Medicinal Chemistry

Wednesday, October 20

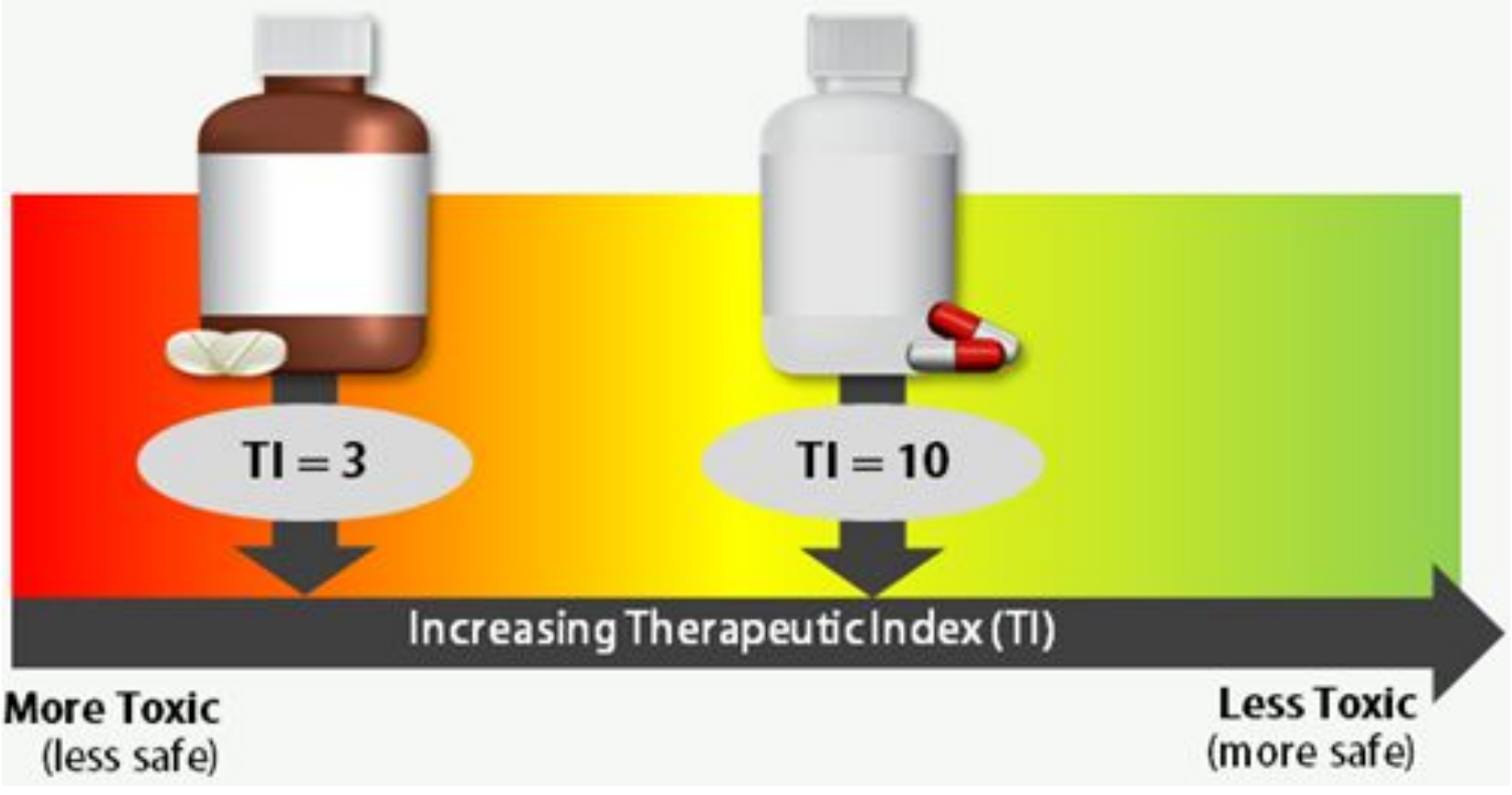
Overview:

1. Semester and Project Timelines
2. Content Tune-Up
3. Extra Help Sessions
4. Medicinal Chemistry

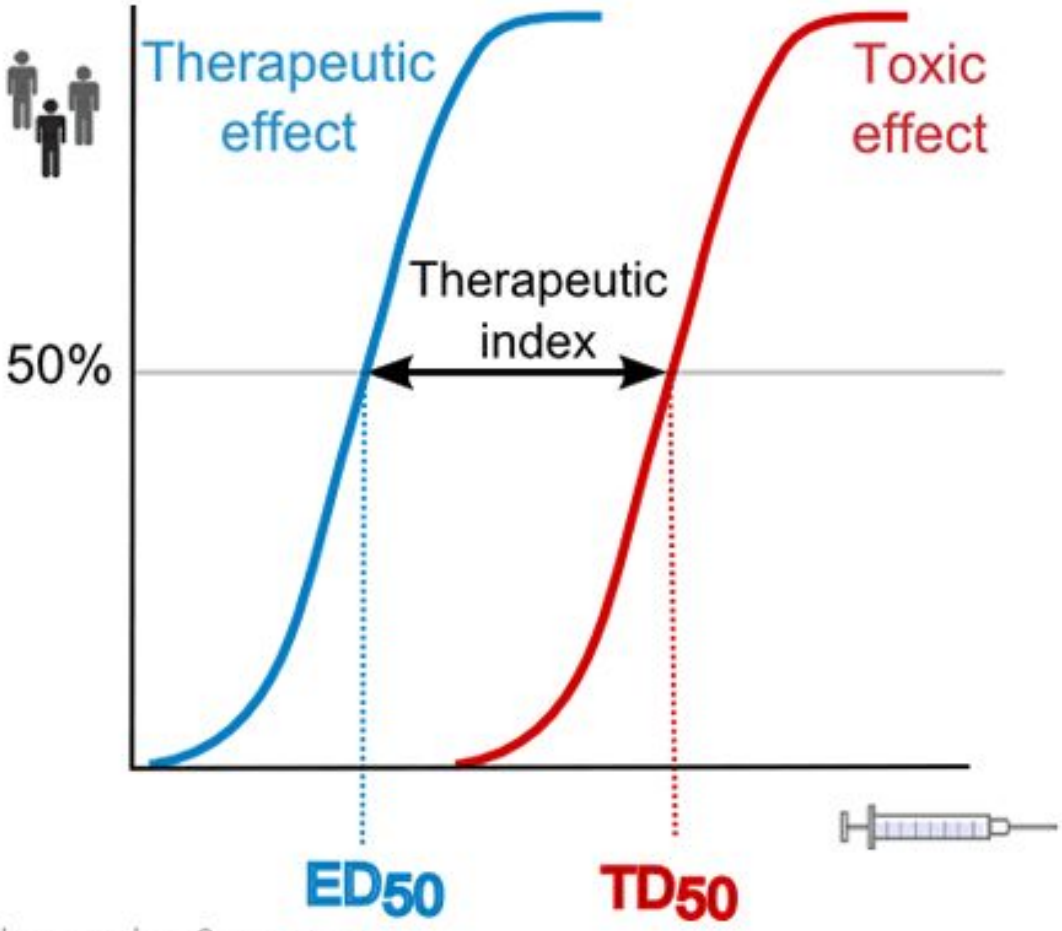
Semester Overview:
https://padlet.com/pamelaaharvey/20z7tps8c1f1knnx

Project Overview:
https://padlet.com/pamelaaharvey/t1y53pg5i5uq8819

Therapeutic Index



Therapeutic Index



Extra Help Sessions

Friday 12:40 - 1:30 pm

Monday 12:40 - 1:30 pm

Location to be determined

Medicinal Chemistry

Learning Goals for Medicinal Chemistry

1. Describe the ways that drugs can be classified
2. Report the “good” and “bad” qualities of a drug
3. Describe the purpose of chemically altering a compound’s structure
4. Understand the basic concept of functional groups

