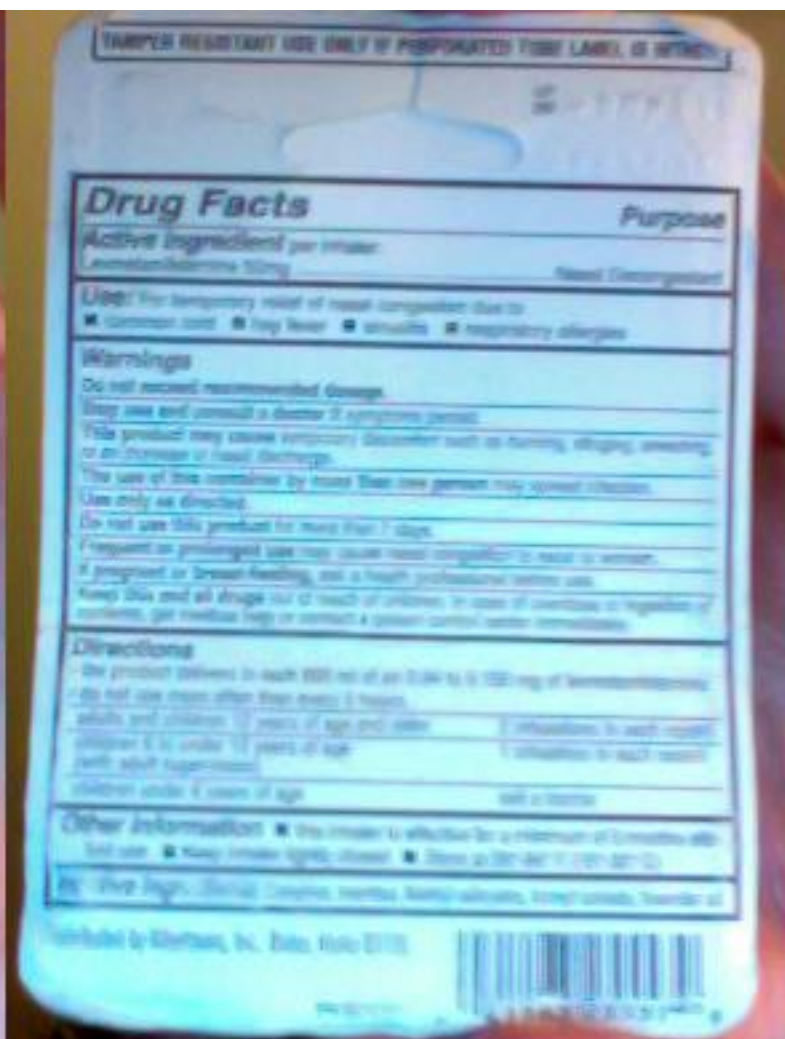


Show and tell



Mariya bought this for me (Zak) at Shaw's supermarket in Cambridge because she knew I would love it. How did she know?



Notice the active ingredient:

levmetamfetamine

Another way to spell it:

lev-o-methamphetamine

Another equally correct name, which probably wouldn't elicit the desired reaction from supermarket customers:

# Meth

# They sell meth at Shaw's?

Yes, they sell it without a prescription and they don't even keep it behind the counter with the Sudafed. They keep the Sudafed behind the counter and record your driver's license number but the meth is in an aisle and they don't even glance at your ID.

# But...

This inhaler contains only the R enantiomer of methamphetamine (also known as levo-, L-, l-, or (-)-methamphetamine). Most of the “ice”, “crank”, and “speed” on the street is either a 50/50 mix of S and R enantiomers, or it is pure S-(+)-methamphetamine. S-meth is more euphoric, but R-meth (contained in this inhaler) will definitely make you high.

# And also...

This inhaler contains a lot of other crap mixed with the meth, like camphor and menthol. I am guessing the mixture is extremely pungent and bitter. The package states it is only 25% meth by weight.

This inhaler contains 50mg of R-meth, total, and it was \$4.29. The whole inhaler would be a fairly strong dose for most normal adults, if swallowed.

