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A REVIEW ON CHEMICAL COMPOSITION OF VARIOUS PAIN RELIEF MEDICINES.

INTRODUCTION

Pharmaceuticals are drugs used to diagnose, cure, treat, or prevent disease. Drug therapy is an important part of the medical field and relies on the science of pharmacology for continual advancement and on pharmacy for appropriate management.

- Pain-relief medicines are used as part of a strategy to manage short-term (acute) or long-term (chronic) pain. They work by targeting the cause of your pain or by reducing how your pain travels along the nerves to the brain.

ANALGESICS

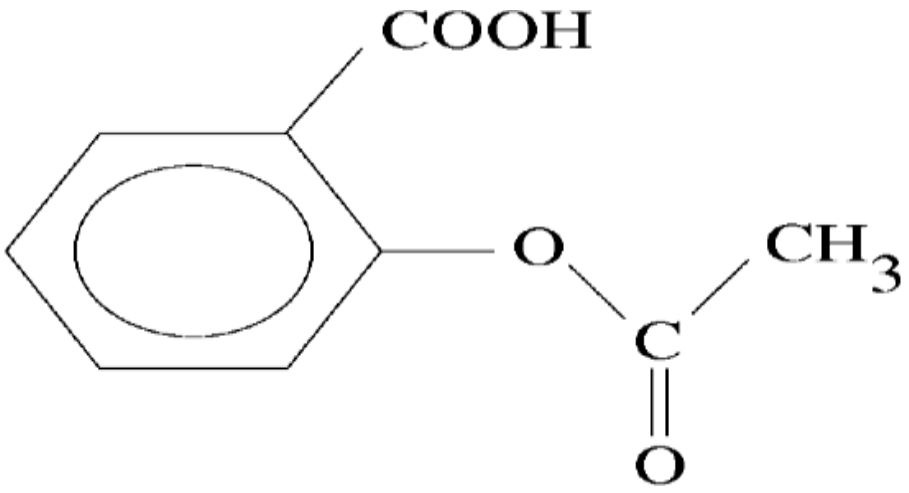
Analgesics are medications that relieve pain. Many of these medications can be purchased without a prescription and are labelled as being over the counter (OTC). All of these OTC formulations have generic counterparts that are chemically equivalent to the brand name.

Acetaminophen (Tylenol, Paracetamol)

- American formulations of this OTC pain killer are available in regular strength (325 mg of acetaminophen per tablet) or extra strength (500 mg of acetaminophen per tablet). Dosages should be extended to 4-6 hour increments when treating fever. Acetaminophen reduces general pain but is not a nonsteroidal anti-inflammatory drug (NSAID0. Of the four OTC analgesics, this molecule does not contain an organic acid functional group (COOH).

Acetylsalicylic Acid (Aspirin)

- Aspirin, like Tylenol , can reduce fevers and general pain. This particular pharmaceutical is an anticoagulant and NSAID. The acetylsalicylic acid molecule does contain an organic acid functional group (COOH). As a result of this molecular structure, Aspirin products can be harsh on the stomach and gastrointestinal tract. At high doses Concentrations of the active ingredient acetylsalicylic acid, can be 81 mg (heart therapy), 325 mg (regular strength), and 500 mg (extra strength).

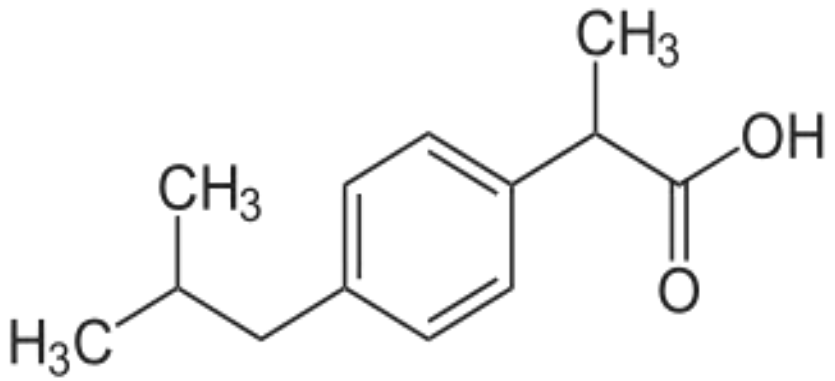


Organic structure of acetylsalicylic acid.