Learning Goals for Medicinal Chemistry

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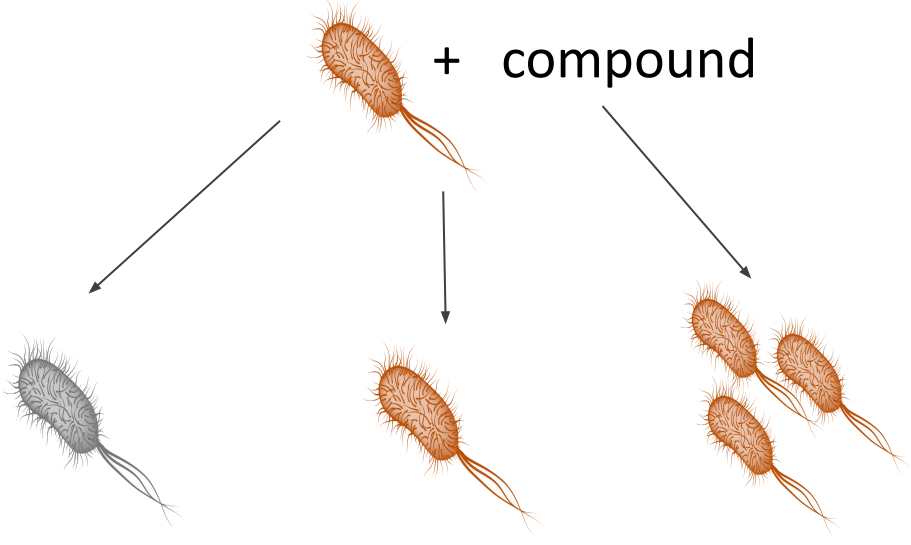
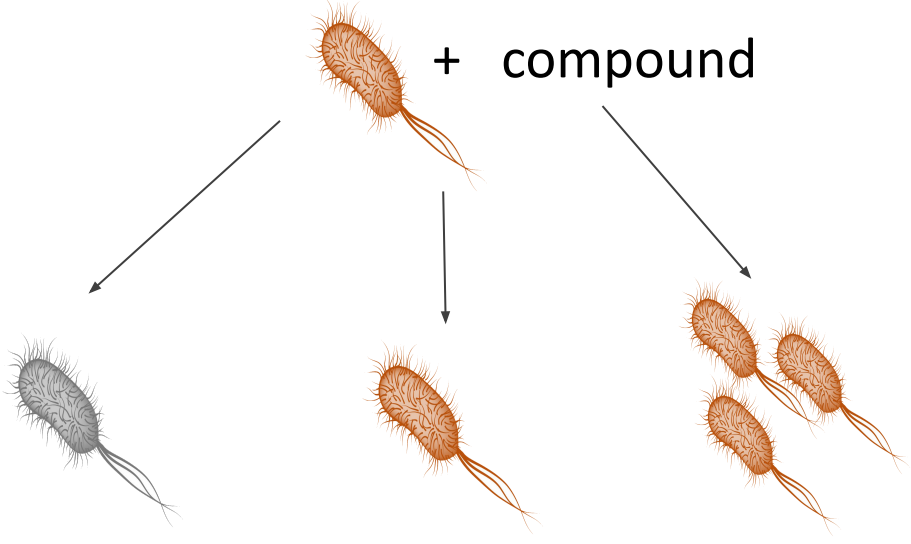
Types of Drug Development

Phenotypic screens

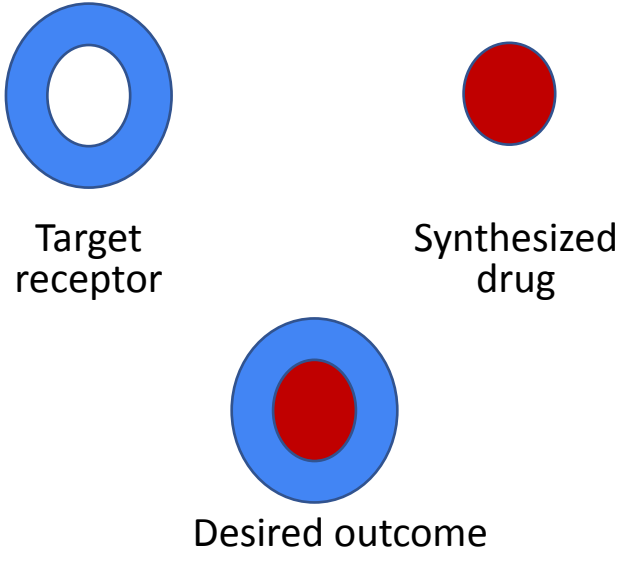


Types of Drug Development

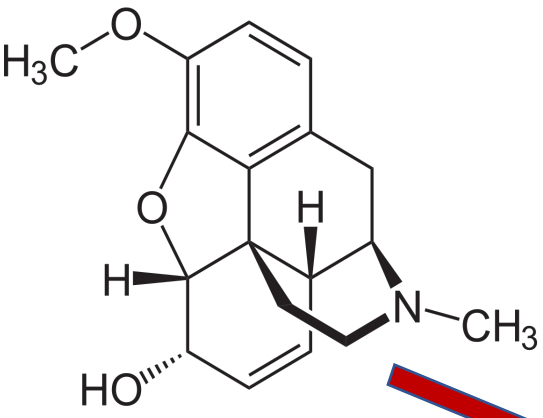
Phenotypic screens

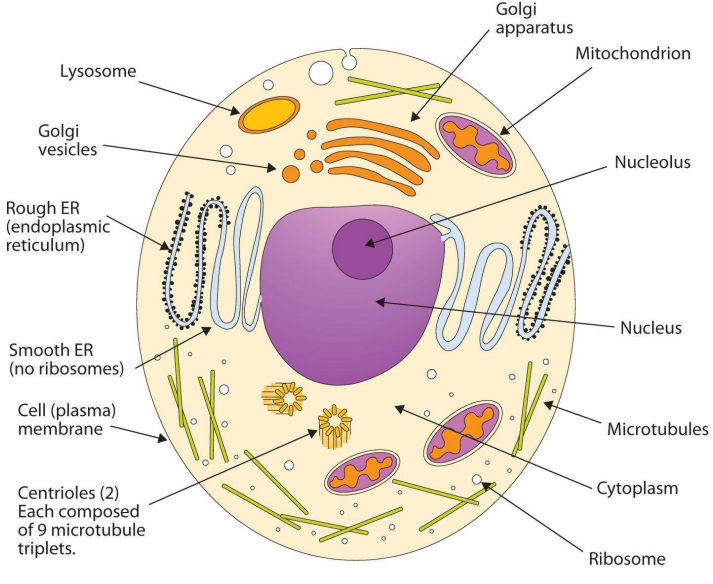


Targeted approach



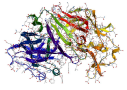
Simple.


