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HDL Seminar 2022.12.12

Verbose version

<https://github.com/uit-hdl/mimisbrunnr/blob/main/reports/Latex/vitamimD/vitamimD.pdf>

- What are vitamins and vitamin D
- Basic metabolism
- Calcium homeostasis
- Understanding advance metabolism and vitamin D functions
- Toxicity and deficiency
- Calcium and Vitamin D food
- Ultraviolet radiation
- Results

Vital Amines

Antioxidant
(antireactive oxyde species, ROS, free radicals)

Co-enzymes
(help making chemistry happens in your body)

B1
B2
B3
B4
B6
B7
B9
B12
C
K3



Water soluble



Fat soluble

A
D1
D2
D3
D4
D5
E
K1
K2

Synthetic



D1
D2
D3
D4
D5

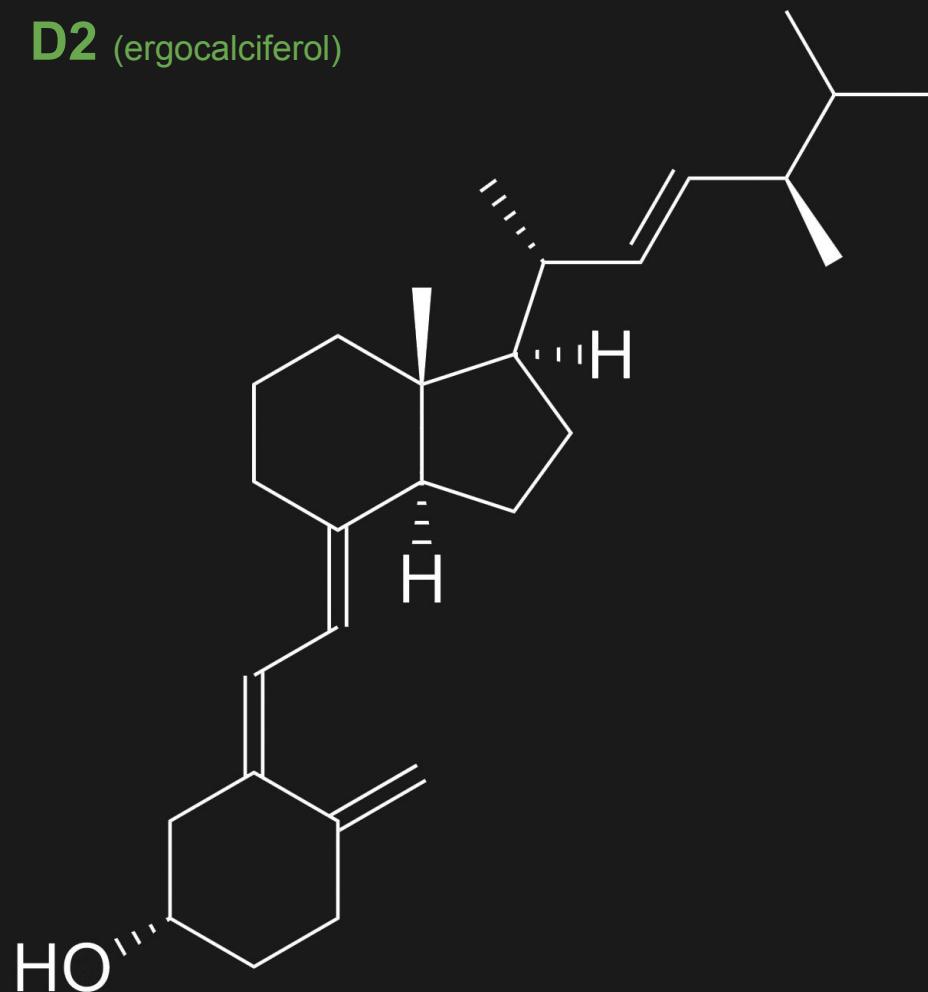
Extremelly rare



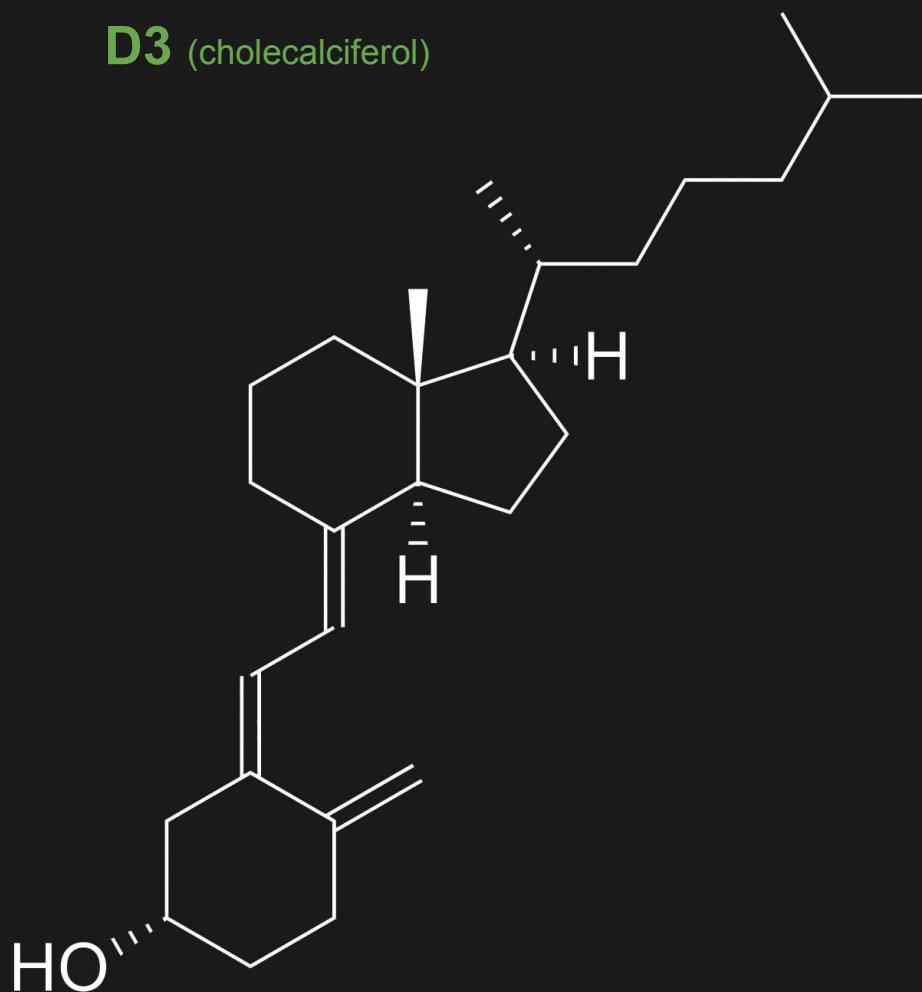
Synthetic



D2 (ergocalciferol)



D3 (cholecalciferol)



Vitamin D

Basic metabolism



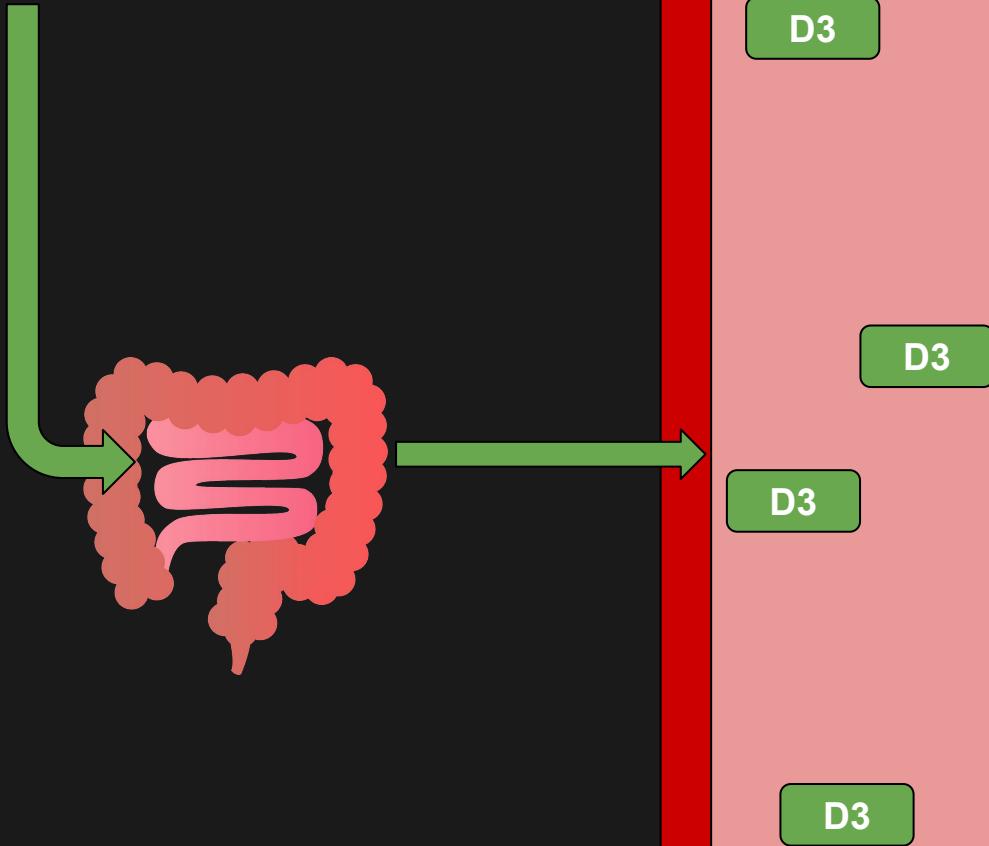
D3 (cholecalciferol)



Blood vessels

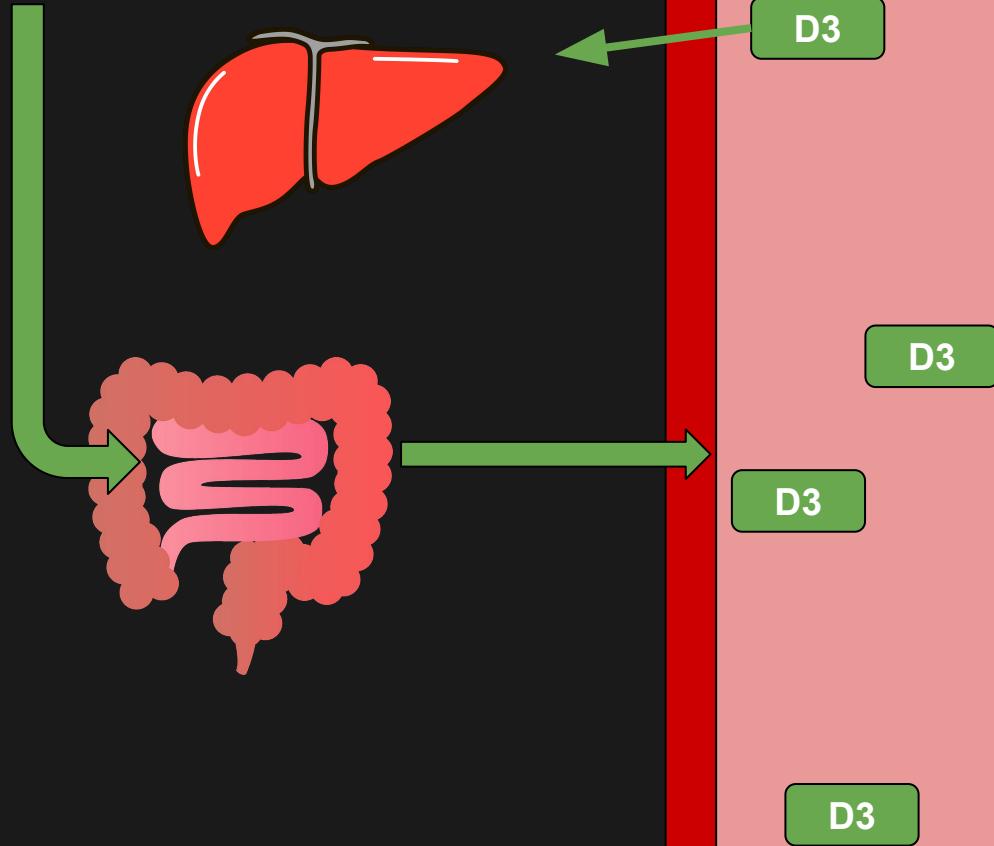


D3 (cholecalciferol)

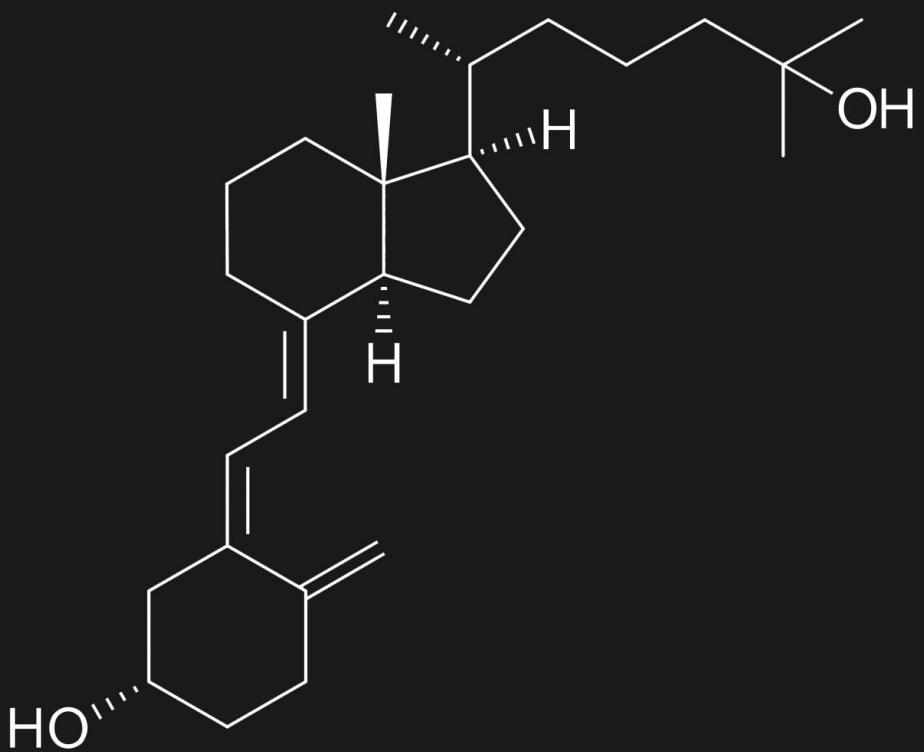




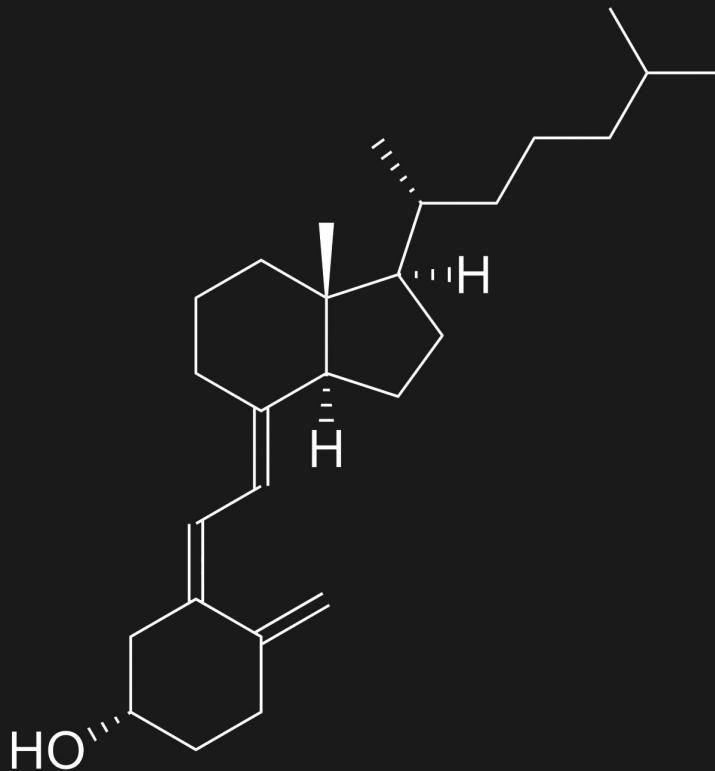
D3 (cholecalciferol)



25(OH)D (Calcidiol)

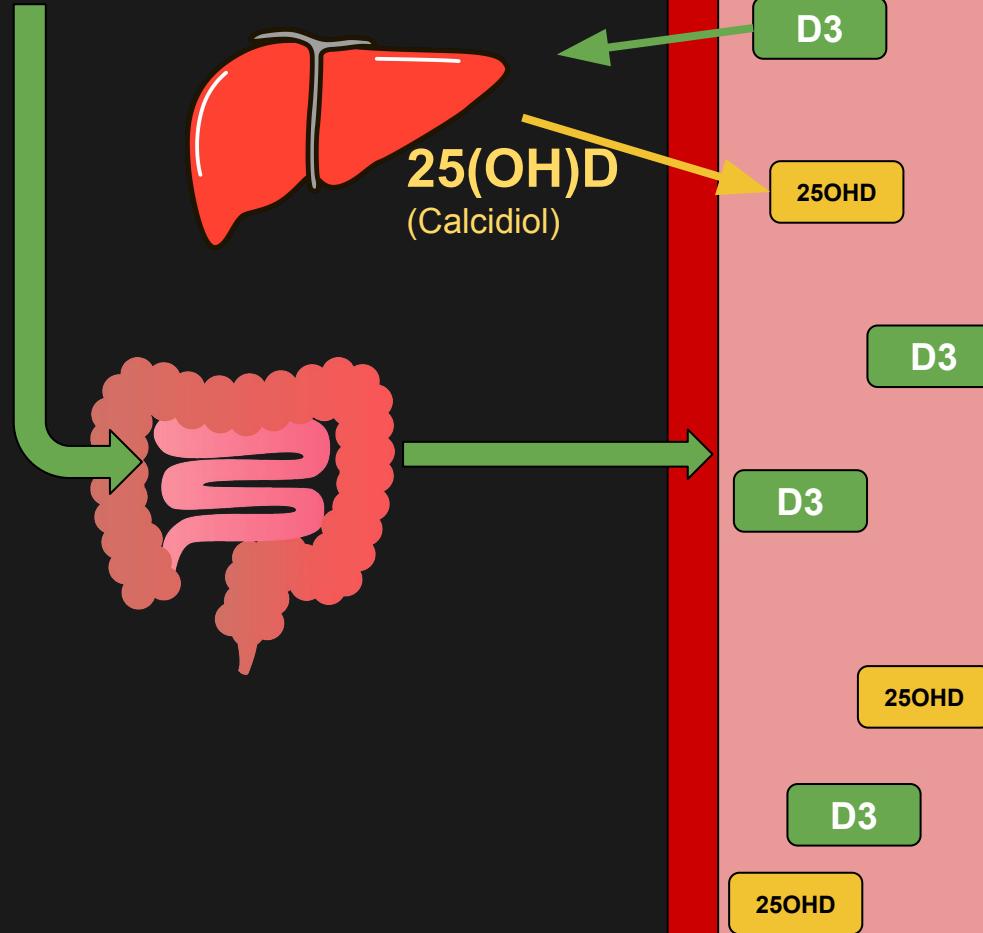


D₃ (cholecalciferol)



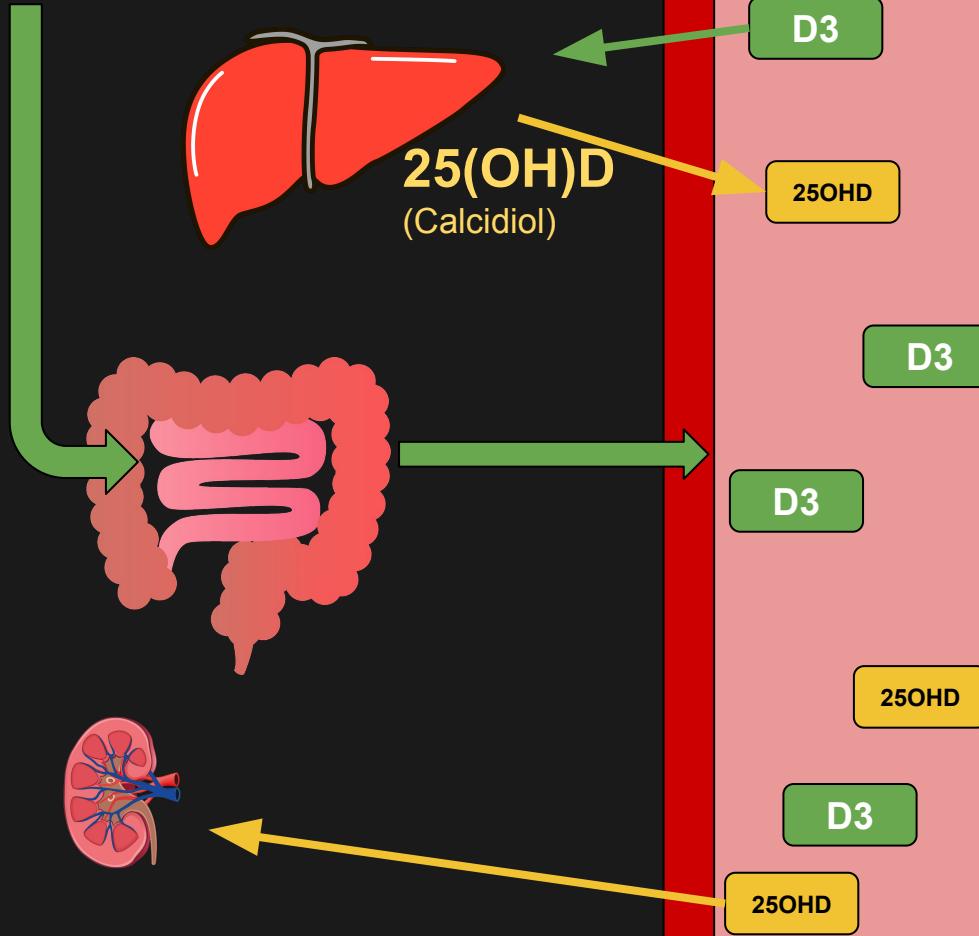


D3 (cholecalciferol)

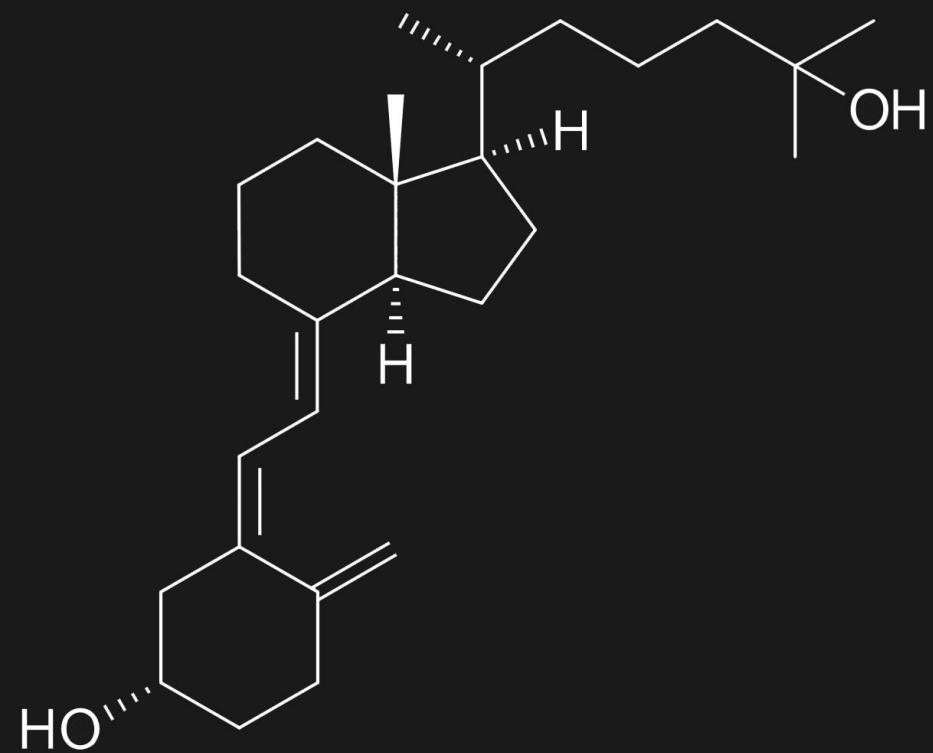




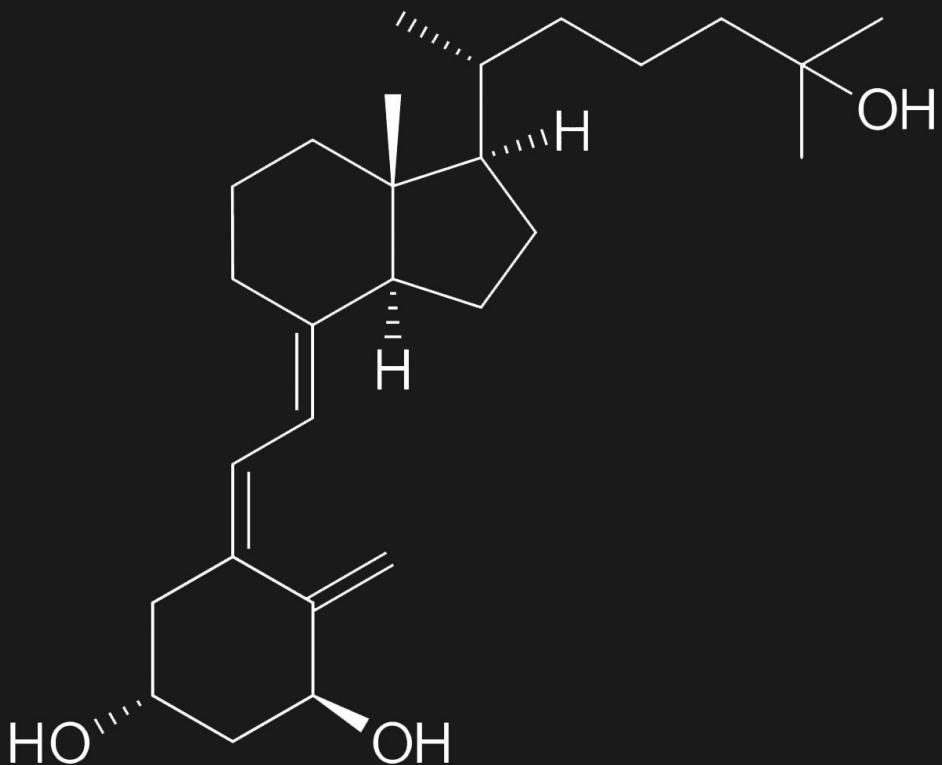
D3 (cholecalciferol)



25(OH)D (Calcidiol)

