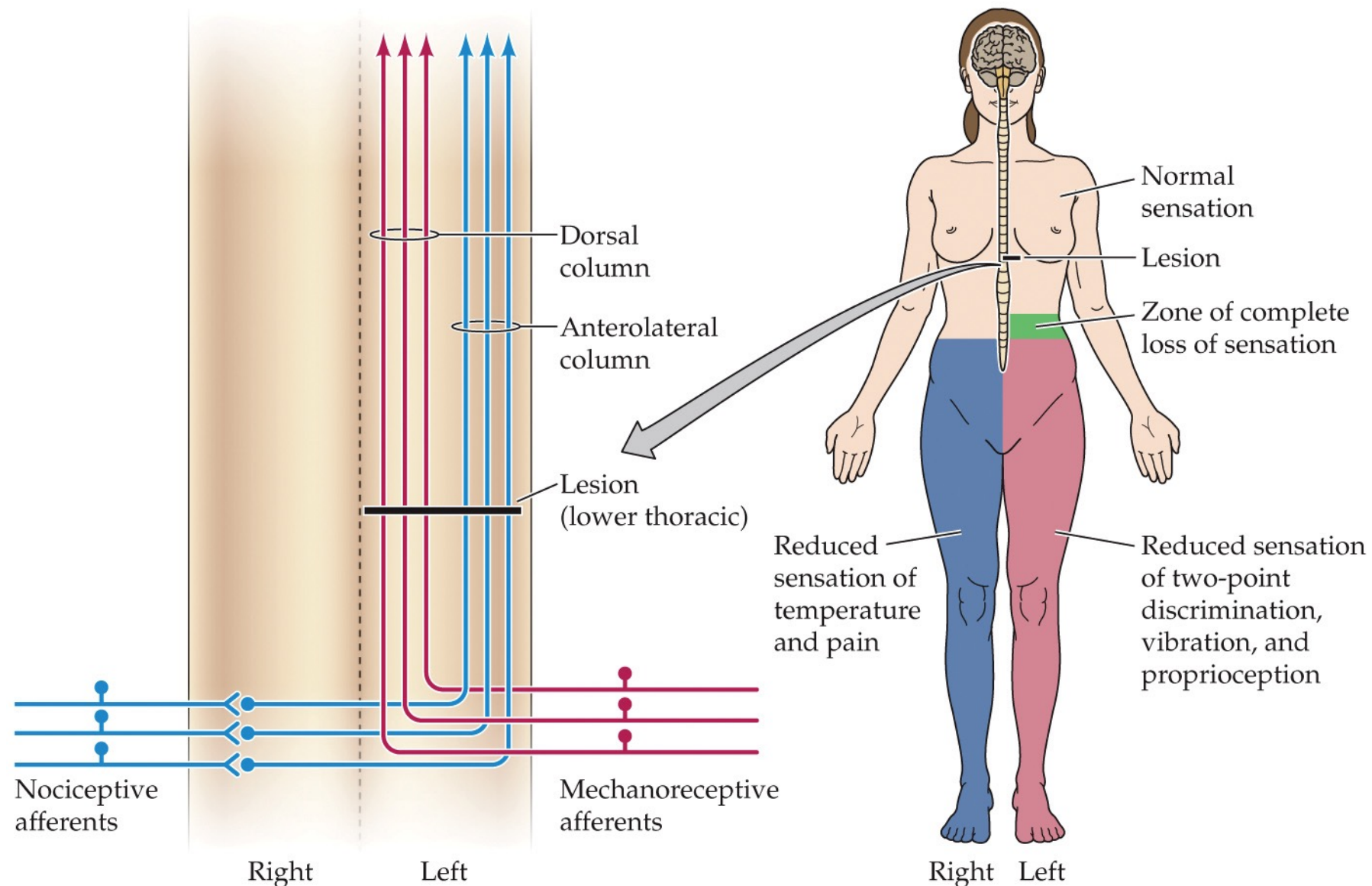
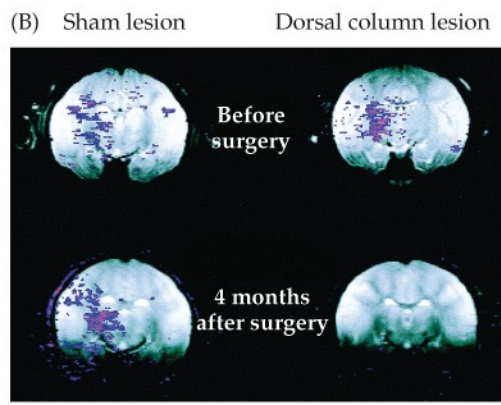
