

# Sites of modulation of opioid tolerance

---

## **Receptor**

Desensitization

Internalization/trafficking

## **Transduction systems**

Adenylyl cyclase

G protein regulation

RGS proteins

Guanylyl cyclase

## **Neurotransmitters and their circuits**

Cholecystokinin

$\delta$  Opioid receptor

Enkephalin

Glutamate transporter GLT-1

Glutamine synthase

Neuropeptide FF

NO

NMDA receptors/glutamate

Orphanin FQ/nociceptin

Superoxide dismutase

## **Pharmacokinetic**

P-glycoprotein

---

RGS, regulator of G-protein signaling.