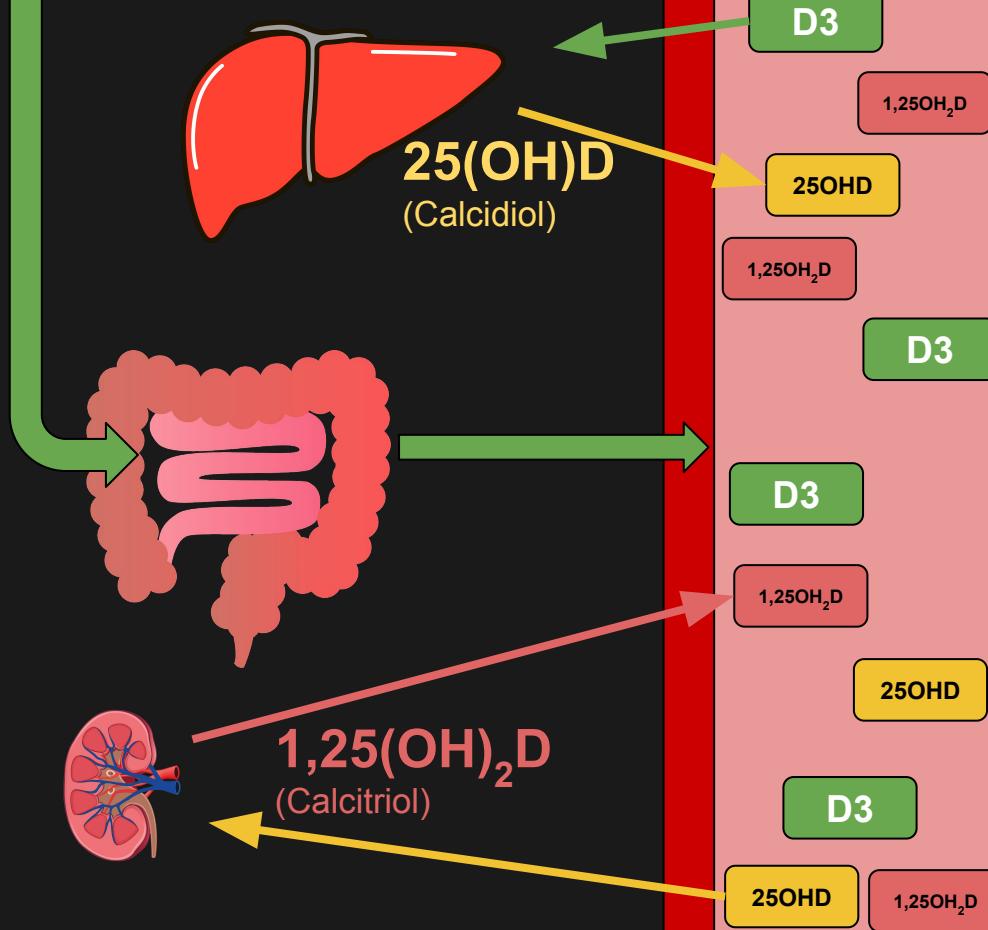


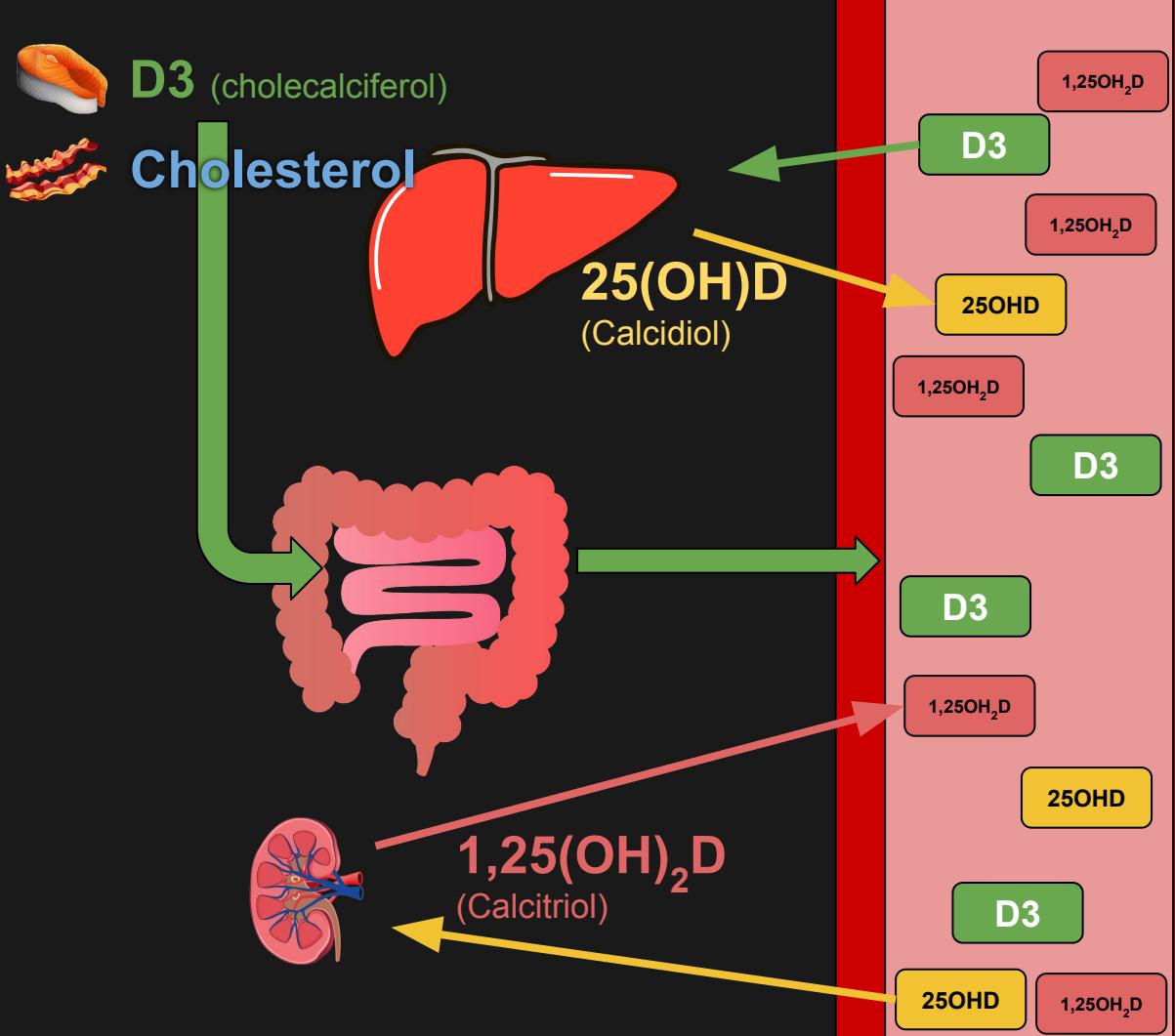
1,25(OH)₂D (Calcitriol)

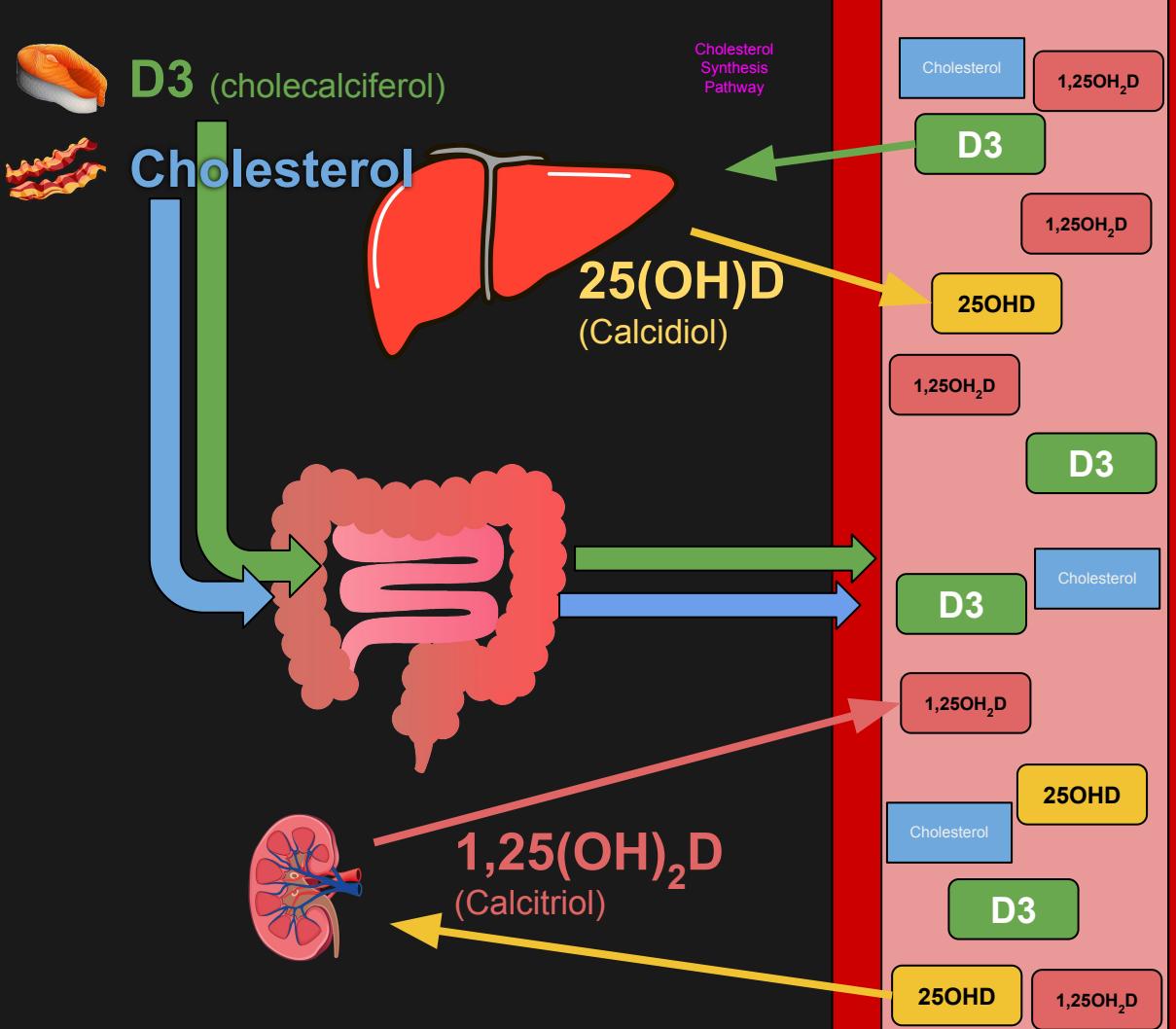


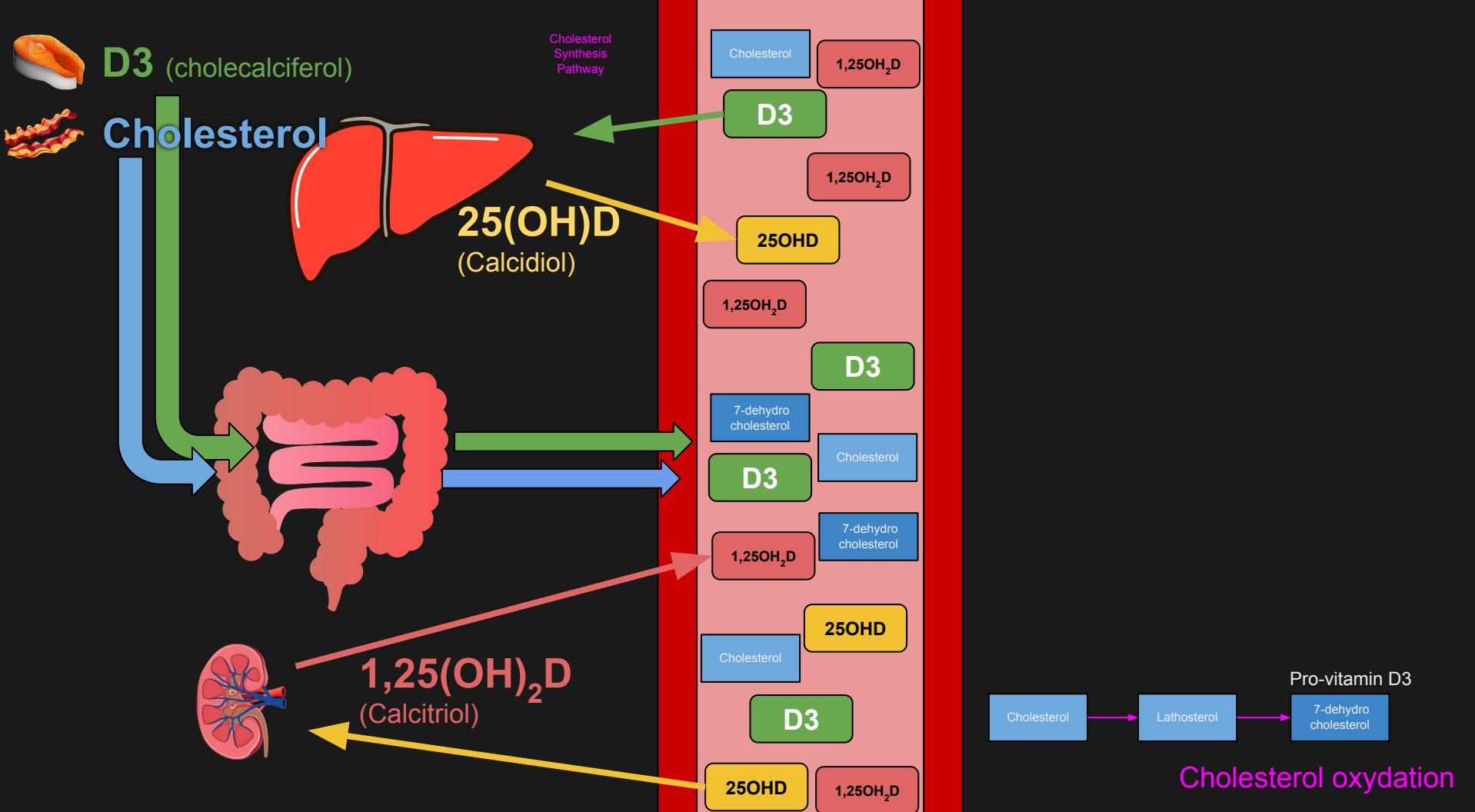


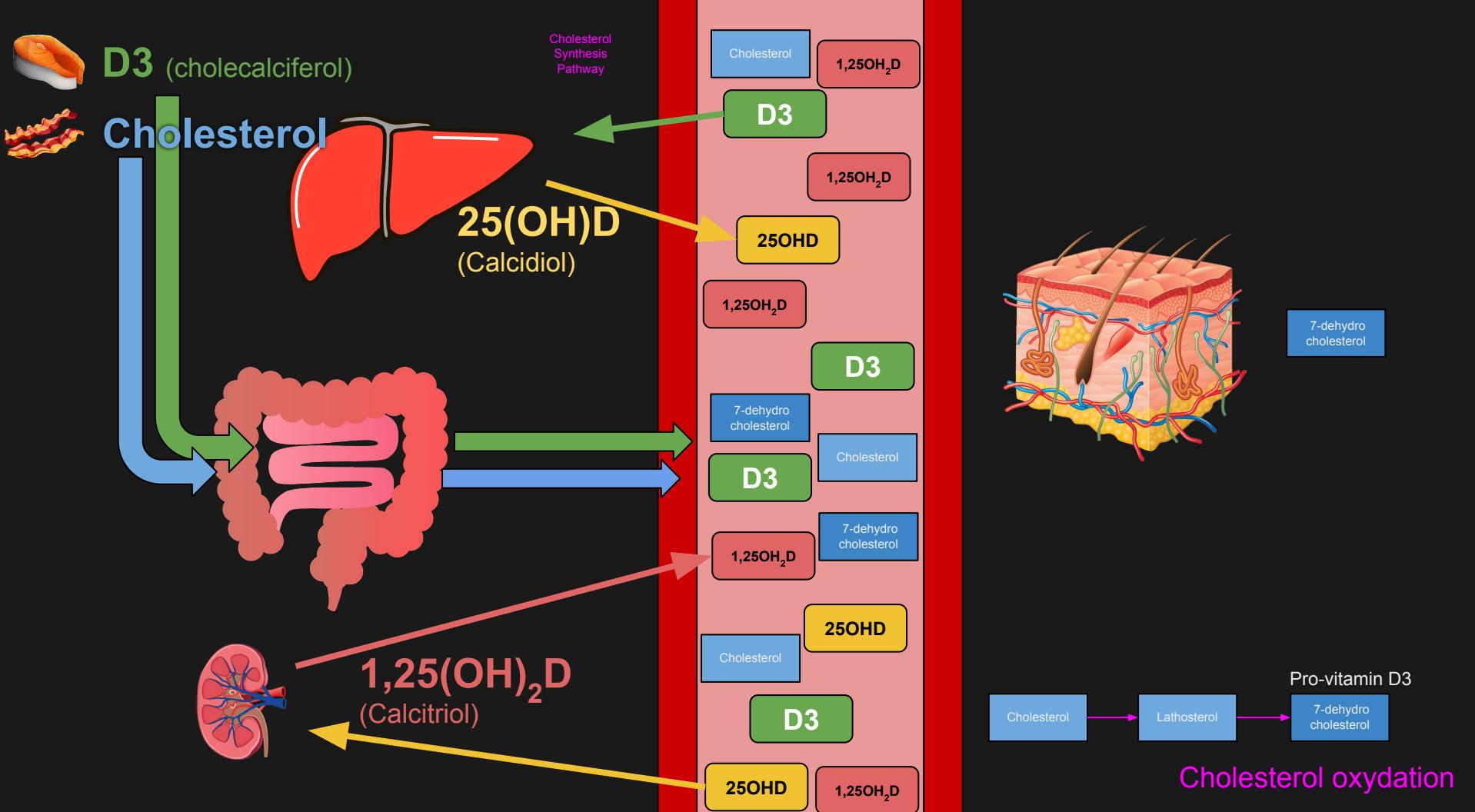
D3 (cholecalciferol)

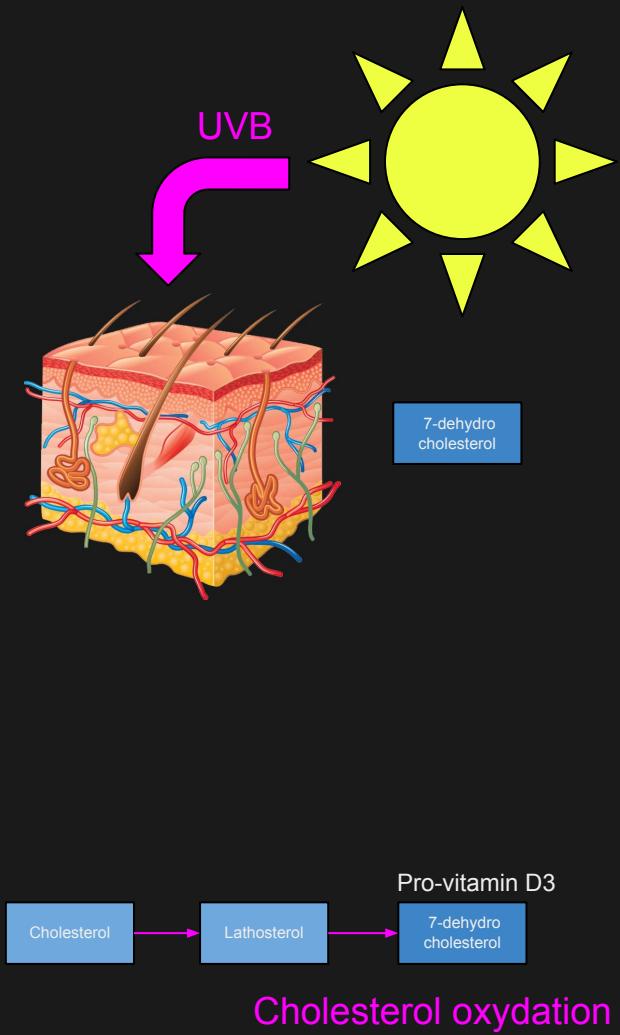
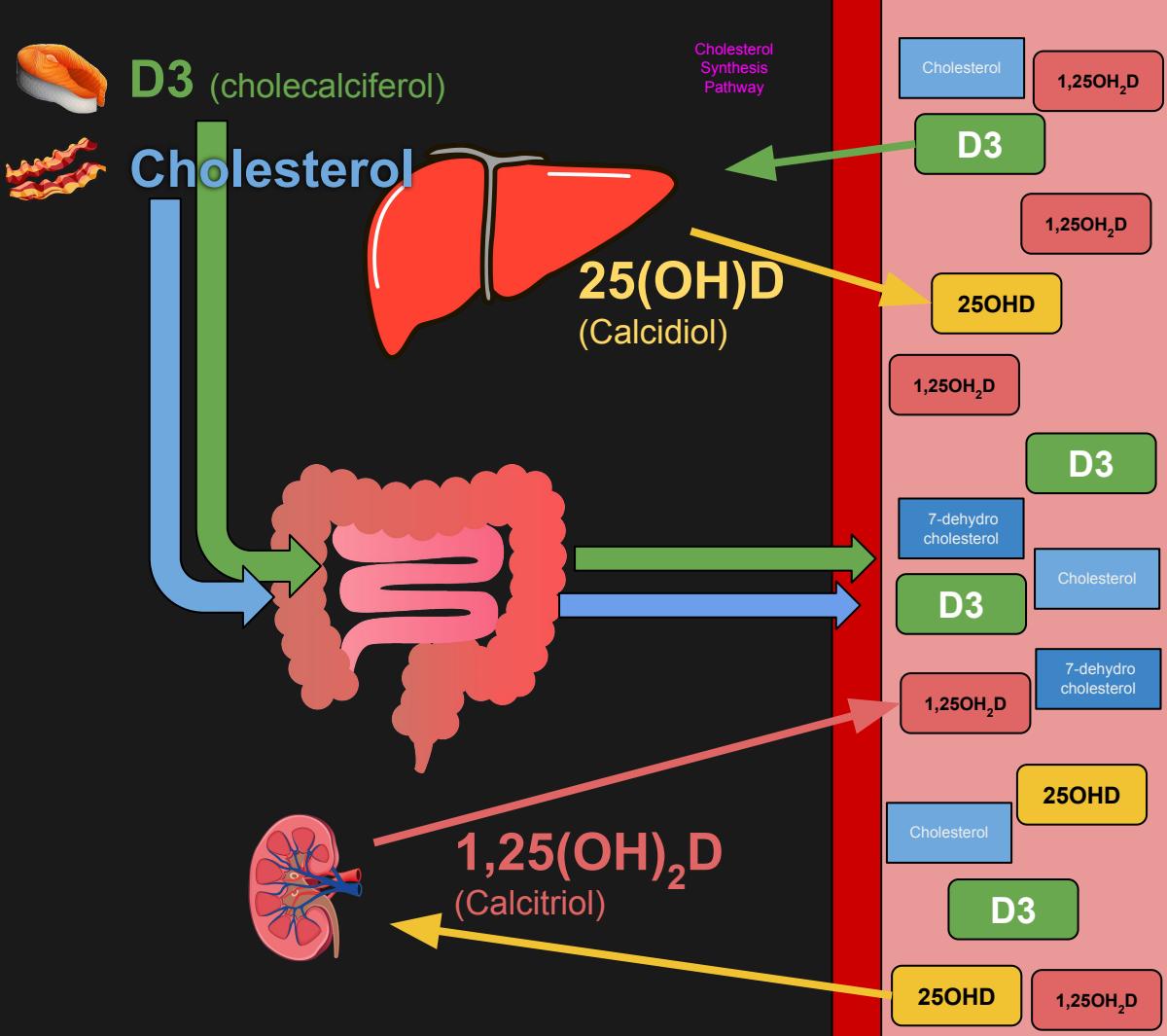


