

*“Painkiller abuse kills a substantial number of Americans each year.”*

ChemistryWorld, July 2017: The US Food and Drug Administration (FDA) have asked Endo Pharmaceuticals to withdraw its extended relief opioid pain medication, **Opana ER (oxymorphone)**, from the market. This represents the first time the agency has asked for an opioid to be withdrawn because of concern that it might be **abused**.



Prescription painkiller misuse is part of a much wider opioid problem in the US. They are widely prescribed for chronic pain, and their addictive nature all too often leaves patients hooked. According to the American Society for Addiction Medicine:

*“In 2016, two million Americans were addicted to prescription painkillers – FOUR TIMES the number who were using heroin, FOUR out of FIVE new heroin users started out with prescription opioids.”*

**Opioid:** substances that act on opioid receptors to produce morphine-like effects. They are primarily used for pain relief, including anaesthesia.

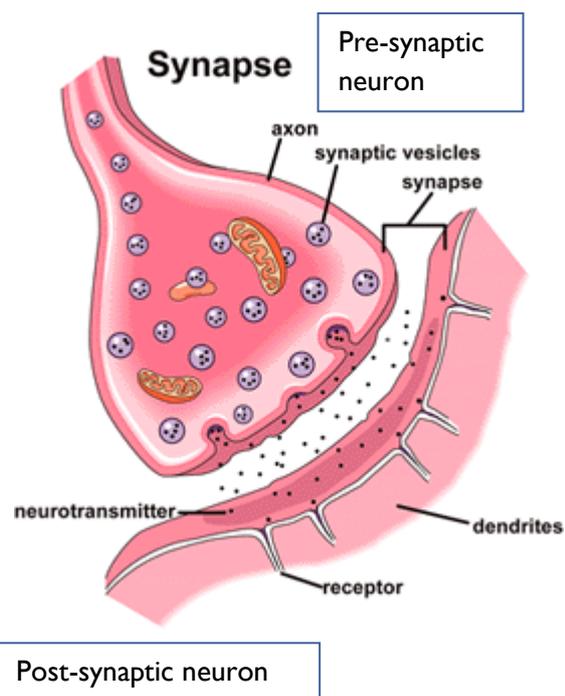
**Morphine:** A pain medication. It acts directly on the central nervous system to decrease the feeling of pain.

**Anaesthesia:** A state of temporary induced loss of sensation or awareness.

**Electrical signal:** It transmits information from one neuron to another neuron.

**Heroin:** Medically it is used as a painkiller to relieve pain but most commonly, it is used as a recreational drug for its euphoric effects.

**Euphoria:** A feeling or state of intense excitement and happiness.



Human brain consists of neurons (brain cells). A synapse is a structure that permits a neuron to pass an electrical signal to another neuron by diffusion of a neurotransmitter.

An electrical signal arrives at pre-synaptic neuron

The vesicles that contain neurotransmitters will move and fuse with the cell membrane

Release of neurotransmitters into the synapse

Neurotransmitters diffuse and attach to the receptor molecules on the cell membrane of post-synaptic neuron

Binding of neurotransmitter - electrical signal is transmitted from one neuron to another

### What is the function of neurotransmitter?

Neurotransmitter, also known as chemical messengers, plays a major role in shaping everyday life and functions.

E.g. **Dopamine** regulates executive functions, motivation, reward and lactation.

### How Pain Works?

Pain is a sensation triggered by a threatening stimulus to the skin (cutaneous pain). A signal is then transmitted to the brain so it becomes aware of the threat and can decide how to respond.

### How do opioids (painkillers) affect the brain?

Opioids act by attaching to opioid receptors which are found on the membrane of neuron in the brain. With these drugs attach to their receptors, they **INHIBIT** the **transmission of PAIN SIGNALS**.

Opioids also act on brain regions involved in REWARD in which they can induce EUPHORIA, particularly when they are taken at a HIGHER-THAN-PRESCRIBED DOSE or administered in other ways than intended. For instance, opioids that are taken ORALLY used to treat moderate to severe pain through a slow, steady release. Some people who misuse opioids intensify their experience by INJECTING OPIOIDS into their body.

## Opioids (Painkillers) Tolerance, Dependence and Addiction

**TOLERANCE:** After taking opioid pain medication for a while, the patient might find that he/she needs more and more of the drug to achieve the same effect in reducing pain.

**DEPENDENCE:** When patients use opioid medication over an extended period of time, they can develop dependence. This can occur when their body becomes so used to the drug that if they abruptly stop taking it, they will get withdrawal symptoms such as nausea, anxiety and irritability.

**ADDICTION:** Patients can develop an addiction to opioids medication. They compulsively seek out the pain medications. They typically have behaviours that lead to negative consequences in their personal lives or workplace.

### If you found this article interesting, you are interested in **Pharmacy!**

Pharmacy is the science and technique of preparing and dispensing medication. The field of Pharmacy combines the study of biology and chemistry to ensure that the medication and drugs that patients consume are safe and effective.

### What are the entry requirements for pharmacy degrees?

Minimum of BBB/ABC/AAC in A-Level:

- Chemistry
- Biology
- Physics
- Mathematics

### What are the course structure and assessment methods?

In some regions of the world, a Bachelor of Pharmacy is offered, elsewhere, the main option is a Master of Pharmacy (MPharm). Pharmacy degrees are typically taught using a combination of lectures, seminars and practical. Most universities offer a work placement at some point during your studies. Assessment is based on theoretical and practical exam and course work.

## What careers are possible with a Pharmacy Degree?

The major types of pharmacy practice areas in Malaysia:

Academic Pharmacy: Teaching, conducting research

Community Pharmacy: Dispensing medication to customers in retail stores such as Watsons and Guardian pharmacies

Hospital Pharmacy: Dispensing medication, prepare intravenous medications (injections), participate in ward rounds, purchase and quality test medication used in the hospital.

Industrial Pharmacy: Drug production for pharmaceutical companies, ensuring that the medication produced is of high quality and safe.

## Top Ten Universities (2017) that specialise in Pharmacy and Pharmacology

1. Harvard University
2. Monash University
3. University of Cambridge
4. University of Oxford
5. University of California, San Francisco
6. The University of Nottingham
7. King's College London
8. University College London
9. The University of Tokyo
10. Karolinska Institutet



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