H3C
O
O
H
H
N
CH3
HO


Golgi apparatus
Mitochondrion
Lysosome
Golgi vesicles
Nucleolus
Rough ER (endoplasmic reticulum)
Nucleus
Smooth ER (no ribosomes)
Cell (plasma) membrane
Microtubules
Cytoplasm
Centrioles (2) Each composed of 9 microtubule triplets.
Ribosome

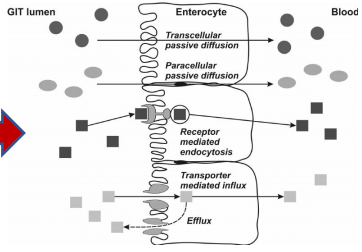
Ingestion

Pepsin degradation



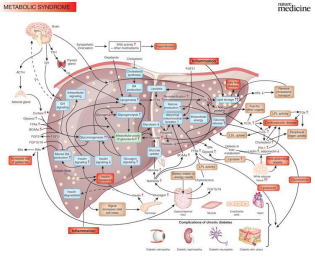
Enter GI tract

GI Absorption

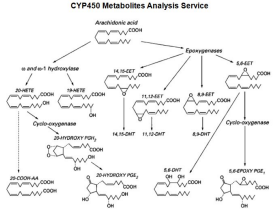


To the liver's metabolic pathways

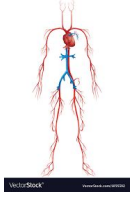
Metabolism (potentially changes compound)



CYP450 metabolic pathway

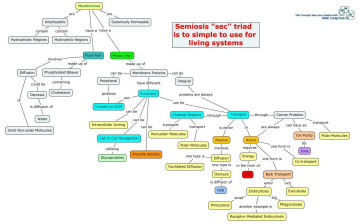


Back to blood

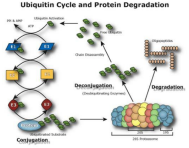


To target cells

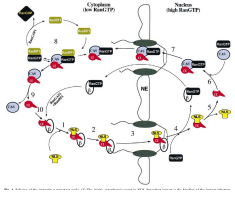
Through the membrane or one of the channels



Avoiding efflux or degradation



Transport into nucleus



Finally get to target

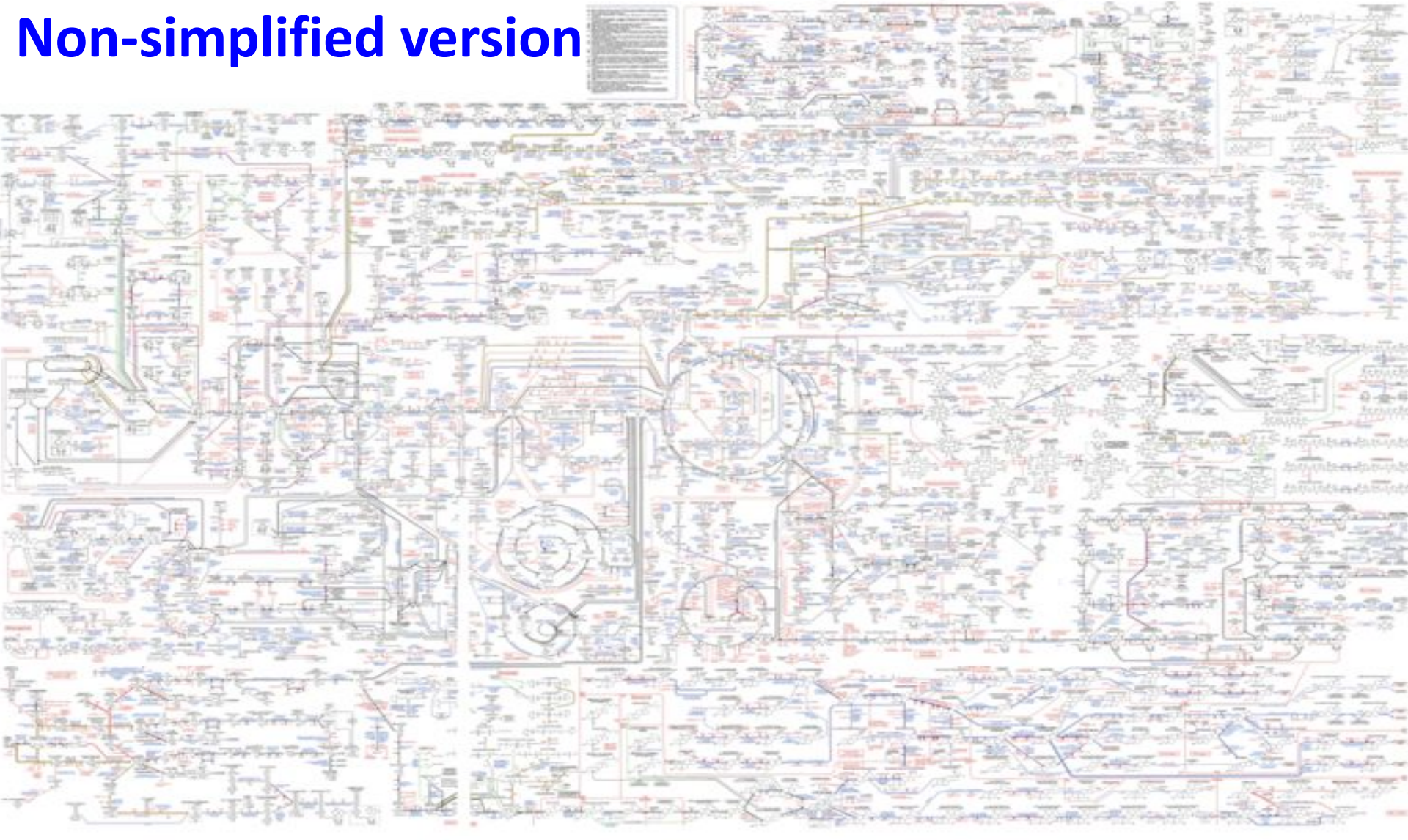
Except…

The compound was changed in step 234 three hours ago.