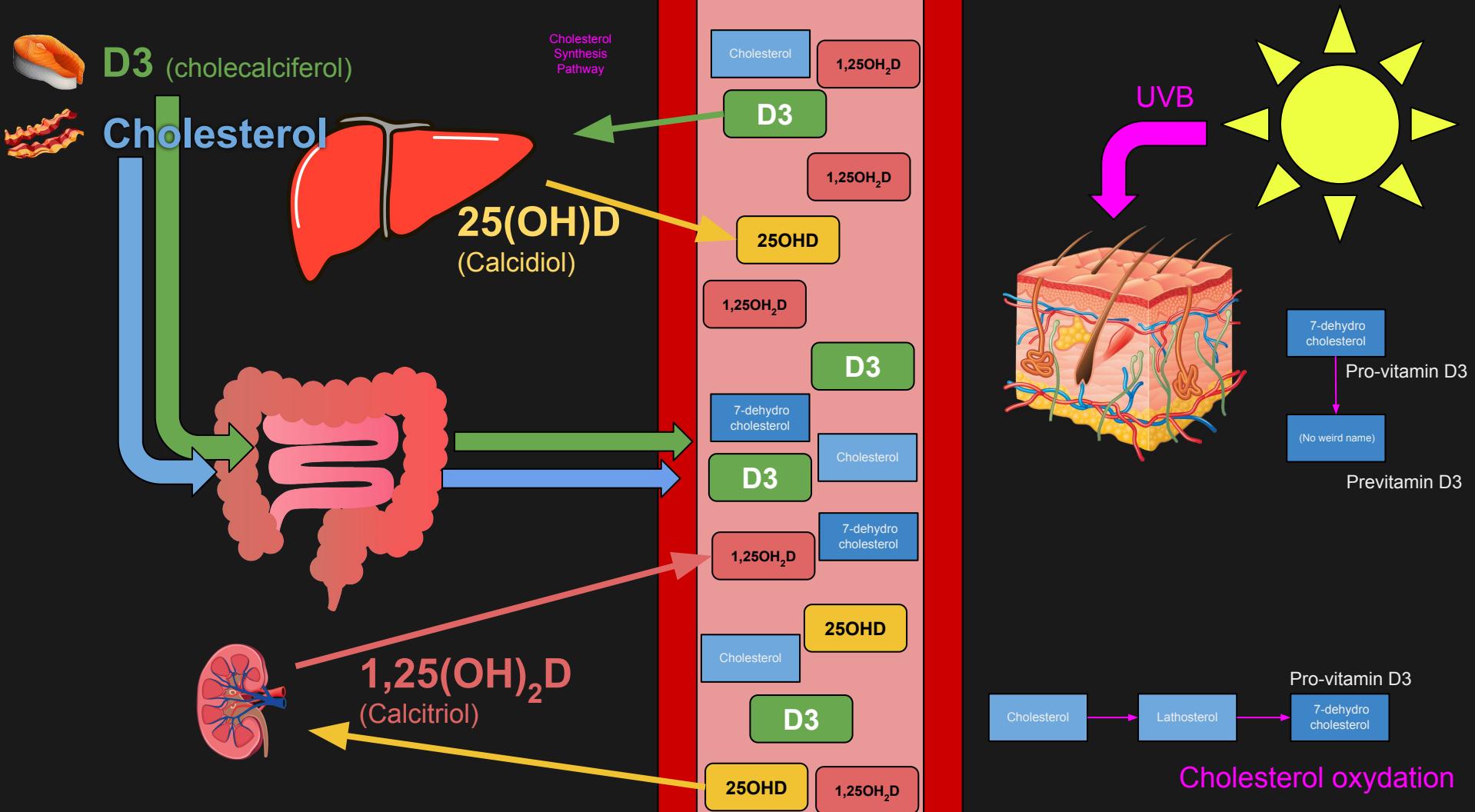


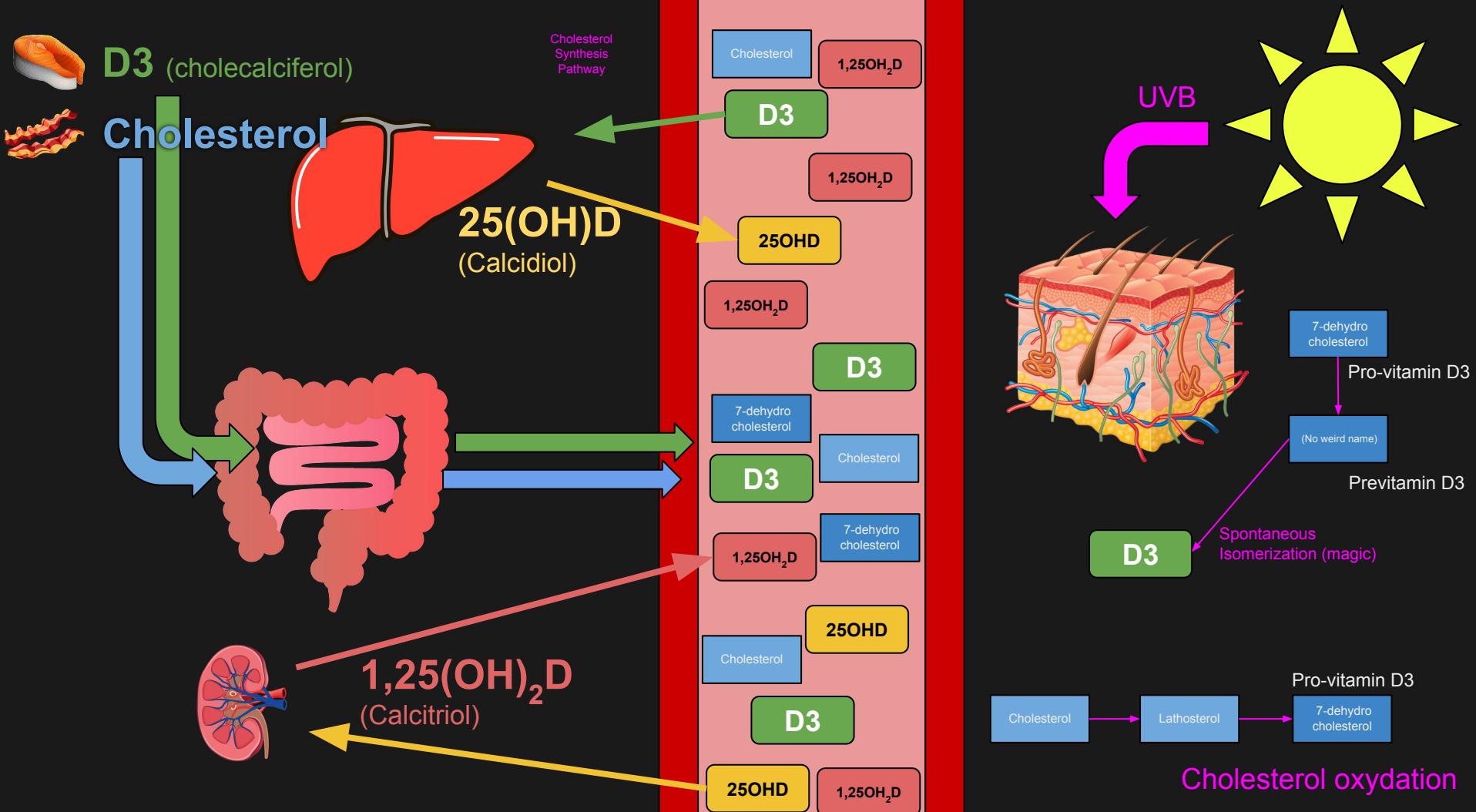




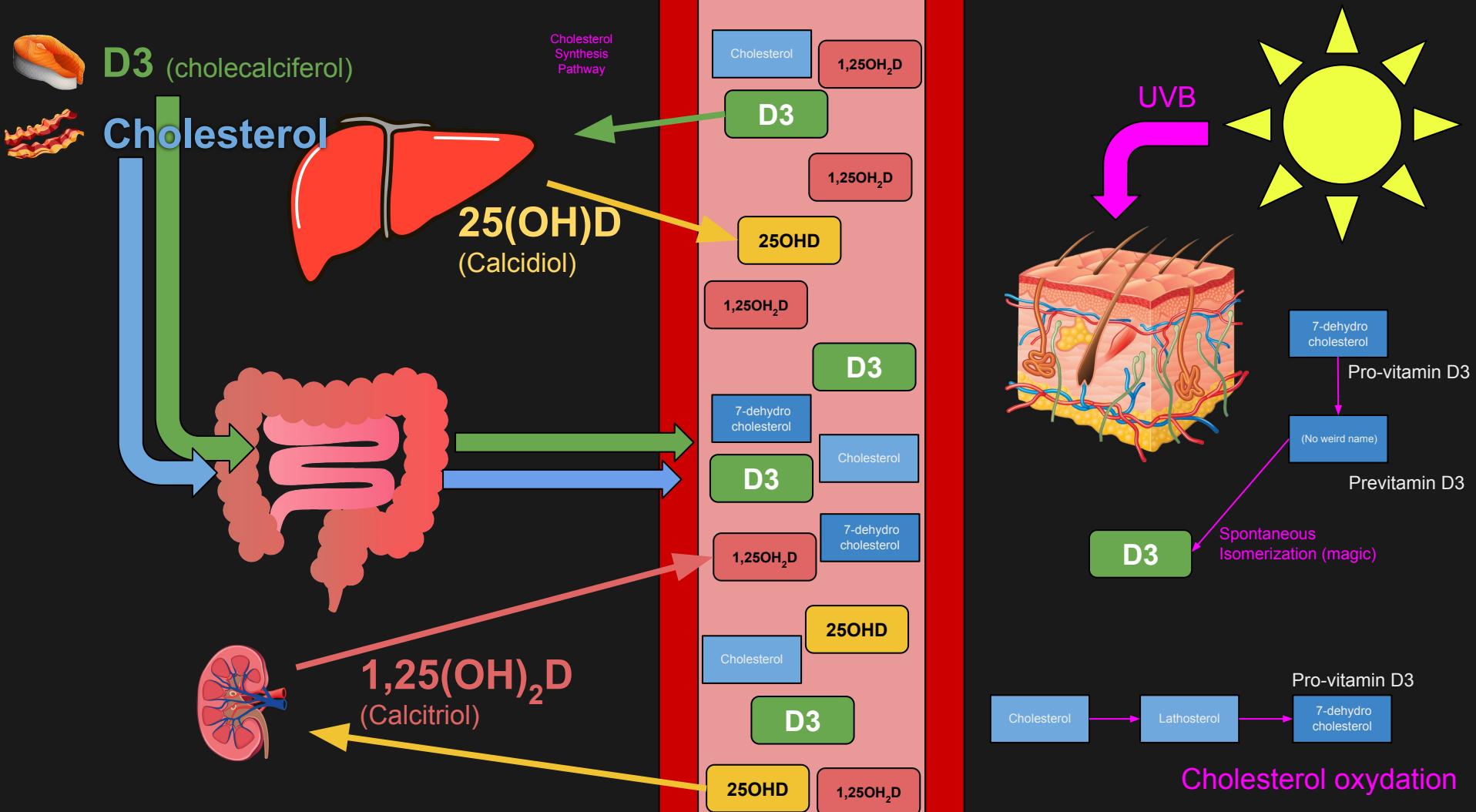


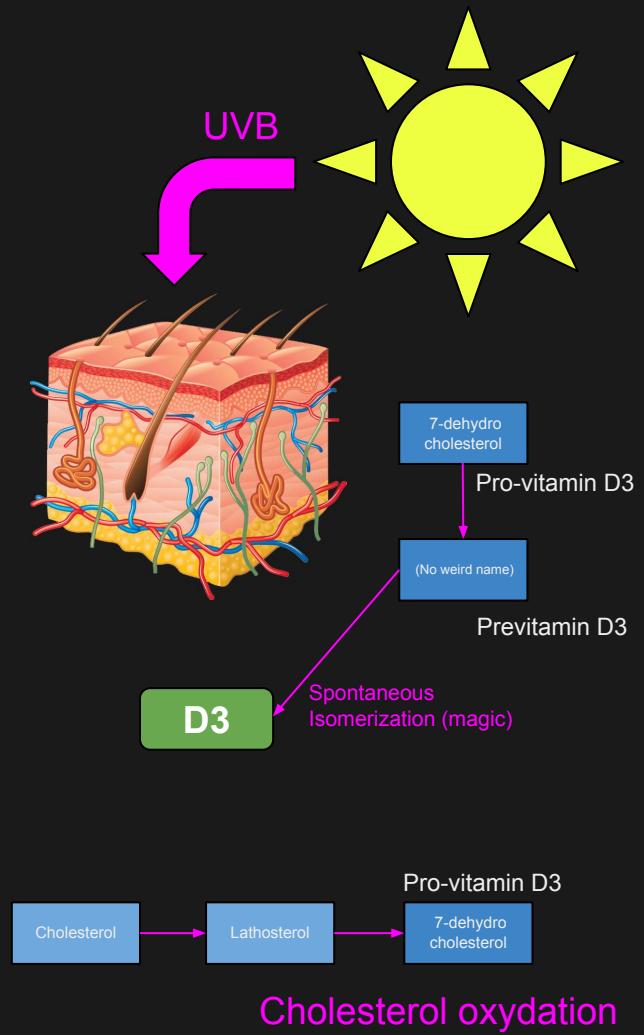
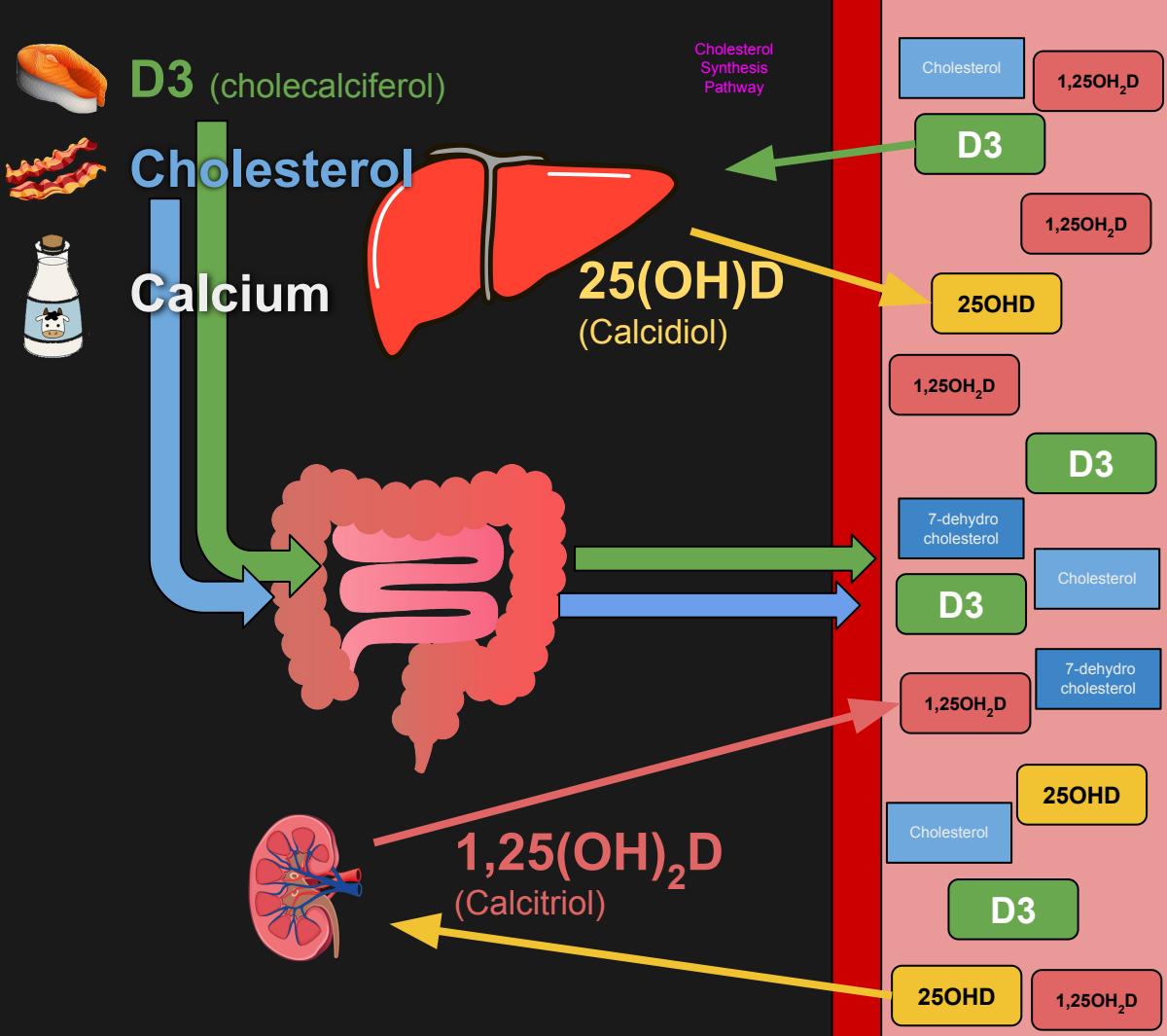


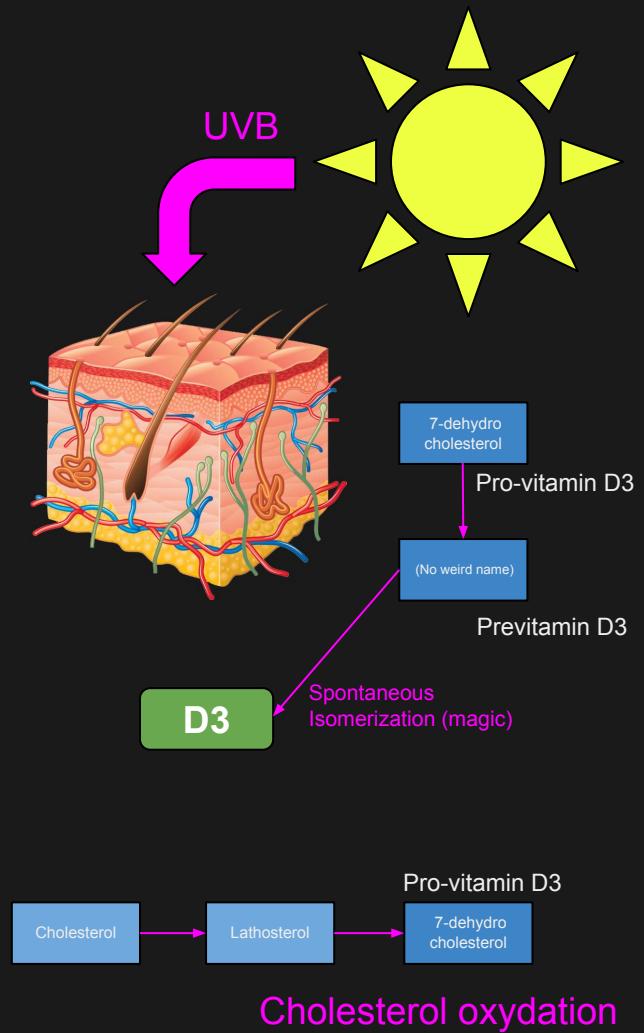
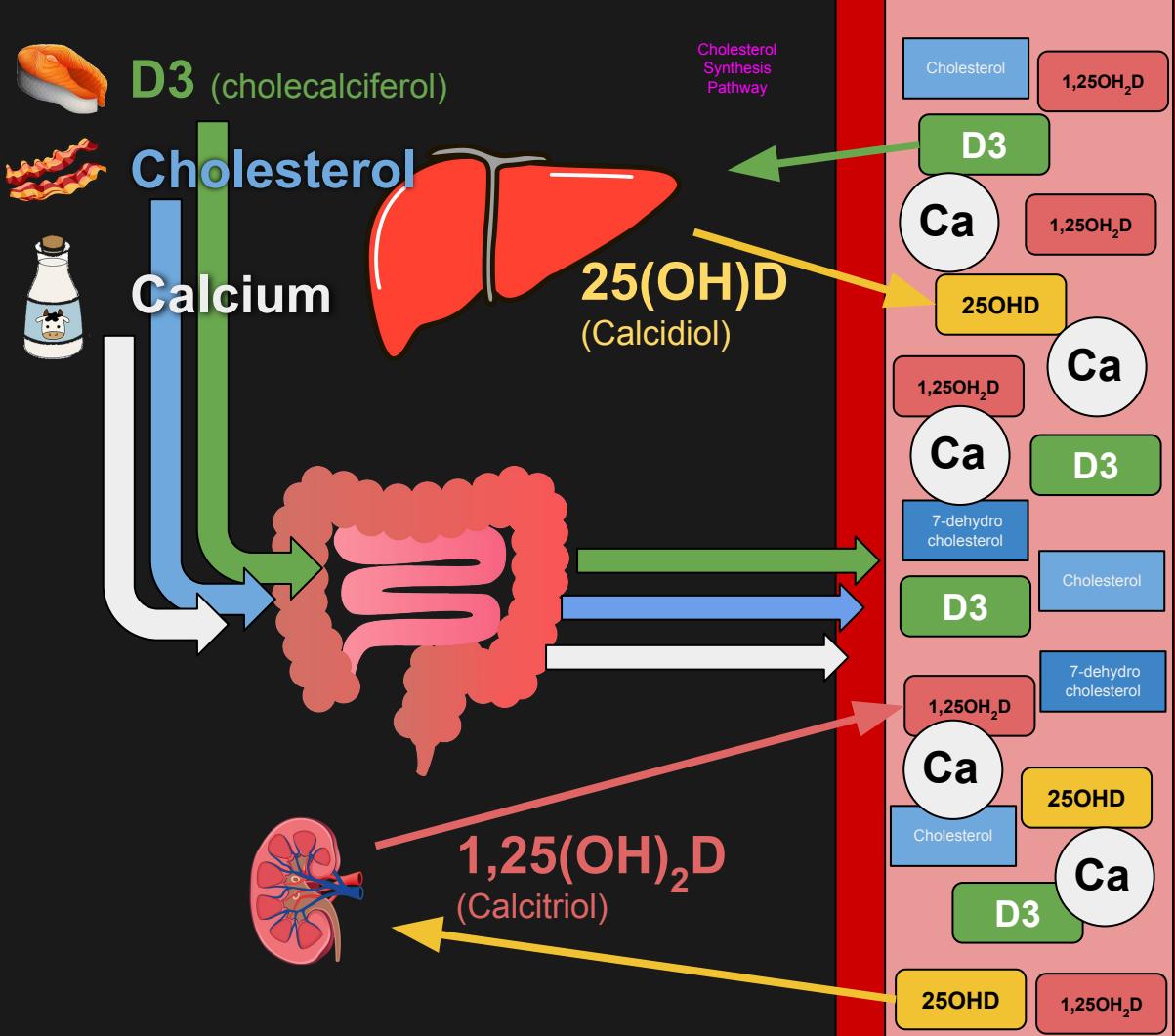


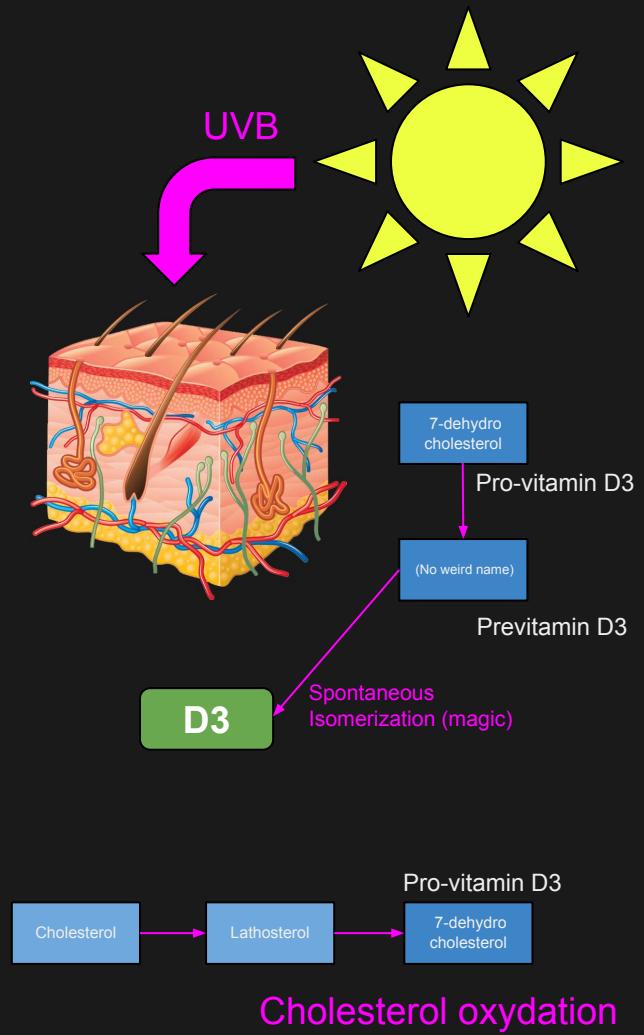
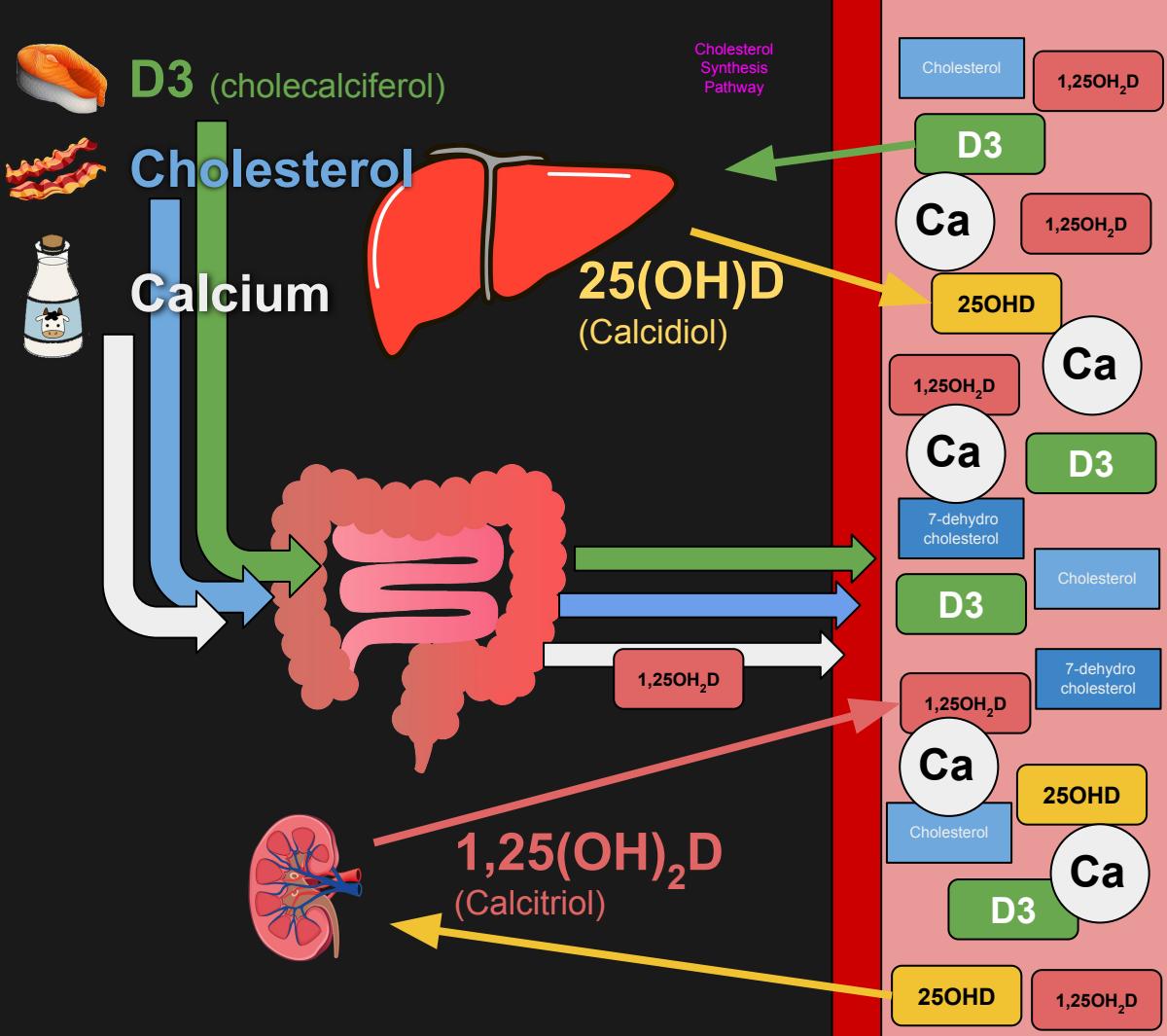


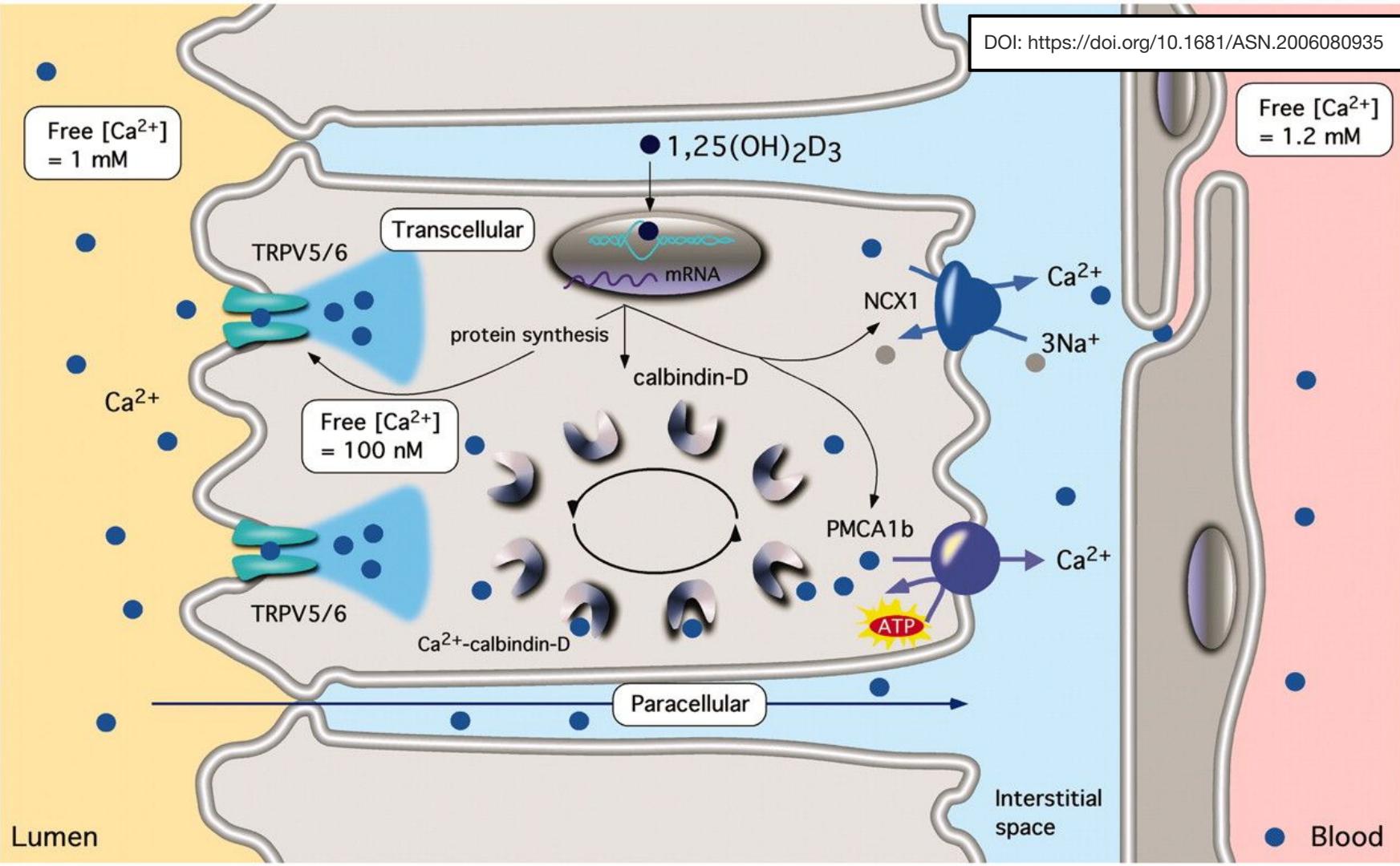
Vitamin D main function









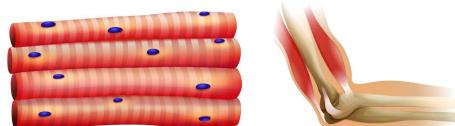


Calcium

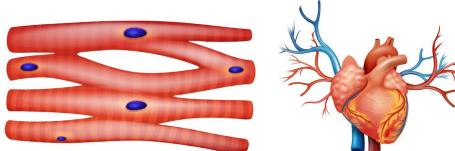
Calcium



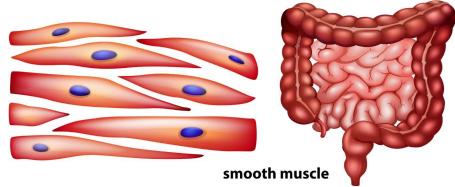
Types of Muscle Cells



skeletal muscle



cardiac muscle



smooth muscle

Hypocalcemia

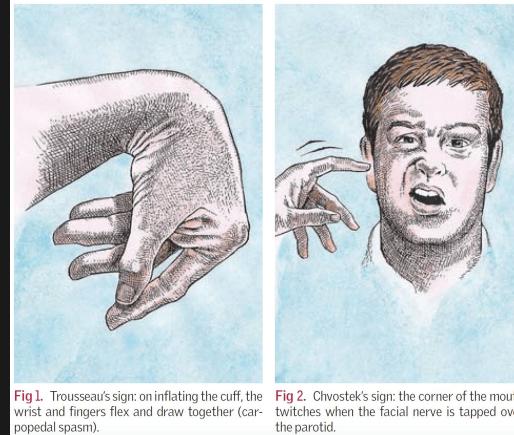
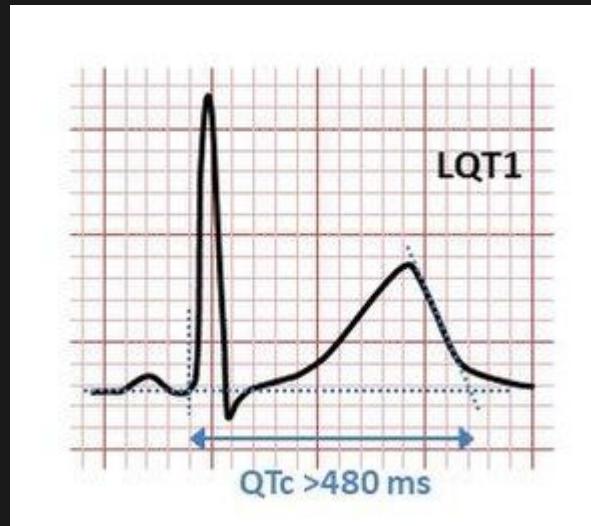


Fig 1. Trousseau's sign: on inflating the cuff, the wrist and fingers flex and draw together (carpopedal spasm).