# Video

- Let's watch the SMBC Theater video called "Gateway Drug"

# The Two Dichotomies

Sympathetic vs. Parasympathetic

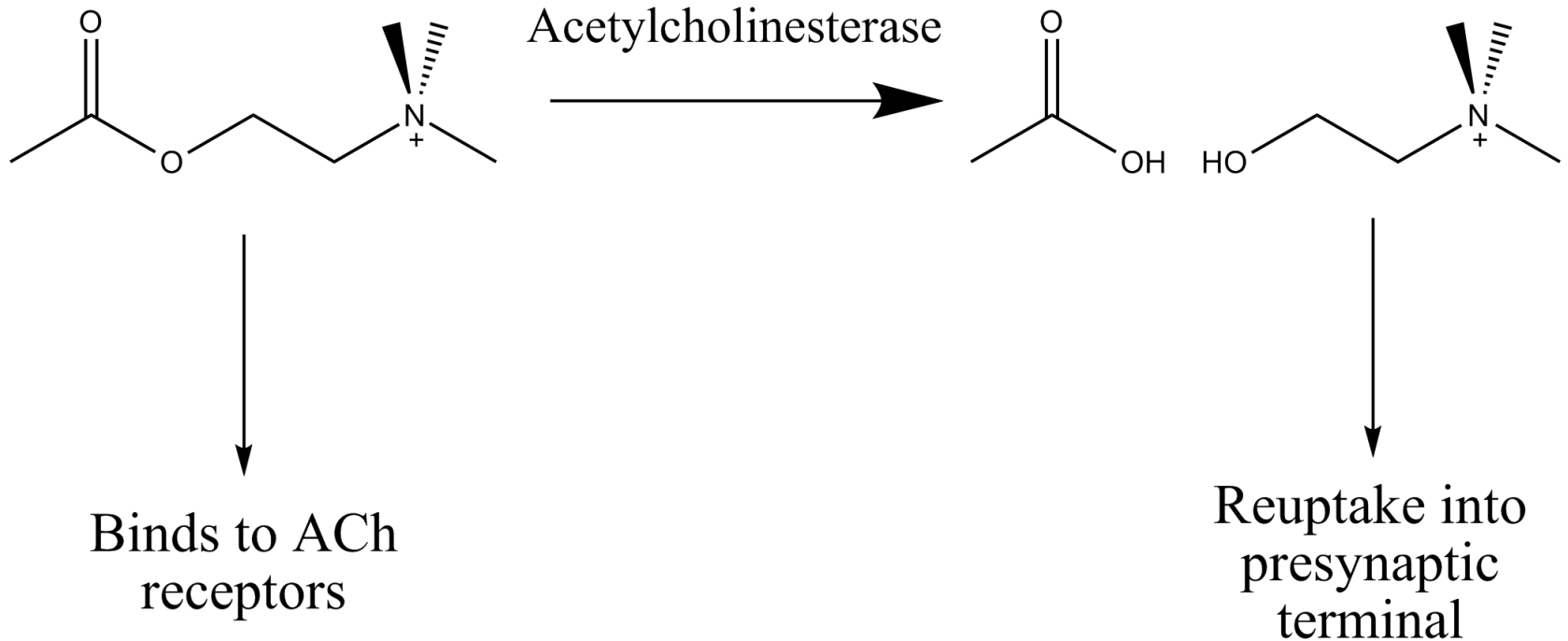
Vasoconstrictor vs. Vasodilator



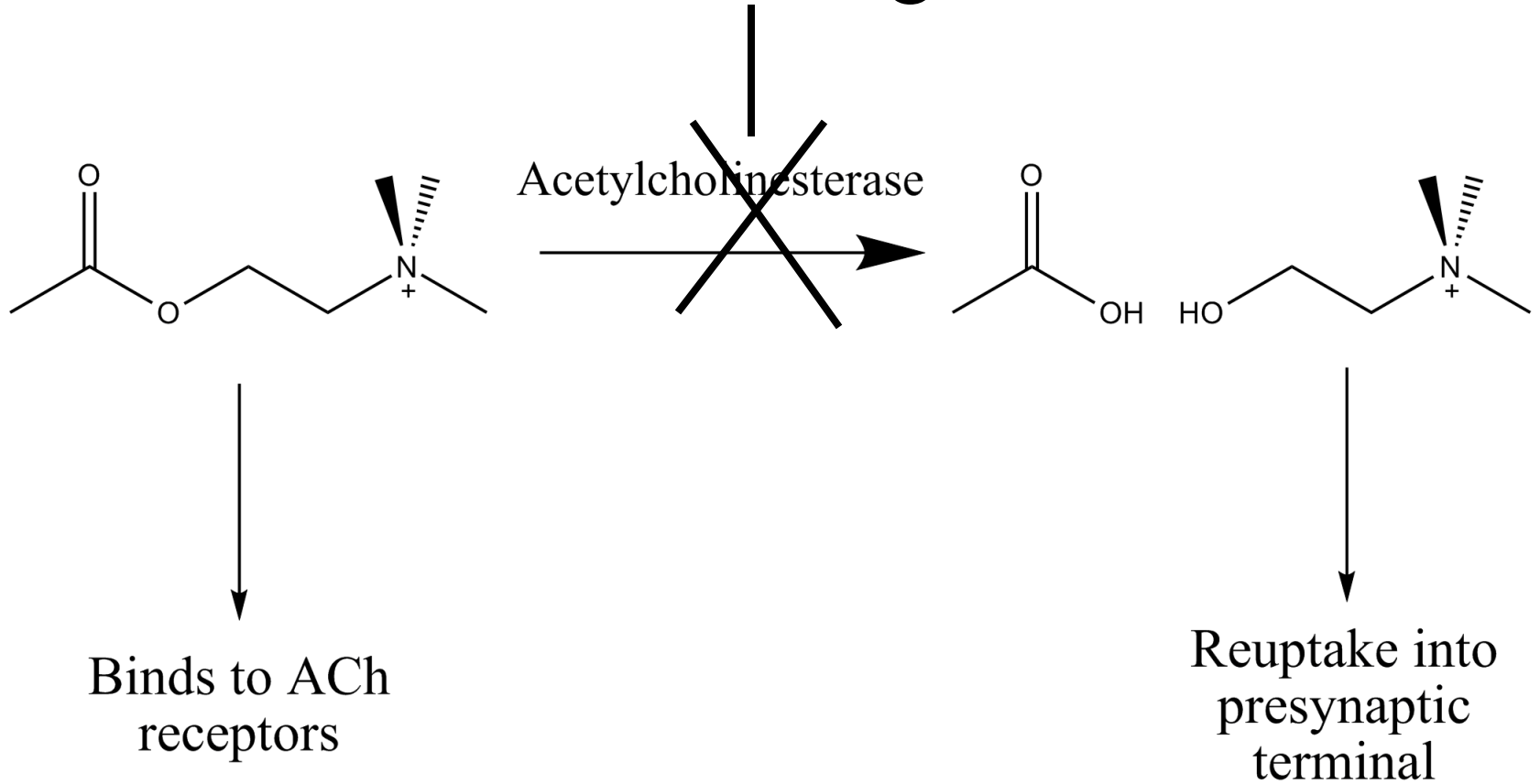