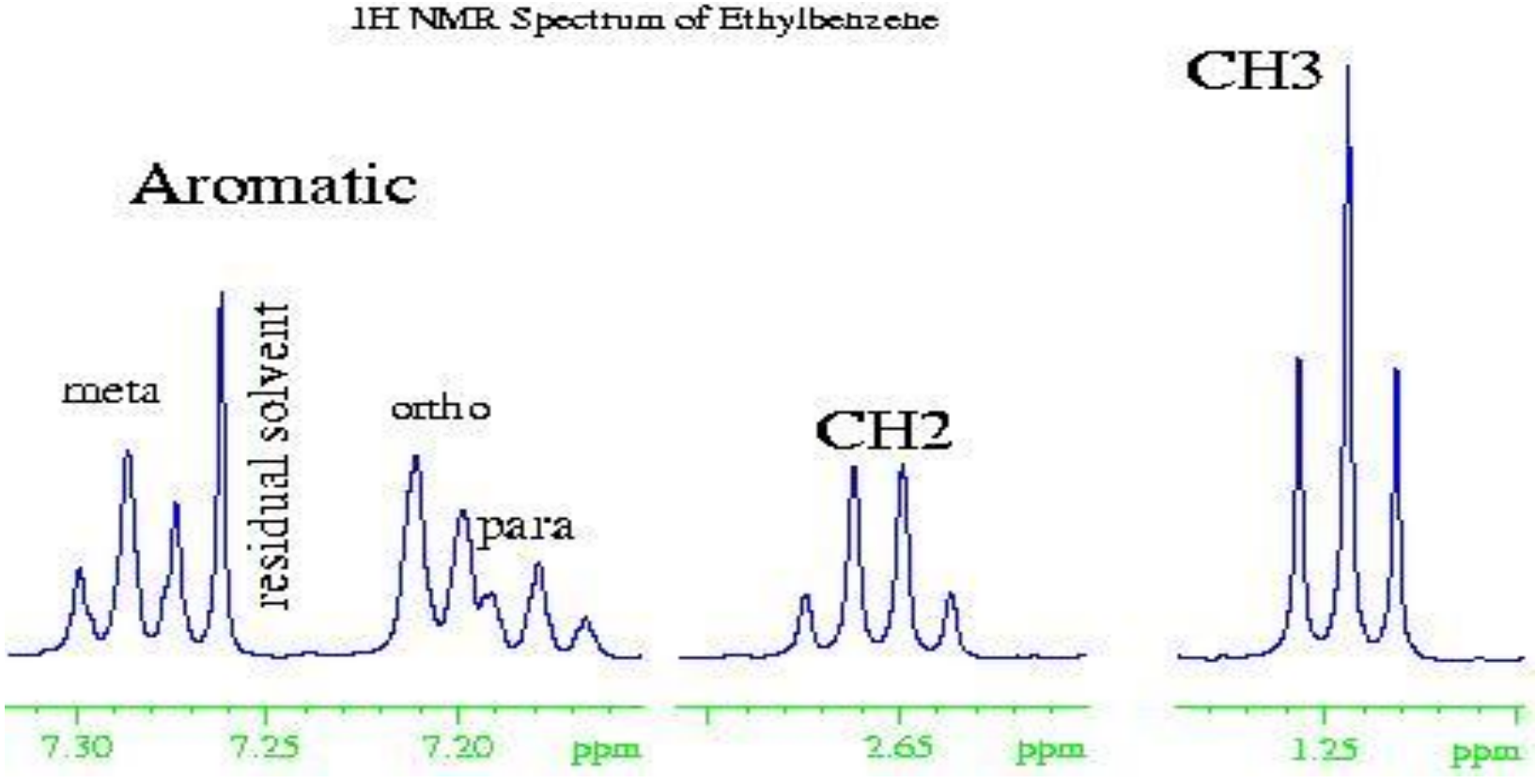
No longer effective

Not at all

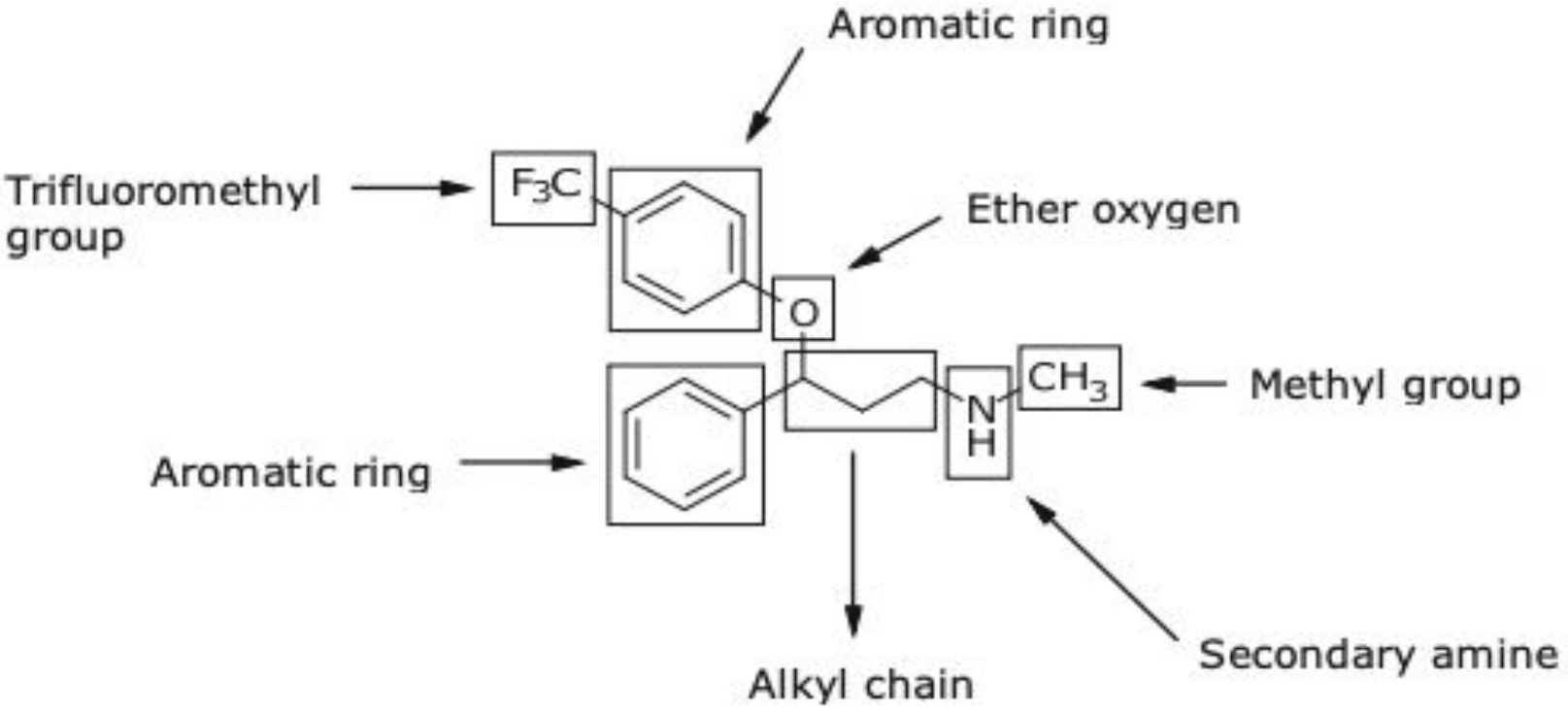
Non-simplified version



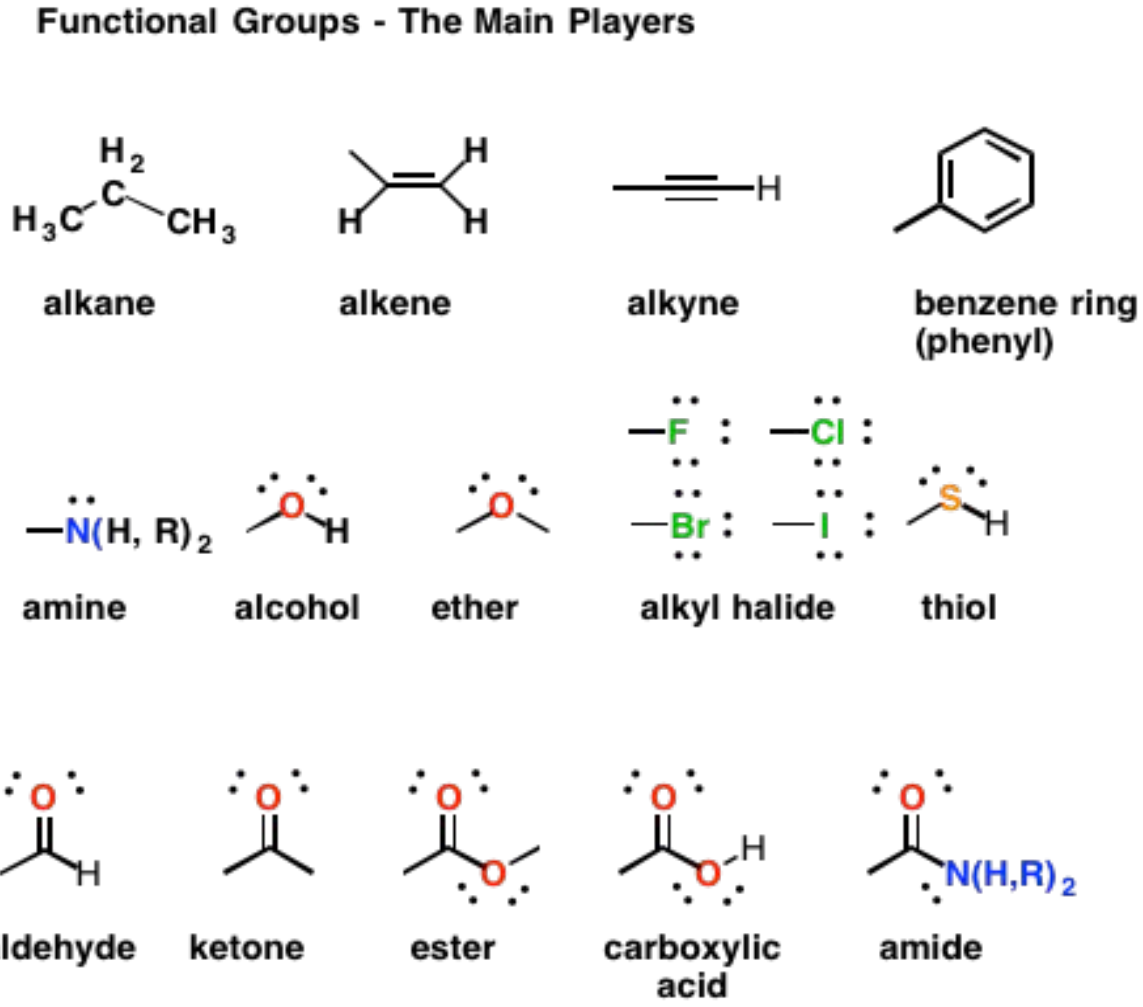
Drug Development Review – Structure Determination



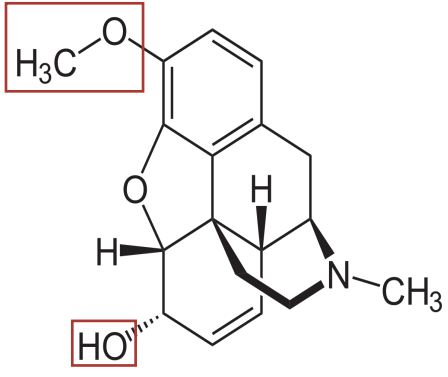
Structure-Activity Relationship (SAR)



What is causing these interactions?