Ibuprofen (Advil and Motrin)

- Ibuprofen does contain the acidic COOH group. For this reason, it is best for patients with stomach issues to avoid or minimize the use of this analgesic. Being an antipyretic and NSAID, this medication is safe for use for those who do not have bleeding disorders (anticoagulant). OTC regular-strength tablets or capsules contain 200 mg of the active ingredient. Like Tylenol, it is recommended that patients should wait between 4-6 hours between dosages.

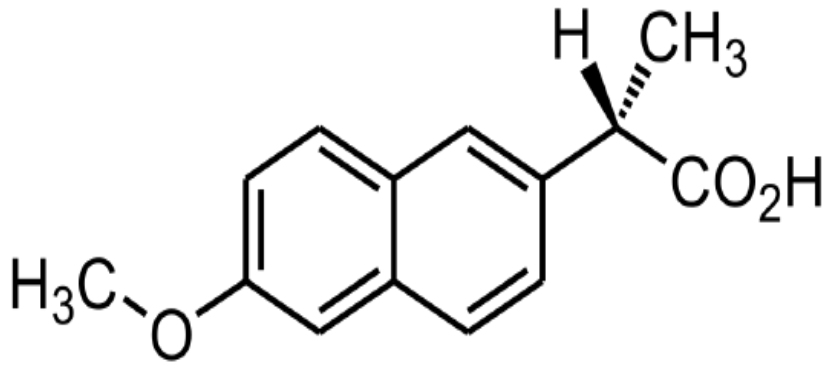
- Ibuprofen is extremely effective in treating dysmenorrhea. With the addition of caffeine, the painkilling effect can be intensified with analgesics like acetaminophen, aspirin, and ibuprofen.



Structure of ibuprofen.