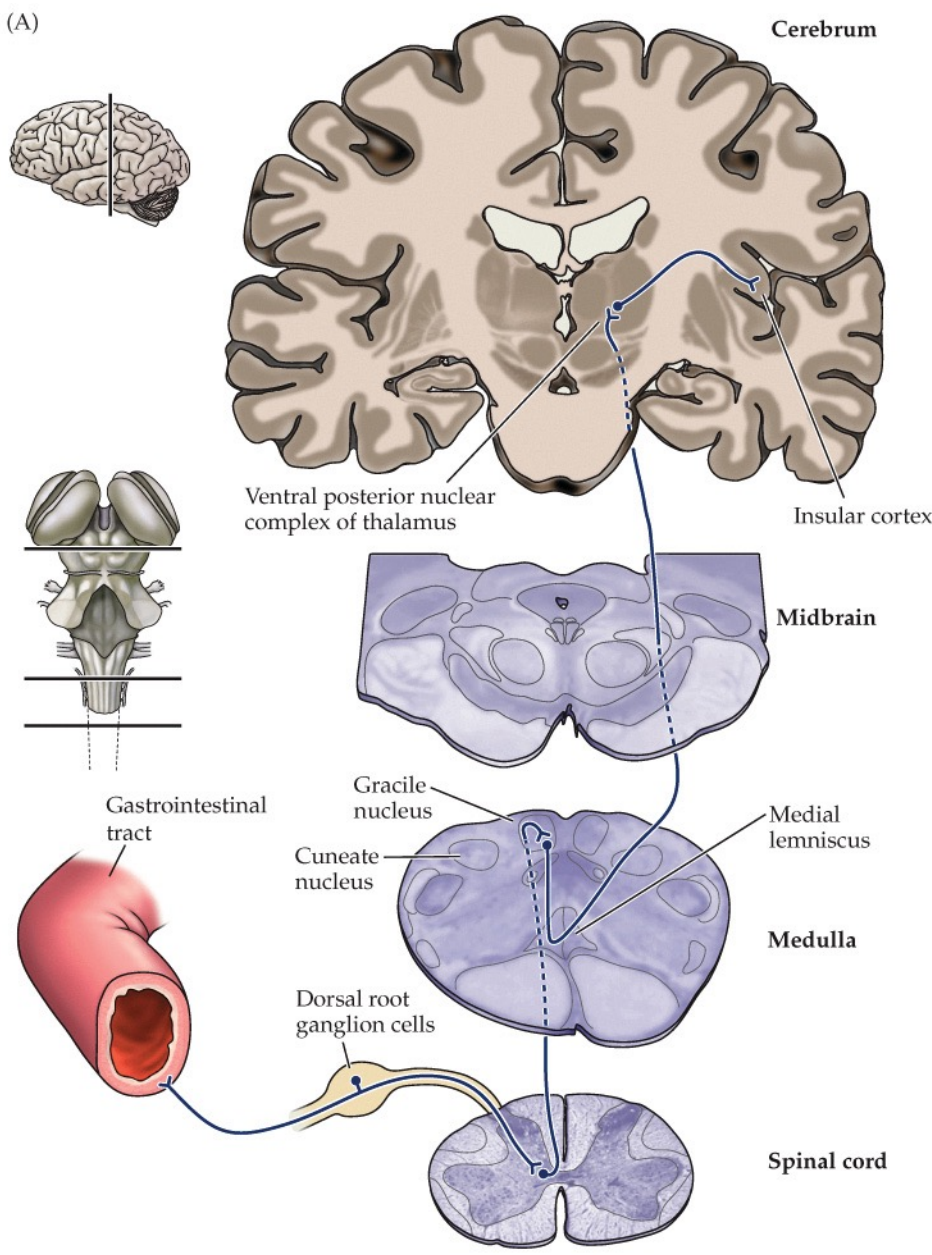