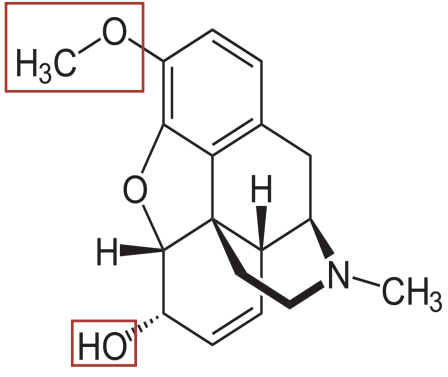


Medicinal Chemistry

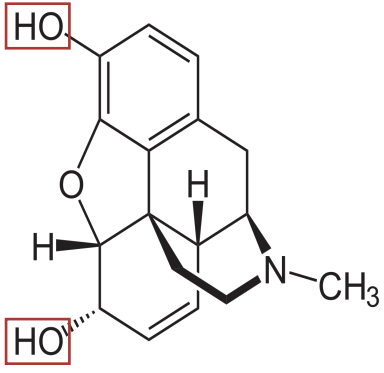


Codeine

Medicinal Chemistry

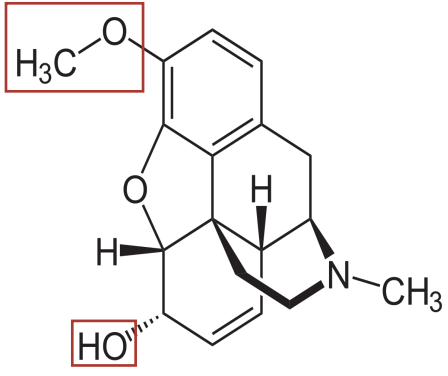


Codeine

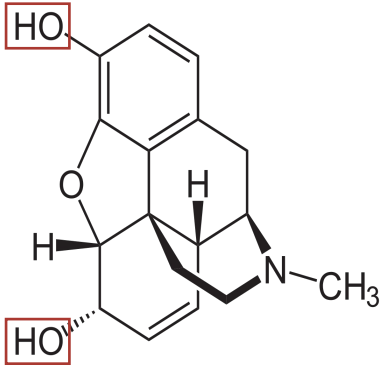


Morphine

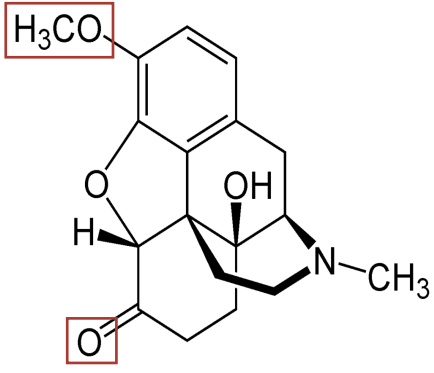
Medicinal Chemistry



Codeine

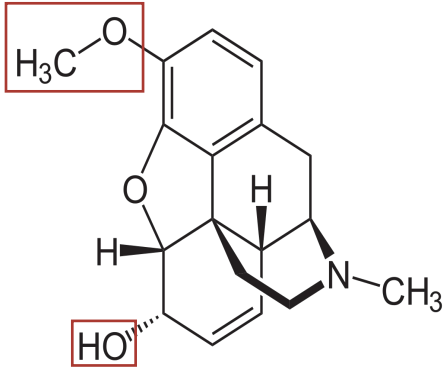


Morphine

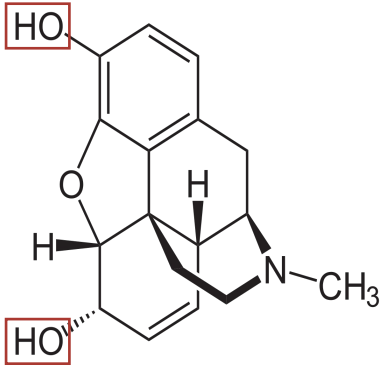


Oxycodone

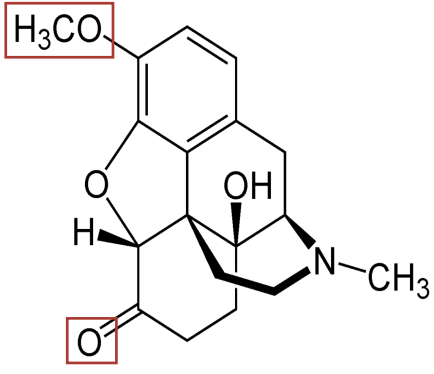
Medicinal Chemistry



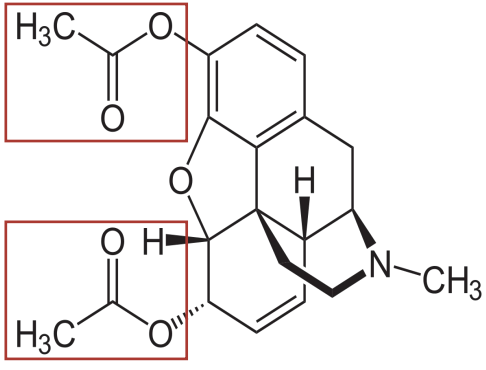
Codeine



Morphine



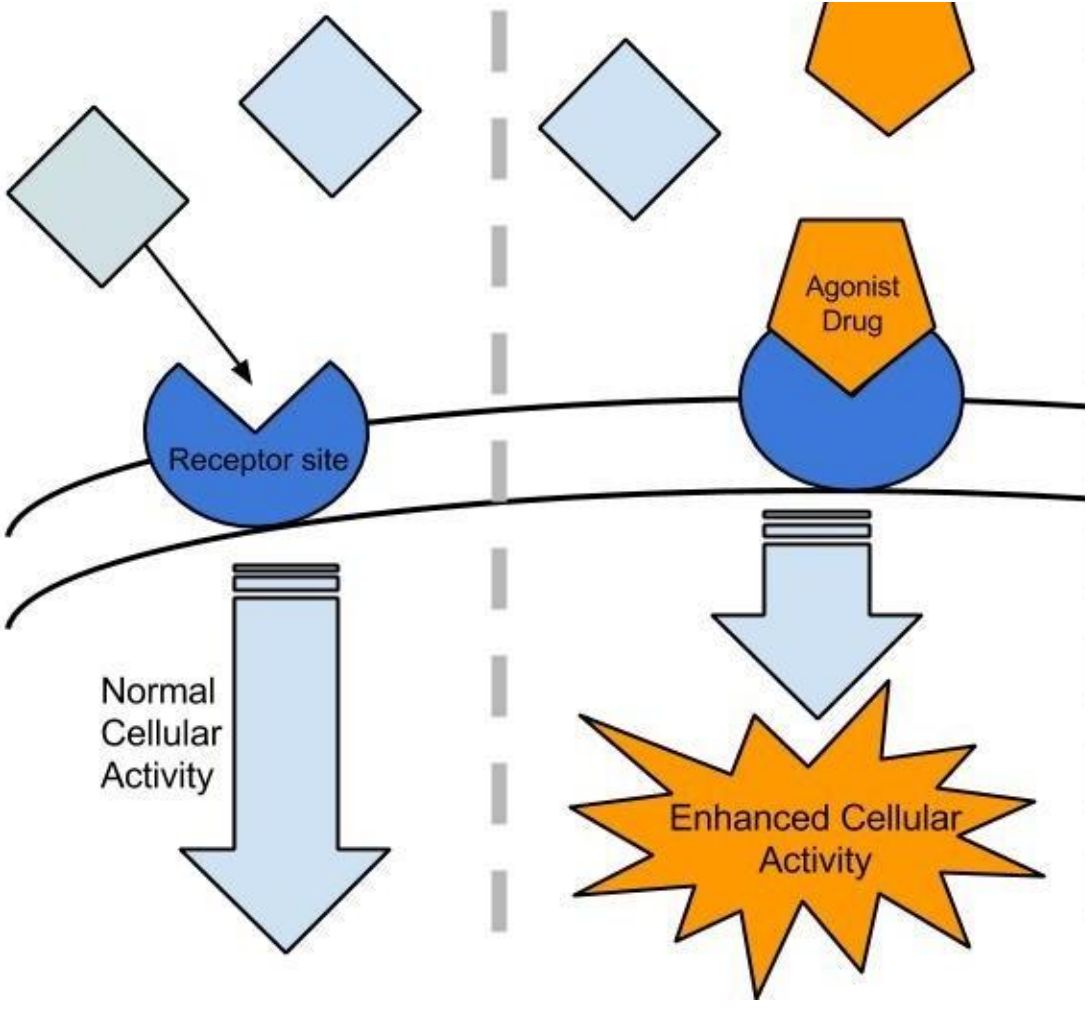
Oxycodone



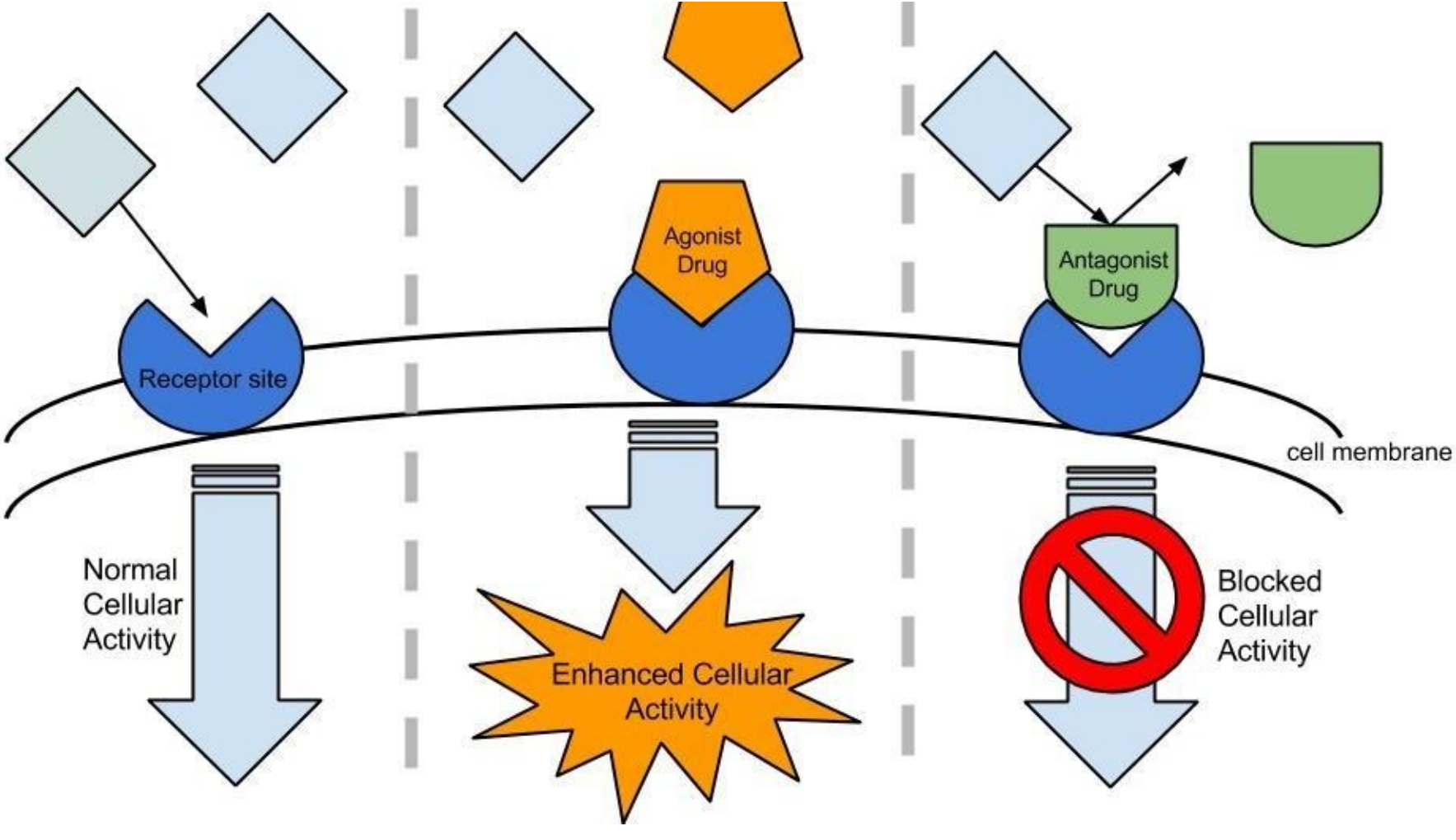
Heroin

These are opioid receptor AGONISTS

