

### Topic 3: Headaches

- 90% of the population experience headaches
- It was once believed that headaches were caused by demons
  - They would put the patient's head in an oven to chase the demons out
  - Metallic tractor: place hot needles in the ear which were supposed to get rid of the demons
  - Surgical cures:
    - Trepanation: they would cut a hole in the skull, supposed to alleviate the pressure, different shapes and sizes of holes were supposed to treat different types of headaches
      - There was no way to reseal the hole
      - They thought it was important to leave the hole open so the brain can "breathe"
      - There are some people who still perform this
        - Example: the hole in the head gang: was a cult who believed that our skulls were never meant to be intact
- The brain itself does not feel pain
  - The origin of the pain is the thin layer of tissue that surrounds the skull
- 12 types of headaches (60 sub-types)
- 2 classes (the two can be treated differently)
  - Muscular
  - Vascular
- Muscular Headache
  - Created by contractions in the muscles band surrounds the skull
    - When it contracts it compresses the tissues surrounding the skull
  - Usually caused by stress
  - Can be treated with a pain medication
    - The ones that reduce the production of prostaglandins would be more effective (ASA, Ibuprofen, Naproxen)
- Vascular Headache:
  - Effects the blood circulation surrounding the head
  - 3 types:

### Toxic

- Caused by poisons (duh)
- The drugs that reduce the production of prostaglandins would be more effective (ASA, Ibuprofen, Naproxen)
- You ingest something that is causing a poisonous result in your body and the headache is your body reacting to the poison
- Pain is caused by vasodilation
  - As the veins get larger they squish the tissue surrounding the skull, which is what causes the pain
- As hangover is an example of a toxic headache
  - Depending on how your body metabolizes the alcohol decides whether you get hung over or not

- Once all the alcohol had been converted to acetic acid your hangover will go away
- Acetaldehyde (the first thing that the alcohol is converted to) is the main cause of the headache not the actual ethyl alcohol
- If someone had more alcohol dehydrogenase than acetaldehyde dehydrogenase you will be more susceptible to the effects of alcohol and are more prone to hangovers
- Antabuse disulfiram is a drug that will completely block acetaldehyde causing an almost immediate extreme hangover, is used on alcoholics to help them quit drinking
- Aged alcohol tends to give a worse hangover
- Part of the aging process the alcohol will extract chemicals from the container it is being aged in, these chemicals can also have a toxic effect along side the alcohol
- Both enzymes are produced by the liver, so liver function is stimulated when consuming alcohol
- Alcohol makes acetaminophen a toxic material
- Some red wines have histamine, which can cause headaches in some people
  - Can be found in other fermented foods too
    - Sauerkraut
- Tyramine
  - Found in aged cheeses
- Nitrites
  - Hotdogs
  - Preservative
  - Potent vasodilator
- Monosodium glutamate (MSG)
  - Flavour enhancer, found in seaweed
  - It was thought because a doctor wrote a letter to the editor of the new England journal of medicine that he was getting headaches after eating at restaurants, and thought it was the seaweed that was causing them
  - However it has been proven that MSGs don't cause them
  - They are very widely found in prepackaged foods
    - This is because when you cook things in a industrial scale it tastes differently
    - This is because of the rates that heat goes in and our and the way it is transferred you lose the flavours
    - Disguised as hydrolyzed vegetable protein
  - It is a normal human metabolite
    - We use it to produce protein
- Caffeine
  - Vasoconstrictor, if you drink too much there is only so much constriction that your body can handle so it starts to vasodilate, then on a day that you do not drink coffee you will experience a headache due to the vasodilation
  - Because of the vasoconstrictor aspects the caffeine can actually help reduce your headache

- Brain freeze
  - When you swallow stuff your tongue squeezes the food against the soft palate, and pushes it toward the back of the mouth
  - When you are eating something cold it will cool the soft palate, causing your body to think that your head is so cold so it dilated the blood vessels to rewarm the head
- Part of the bodies response to detoxify ro get rid of the toxic substance