FIGURE 10.4 Nociceptive and mechanosensory pathways

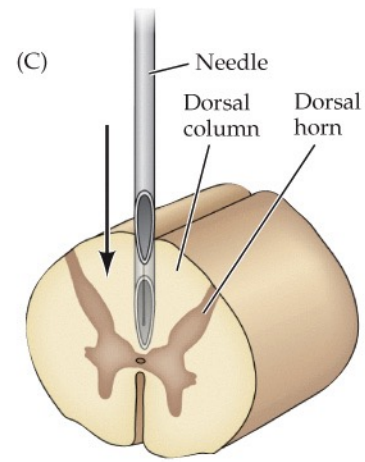




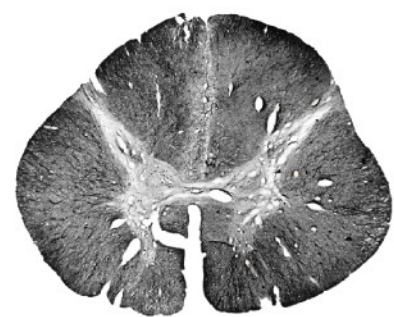
BOX 10C A Dorsal Column Pathway for Visceral Pain



From Willis et al. (1999) *Proc. Natl. Acad. Sci. USA* 96: 7675–7679.



After Nauta et al. (1997) *J. Neurosurg.* 86(3): 538–542.



From Hirschberg et al. (1996) *Pain* 67: 291–305.

FIGURE 10.8 Descending systems modulate the transmission of ascending pain signals (Part 1)