Medicinal Chemistry

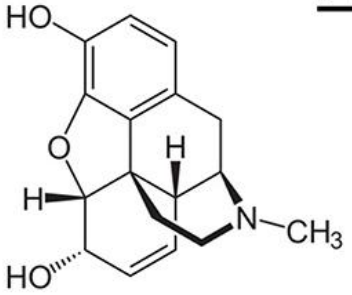


Medicinal Chemistry

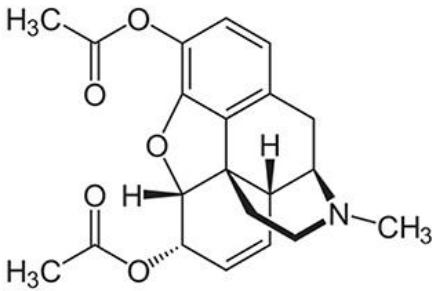


Medicinal Chemistry

Agonists

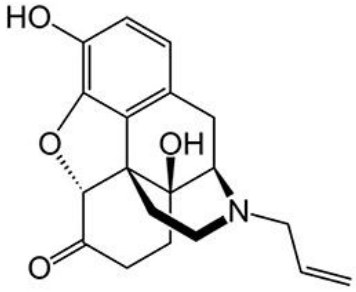


Morphine

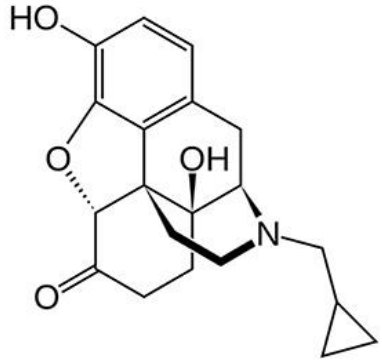


Heroin

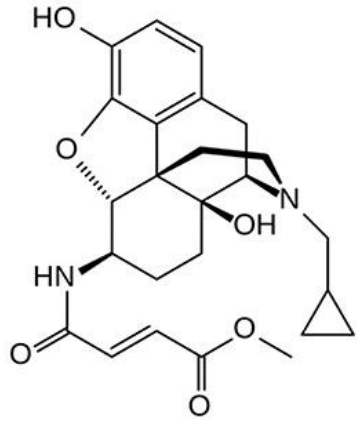
Antagonists



Naloxone



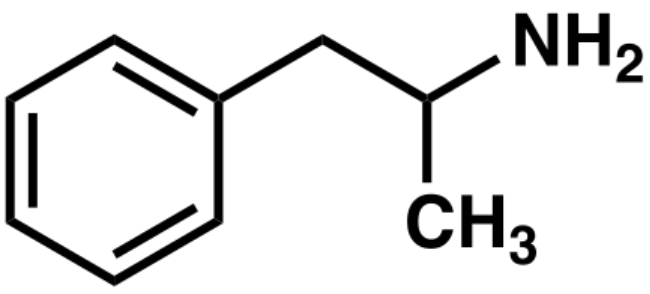
Naltrexone

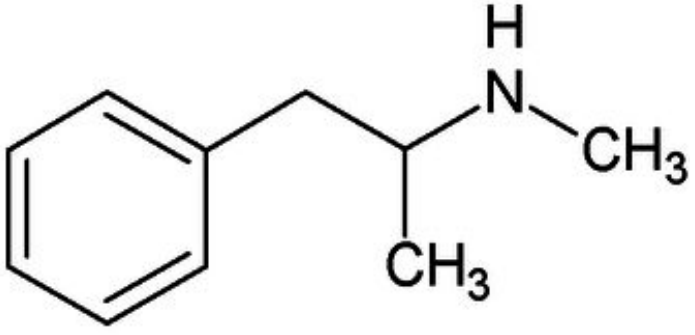


β-funaltrexamine

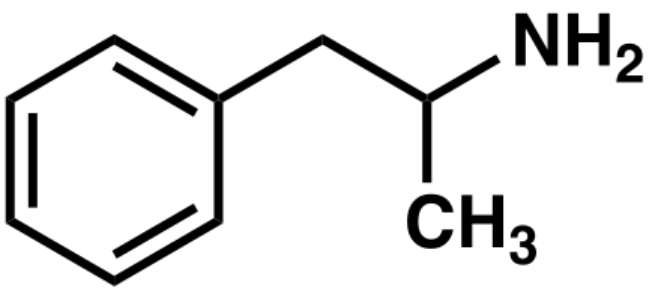

AXON FLEX 2 X83017120

Medicinal Chemistry

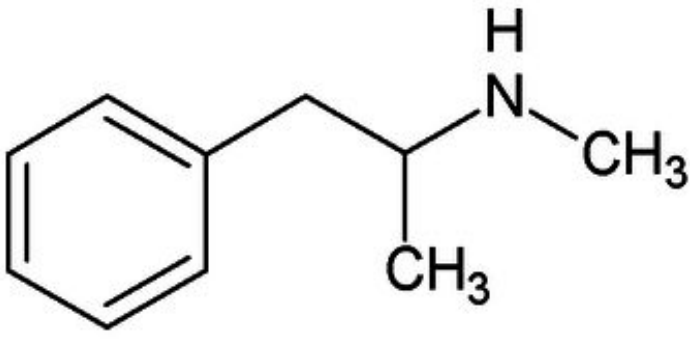




Medicinal Chemistry

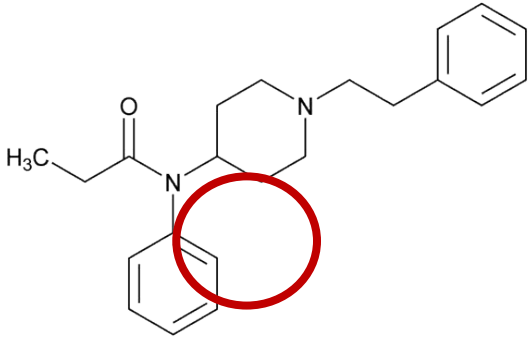


Adderall



Methamphetamine