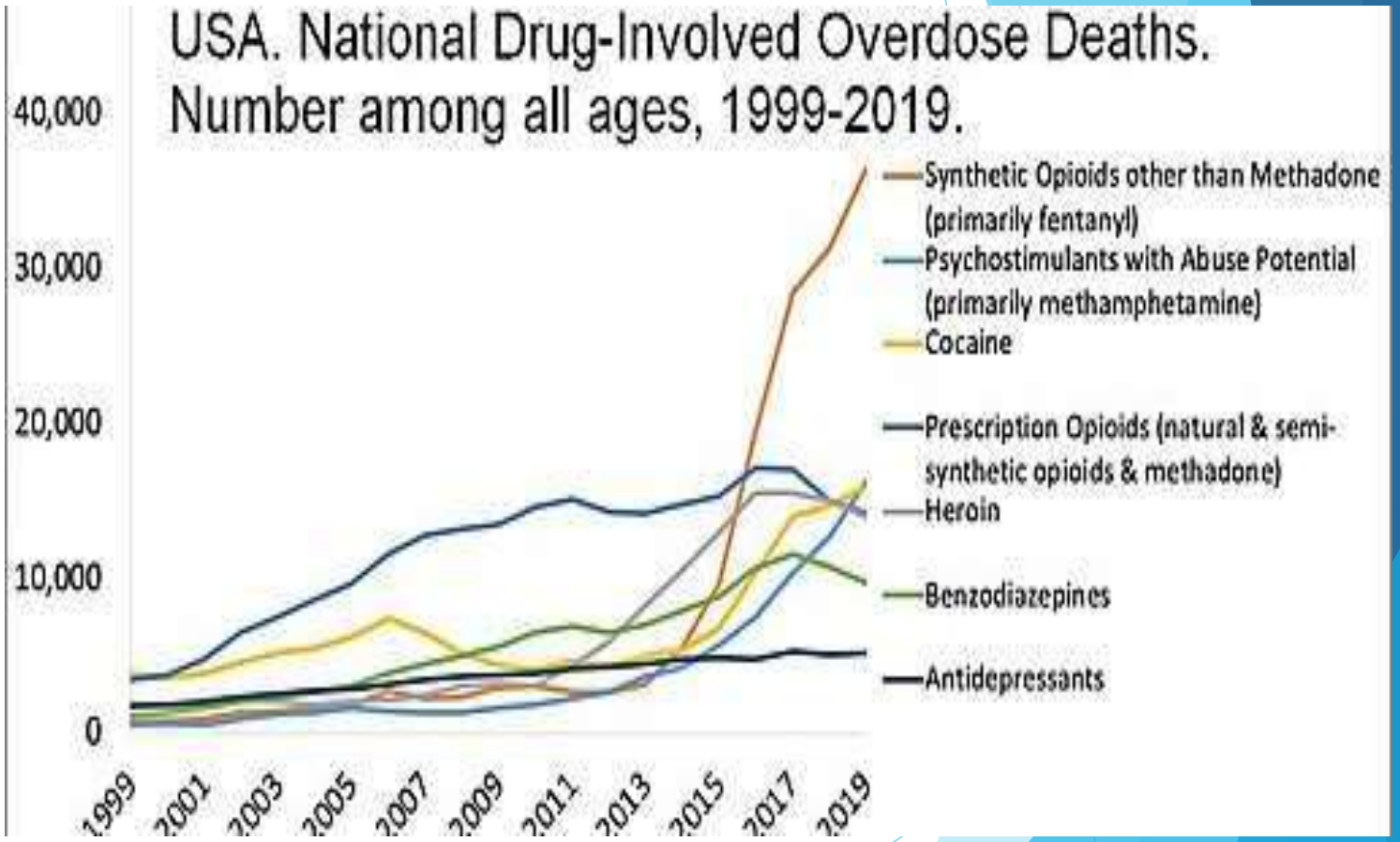
Naproxen (Aleve)

- This analgesic possesses the longest chemical half-live (12 hours) than the previously mentioned medications. For this reason, it is recommended to extend dosage to 8-12 hours (other analgesics are dosed between 4-6 hours).
- Naproxen sodium is an organic sodium salt consisting of equimolar amounts of naproxen anions and sodium anions. It has a role as a non-narcotic analgesic, a cyclooxygenase 2 inhibitor, a cyclooxygenase 1 inhibitor, an antipyretic and a non-steroidal anti-inflammatory drug. It contains a naproxen.



Structure of Naproxen.

National Drug-Involved Overdose Deaths by Specific Category—Number Among All Ages, 1999-2019. Overall, drug overdose deaths rose from 2018 to 2019 with **70,630 drug overdose deaths** reported **in 2019.** Deaths involving **other synthetic opioids** other than methadone (primarily **fentanyl)** continued to rise with more than **36,359** overdose deaths reported in 2019. Those involving psychostimulants with abuse potential (primarily methamphetamine) also continued to increase.

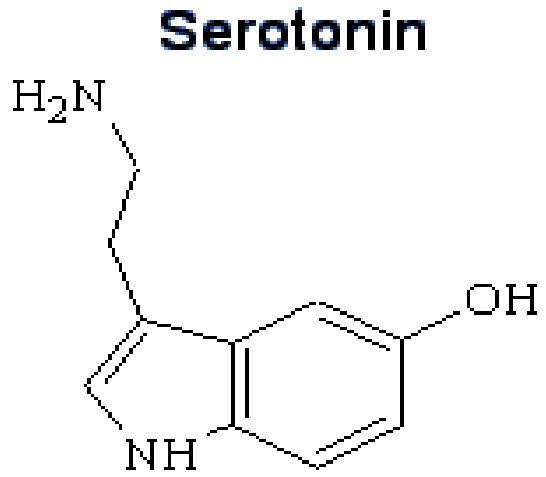


Heroin (diacetylmorphine)