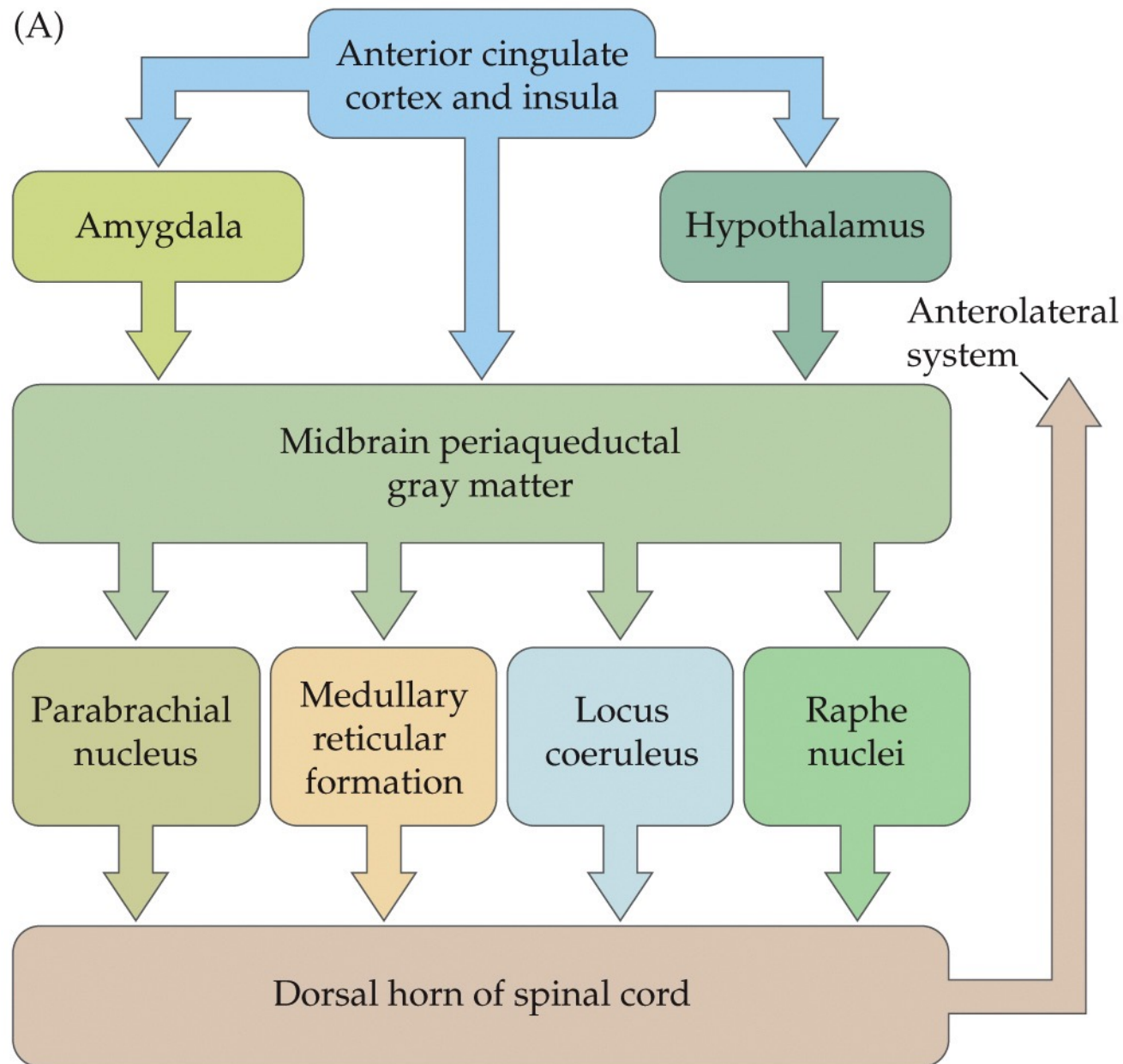


FIGURE 10.6 