Fig 2. Chvostek's sign: the corner of the mouth twitches when the facial nerve is tapped over the parotid.



<https://mam.org.mm/healthcare-and-research/rickets>

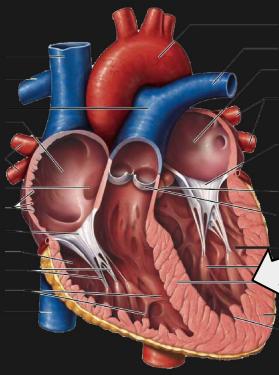
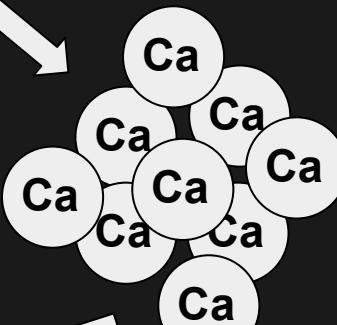


Calcium Homeostasis

Thyroid gland
Parathyroid gland

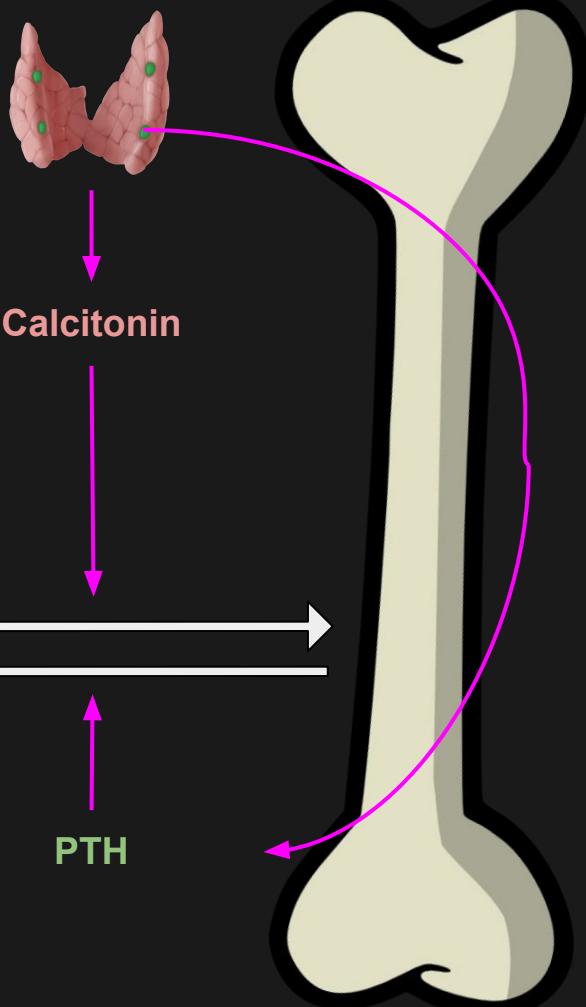


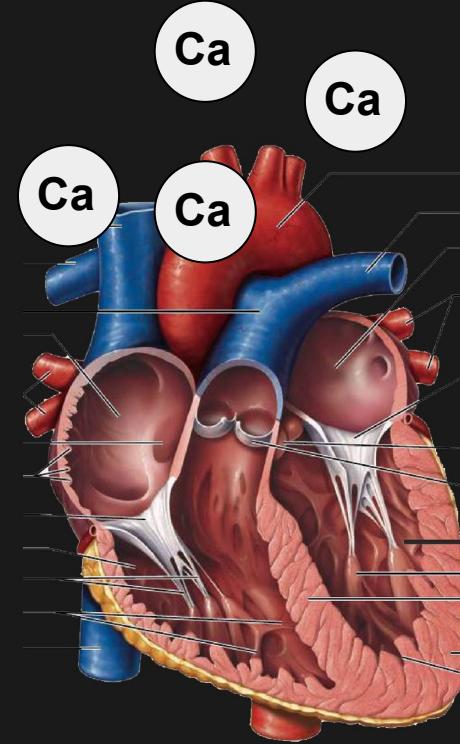
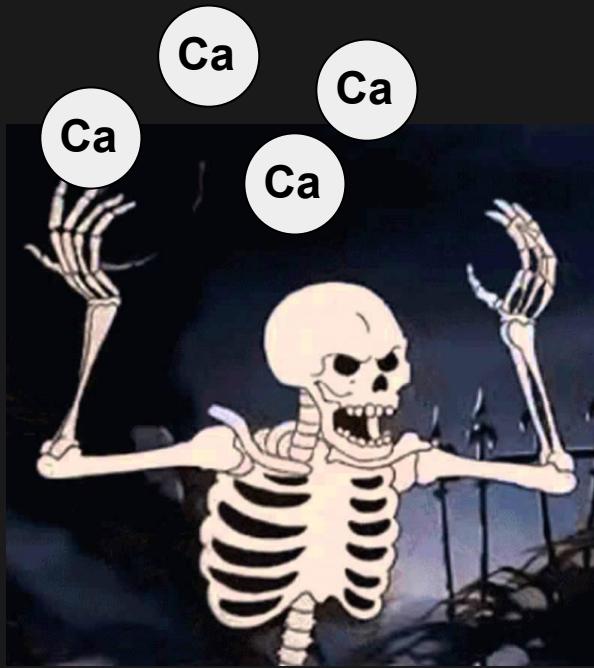
$1,25\text{OH}_2\text{D}$



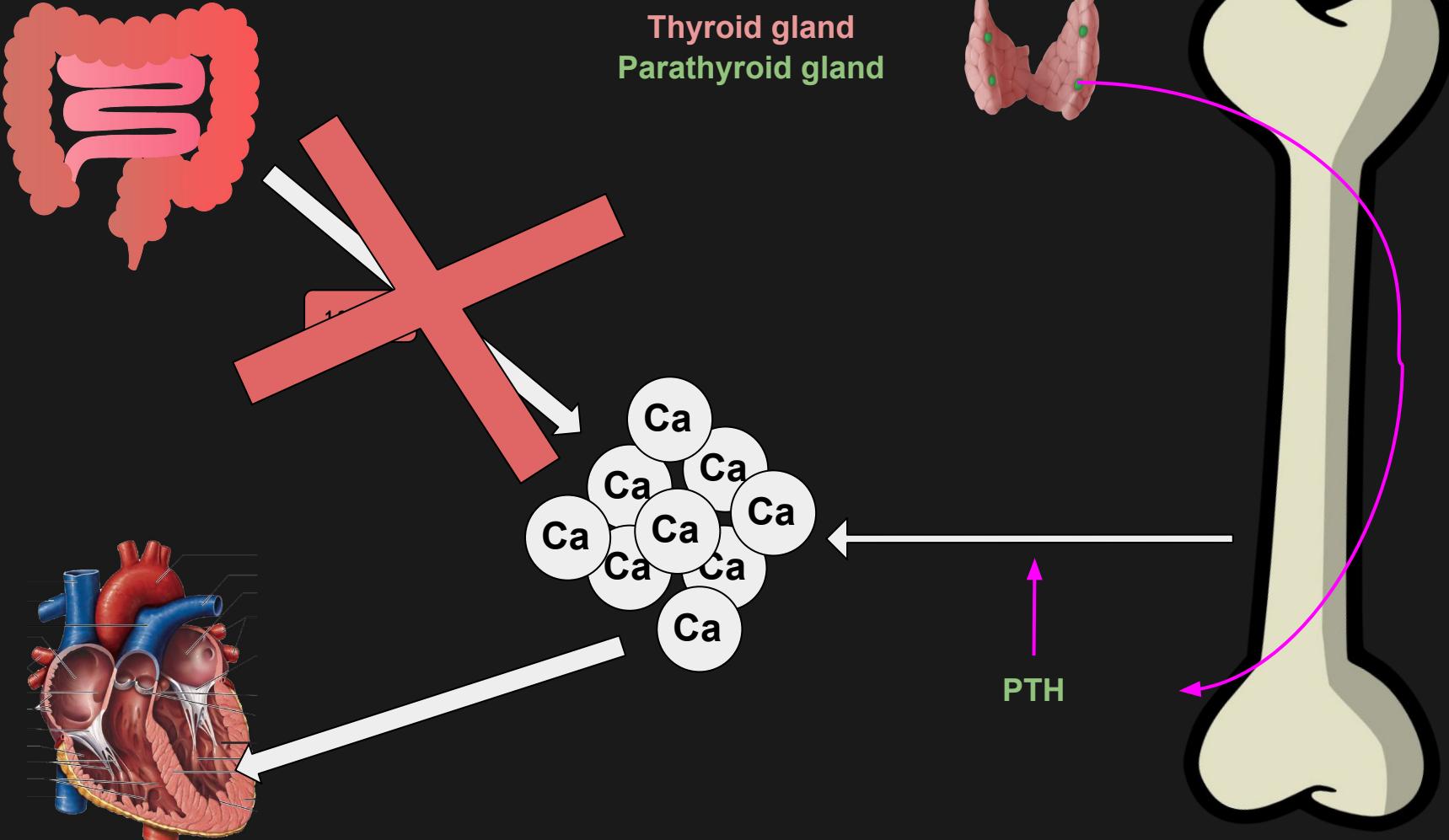
Calcitonin

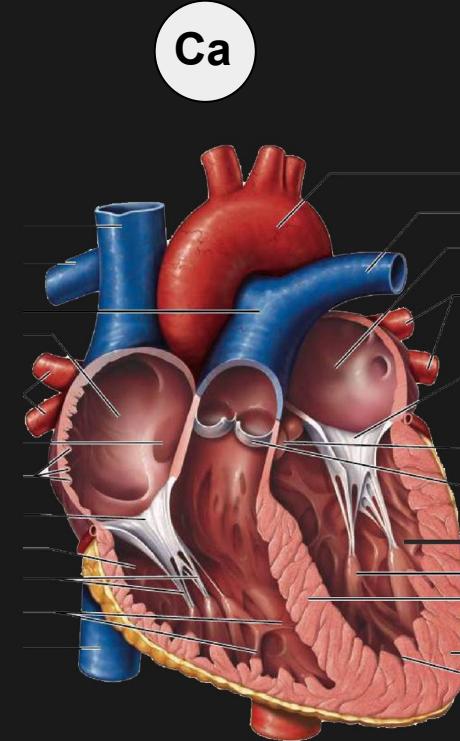
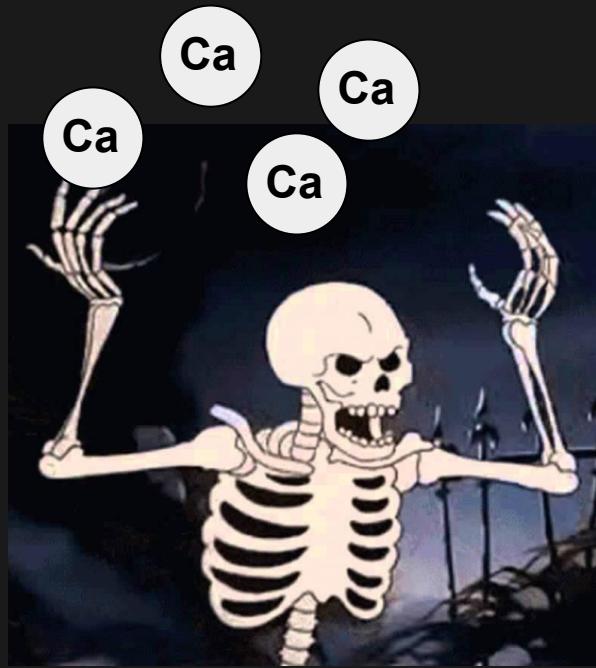
PTH

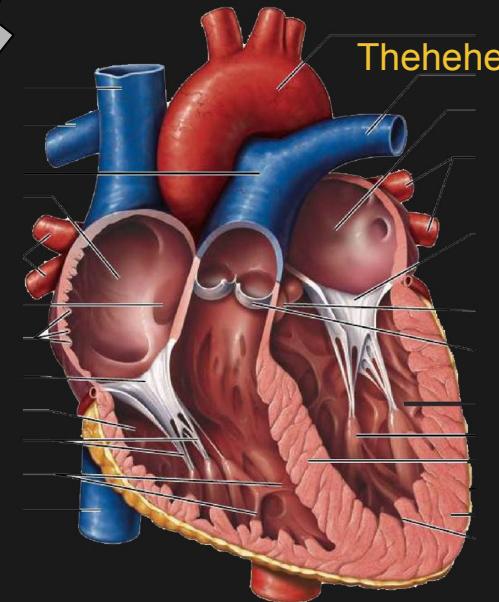
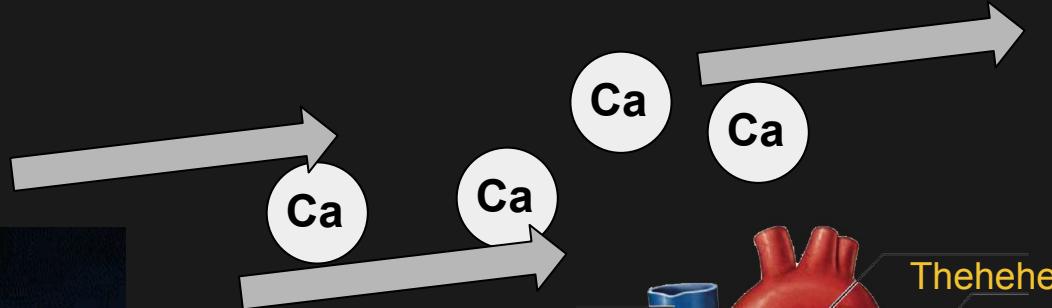
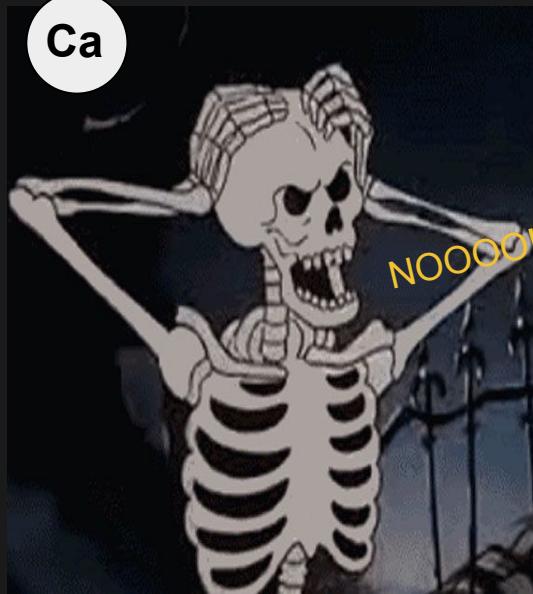


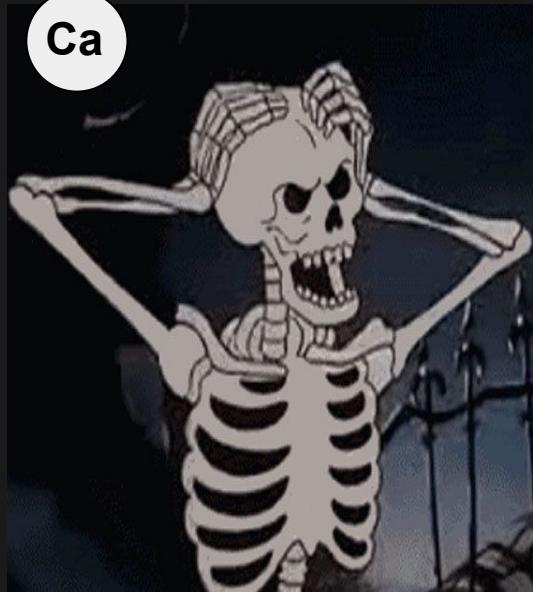


Thyroid gland
Parathyroid gland

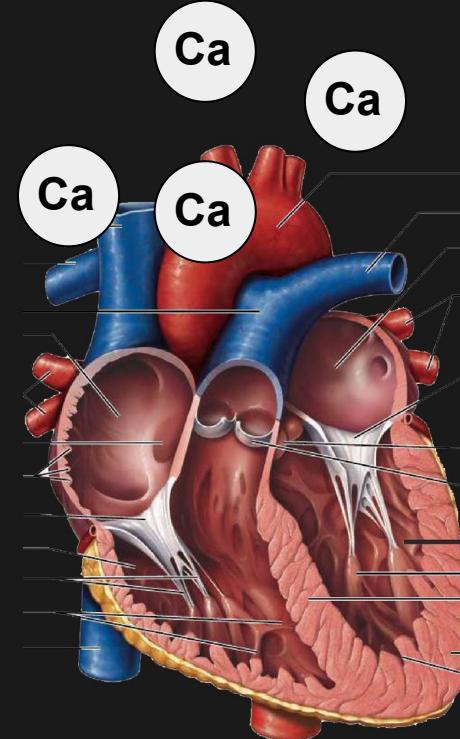






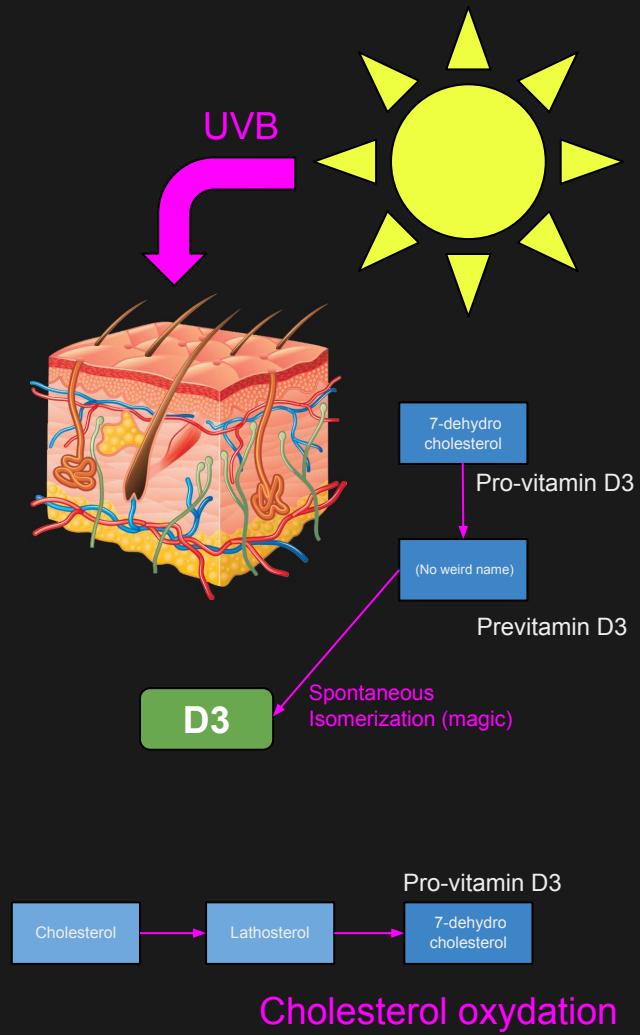
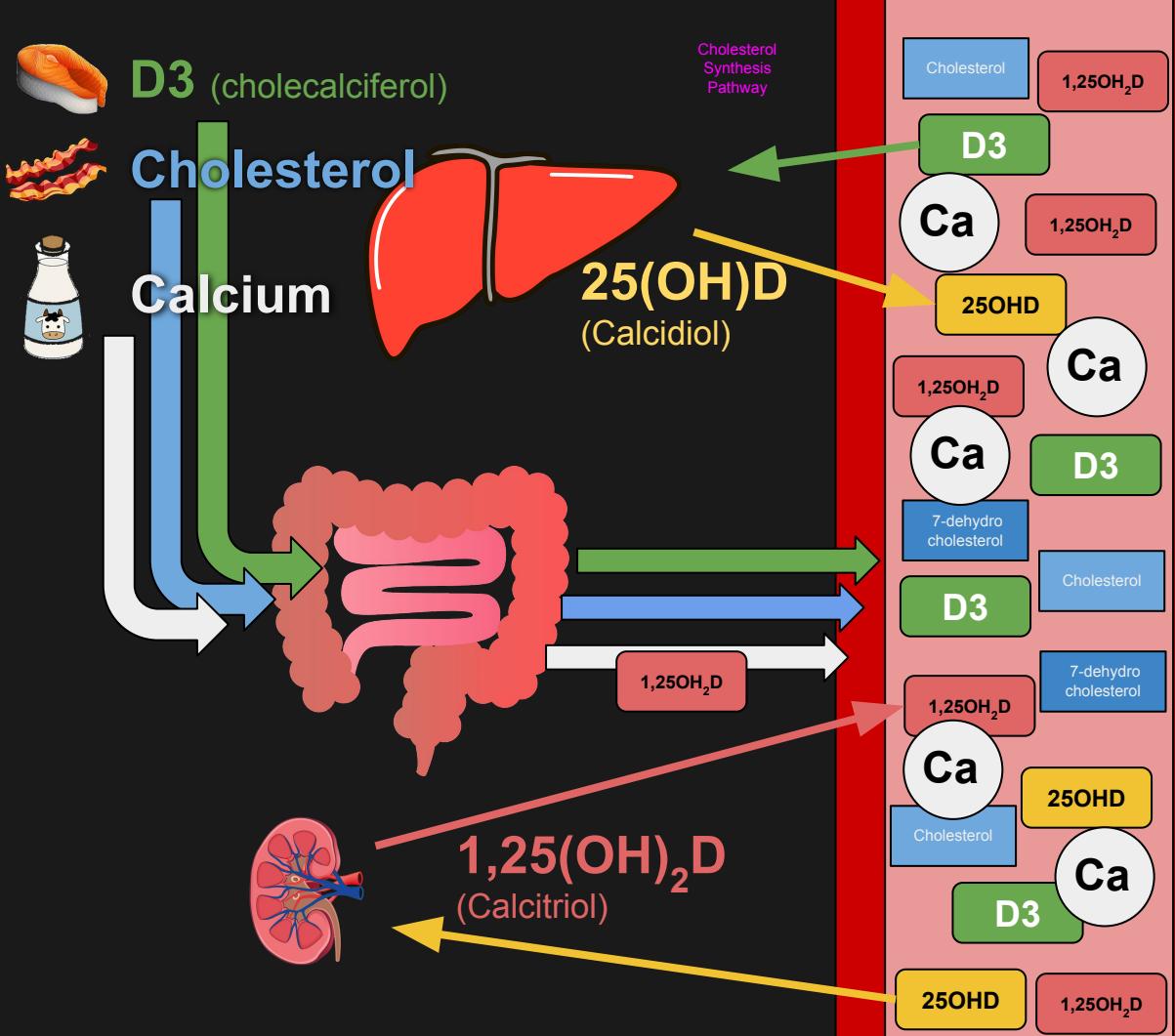