# Definition

- A dichotomy is two sets which are:
  - Mutually exclusive, and
  - All inclusive

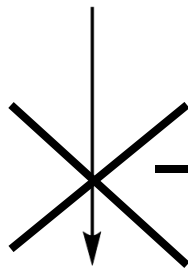
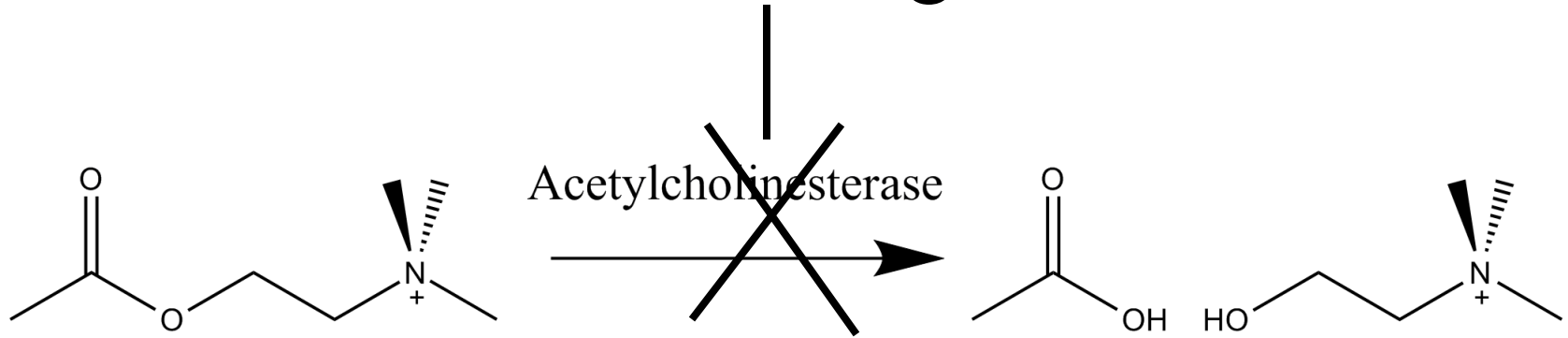
# Acetylcholine (ACh)



