What the Heck is in Vaccines?

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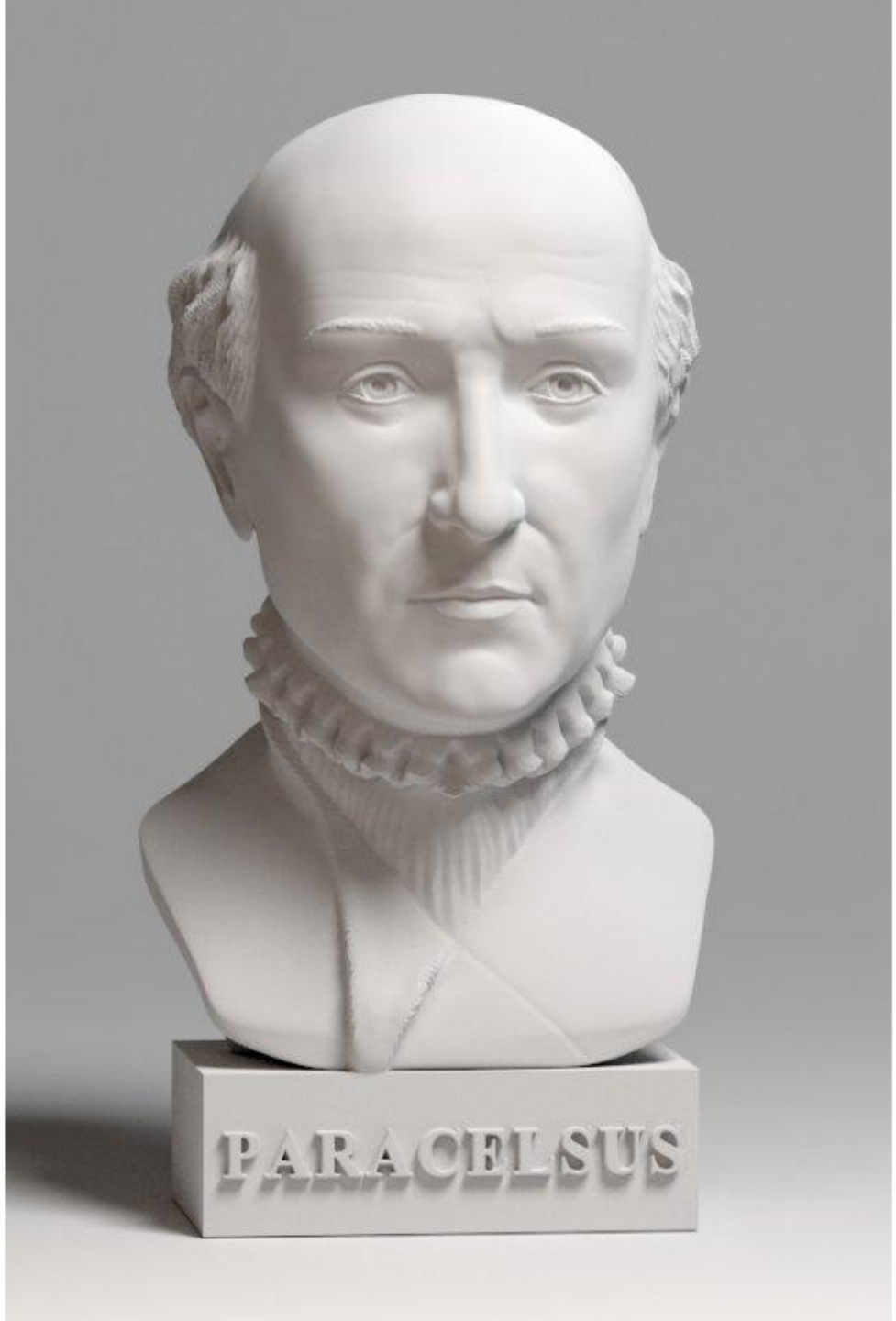
Disclosures

- No disclosures.
- I receive no support from pharmaceutical companies either directly or indirectly.
- No photograph is of a patient.
- Use of a trade name of a vaccine does not imply endorsement of that vaccine.

Poison or Harmless?