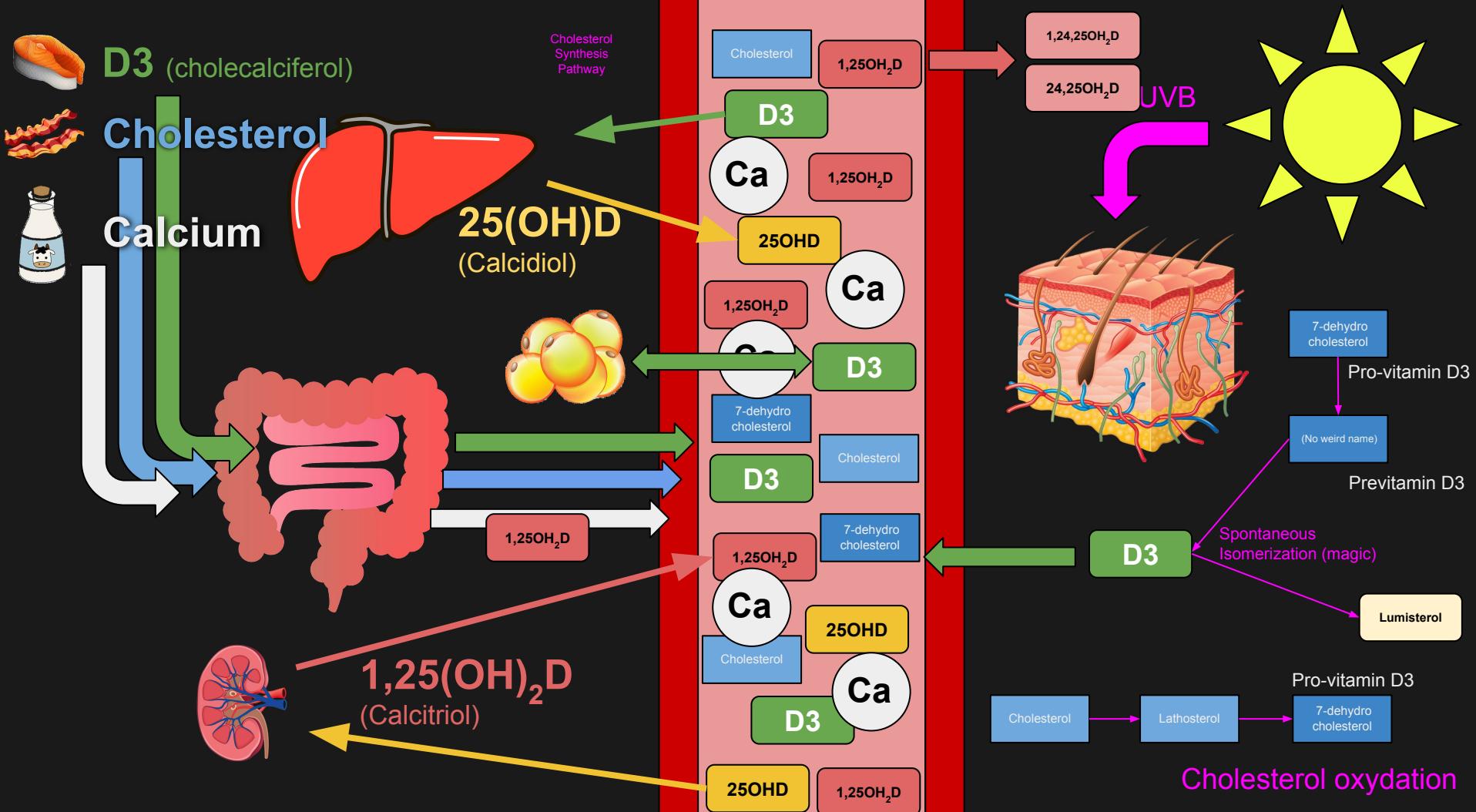
Cons: Rickets
Osteoporosis
Artrosis

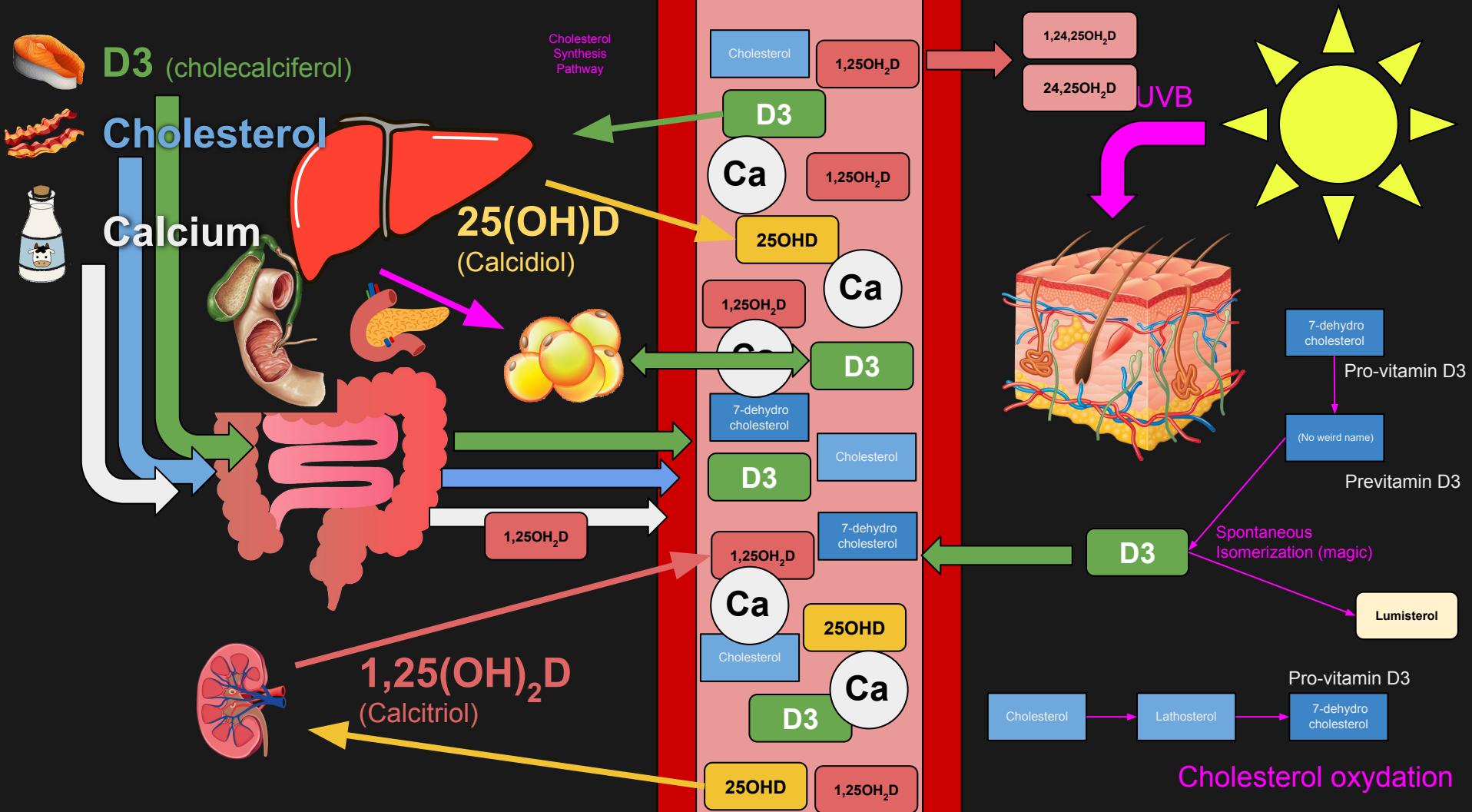


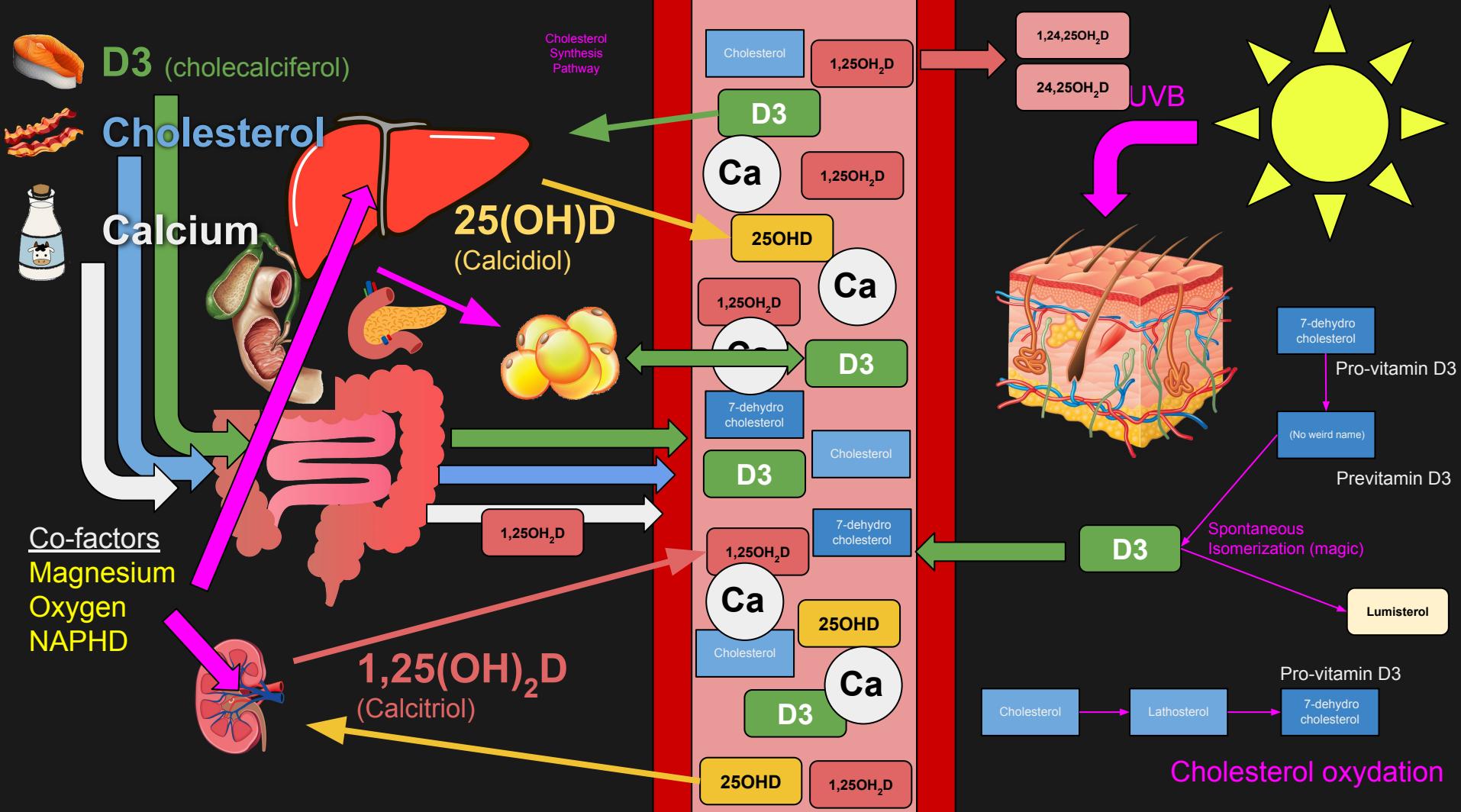
Pros: Working heart

Vitamin D
advance metabolism



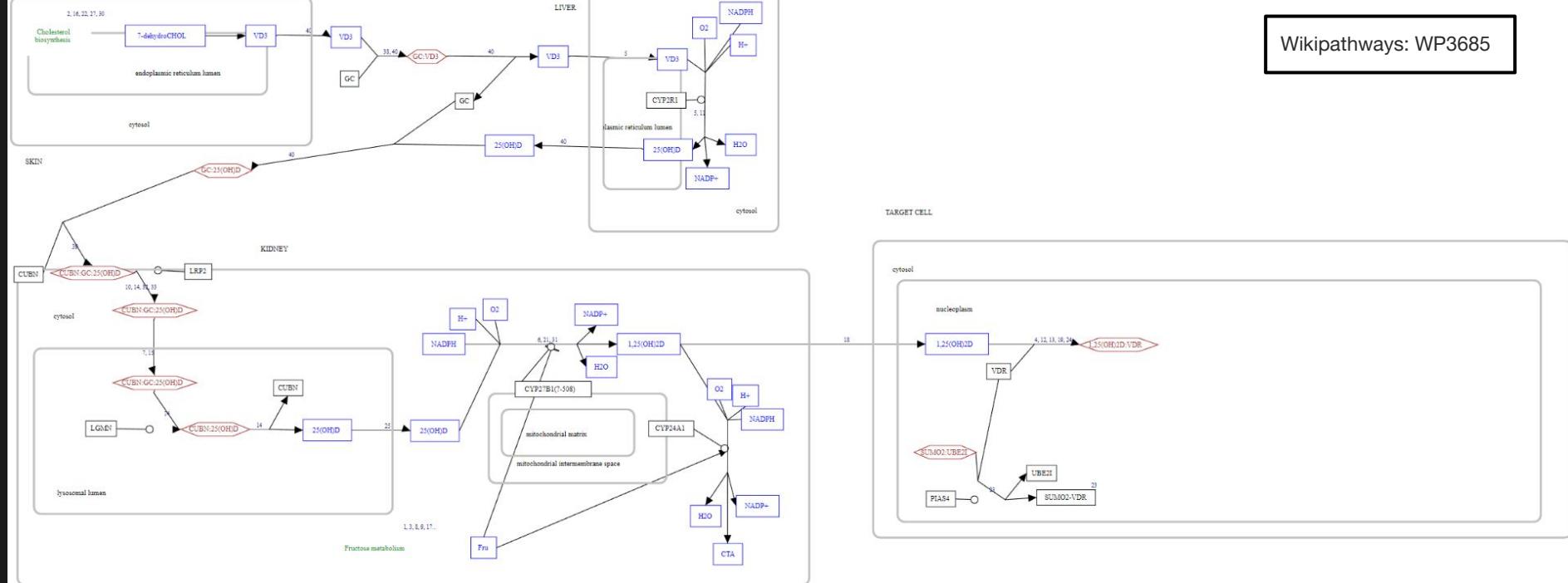






Wikipathways: WP3685

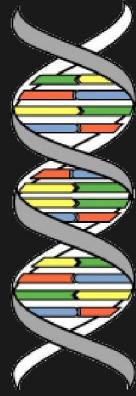
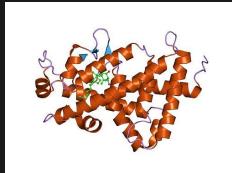
Title: Vitamin D (calciferol) metabolism
Organism: Homo sapiens



Wikipathways: WP3685

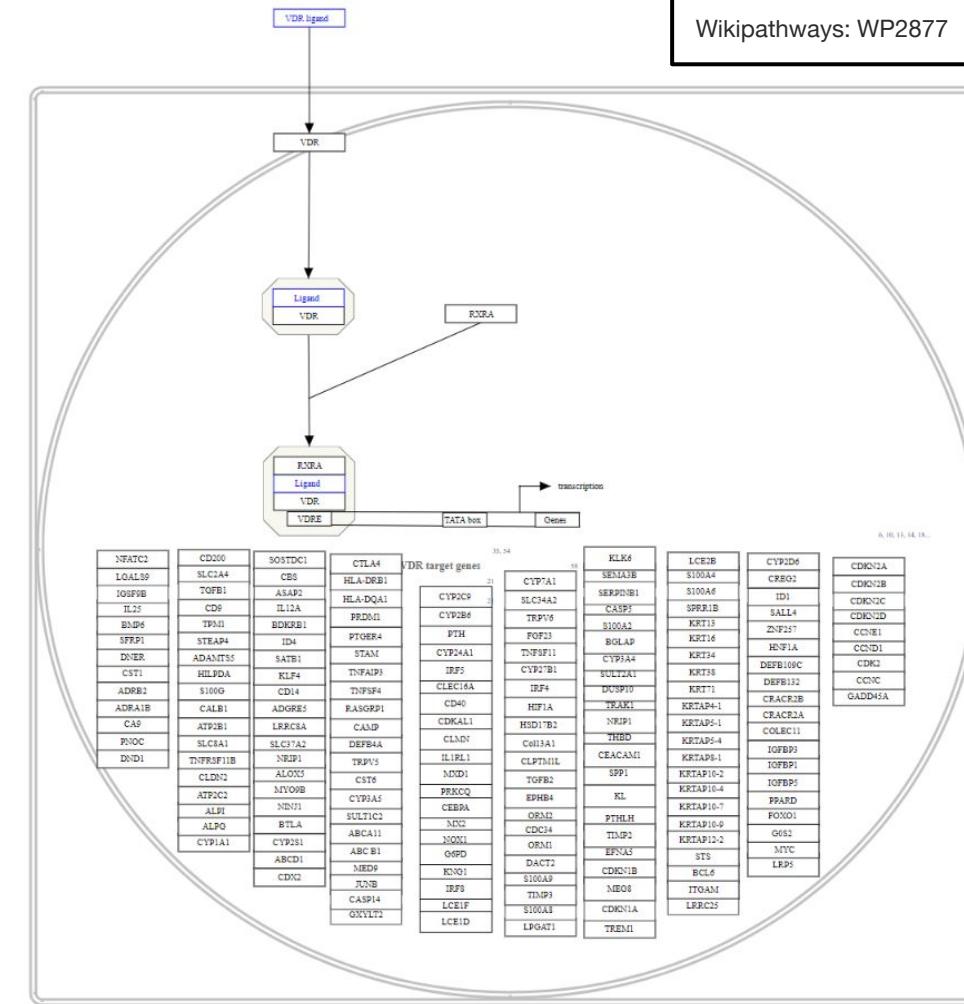
Vitamin D bonus functions

VDR = Vitamin D Receptor

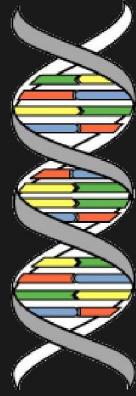
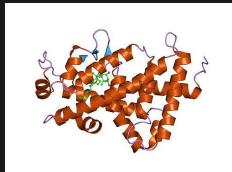


Title: Vitamin D receptor pathway
Organism: Homo sapiens

Wikipathways: WP2877

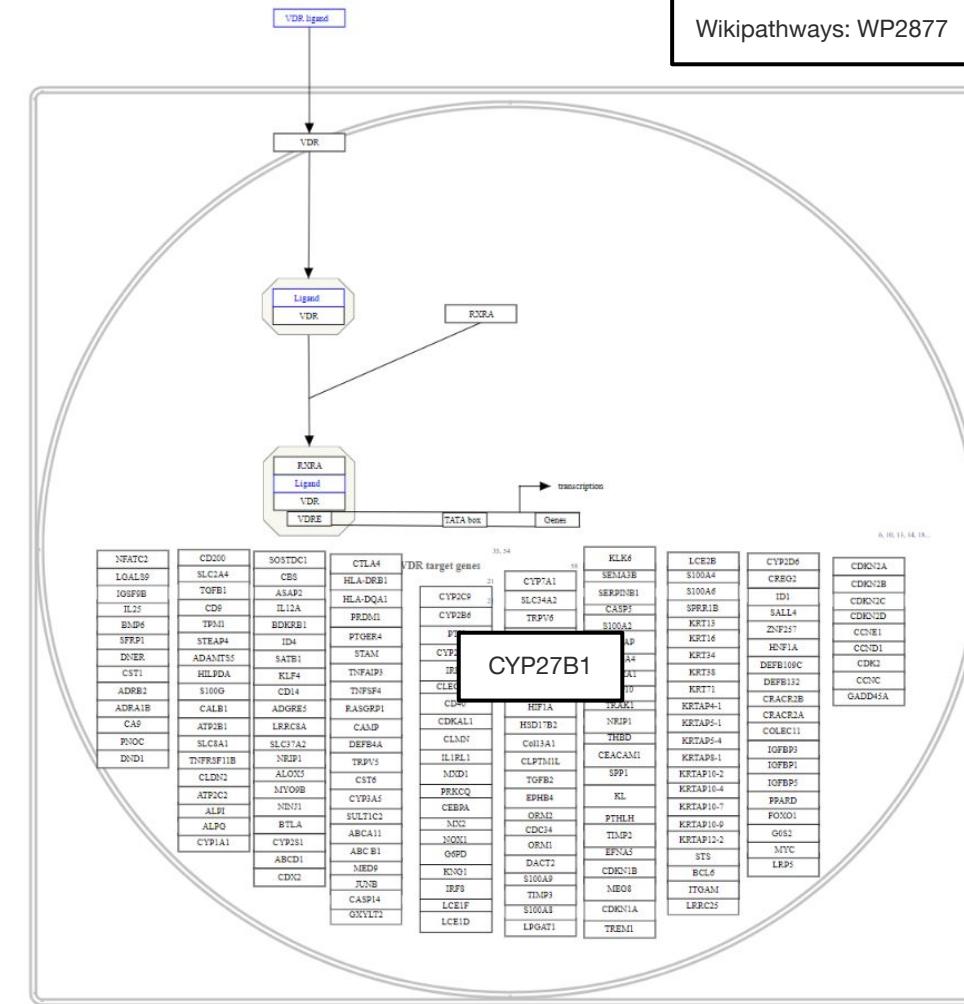


VDR = Vitamin D Receptor



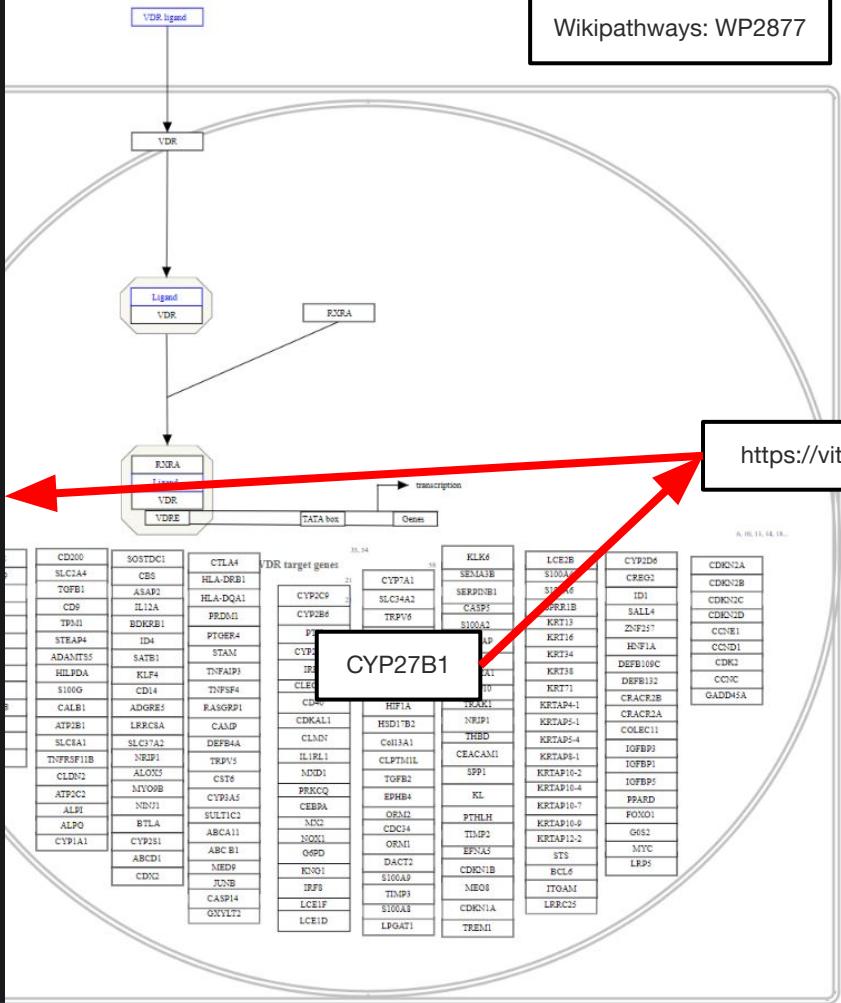
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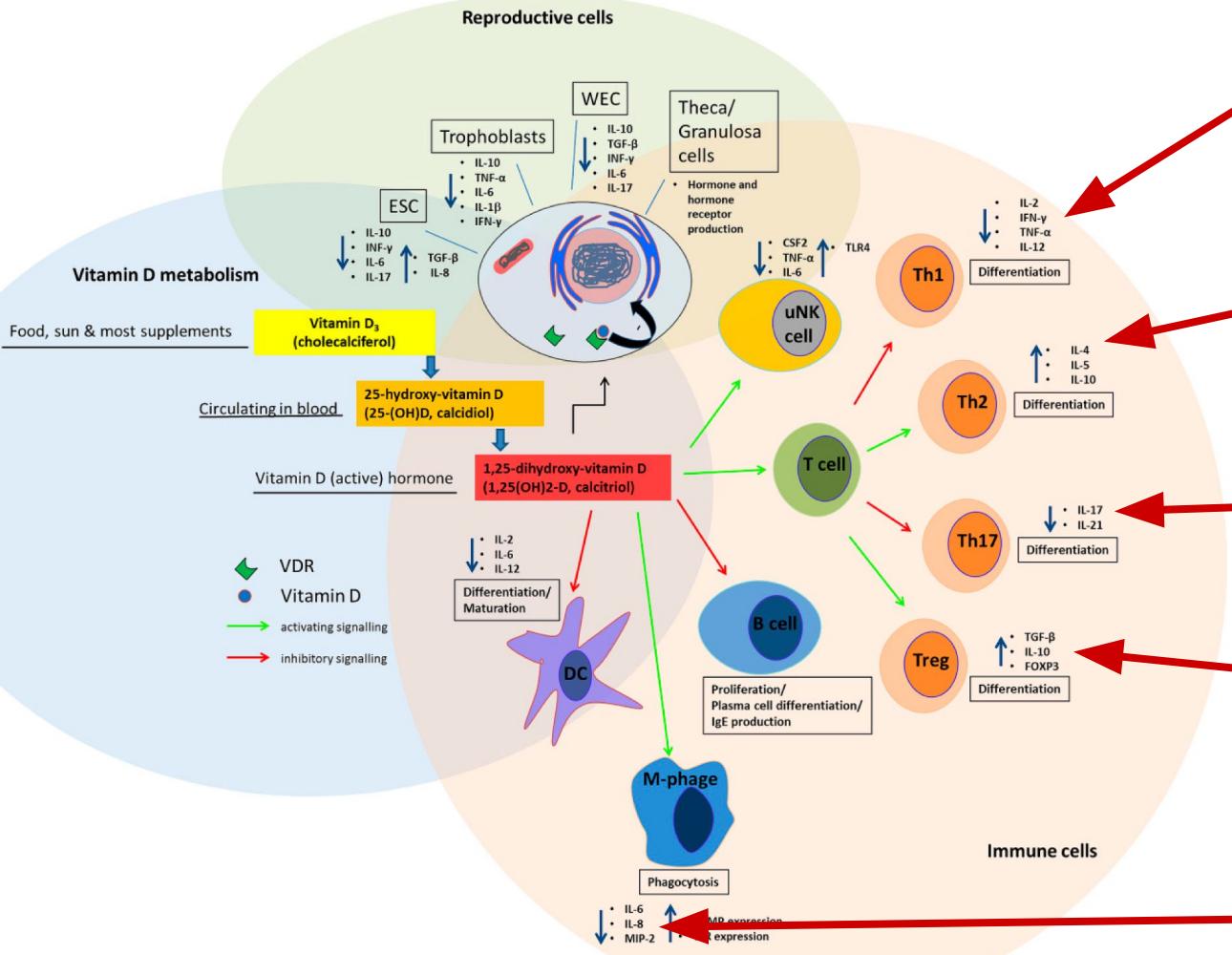
Wikipathways: WP2877



Here are all of the CYP27B1 articles

- Neuro problems (AD, PD, MS) associated with poor vitamin D genes (CYP27A1, CYP27B1) – Sept 2022
- An ocular disease can be associated with low vitamin D and 1 of 5 poor vitamin D genes – June 2022
- Vitamin D genes - Review June 2022
- Vitamin D may reduce action by increasing nitric oxide – June 2022
- Vitamin D metabolism and genes as of Nov 2019
- Poor vision associated with poor Vitamin D or poor VD, D genes – June 2022
- Poor Vitamin D gene activation that results in rickets etc. (CYP27B1: 1 in 10 people in a region of Quebec) – May 2022
- Poor Vitamin D gene activation that results in rickets etc. (CYP27B1: 1 in 20 people in a region of Quebec) – May 2022
- Better grip strength if come good vitamin D genes (or if supplement?) – April 2022
- Gene variants can change Vitamin D response by 17X (14,000 IU daily, Multiple Sclerosis) – Dec 2021
- Every Parkinson's brain had a gene modification that limited how much vitamin D was available (CYP27B1) – Feb 2022
- Vitamin D Metabolic Profiling and genes (CYP24A1, CYP27B1) – Nov 2021
- Breast Cancer, Vitamin D, and genes - Welsh Nov 2021
- Vitamin D levels in cells, not blood, is important (Vd follicular fluid in this case) – Aug 2021
- Breasts process Vitamin D and change gene activation, might prevent breast cancer if given more Vd - July 2021
- COVID virus alters the activation of 100 vitamin D related genes in the lung – April 2021
- Mucosal membranes (mouth, lungs, nose, intestines, etc) can activate Vitamin D – July 2020
- Vitamin D genes are important, update - Sept 2020
- Vitamin D in the blood encounters many restrictions in getting to the cells – Sept 2020
- Parathyroid increase with age associated with worsening Vitamin D levels – April 2020
- Infant and child immunity depends on Vitamin D and two Vitamin D genes - Review April 2020
- Gene mutations which restrict Vitamin D activation (CYP27B1) results in many health problems – March 2020
- Vitamin D genes very with UV in Europe, Africa, Asia – March 2020
- Vitamin D genes may be a magic bullet for the cells (not based on Vitamin D blood tests) – Jan 2020
- Does survival of the less fit mean less health (less genes may be inherited)
- Eye vitamin D may not be associated with blood VD, but is associated with CYP27B1 and CYP24A1 – Nov 2019
- Acute Coronary Syndrome is associated with poor Vitamin D genes (CYP27B1, CYP24A1) – Nov 2019
- Vitamin D deficiency is associated with 35 genes, only 7 of are commercially tested – Nov 2019
- CYP27B1
- Increased risk of various cancers if poor vitamin D genes (Binding Protein and CYP27B1) - Sept 2019
- ALS is associated with poor CYP27B1 gene find seen by Vitamin D blood test – May 2019
- Body may change gene activation if more Vitamin D is needed by tissue (Vdr in this case) – Oct 2018
- Cancer treatment by Vitamin D sometimes is restricted by genes – Oct 2018
- Vitamin D gene expression varies with Eccologic age – March 2018
- Brain cells can probably activate Vitamin D without liver or kidney (at least in rats) – Sept 2017
- Brain may deal with all forms of Vitamin D (rat brain) – Sept 2017
- Review of 11 Vitamin D genes – Nov 2017
- Glucocorticoid treatment reduces Vitamin D getting to cells via 3 or 4 genes
- Miscarriages strongly associated with poor placental, decidua genes which locally activates Vitamin D – Dec 2016
- Genes which regulate active Vitamin D version with age – Oct 2016
- Miscarriages 76 percent more likely if low vitamin D (see also data on CYP27B1) – May 2016
- Lungs with cystic fibrosis fail to activate vitamin D gene (CYP27B1) – Feb 2016
- Lung cancer / reduced deaths if have a good Vitamin D gene (CYP27B1) – Feb 2015
- Colon cancer 30 percent more (Body) problems with Vitamin D genes CYP24A1 or CYP27B1 – Nov 2015
- UVB increases vitamin D even if poor kidney by changing CYP27B1 genes in skin – Dec 2013
- UVB effects on genes of those with and without Psoriasis - April 2014
- CYP27B1 gene decreases kidney production of active vitamin D – Feb 2013
- Genes such as CYP27B1, CYP24A1 and Vitamin D - JAMA Nov 2012
- Vitamin D levels are strongly associated with genes: overview of twin studies - Nov 2012
- Mutation of Vitamin D gene (CYP27B1) is strongly tied to MS - Dec 2011
- Prostate Cancer - Vitamin D - CYP27B1 - CYP24 – June 2011





Less autoimmune diseases
...but less fighting cancer

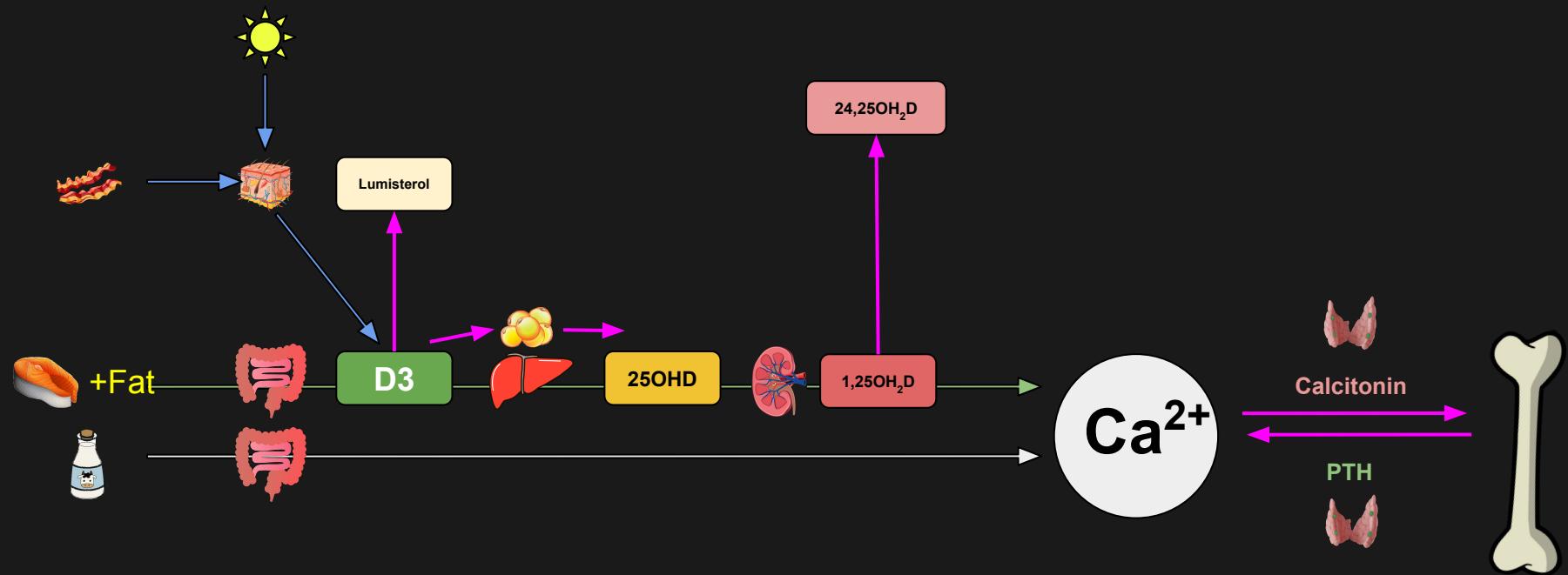
...but more antiangiogenic!