- **Heroin**, also known as **diacetylmorphine** and **diamorphine** among other names,is a opioid substance synthesized from the dried latex of the *Papaver somniferum* plant; it is mainly used as a recreational drug for its euphoric effects.
- Treatment of heroin addiction often includes behavioral therapy and medications. Medications can include buprenorphine, methadone, or naltrexone. A heroin overdose may be treated with naloxone. An estimated 17 million people as of 2015 use opiates, of which heroin is the most common, and opioid use resulted in 122,000 deaths. The total number of heroin users worldwide as of 2015 is believed to have increased in Africa, the Americas, and Asia since 2000. In the United States, approximately 1.6 percent of people have used heroin at some point. When people die from overdosing on a drug, the drug is usually an opioid and often heroin.

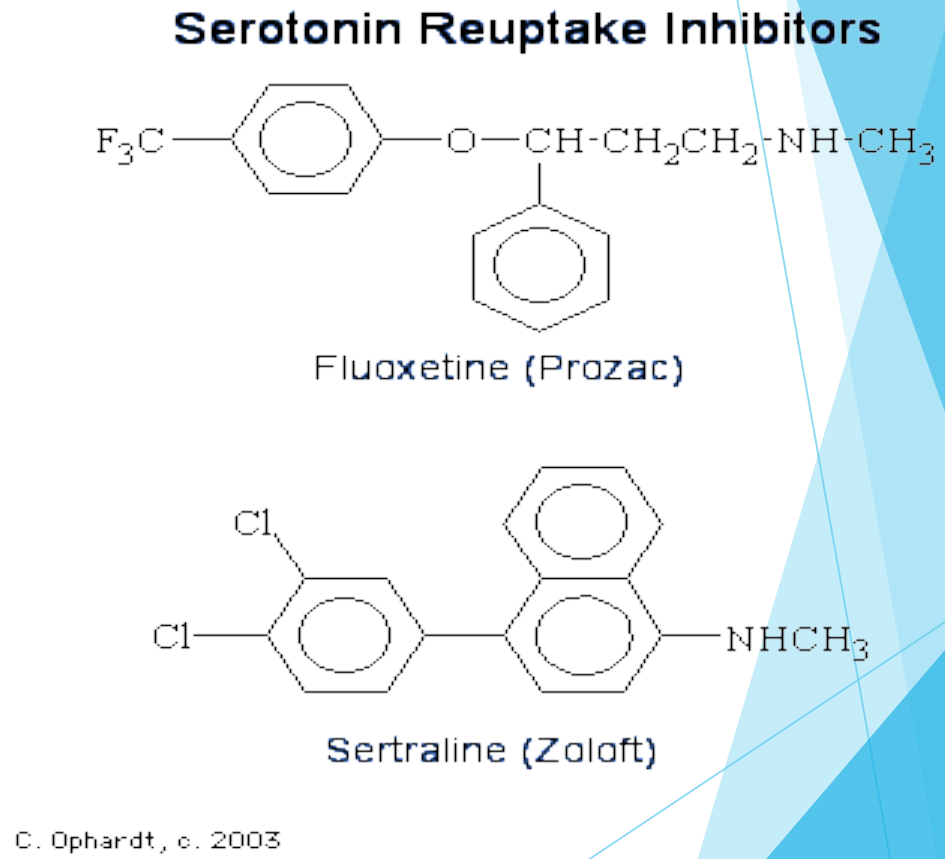
Serotonin

- Serotonin (5-hydroxytryptamine or 5-HT) is a monoamine neurotransmitter found in cardiovascular tissue, in endothelial cells, in blood cells, and in the central nervous system. The role of serotonin in neurological function is diverse, and there is little doubt that serotonin is an important CNS neurotransmitter. Although some of the serotonin is metabolized by monoamine oxidase, most of the serotonin released into the post-synaptic space is removed by the neuron through a re-uptake mechanism inhibited by the tricyclic antidepressants and the newer, more selective antidepressant re-uptake inhibitors such as fluoxetine and sertraline.