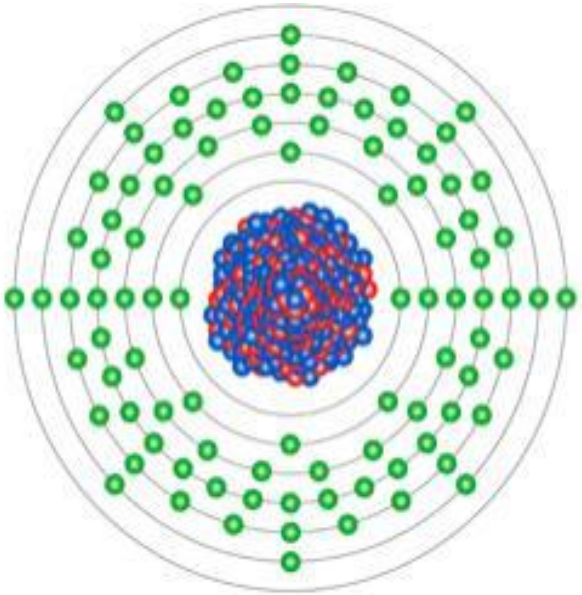
- Plutonium
- Lead
- Vitamin A
- Water

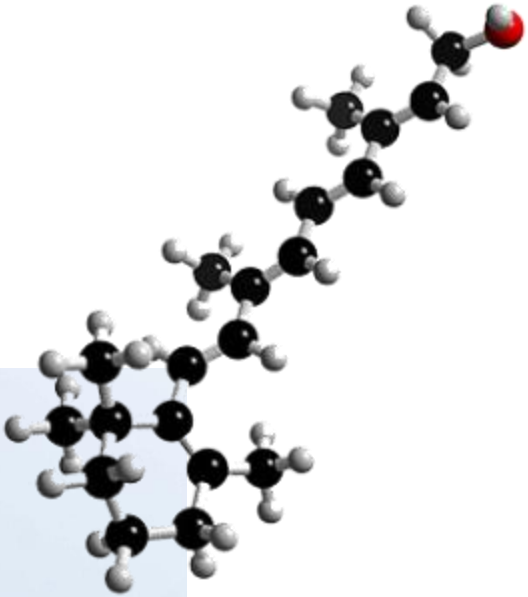
FAMOSO·DOCTOR
PARESELSVS


PARACELSUS

Paracelsus

- Born in Switzerland in 1493
- Alchemist, botanist, chemist, doctor, astrologer
- Full correct name was Theophrastus Phillippus Aureolus Bombastus von Hohenheim
- „Dose makes the poison“.
  - All substances have the potential to be both innocuous and poisonous





Vaccines

- Vaccines prompt the immune system to go through some of the same biological reactions caused by a disease without forcing the recipient to get sick.
- Vaccines contain numerous components to enable these biological reactions.

So What is in Vaccines?

- Antigens
- Preservatives, antibiotics
- Buffers, stabilizers, solubilizer
- Adjuvants
- Residuals

Antigens

Toxoids – diphtheria, tetanus,

Inactivated (killed) virus – polio, Hep A

Recombinant viral surface protein – Hep B

Purified, subunit viral proteins – inact. influenza

Bacterial

- proteins – pertussis
- conjugated polysaccharides – Hib, PCV13, mening

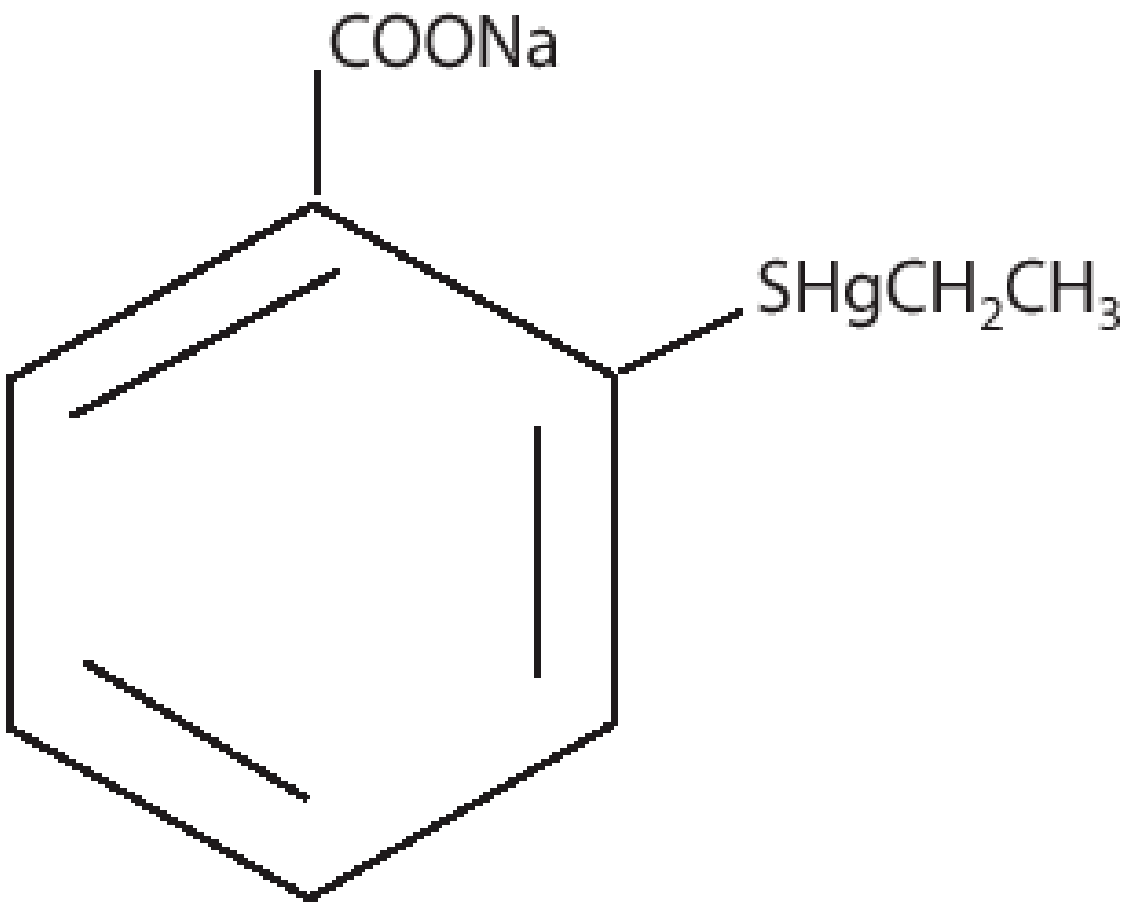
Live, attenuated viruses – M,M,R,V, rotavirus