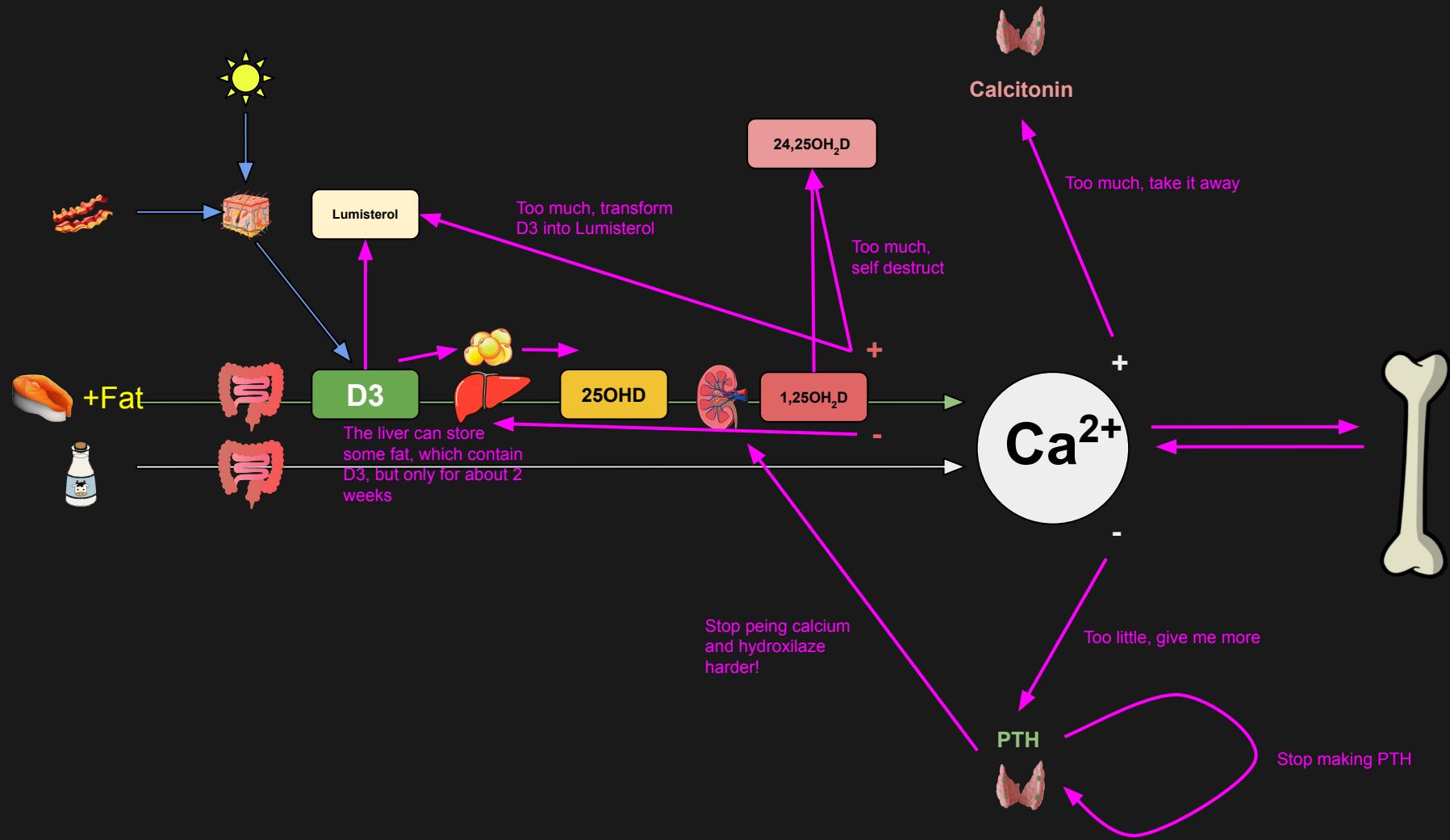
less liver damage

more killing via antibodies,
and not so much by suicide
immune death squads

less inflammation

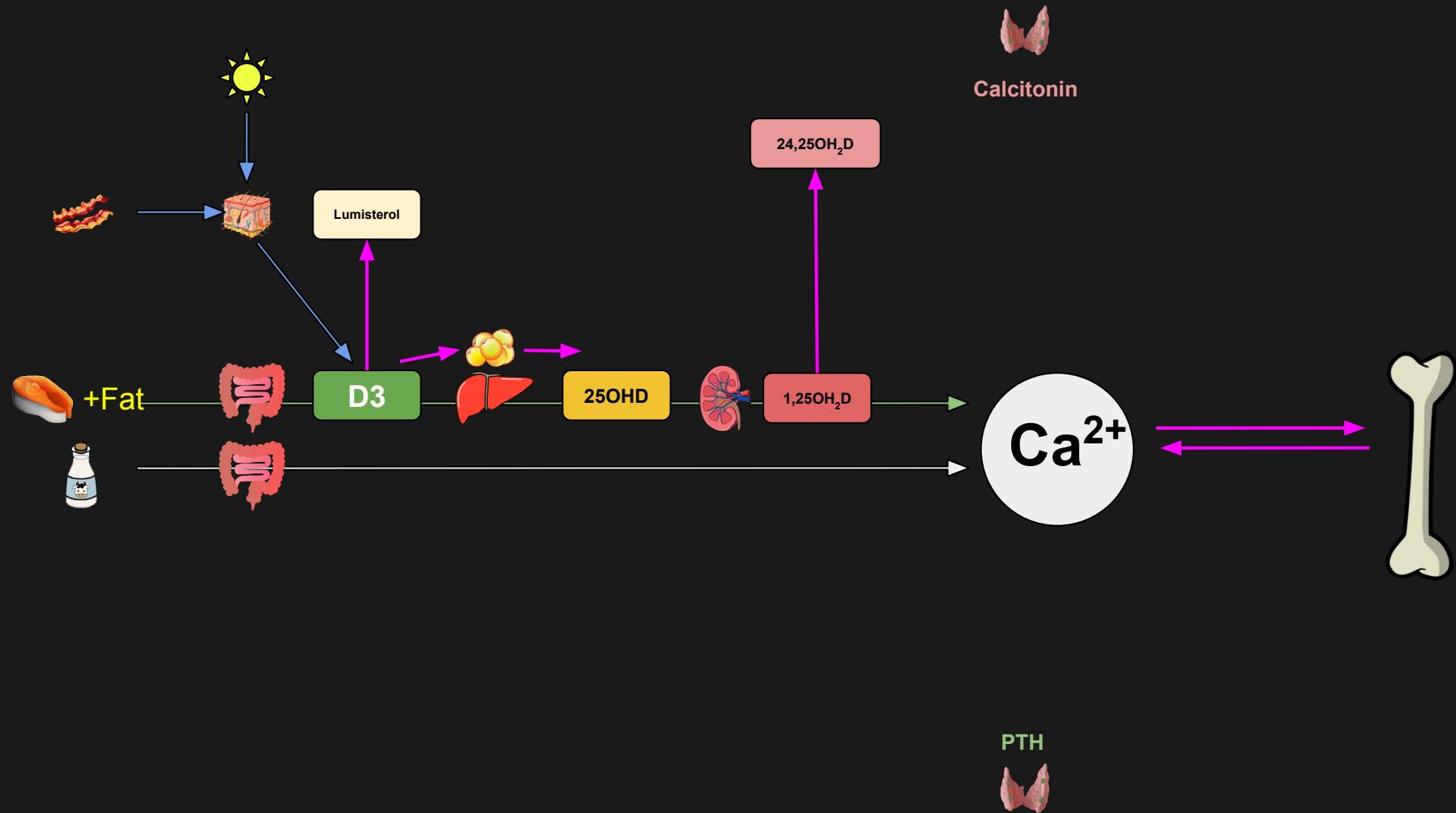
Vitamin D toxicity and deficiency

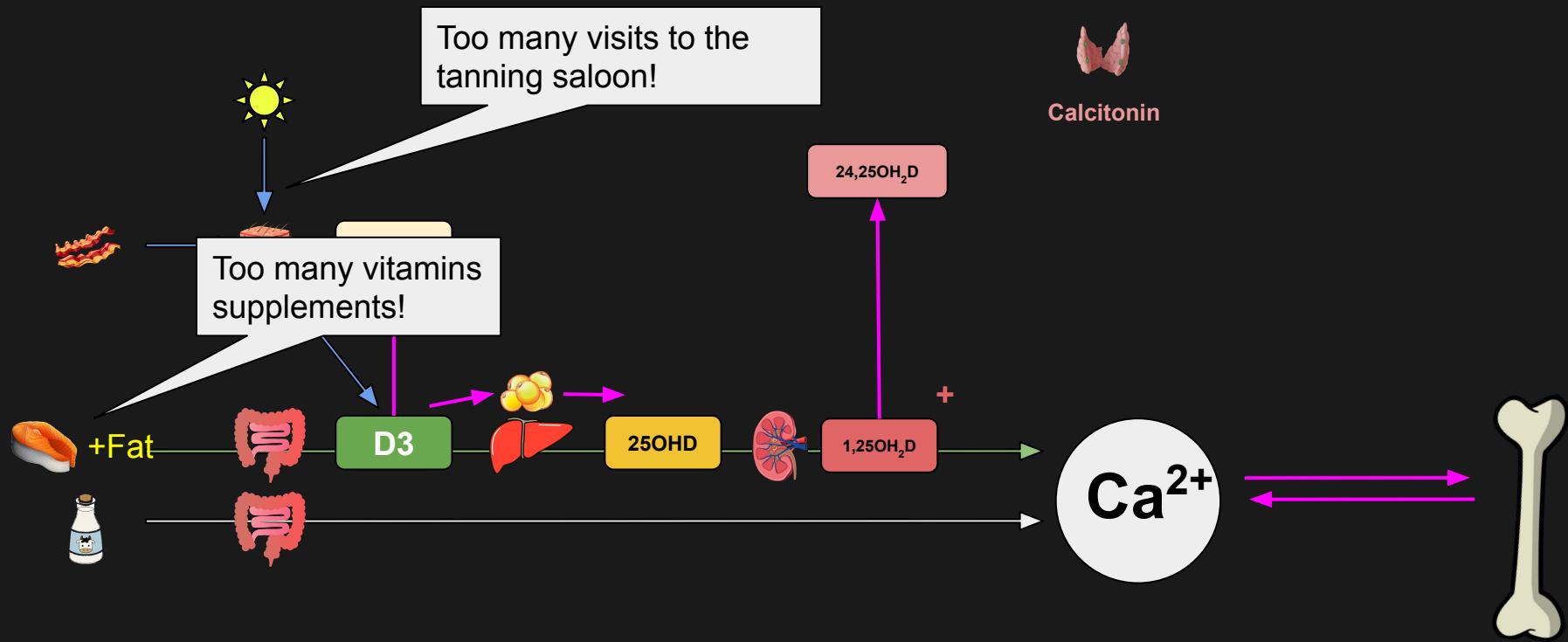




Hypervitaminosis D

- hypercalcemia





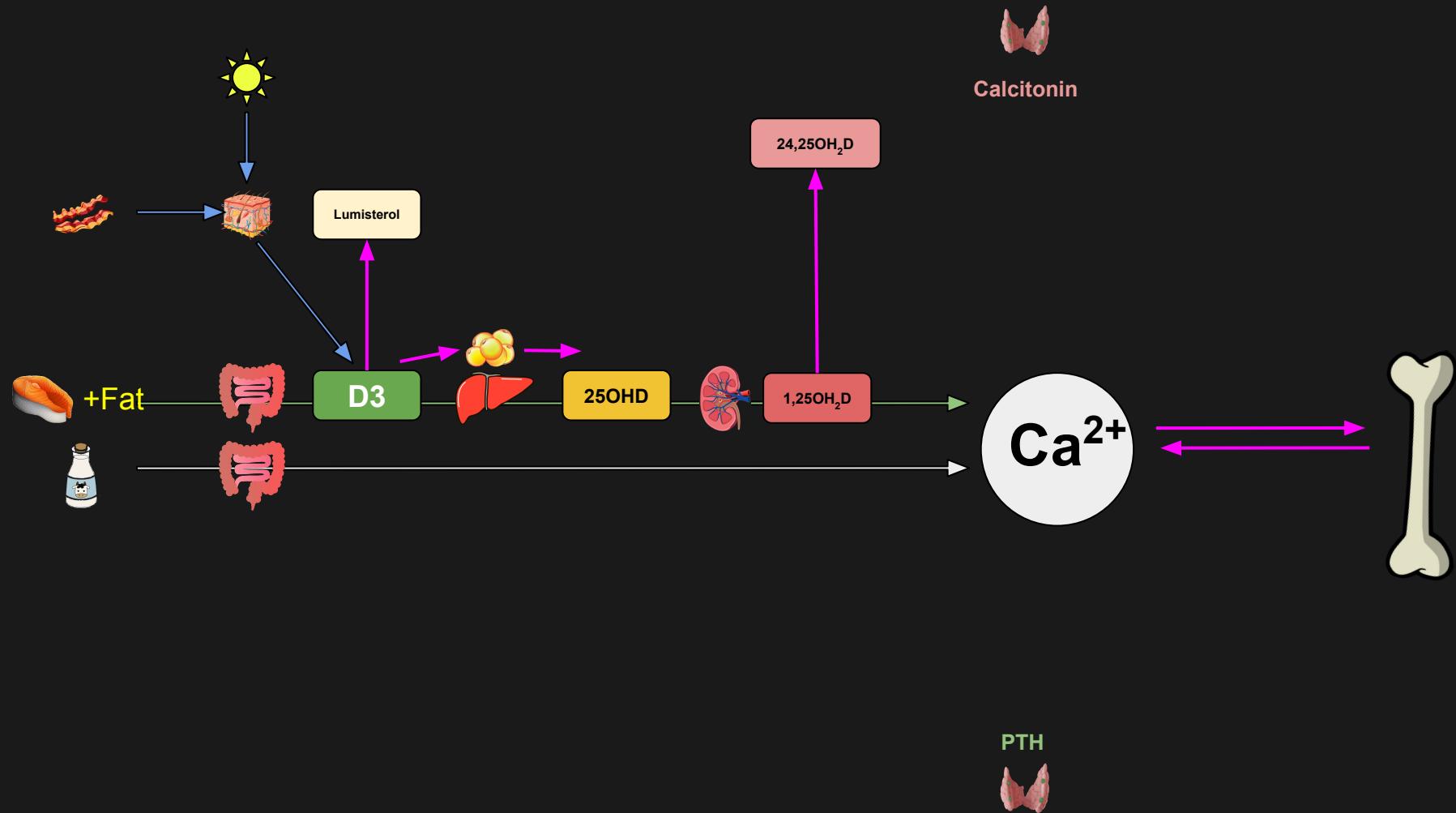
Why do I have too much vitamin D ?

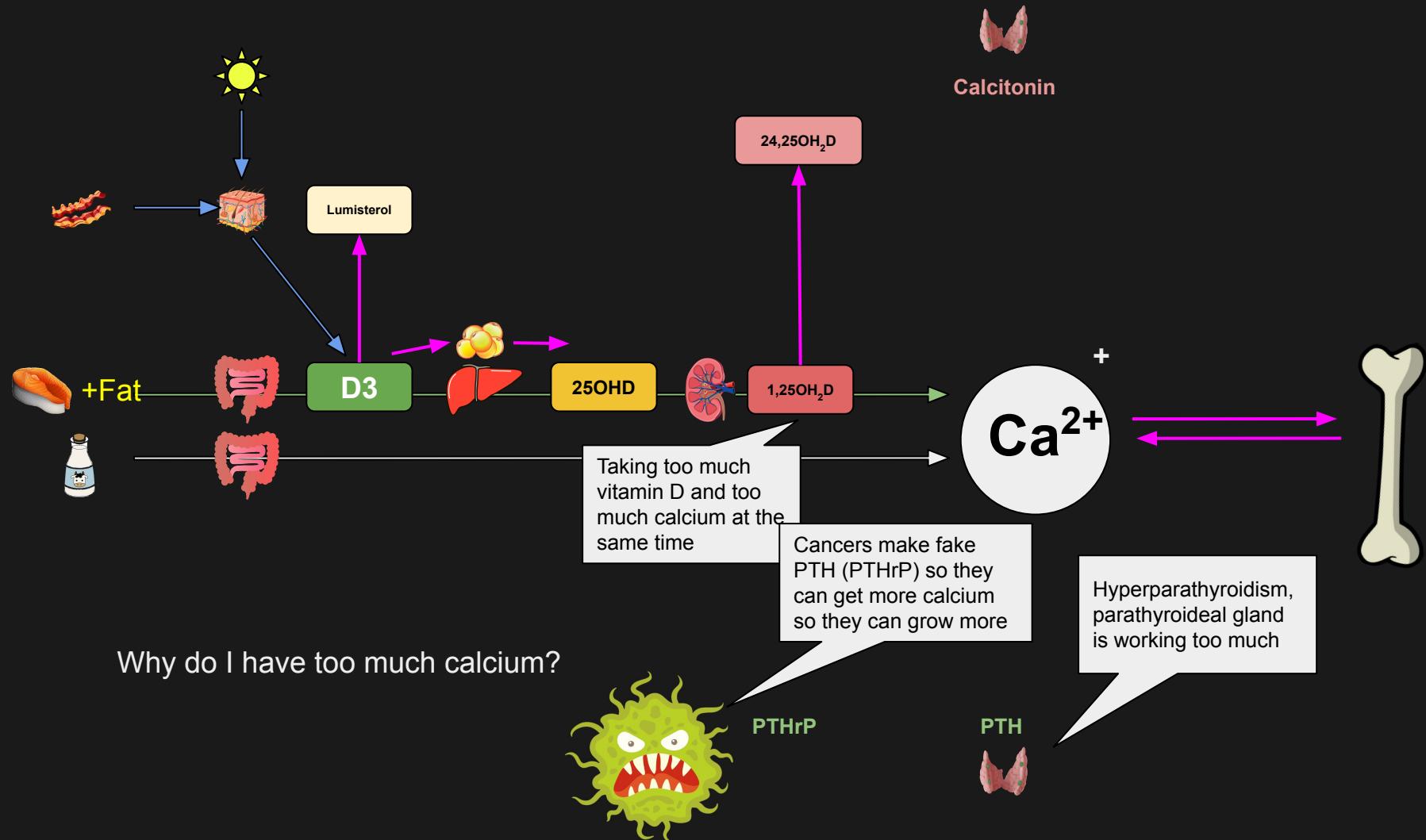
Almost impossible!

PTH

Hypercaelcemia

- Calcium blocks sodium channels (muscular weakness, neurological and heart issues)
- Calcium deposits in kidneys (kidneys stones and peeing too much)



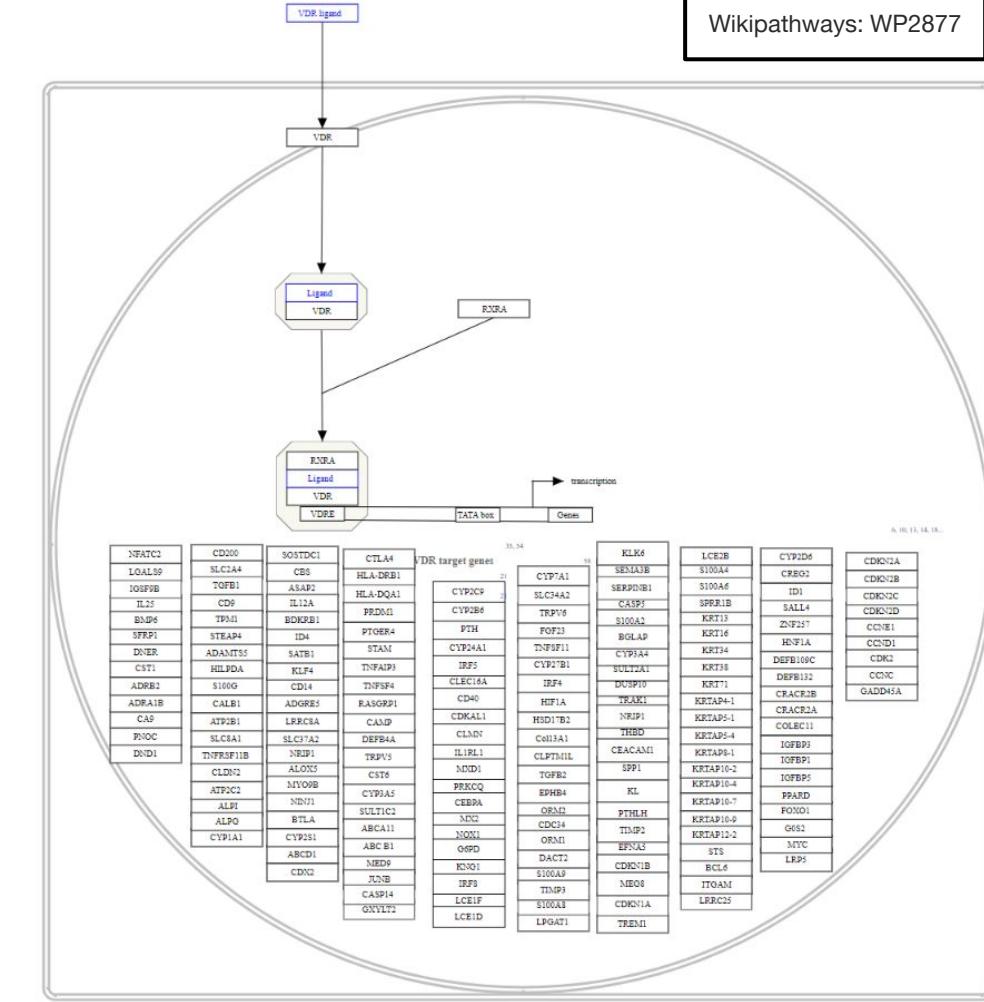


Hypovitaminosis D

Hypovitaminosis D

Bone diseases for sure

Wikipathways: WP2877



Hypovitaminosis D

Bone diseases for sure

Cancer

- Observation says yes
- Intervention says no

Muscle weakness

- Bad food standarization
- Include Calcium supplements

Cardiovascular diseases

- Observation says yes
- Clinical trials says no

Mental illnesses

- Observation says yes
- Clinical trials says no

Multiple Sclerosis

- Observation says yes
- Clinical trials says no

Diabetes and glucoses homeostasis

- VitD stimulate B-receptors in pancreas
- Interventions badly designed with mix levels