Selective Serotonin Reuptake Inhibitors

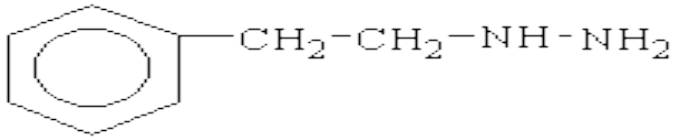
- In recent years, selective serotonin reuptake inhibitors have been introduced for the treatment of depression. Prozac is the most famous drug in this class. Clomiprimine, fluoxetine (Prozac), sertraline and paroxetine selectively block the re-uptake of serotonin, thereby increasing the levels of serotonin in the central nervous system. Note the similarities and differences between the tricyclic antidepressants and the selective serotonin re-uptake inhibitors. Clomipramine has been useful in the treatment of obsessive-compulsive disorders.



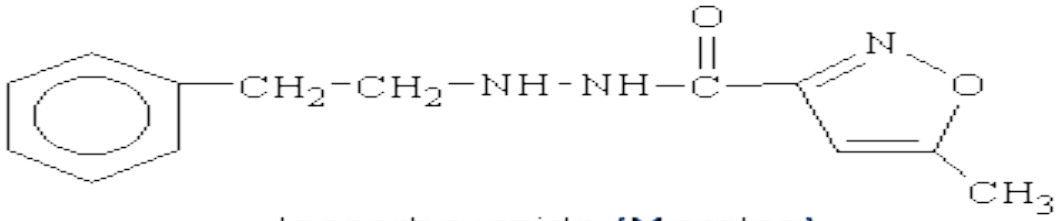
Monoamine Oxidase Inhibitors

- Monoamine oxidase (MAO) causes the oxidative deamination of norephinephrine, serotonin, and other amines.
- MAO inhibitors are hydrazine derivatives. Hydrazine is highly reactive and may form a strong covalent bond with MAO with consequent inhibition for up to 5 days.

Monoamine Oxidase (MAO) Inhibitors



Phenelzine (Nardil)