## **Migraine**

- Is an overused term
- 18% of women get them
- 6% of men get them
- Two stage process
  - Stage 1: vasoconstriction
    - Not painful
  - Stage 2: vasodilation
    - The painful aspect
- Initiated by triggers
  - Tension
  - Lack of sleep
  - Menstruation
  - Foods
  - Relaxation
  - Too much sleep
  - Pregnancy
  - Drugs
  - Strong smells
- Once it have been triggered there are 4 stages: (not everyone experienced all 4)
  - Prodrome phase
    - Gives a warning
    - Mood swings
    - Can happen hours or days before the migraine
  - Aura:
    - 20-30% suffers get auras
    - One or two hours before pain phase
    - Symptoms:
      - Scotomas
        - Visual disturbances, flashes of light
      - Olfactory hallucinations
      - Auditory hallucination
      - Vertigo
      - Reduced sensation
      - Hypersensitivity
  - Pain:
    - Pain only occurs in half the head

- Lasts 1-72 hours
    - Nausea
    - GI disturbances
    - Movement makes it worse
    - Sensitive to light, sound, smell
  - Postdrome:
    - Hung over, exhausted
    - Takes hours or days
    - Poor concentration
    - Depression or euphoria
- Treatment
  - A.S.A
  - Acetaminophen
  - Ibuprofen
  - Naproxen
  - Prescription pain meds
  - Triptans
    - Stop the biochemical reactions in the brain that cause the headache
    - Ergot fungus found in rye bread:
      - Used in middle ages to stimulate muscle contractions (like for childbirth)
      - Causes powerful hallucinations
      - In the medieval times the combination of these two symptoms were categorized as demon possession/witchcraft
        - Rye was also a staple in the diet in Salem, causing the Salem Witch trials
      - Causes St. Anthony's Fire
      - It can be used as a vasodilator and to treat migraines
      - Had mixed results in 1862 but because they were using an extract and extracts can have different amounts of active ingredient
      - In 1918 the active ingredient, ergotamine, was isolated as a powder substance
        - Still used today as Cafergot, a combination of caffeine and ergotamine
        - It is not an ideal drug (not drug-like, not an ideal substance) though because if the dose is wrong it can have very serious side effects:
          - Hallucinations
          - Muscular contractions
          - Vasoconstriction
          - Gangrene
          - Death
        - LSD was discovered when trying to create drugs that had a better effect than ergotamine
          - Got a little residue on his hands and licked it

- He then experienced an hallucination, a good one
- A couple days later he took a higher dose on purpose (celebrated as the bicycle day in the drug world)
- He then used it throughout his life and it spread throughout the states as a recreational drug
- Was used by the CIA as a psychic war drug

**Cluster** (not going to cover this)

Drug-like substance:

- Provides beneficial effect
  - Specific
- Limited side effects
  - Low incidence
  - Low severity
- Cheap to manufacture
- Patentable
  
- The chemical nerve signals are enhanced (tbh idk what he's talking about, he was talking about serotonin or something and something to do with migraine medication)
- Nerve signals are cascading chemical reactions
  - One reaction will set off another, which will then set off another, until the message reaches the part of the body it was meant for
- In a migraine headache a cell will not stimulate enough neurotransmitters, a drug can imitate the transmitters and help transmit the message and prevent the migraine
  - The transmitter that is being mimicked is serotonin
    - We mimic it because it is a poor drug
    - It also has other jobs other than preventing headaches and we don't want to mess with that
    - Can't actually be transferred from our blood to our brain due to its molecular structure
    - Discovered that sections of LSD and Ergotamine are almost identical to Serotonin, they used this info to create Sumatriptan (which is part of the category of Triptan drugs)

Triptan

- Meant to be taken before a migraine to prevent it
  - Can be taken when you get an aura for example
- It replaces the neurotransmitter serotonin in the brain