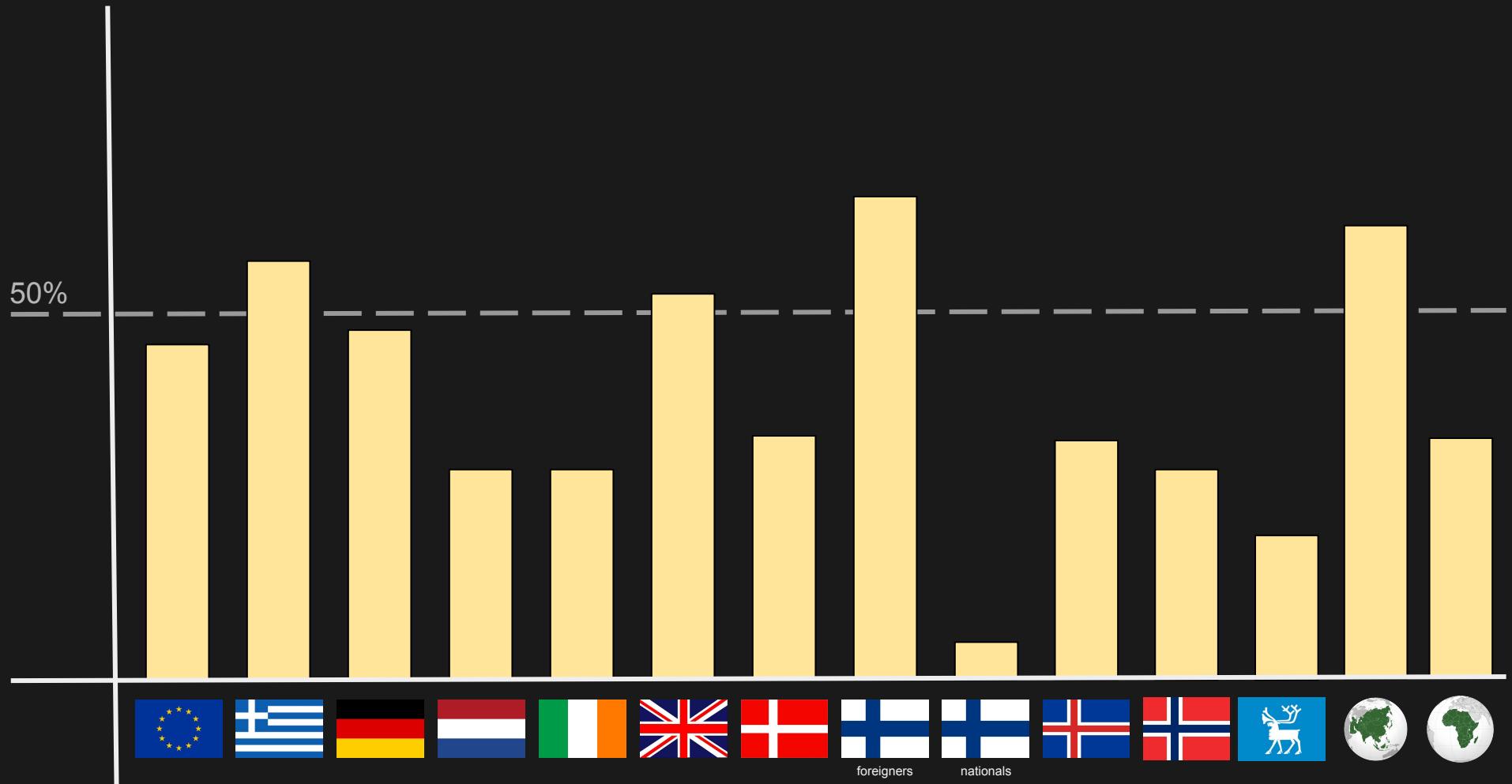
Obesity

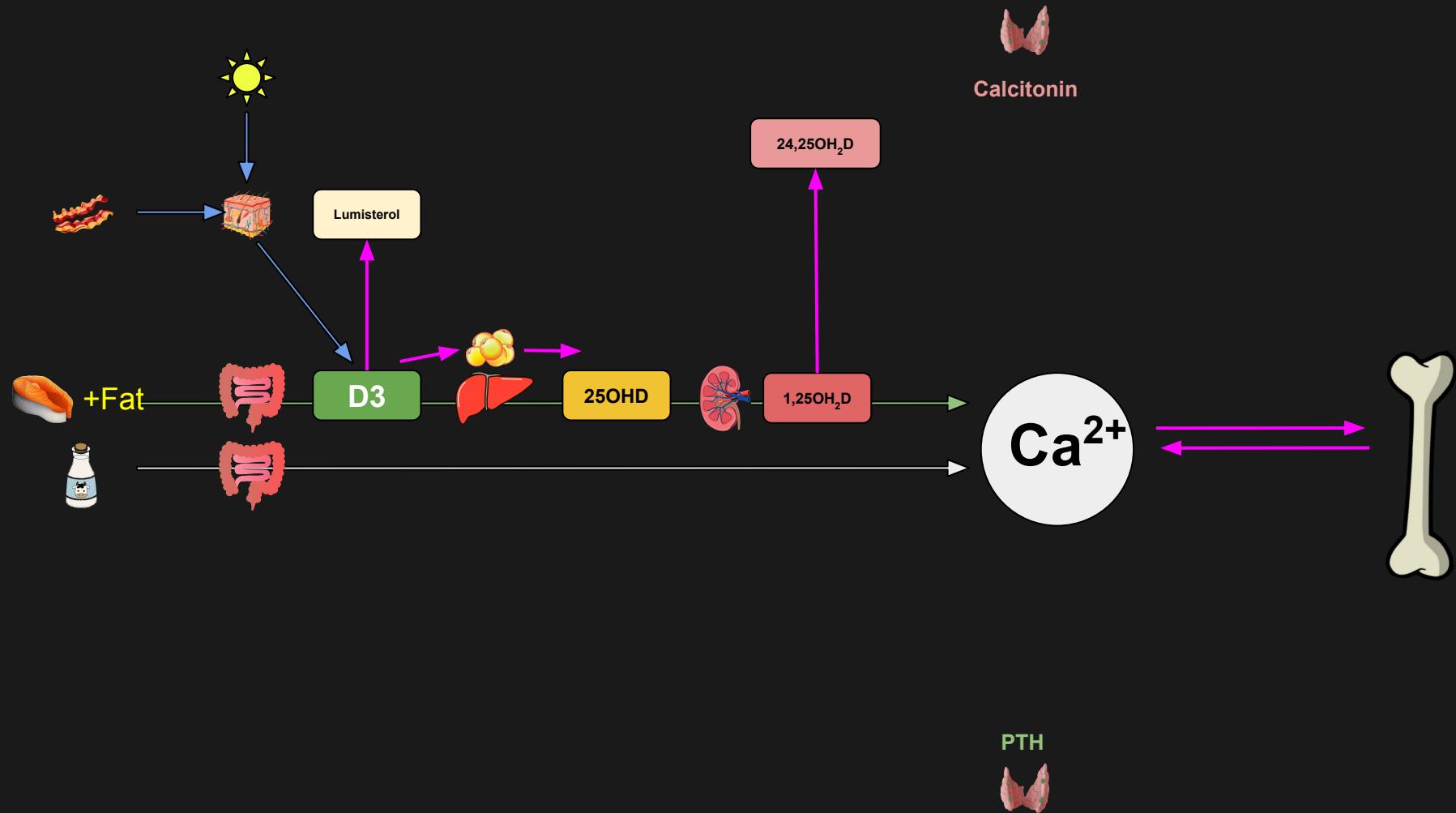
- Maybe for post-menopausal women
- No effect in anybody else

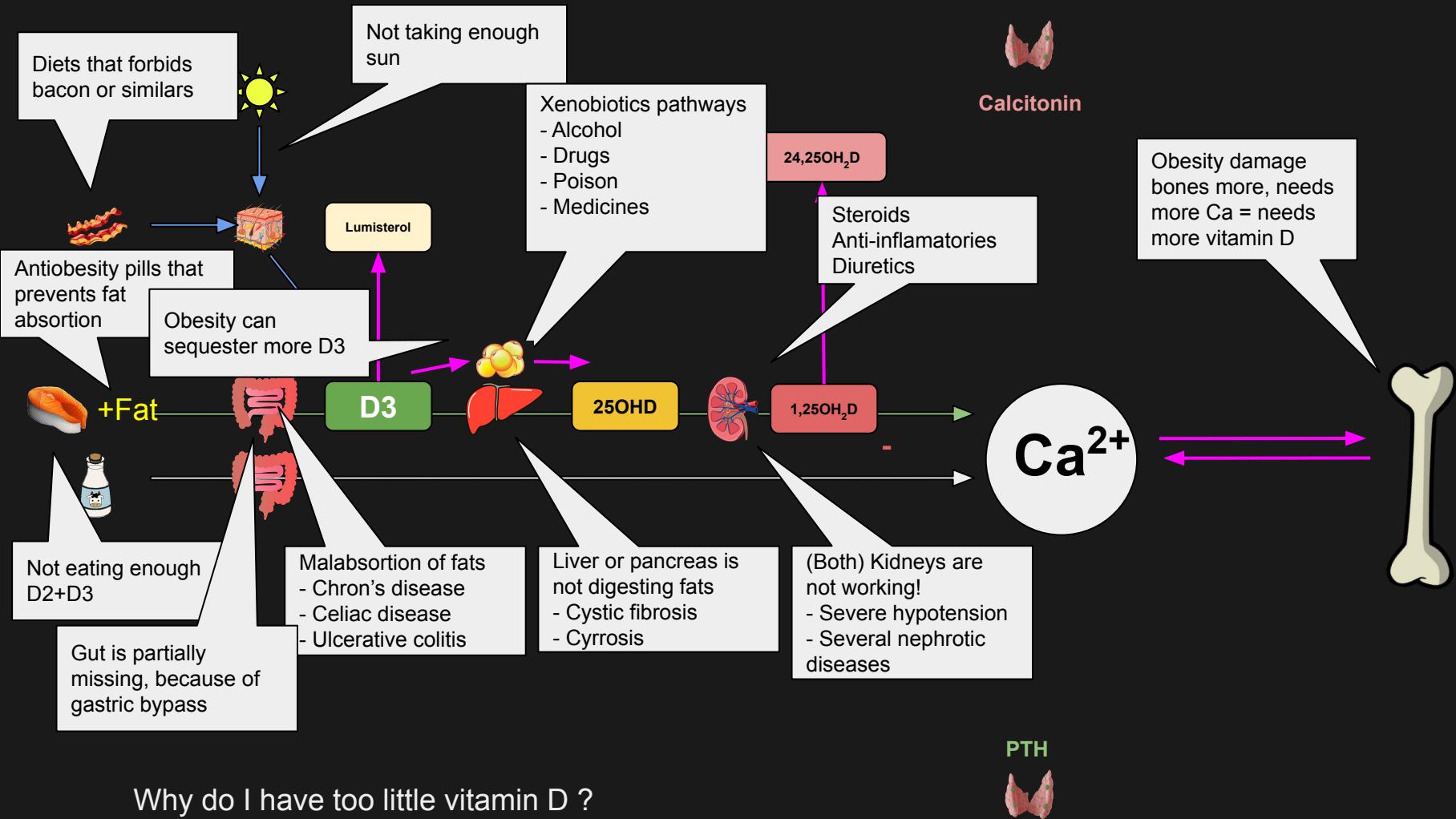
And many more

go and read the document!

Prevalence vitamin D deficiency (more is worse)



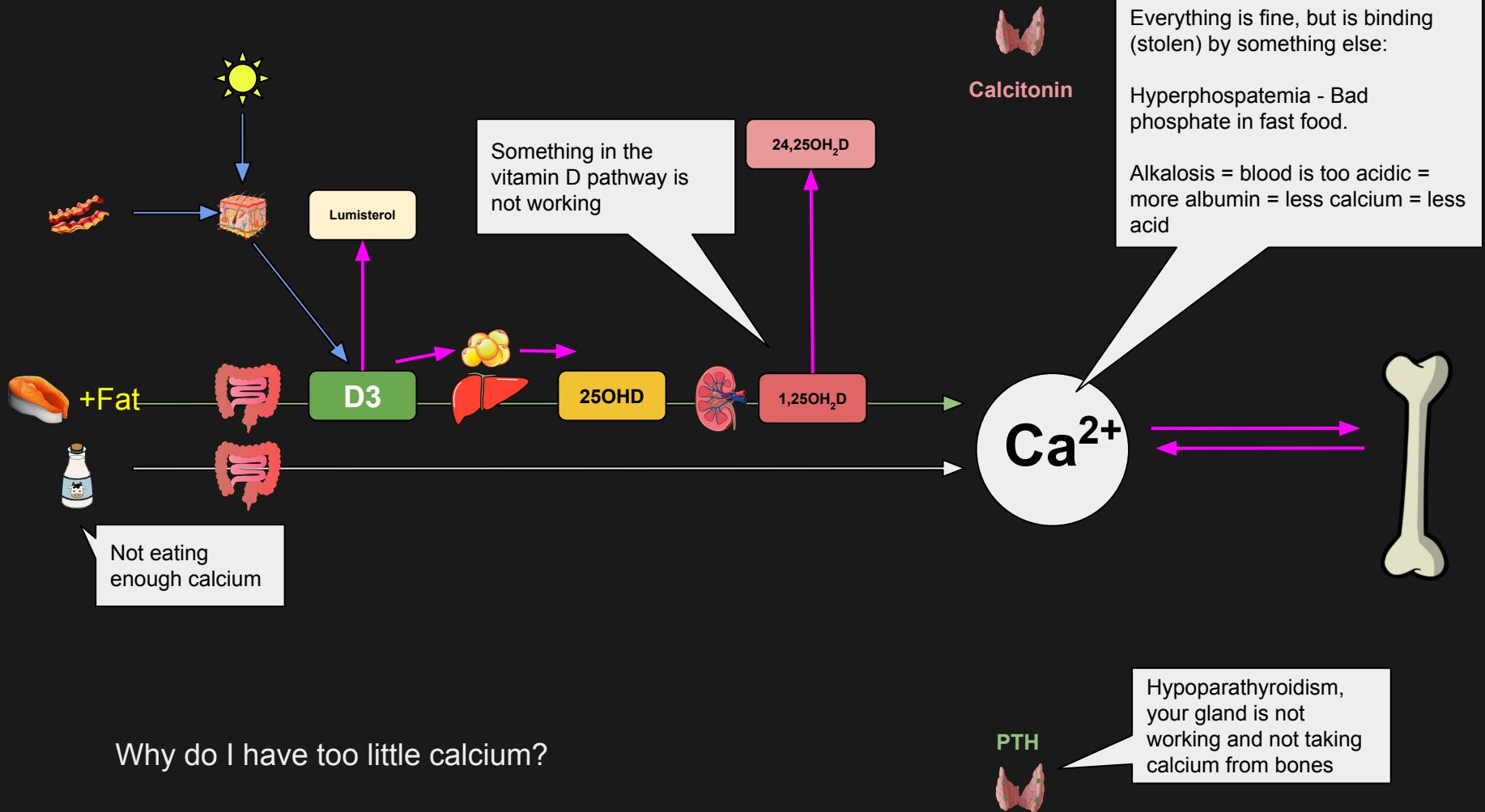




Why do I have too little vitamin D ?

Hypocalcemia







How do I get calcium? *

How do I get calcium? *

Oxalate
Phytate



How do I get calcium? *

Oxalate
Phytate





How do I get calcium? *

Oxalate
Phytate



Anything that makes your kidneys work too much:

- Alcohol
- Salty things
- Insane Proteins

How do I get vitamin D

% Daily Intake / 100 g

Salmon



650 IU

100%

% Daily Intake / 100 g

100%

Salmon



650 IU

Mackerel



% Daily Intake / 100 g

Salmon



650 IU

100%

Mackarel



1010 IU

% Daily Intake / 100 g

100%

Salmon



650 IU

Mackerel



1010 IU

Cod



Caviar



Shrimps



Tuna



% Daily Intake / 100 g

100%

Salmon



650 IU

Mackarel



1010 IU

Cod



36 IU

Caviar



117 IU

Shrimps



2 IU

Tuna



% Daily Intake / 100 g

Salmon



650 IU

Mackarel



1010 IU

Cod



36 IU

Caviar



117 IU

Shrimps



2 IU

Tuna



270 IU

100%

% Daily Intake / 100 g

100%

Salmon



650 IU

Mackarel



1010 IU

Cod



36 IU

Caviar



117 IU

Shrimps



2 IU

Tuna



270 IU

Beef



Poultry



% Daily Intake / 100 g

Salmon



650 IU

Mackarel



1010 IU

Cod



36 IU

Caviar



117 IU

Shrimps



2 IU

Tuna



270 IU

Beef



28 IU

Poultry



9 IU

100%

% Daily Intake / 100 g

Salmon



650 IU

Mackarel



1010 IU

Tuna



270 IU

100%

% Daily Intake / 100 g

100%

Salmon



650 IU

Mackarel



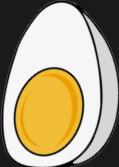
1010 IU

Tuna



270 IU

Eggs, white



Eggs, yolk

% Daily Intake / 100 g

Salmon



650 IU

Mackarel



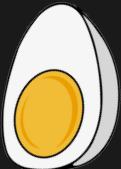
1010 IU

Tuna



270 IU

Eggs, white



0 IU

Eggs, yolk

231 IU

100%

% Daily Intake / 100 g

Salmon



650 IU

Mackarel



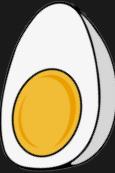
1010 IU

Tuna



270 IU

Eggs, white



0 IU

Eggs, yolk



231 IU

Milk, 3.5%



100%

% Daily Intake / 100 g

Salmon



650 IU

Mackarel



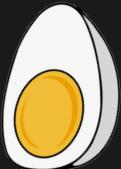
1010 IU

Tuna



270 IU

Eggs, white



0 IU

Eggs, yolk



231 IU

Milk, 3.5%



2 IU

100%

% Daily Intake / 100 g

Salmon



650 IU

Mackarel



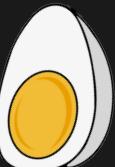
1010 IU

Tuna



270 IU

Eggs, white



0 IU

Eggs, yolk

231 IU

Milk, 3.5%



2 IU

Milk + D



51 IU

100%

% Daily Intake / 100 g

Salmon



650 IU

Mackarel



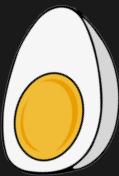
1010 IU

Tuna



270 IU

Eggs, white



0 IU

Eggs, yolk



231 IU

Milk, 3.5%



2 IU

Milk + D



51 IU

Human Milk



100%

% Daily Intake / 100 g

100%

Salmon



650 IU

Mackarel



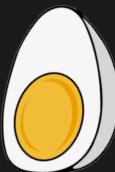
1010 IU

Tuna



270 IU

Eggs, white



0 IU

Eggs, yolk



231 IU

Milk, 3.5%



2 IU

Milk + D



51 IU

Human Milk



0 IU

Enrichment of vitamin D

6th of May DOI: 10.1007/s10654-022-00867-4

| | Baby Food | Dairy | Cereals | Other drinks |
|--|------------|------------|------------|--------------|
|  | Widespread | Rare | Rare | Rare |
|  | Mandatory | Voluntary | Rare | Rare |
|  | Rare | Rare | Rare | Rare |
|  | Widespread | Widespread | Widespread | Widespread |
|  | Widespread | Widespread | Voluntary | Voluntary |
|  | Mandatory | Forbidden* | Forbidden | Forbidden |
|  | Widespread | Widespread | Voluntary | Rare |
|  | Mandatory | Widespread | Widespread | Voluntary |
|  | Mandatory | Mandatory | Widespread | Widespread |



Vitamin D and flavor



Vitamin D and flavor



↑
Salmonella ,
Listeria ,
Staphylococcus aureus ,
Brucellosis
Campylobacter,
Yersinia enterocolitica ,
Pathogenic Escherichia coli ,
Cronobacter sakazakii ,
...

← Tweet



Teresa Jordà
@TeresaJorda

The biological and taste value of raw cow's milk is spectacular



1:17 PM · Jul 20, 2018 · Twitter for iPhone



Vitamin D and flavor



Salmonella ,
Listeria ,
Staphylococcus aureus ,
Brucellosis
Campylobacter,
Yersinia enterocolitica ,
Pathogenic Escherichia coli ,
Cronobacter sakazakii ,
...

% Daily Intake / 100 g

100%

Salmon



650 IU

Mackarel



1010 IU

Tuna



270 IU

Eggs, whole



90 IU

% Daily Intake / 100 g

Salmon



650 IU

Mackarel



1010 IU

Tuna



270 IU

Eggs, whole



90 IU

Veggetable



0 IU

Cereals & nuts



0 IU

Mushrooms



10 IU

100%

% Daily Intake / 100 g

100%

Salmon



650 IU

Mackarel



1010 IU

Tuna



270 IU

Eggs, whole



90 IU

Vegetable



0 IU

Cereals & nuts



0 IU

Mushrooms



10 IU

Mushrooms + UV



1140 IU

% Daily Intake / 100 g

100%

Salmon



650 IU

Mackarel



1010 IU

Tuna



270 IU

Eggs, whole



90 IU

Mushrooms + UV



1140 IU

% Daily Intake / 100 g

Salmon



650 IU

Mackarel



1010 IU

Tuna



270 IU

Eggs, whole



90 IU

Mushrooms + UV

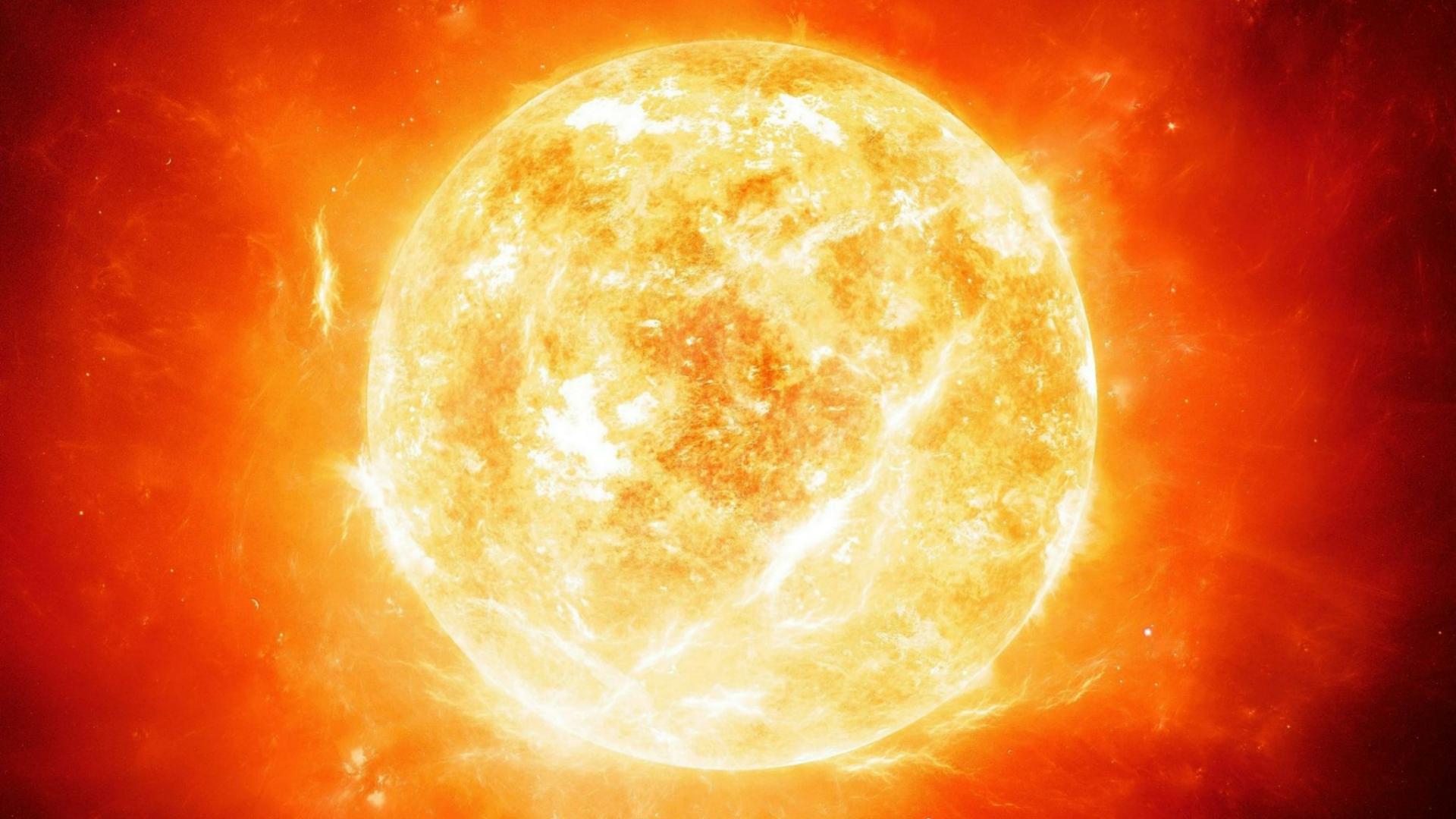


1140 IU



100%

It's OVER
9000 IU!!!



