

OPTION D

MEDICINES and DRUGS

D1: Pharmaceutical products

and short overview of the option

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Outline of this option

- Pharmaceutical products
- Antacids
- Analgesics
- Depressants
- Stimulants
- Antibacterials
- Antivirals
- Drug action (HL)
- Drug design (HL)
- Mind altering drugs (HL)

What is a medicine or drug?

A substance that alters **one or more** of the following:

- Incoming sensory sensations
- Mood or emotions
- Physiological state
 - ◆ Consciousness
 - ◆ Activity level
 - ◆ Co-ordination

Categories of medicines

- Infection fighters
 - ◆ Antiseptics
 - ◆ Antibiotics
 - ◆ Antivirals
- Affecting metabolism
 - ◆ Hormones
 - ◆ Vitamins
- Affecting central nervous system
 - ◆ Stimulants
 - ◆ Depressants
 - ◆ Analgesics
 - ◆ Anaesthetics

Placebo Effect

- Inert substance **but effective**
- Used as control substance
- Power of suggestion
- Body's natural healing

Research on new products

1. Tests on animals
Dose, side effects
 2. Clinical trial (phase 1)
Safety, dose range
 3. Clinical trial (phase 2)
Response, investigator bias, statistics
 4. Clinical trial (phase 3)
Extended evaluation
- > 16/3620 medicines into the market in 1970
 - > **Thalidomide**: for morning sickness but deformed babies

Administration of drugs

- Oral
convenient, absorbed at small intestines
- Rectal
when not able from mouth or destroyed by acids
- Inhalation
rapid, anaesthesia
- Parenteral / Injection
 - ◆ Subcutaneous (dental, slow)
 - ◆ Intramuscular (vaccinations, large V)
 - ◆ Intravenous (fast, practical)

Lethal Dose (LD₅₀)

= the dose of a substance in mg per Kg of body mass, that kills 50% of sample

**The smaller the LD₅₀,
the more toxic the substance**

<i>Examples:</i>	<i>aspirin</i>	<i>rat: 200</i> <i>rabbit: 1000</i>
	<i>nicotine</i>	<i>rat: 50</i>
	<i>ethanol</i>	<i>rat: 9000</i>

Effective Dose (ED₅₀)

= the dose of a substance in mg per Kg of body mass, that is effective to 50% of sample

**The smaller the ED₅₀,
the more effective the substance**

Examples: aspirin 55

Therapeutic window

= the ratio of LD50 over ED50

**The wider the window,
the safer the substance**

Examples: aspirin

therapeutic window = 200/55

Drug effect

- Main effect (desired)
- Side effects (unwanted responses)

Drug effects are relative!!

Morphine:

For pain relief, constipation is side effect

For diarrhoea, pain relief is side effect

Tolerance

Over time and with regular use, the user requires larger dose of the drug to achieve the effect originally obtained by smaller dose

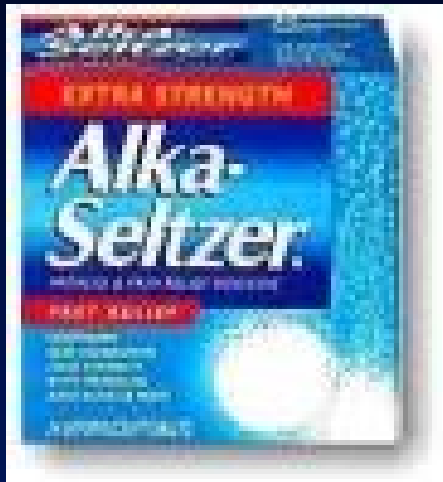
- Increase of hazards (larger amounts)
- No tolerance to side effects
- If drug not taken for long time > decrease of tolerance > **overdose**

And now a short
presentation of the rest of
the topics of this option...

ANTACIDS



- Why is stomach acidic?
- How can we neutralize it?
- What are the most common antacids?
- What are the neutralizing reactions?
- With what can the antacids be combined?



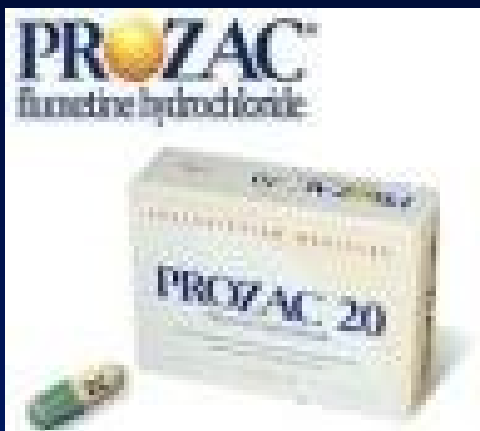
ANALGESICS



- What are soft and strong analgesics?
- How do they prevent pain?
- Aspirin versus paracetamol?
- Morphine versus heroin/codeine?
Advantages – disadvantages?



DEPRESSANTS



- What is their effect?
- How is effect dependant on dose?
 - ◆ Tranquilizers
 - ◆ Sedatives
 - ◆ Hypnotics
 - ◆ Anaesthetics
- **Ethanol** (effects, detection)
- Most common depressants?

STIMULANTS



- What is their effect?
- **Adrenaline** versus **amphetamines**
- **Nicotine**
 - ◆ Short-term effects
 - ◆ Long-term effects
- **Caffeine**
 - ◆ Effects
 - ◆ Comparison to nicotine



ANTIBACTERIALS



- The discovery of **penicillin**
- How penicillin works
- Modifications of penicillin
- Use and overprescription

- **Broad versus narrow spectrum antibiotics**

ANTIVIRALS



- **Viruses** versus **bacteria**
- How do antiviral drugs work?
- What is **HIV** and what **AIDS**?
- Why is it difficult to fight HIV?
- (AIDS prevention methods?)

DRUG ACTION

- Geometrical isomers can have different pharmacological effects
- **Examples:** CISplatin – Thalidomide
- Optical isomers can have different pharmacological effects
- **Examples:** Thalidomide
- How structural features affect the pharmacological effect
- **Examples:** Penicillin, heroin

DRUG DESIGN

- Compound library
- Combinatorial and parallel chemistry
- Computer aided drug design
- Polarity modification
- Chirality modification

MIND ALTERING DRUGS

- LSD, Mescaline, Psilocybin, THC
- Effects similarities, differences
- Legalization of cannabis