Discriminative pain pathways

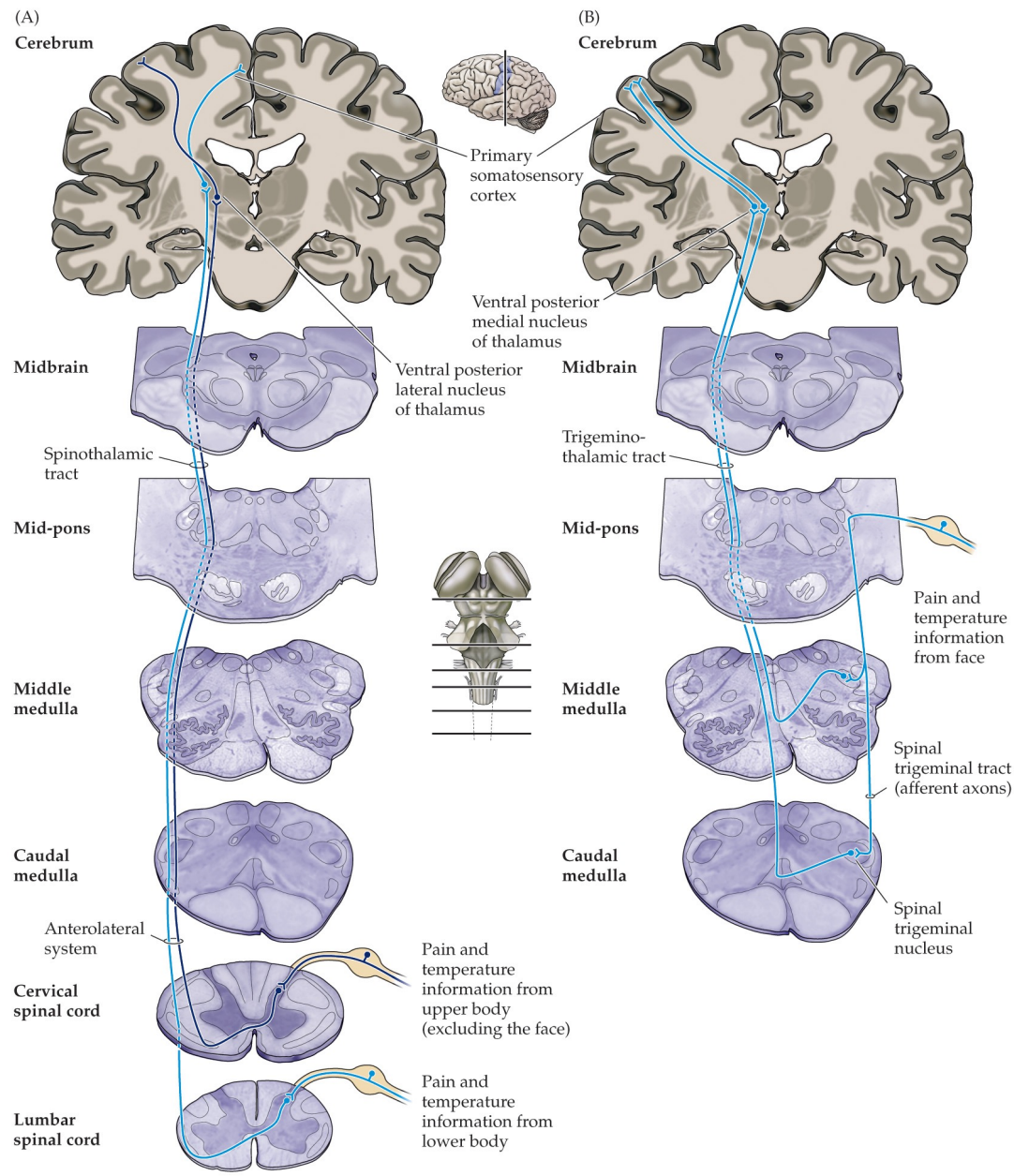
