

### Pain and its Treatments



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### Our Goals:



Understand:

1. What is pain and what causes it?
2. What are different types of pain?
3. How do opioid drugs work?

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### What is pain and what causes it?

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### How do we sense pain?

"Pain" is the conscious experience of how we interpret a tissue-damaging stimulus

Painful stimuli activate **pain receptor neurons** that send a signal along a circuit of nerves to the spinal cord & brain

**How pain gets to the brain**

No Brain No pain

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### Factors that influence pain perception

**Cognition:** attention, distraction, hypervigilance, catastrophizing

**Mood:** depression, anxiety, worries, fear

**Context:** past experiences, traumatic events, cultural beliefs, expectations

**Heredity:** relatives who had pain, your genetic makeup

**Body:** past physical injuries may have caused overactive nerve fibers & amplified neural pain circuits

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### What are different types of pain?

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### Acute pain is good & protective

- Response to injury or threat to body
- May be mild and brief, or severe and lasting
- Warning to prevent further damage
- Responds well to treatment of cause
- Decreases over time with healing
- Does not last more than 3-6 months
- Without acute pain: shortened lifetime of continuous injuries



Congenital Insensitivity to Pain




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### What treatments help acute pain?

- RICE (Rest, Ice, Compression, Elevation)
- Anesthetics (numbing: lidocaine)
- Analgesics (anti-inflammatories: aspirin, ibuprofen)
- Physical therapy
- Massage therapy
- Unrelieved *acute pain* might lead to *chronic pain*




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### Chronic pain is bad, no purpose A Huge Public Health Problem

Universal factor common to most medical conditions

Primary reason people seek medical care

100 million (**1 in 3**) American adults report pain  
 40 million have severe pain  
 25 million report daily pain

Costs \$635 billion per year in U.S.  
 More than cancer & heart disease & diabetes




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### Common types of Chronic Pain

<p><b>Low back pain</b></p> 	<p><b>Joint pain</b> <b>Arthritis</b></p> 	<p><b>Headache</b> ♀ <b>Migraine</b> ♀</p> 
<p><b>Abdominal pain</b> ♀</p> 	<p><b>Neck pain</b></p> 	<p><b>Neuropathic pain</b></p> 

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### Chronic pain is maladaptive



- May be a symptom of a disease
- May become a disease itself
- Persists after an injury or disease has healed
- May appear in absence of injury or disease
- Lasts months to years, sometimes entire life
- **Difficult to treat**
- **Often needs a multidisciplinary approach**

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### Why does pain become chronic?

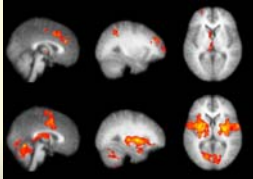
**Amplification of signals in Spinal Cord & Brain**

- Inflammation
- Molecular & cellular changes
- Neural Circuit changes
- Altered brain connections



❖ *Persistence*

❖ *Spontaneous pain*    Touch



Chronic pain

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### Who is likely to develop chronic pain?

#### Risk factors

- Psychological profile, stress
- Genetic heritability
- Early life trauma, abuse
- Gender ♀
- Race, ethnicity
- Socioeconomic Status
- Age



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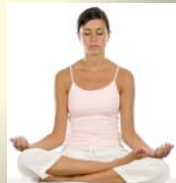
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### What treatments are helpful?

- Cognitive behavioral therapy
- Psychological therapy
- Physical rehabilitation & exercise
- Medications (opioids)
- Complementary therapies (yoga, mindfulness, meditation)



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### What lifestyle factors affect pain?

- Weight
- Age
- Diet
- Exercise



- Sleep
- Mood
- Stress, coping skills
- Smoking
- Drugs
- Alcohol



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### How do opioid drugs work?

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### Opioids for Treatment of Chronic Pain

CN1CC[C@]23[C@@H]4OC5=C(O)C=CC(=C5O)C4=CC=C23

*morphine*



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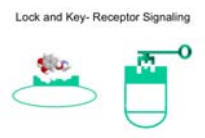
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### Your body has natural "good" opioids that act on opioid receptors

Lock and Key- Receptor Signaling



Key (Opioid)	Lock (Opioid Receptor)
Endorphins	⇒ mu
Enkephalin	⇒ delta
Dynorphin	⇒ kappa



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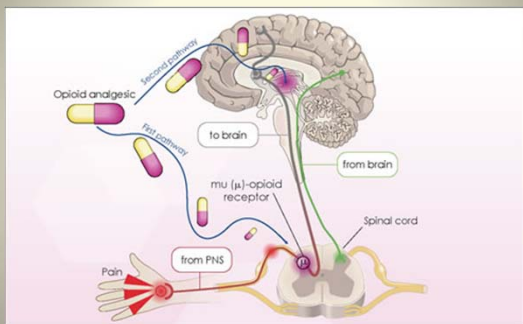
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### How do opioids to relieve pain?




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### Rx opioids do some good & many bad things



- + Pain relief
- ? Euphoria
- Addiction
- Tolerance
- Constipation
- Nausea
- Breathing problems
- Confusion
- Sleepiness
- Can induce pain themselves!

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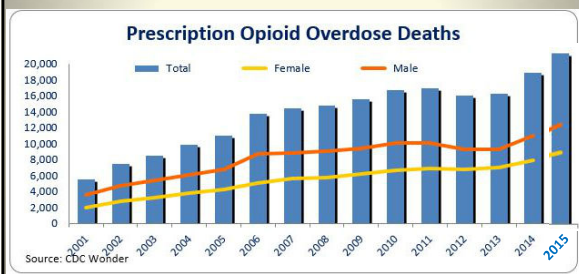
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### What are we doing wrong for pain relief?

Unintended consequences




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**MEDICAL COLLEGE OF WISCONSIN**

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- Ashley Reynolds
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- Kate Sadler PhD
- Crystal O'Hara
- Tony Menzel
- Sarah Langer
- Kate Zappia PhD
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ENDOWMENT

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