Live, cold adapted, temp sens – LAIV

Preservatives, antibiotics

- Preservatives
  - Prevent the growth of bacteria, fungi
  - Required to be in multi-dose vaccine vials in US.
  - Definition is functional
    - A vaccine preservative must reduce the number of test dose bacteria and prevent the growth of yeast (In: Vaccines additives and manufacturing residuals in U.S.-licensed vaccines, pg 74.)
    - Challenged with *Candida albicans, Aspergillus niger, E.coli, Staph aureus, Pseudomonas aeruginosa*

Thimerosal



Preservatives, antibiotics

- Cannot decrease potency of the product
- Preservatives used
  - phenol (Pneumovax 23)
  - 2-phenoxyethanol (Daptacel, Pentacel, Adacel, IPV)
  - Thimerosal (multidose influenza). Trace amounts in several vaccines.

Preservatives, antibiotics

- Antibiotics
  - Residual from cell culture
    - Streptomycin B, gentamicin, neomycin, polymyxin B

Stabilizers, solubilizers

- "Stabilizers" have several purposes
  - Prevention of adherence to vial wall
  - Stability in freeze-drying
- Sugars (sucrose, sorbitol), amino acids, proteins
- Albumin, gelatin, bovine serum products
  - Concern re: prion diseases
    - Bovine products must be non BSE-country sourced
  - Can induce anaphylaxis
    - 5 cases in 7,644,000 doses

Buffers, solubilizers

- Hydrochloric acid
  - Adjusts pH to be more acidic in DTaP
- Emulsifier, solubilizer: Polysorbate 80
  - Made from glucose and oleic acid

Adjuvants

- Adjuvant is a substance to improve the immune response
- Aluminum-based compounds are common
- During the first 6 months of life, children could receive 4 milligrams of aluminum
  - During the same interval
    - 10 mg in breast milk
    - 40 mg in cow-milk formula
    - 120 mg in soy-based formula

Adjuvants

- Aluminum compounds
  - Crystalline, high surface area
  - Solubilized by citric, oxalic and malic acids
  - Adsorb antigens well
  - Immunopotentiator, property discovered in 1926
    - Mechanism uncertain
      - Depot
      - Inflammation
      - Adsorption

Adjuvants

- Monophosphoryl lipid A
  - Bacterial lipid toxoid
  - Used in HPV2

Residuals

- Formaldehyde, formalin (water solubilized), glutaraldehyde (many non-live vaccines)
  - Residual amounts after inactivating the toxin activity while preserving antigenicity

Residuals

- Protein:
  - E.g. yeast, egg
- Cell walls
  - E.g. Vero cells, monkey kidney cells
- DNA
  - E.g. Vero cells, fetal cell lines,

What Vaccines Do NOT Contain

- Historic types of antifreeze
  - Which is ethylene glycol
  - Vaccines contain propylene glycol
    - Component of oils that are used in many foods
- Aborted fetal tissue
  - Vaccine viruses are grown in two cell lines that were derived from cells from legal abortions
    - 2005 Vatican Pontifical Academy for Life statement
    - Usage was acceptable because vaccines save lives.