# VX nerve gas



# VX nerve gas



Binds to ACh receptors

BZ (anticholinergic)

Reuptake into presynaptic terminal

# Vasoconstriction and vasodilation

Vasoconstriction: Less blood flow

Useful during fight and flight

Caused by sympathetic nervous system

Caused by NE

Vasodilation: More blood flow

Useful while resting and digesting,  
secreting

Caused by parasympathetic nervous system

Caused by NO (nitric oxide)

# Vasoconstriction and vasodilation

## Vasoconstrictors:

↑NE type: Cocaine, amphetamine, pseudoephedrine, phenylephrine

Other type: Caffeine, triptans (sumatriptan)

They treat: Nasal congestion, headaches, priapism, bleeding, low blood pressure

# Vasoconstriction and vasodilation

Vasodilators:

↓NE type: Phentolamine

Other type: Viagra, calcium channel blockers (nimodipine), nitrates

(nitroglycerine), papaverine, alprostadil

They treat: Dry mouth, erectile dysfunction, ischemia (insufficient blood flow), high blood pressure, angina, heart attacks

Vasoconstrictors treat/  
vasodilators cause:

- Nasal congestion
- Headaches
- Priapism, anorgasmia
- Bleeding
- Low blood pressure
- N/A
- Asthma

Vasodilators treat/  
vasoconstrictors cause:

- Dry mouth
- Angina (heart ache)
- Erectile dysfunction
- Ischemia
- High blood pressure
- Heart attacks



# Nitroglycerine notes

Very poisonous, but never has a child proof cap or bitter stuff added, why?

Explosive factory workers get headaches on Mondays and heart attacks on Sundays, why?

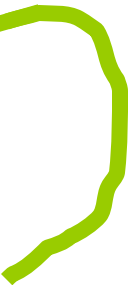
# Viagra works by strengthening parasympathetic signaling.

## Here's how the parasympathetic nervous system causes erections:

1. parasympathetic nervous system is stimulated
2. nitric oxide (NO) is released in the corpus cavernosum of the penis
3. NO binds to the receptors of the enzyme guanylate cyclase
4. Levels of cyclic guanosine monophosphate (**cGMP**) increase
5. the smooth muscles of the blood vessels relax (vasodilation) in the corpus cavernosum --> increased inflow of blood --> erection

## Here's how Viagra causes erections:

1. inhibits phosphodiesterase, the enzyme that breaks down **cGMP**
2. Step #5 is amplified



# Sexual arousal notes

Viagra works for women, too. There are also other drugs for female sexual dysfunction.

What happens if you show up at the hospital with a four-hour erection?

What will men do for an erection? (List the drugs, note the QALY studies)

Young-onset Parkinson's cocktail surprise!

# Caffeine addiction

# Cocaine notes

Cocaine is not only a vasoconstrictor, it is also a local anesthetic, this makes it ideal for surgery and nose bleeds

Cocaine addicts get high as soon as they feel the numbing

The “Novocaine” at the dentist is similar in structure to cocaine, they have to mix in a vasoconstrictor to keep it from being carried away in your blood

Cocaine not only decreases blood flow to your heart muscle, it also numbs your heart, and makes you more active so that your heart has to work harder.

Image removed due to copyright restrictions.

[View](#) a photo of the effects of cocaine-induced vasoconstriction.

# Checklist

- Headaches, asthma, allergies, nose bleeds, surgery, local anesthesia (e.g. novocaine), sexual arousal, explosives and heart attacks, and iatrogenic infarcts.

MIT OpenCourseWare  
<http://ocw.mit.edu>

ES.S10 Drugs and the Brain  
Spring 2013

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.