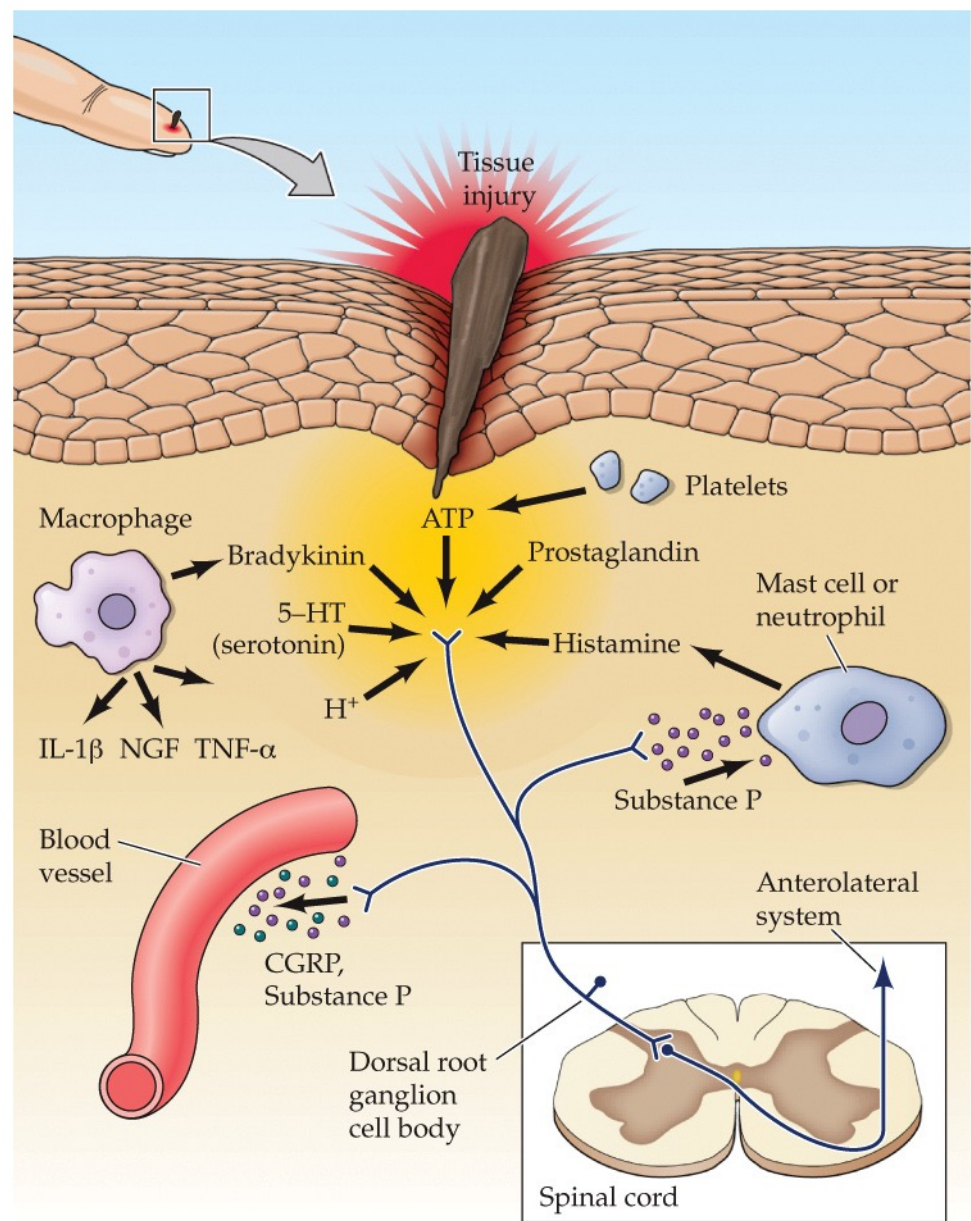