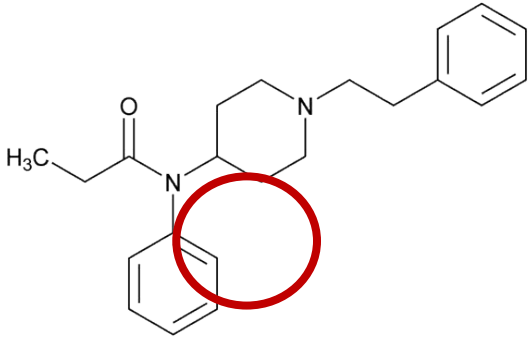
Medicinal Chemistry



Fentanyl

- Alternative to Morphine
- Does not cause respiratory depression
- Good for chest trauma
- Can be absorbed through the skin
- 100 times stronger than morphine

Medicinal Chemistry



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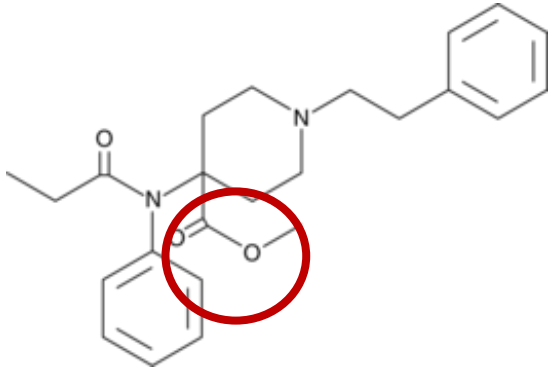


Carfentanyl

Medicinal Chemistry

118 pounds of morphine

Enough to kill 26,000 people

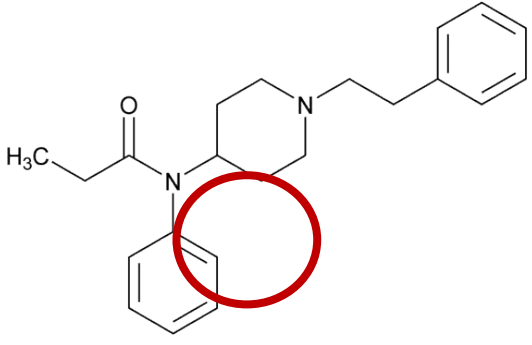
Medicinal Chemistry

118 pounds of fentanyl

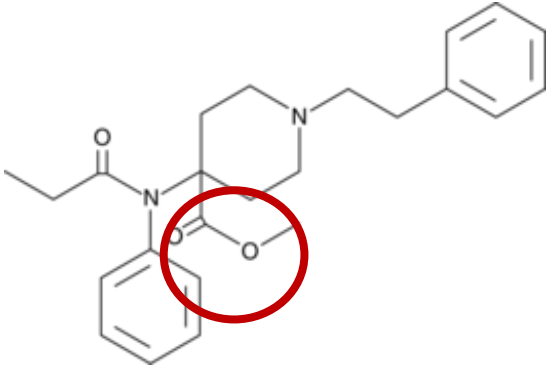
Enough to kill 28,000,000 people

Medicinal Chemistry

118 pounds of carfentanyl is enough to kill 77% of the United States.