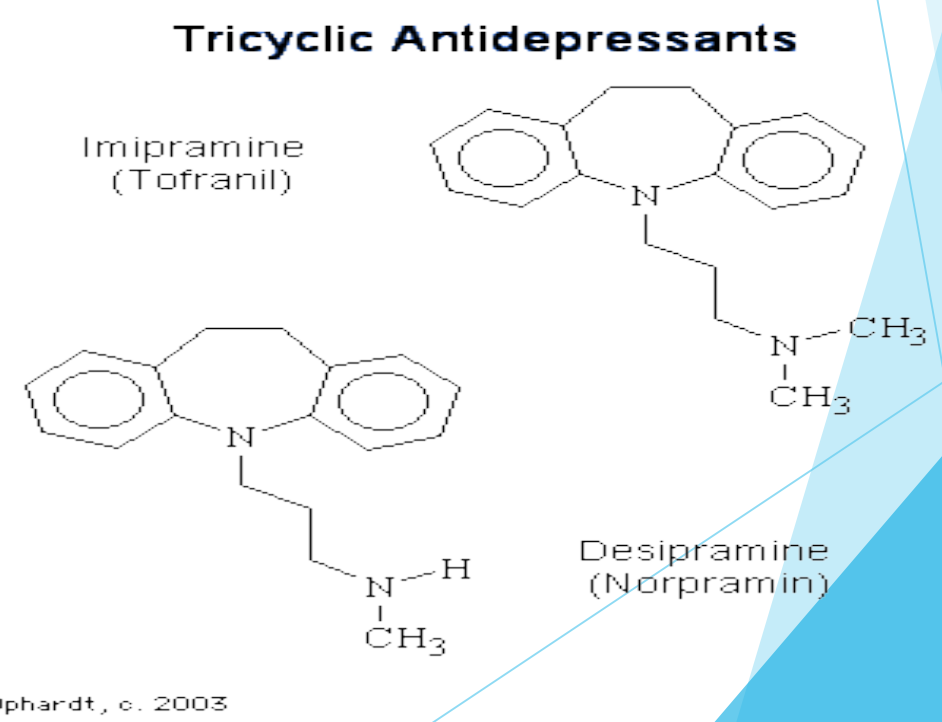


Isocarboxazide (Marplan)

Tricyclic Antidepressants

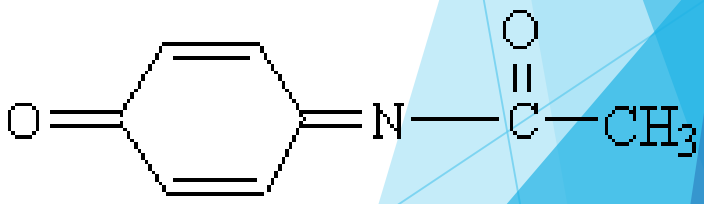
- The tricyclic antidepressants are the most effective drugs presently available for the treatment of depression. These act by increasing the release of norepinephrine. Amphetamine and cocaine can also act in this manner. Imipramine, amitriptylin, and other closely related drugs are among the drugs currently most widely used for the treatment of major depression.

- imipramine (Tofranil)
- desipramine (Norpramin)



Amphetamine

- Amphetamine (contracted from) is a potent central nervous system (CNS) stimulant that is used in the treatment of attention deficit hyperactivity disorder (ADHD), narcolepsy, and obesity.
- Amphetamine belongs to the phenethylamine class. It is also the parent compound of its own structural class, the substituted amphetamines, which includes prominent substances such as bupropion, cathinone, MDMA, and methamphetamine.
- Researchers attribute the pain-relieving activity of acetaminophen to the drug's ability to elevate the pain threshold, although the precise mechanisms involved in this process have not been clearly identified. The antipyretic, or fever-reducing, effect of acetaminophen is far better understood. Research shows that the drug inhibits the action of fever-producing agents on the heat-regulating centers of the brain by blocking the formation and release of prostaglandins in the central nervous system. However, unlike aspirin and other NSAIDs, acetaminophen has no significant effect on the prostaglandins involved in other body processes.



N-acetyl-p-benzoquinoneimine

CONCLUSION

- Pain relievers are medicines that reduce or relieve headaches, sore muscles, arthritis, or other aches and pains. There are many different pain medicines, and each one has advantages and risks. Some types of pain respond better to certain medicines than others. Each person may also have a slightly different response to a pain reliever.

- Over-the-counter (OTC) medicines are good for many types of pain. There are two main types of OTC pain medicines: acetaminophen (Tylenol) and nonsteroidal anti-inflammatory drugs (NSAIDs). Aspirin, naproxen (Aleve), and ibuprofen (Advil, Motrin) are examples of OTC NSAIDs.

Future Research and Upcoming Considerations

- Emerging trends in pharmacological pain management focus on novel drug targets and innovative drug delivery systems. By expanding our understanding of pain mechanisms and utilizing advanced technologies, researchers and pharmaceutical companies are striving to develop more efficient, targeted, and personalized medications for pain relief.

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ACKNOWLEDGEMENT

- I would like to express my special thanks of gratitude to, Dr. Mumu Chakraborty who gave me the golden opportunity to do this wonderful project on **“A Review on Chemical composition of various pain relief medicines”**, whose motivational personality, constant encouragement, and sustained guidance has made this project come true.

- I would also like to extend my gratitude to the other teachers of the department Dr. Bhaswati Bhattacharya for providing me with all the facility that was required. I also acknowledge all the staff members of our department.

THANK YOU