FIGURE 10.7 Inflammatory response to tissue damage



# Sensitization

## Hyperalgesia



[http://www.hellobeautyblog.com/wp-content/uploads/2010/07/sunburn\\_hawk684.jpg](http://www.hellobeautyblog.com/wp-content/uploads/2010/07/sunburn_hawk684.jpg)



[http://farm4.static.flickr.com/3096/2618585448\\_0705af5730.jpg](http://farm4.static.flickr.com/3096/2618585448_0705af5730.jpg)

(A)

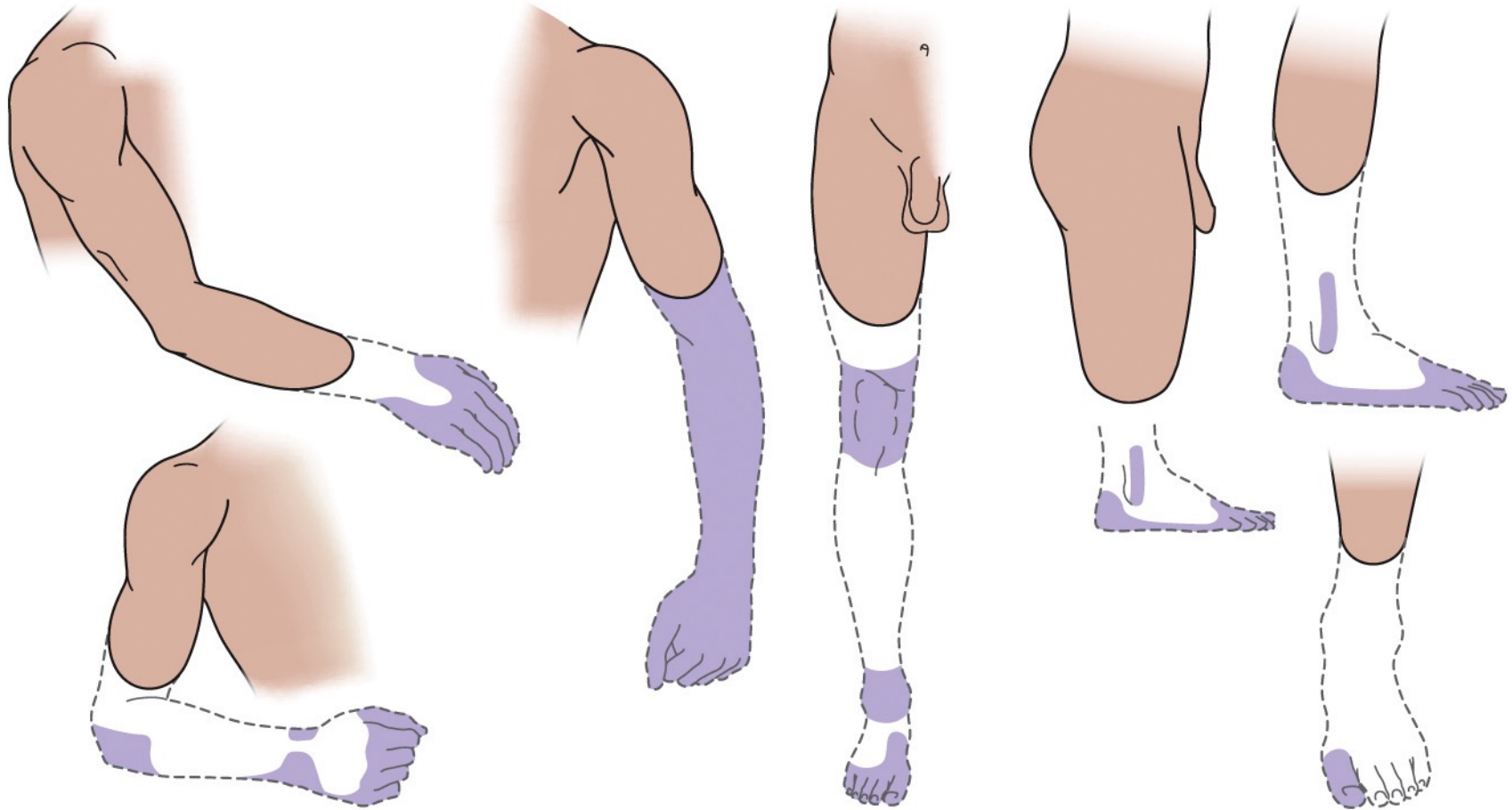
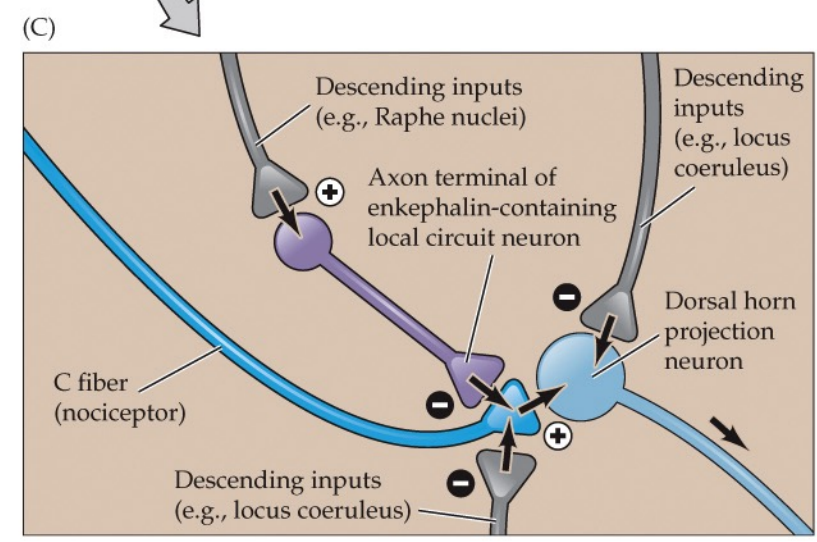
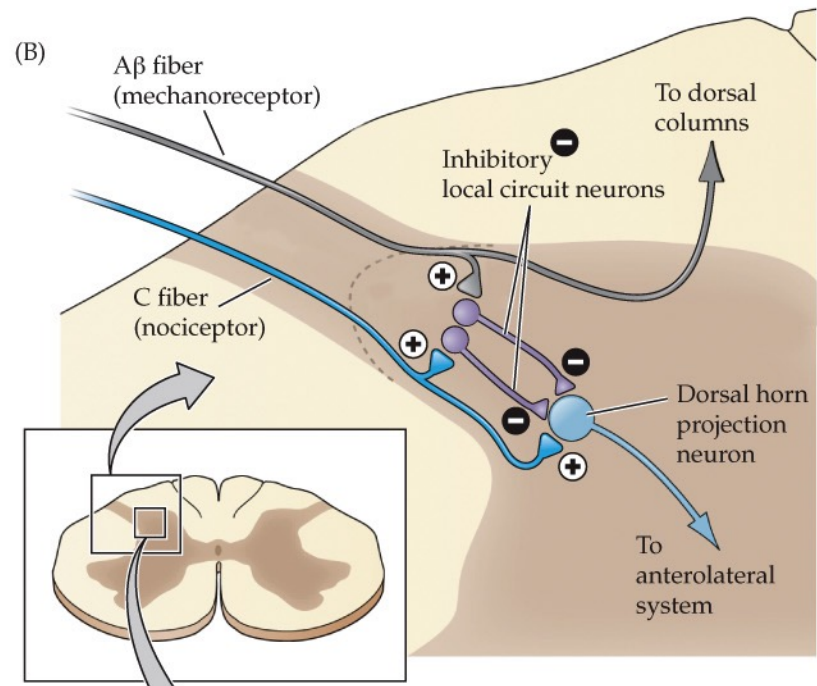