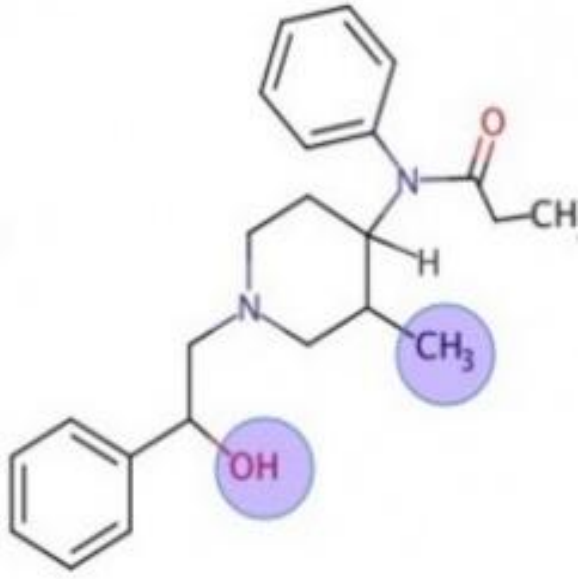
Fentanyl



Carfentanyl

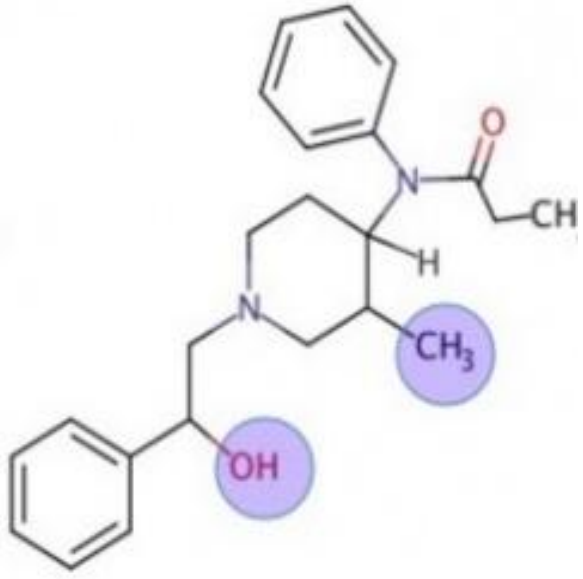
Medicinal Chemistry

118 pounds of ohmefentanyl is enough to kill every person on earth.



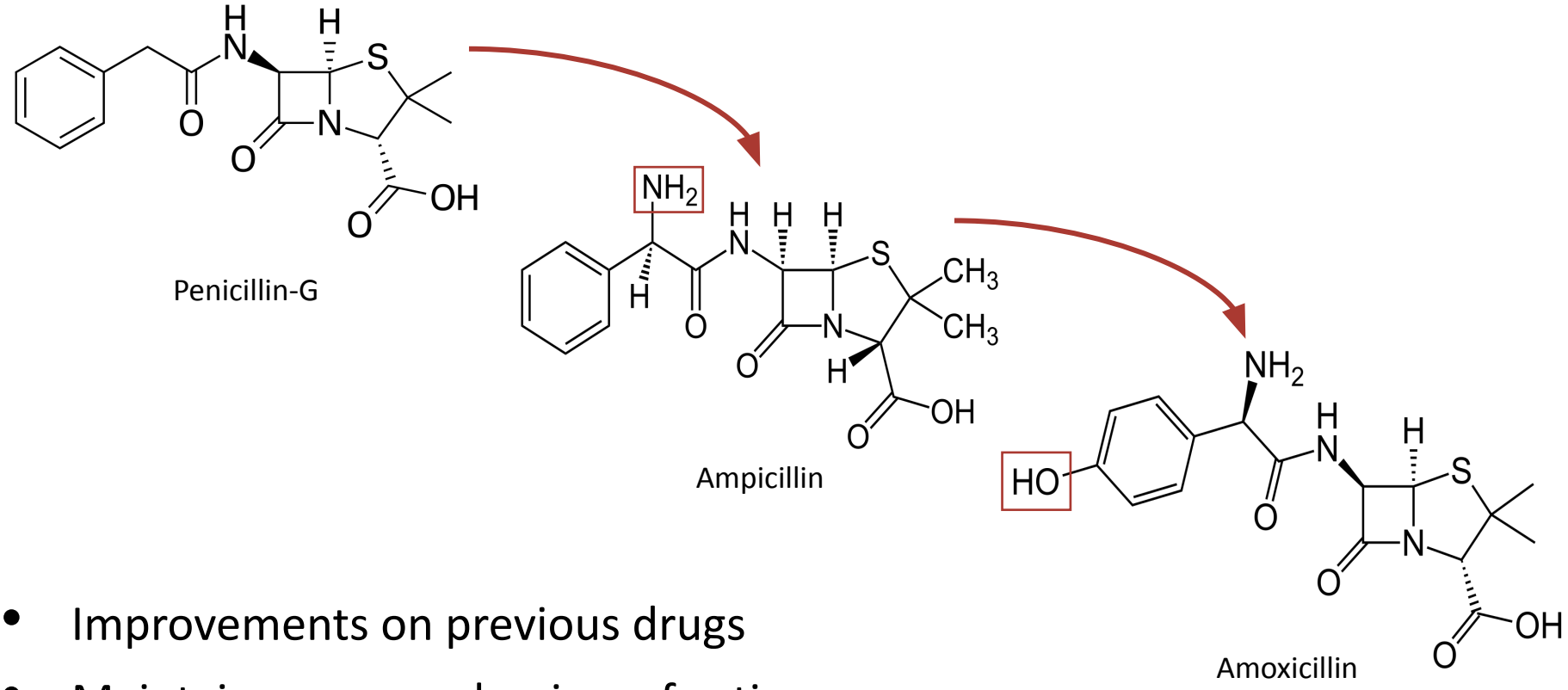
Medicinal Chemistry

118 pounds of ohmefentanyl is enough to kill every person on earth. FORTY-FOUR TIMES.



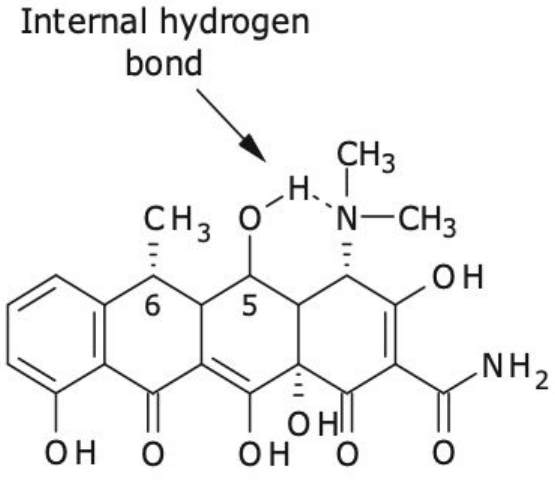

HEROIN
FENTANYL
CARFENTANIL
INCHES
1
2

Analog Drugs

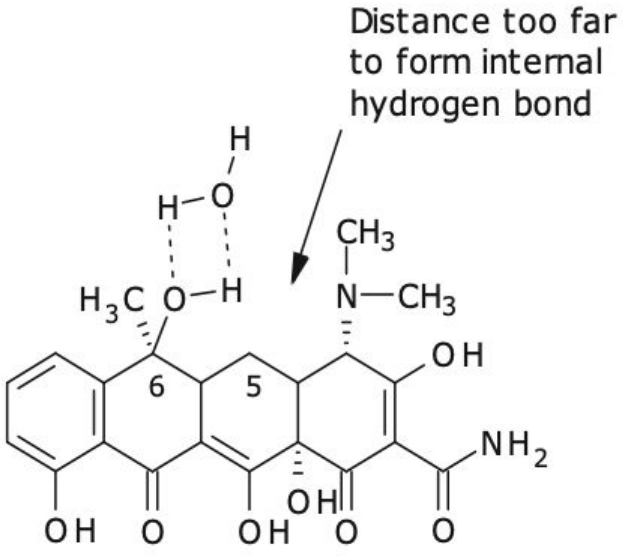


- Improvements on previous drugs
- Maintains core mechanism of action

Analog Drugs



Doxycycline



Tetracycline

- Doxycycline is less water soluble because -OH is not accessible

Conclusion

1. Describe the ways that drugs can be classified
2. Report the “good” and “bad” qualities of a drug
3. Describe the purpose of chemically altering a compound’s structure
4. Understand the basic concept of functional groups