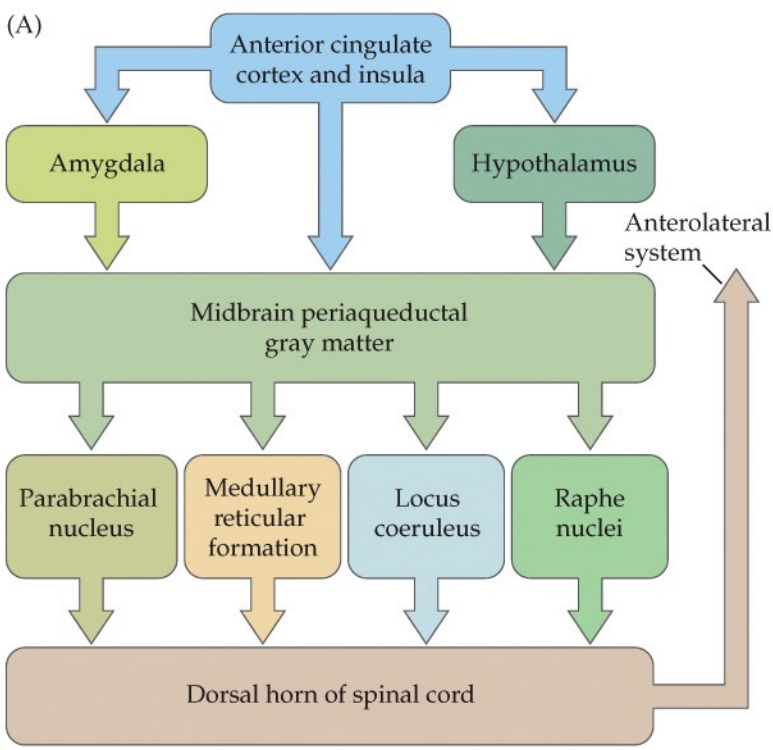




FIGURE 10.8 Descending systems modulate the transmission of ascending pain signals



# Placebo and opioid analgesia



Left Image: Brain activity most pronounced in the rostral anterior cingulate cortex (rACC) during the height of opioid treatment. Increased activity also in the lower pons.

Middle Image: rACC in high-placebo responders during “opioid” treatment.

Right Image: rACC in nonresponders during “opioid” treatment.

(Petrovic *et al.*, Reprinted from *Science*, 295:1737-40, 2002.)