Ultraviolet C

Ultraviolet B

Ultraviolet A



Ultraviolet C

Ultraviolet B

Ultraviolet A



Ultraviolet C



Ultraviolet B

Ultraviolet A



Ultraviolet C



Ultraviolet B



Ultraviolet A



Ultraviolet C



D3

Ultraviolet B



Ultraviolet A



Ultraviolet C



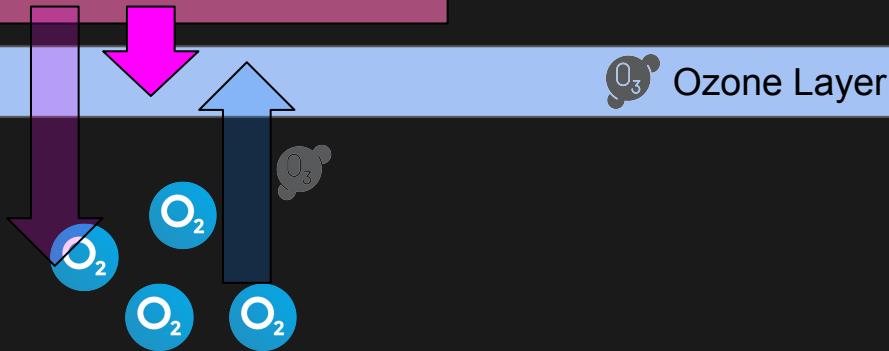
Ultraviolet B



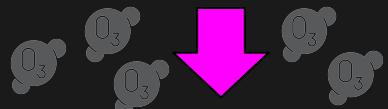
Ultraviolet A



Ultraviolet C



O_3 Ozone Layer





Ultraviolet C

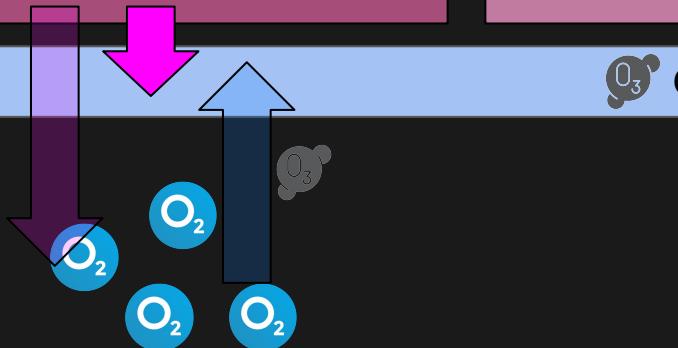


5%



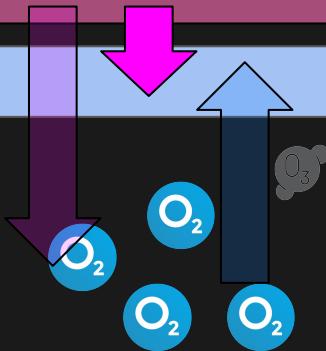
95%

Ultraviolet A





Ultraviolet C



Ultraviolet B

O_3 Ozone Layer

2mm

5%



Ultraviolet A

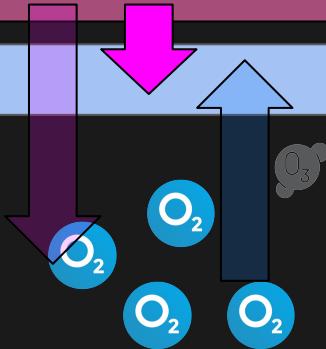
6mm

95%





Ultraviolet C



5%

Ultraviolet B

O_3 Ozone Layer

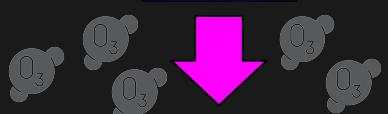
2mm



95%

Ultraviolet A

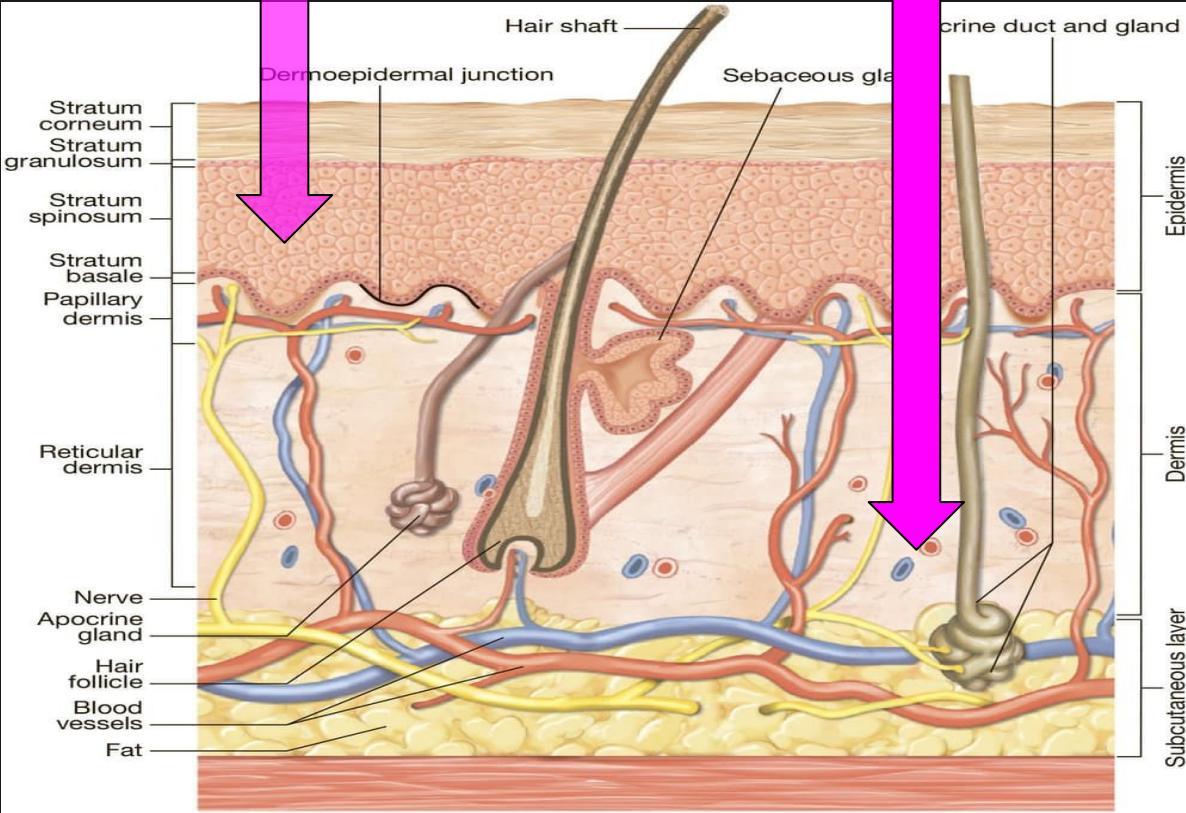
6mm



\approx 6 mm



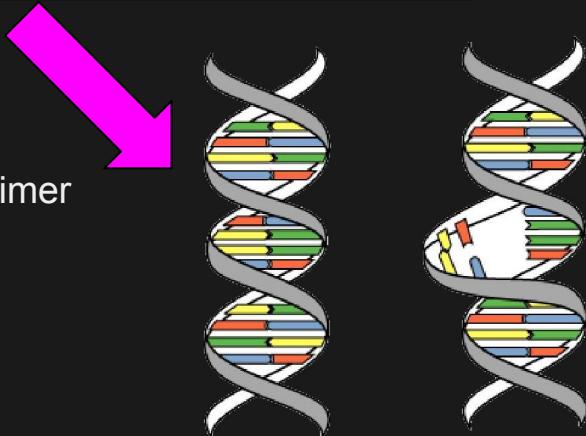
Ultraviolet B





Ultraviolet B

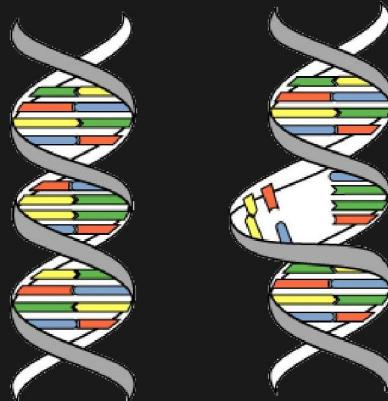
Thymine Dimer



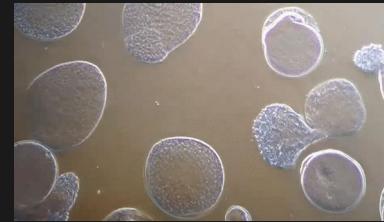


Ultraviolet B

Thymine Dimer



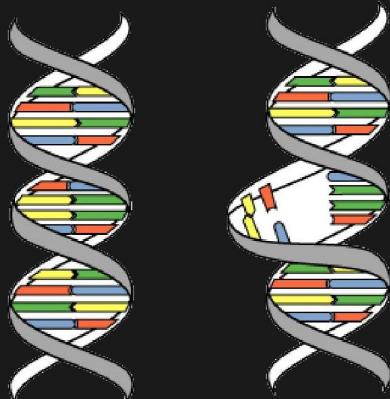
Seppuku
by Apoptosis



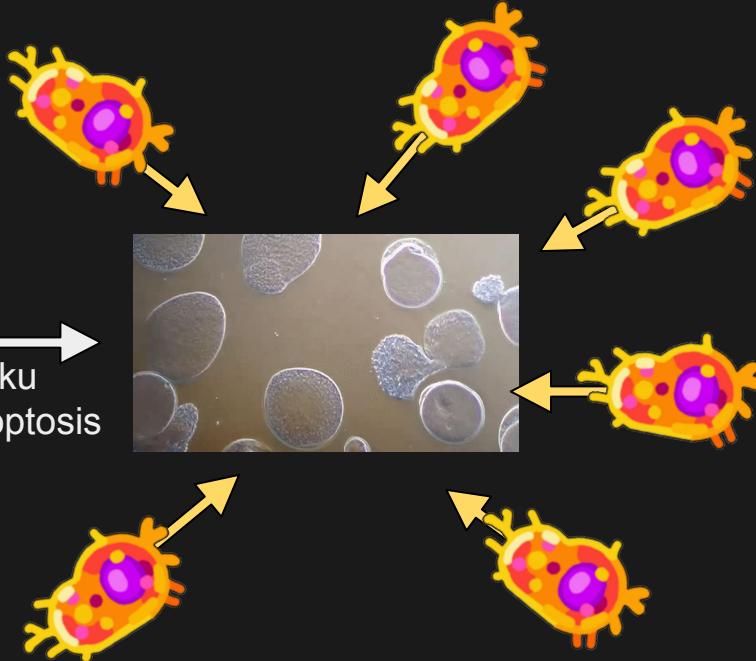


Ultraviolet B

Thymine Dimer



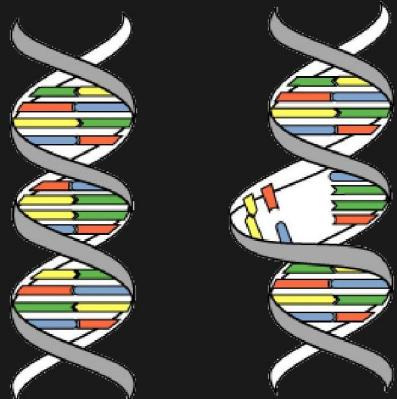
Seppuku
by Apoptosis



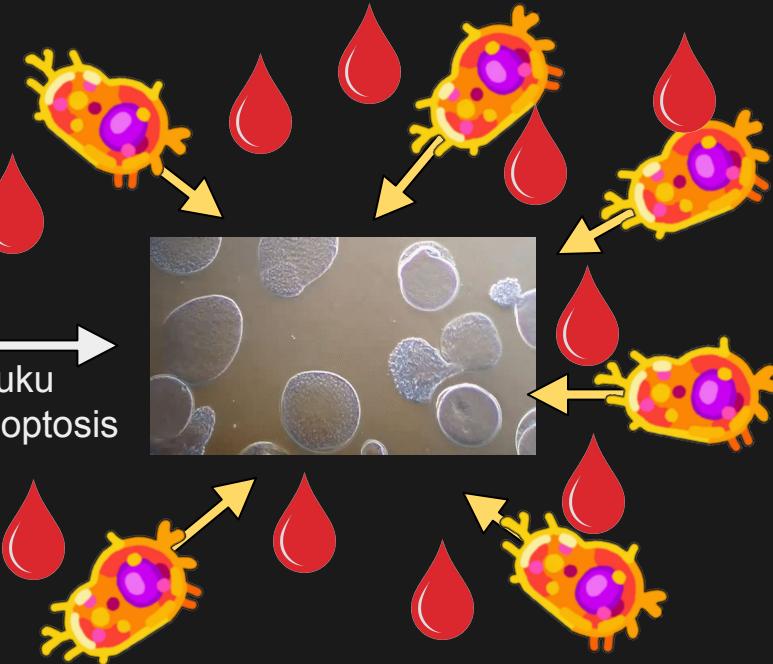


Ultraviolet B

Thymine Dimer



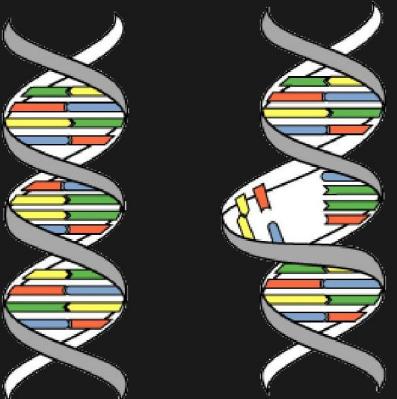
Seppuku
by Apoptosis



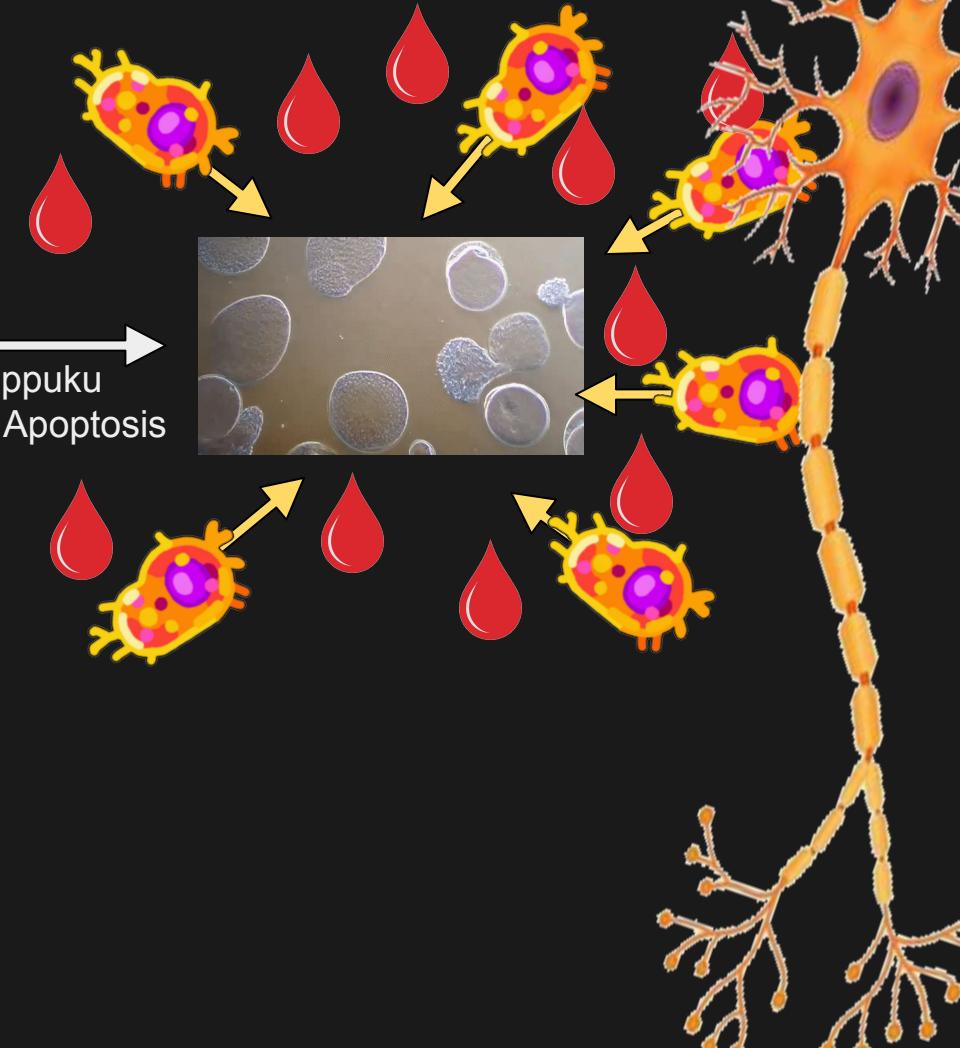


Ultraviolet B

Thymine Dimer



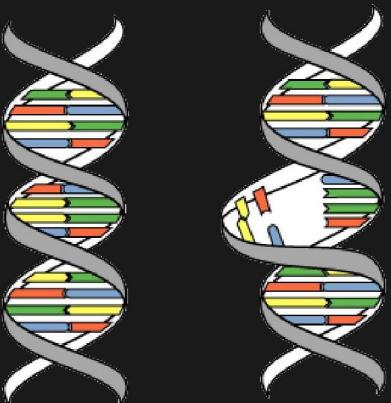
Seppuku
by Apoptosis





Ultraviolet B

Thymine Dimer

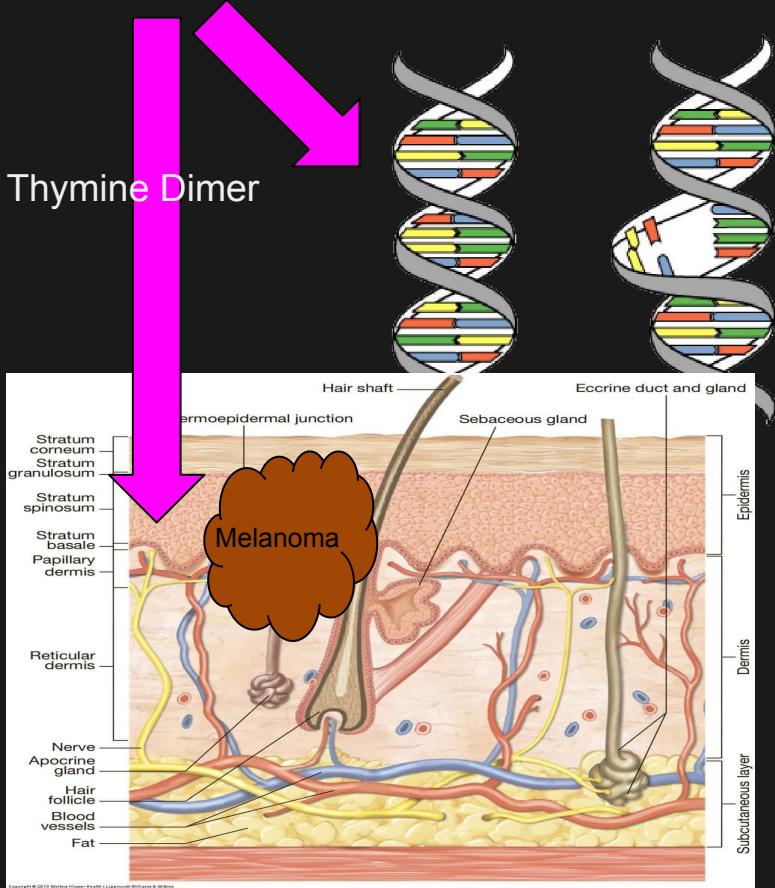


S
b





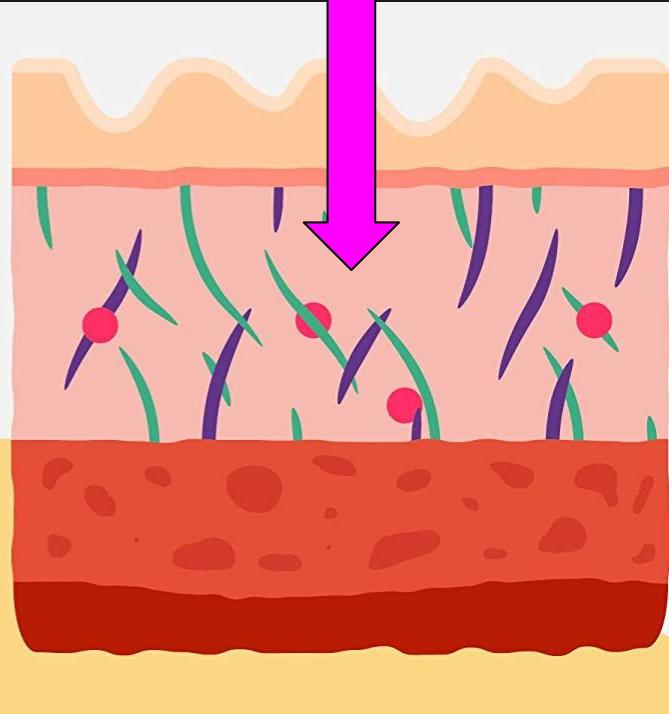
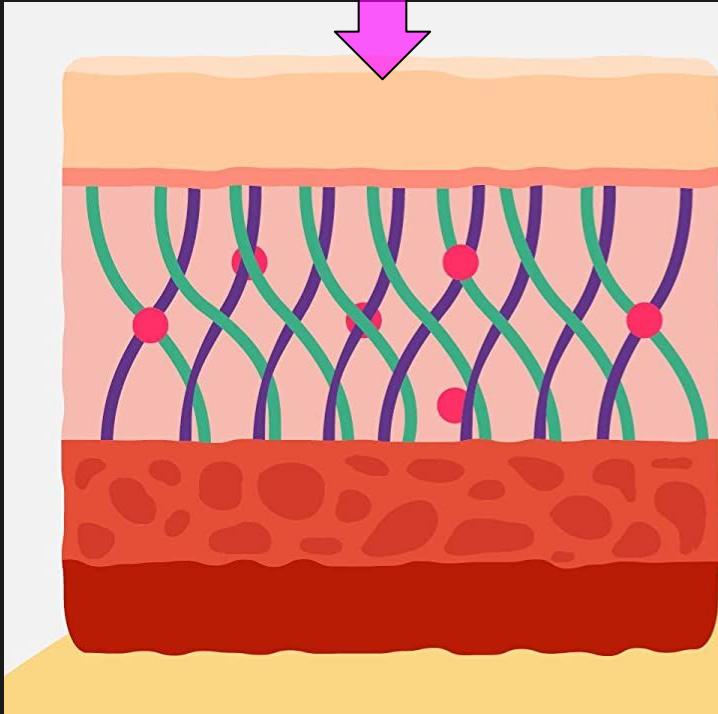
Ultraviolet B





Ultraviolet B

Ultraviolet A





Ultraviolet B

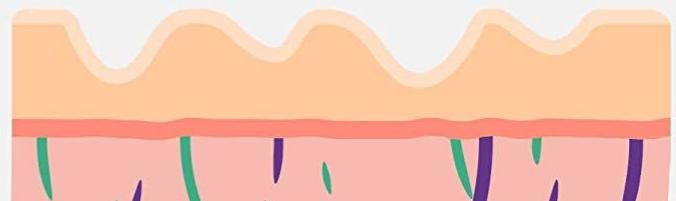


Ultraviolet A



Vitamin A depletion

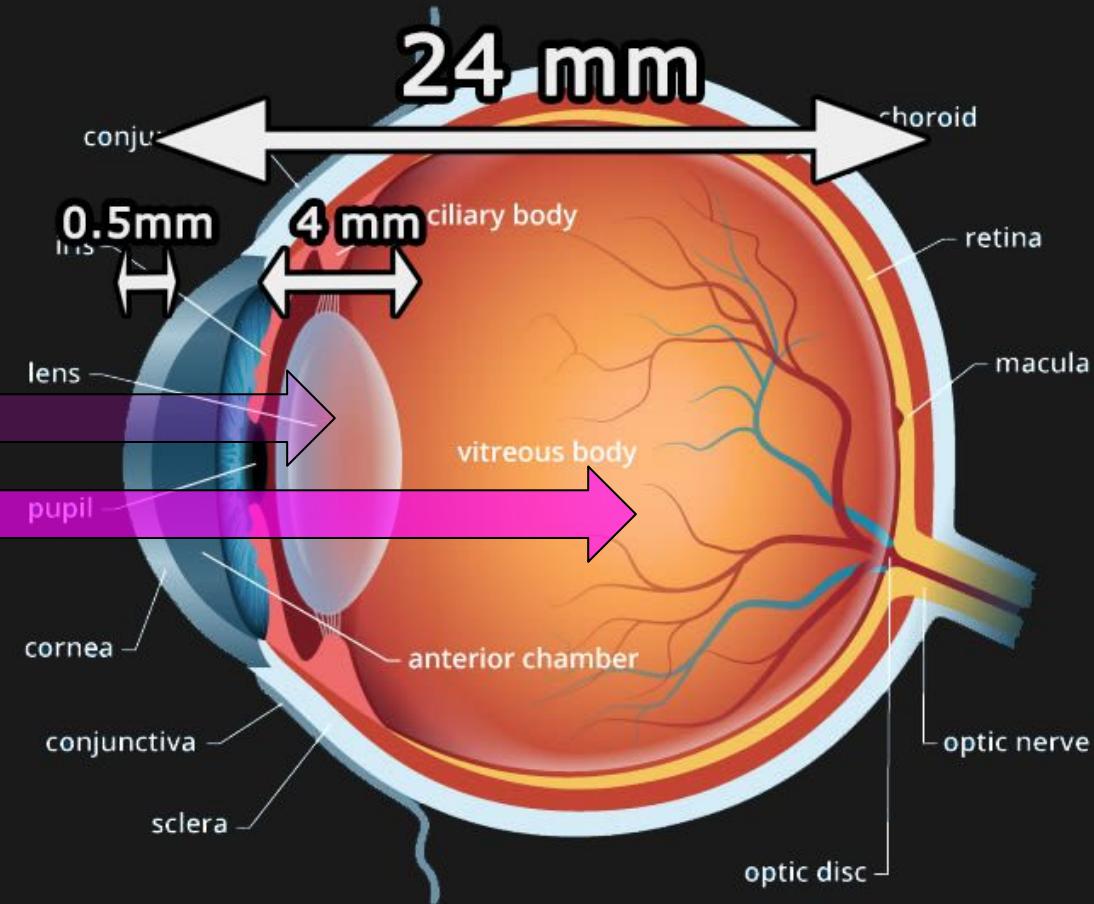
less collagen, less melatonin, **positive damage feedback loop**





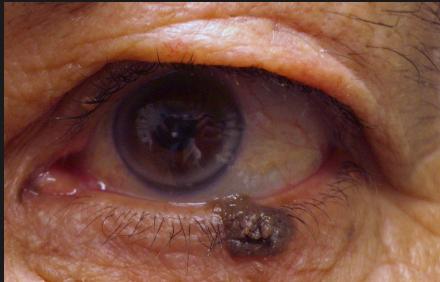
UVB

UVA

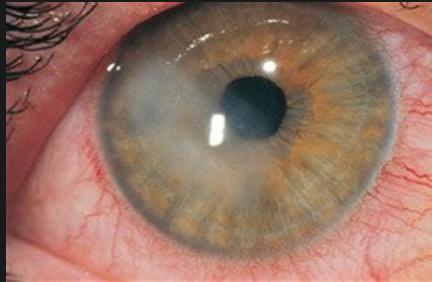




Ultraviolet B



Eyelid cancer



Photokeratitis



Ultraviolet A



Macular
degeneration



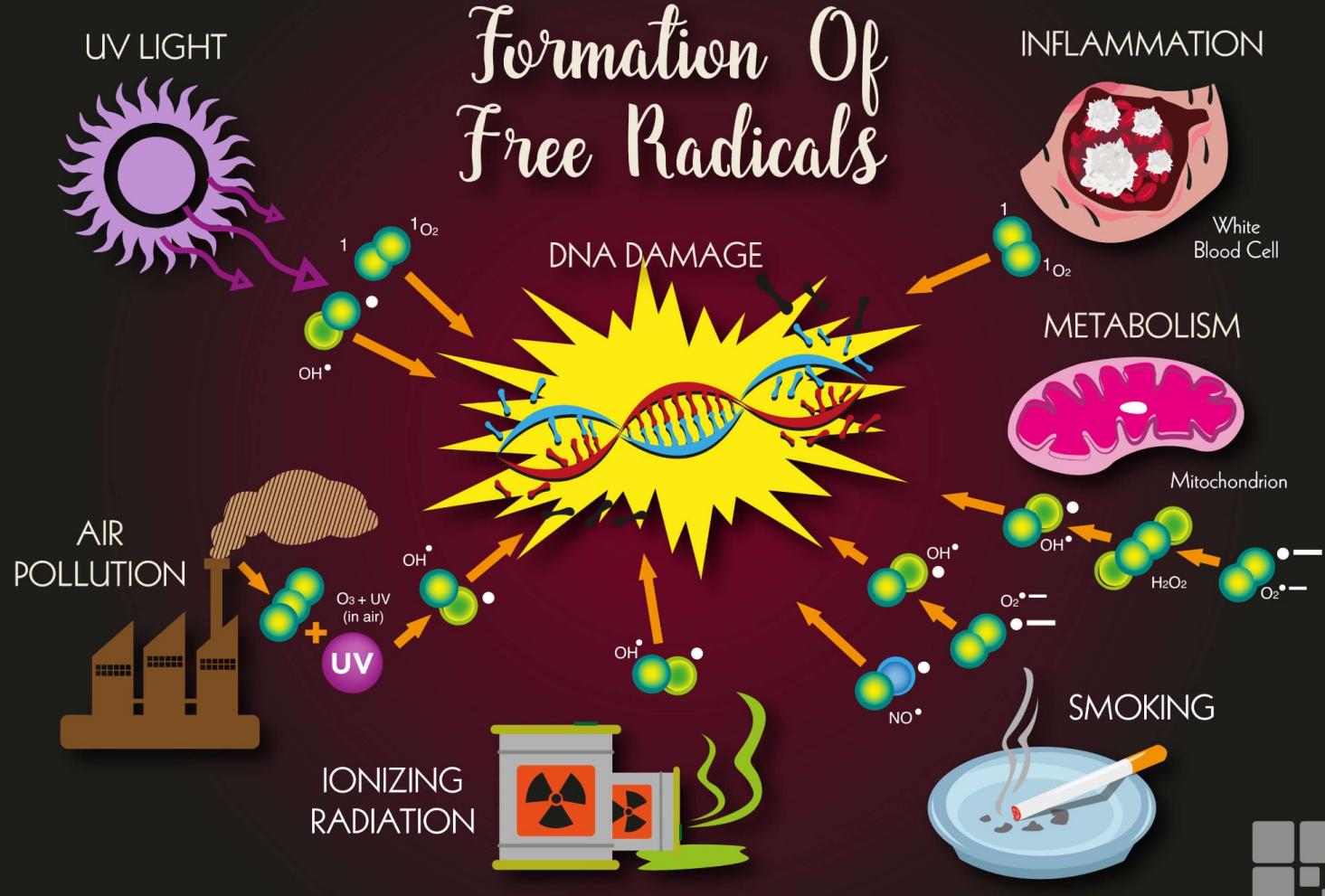
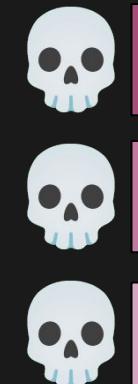
Cataracts



Pinguecula



Formation Of Free Radicals







Uric acid (zinc)

Vitamin E + Vitamin C

Coenzyme Q₁₀ (oil and beef)







HAPPINESS IS



> [Cell.](#) 2014 Jun 19;157(7):1527-34. doi: 10.1016/j.cell.2014.04.032.

Skin β -endorphin mediates addiction to UV light

Gillian L Fell ¹, Kathleen C Robinson ¹, Jianren Mao ², Clifford J Woolf ³, David E Fisher ⁴

Affiliations + expand

PMID: 24949966 PMCID: [PMC4117380](#) DOI: [10.1016/j.cell.2014.04.032](#)

Free PMC article



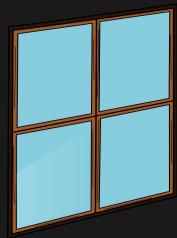
BEST

Blocks UVB but not UVA

Blocks UVA

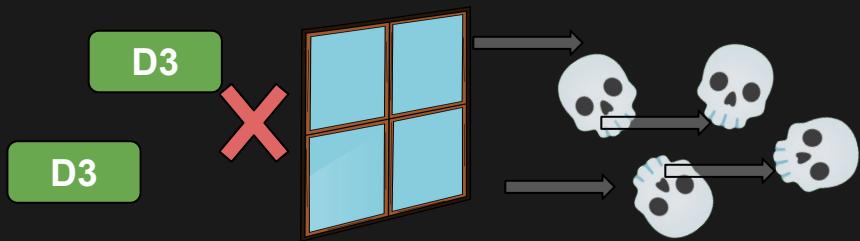
Blocks UVB but not UVA

Blocks UVA



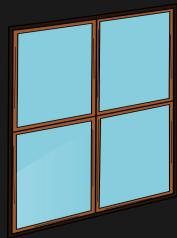
Blocks UVB but not UVA

Blocks UVA

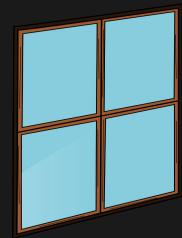


Blocks UVB but not UVA

Blocks UVA



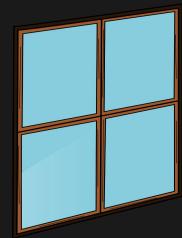
Blocks UVB but not UVA



Blocks UVA



Blocks UVB but not UVA



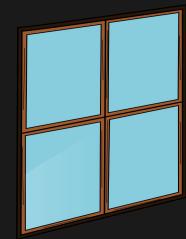
Blocks UVA



Up to 90% vit D deficiency in Middle East Women



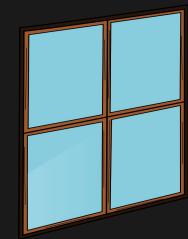
Blocks UVB but not UVA



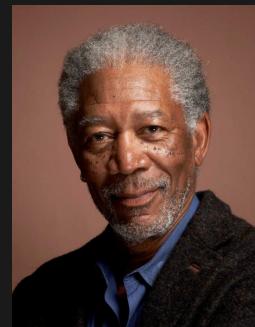
Blocks UVA



Blocks UVB but not UVA



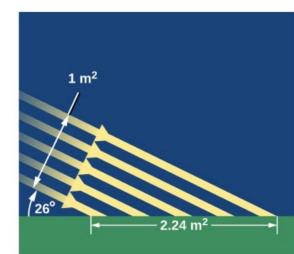
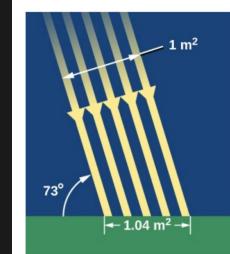
Blocks UVA



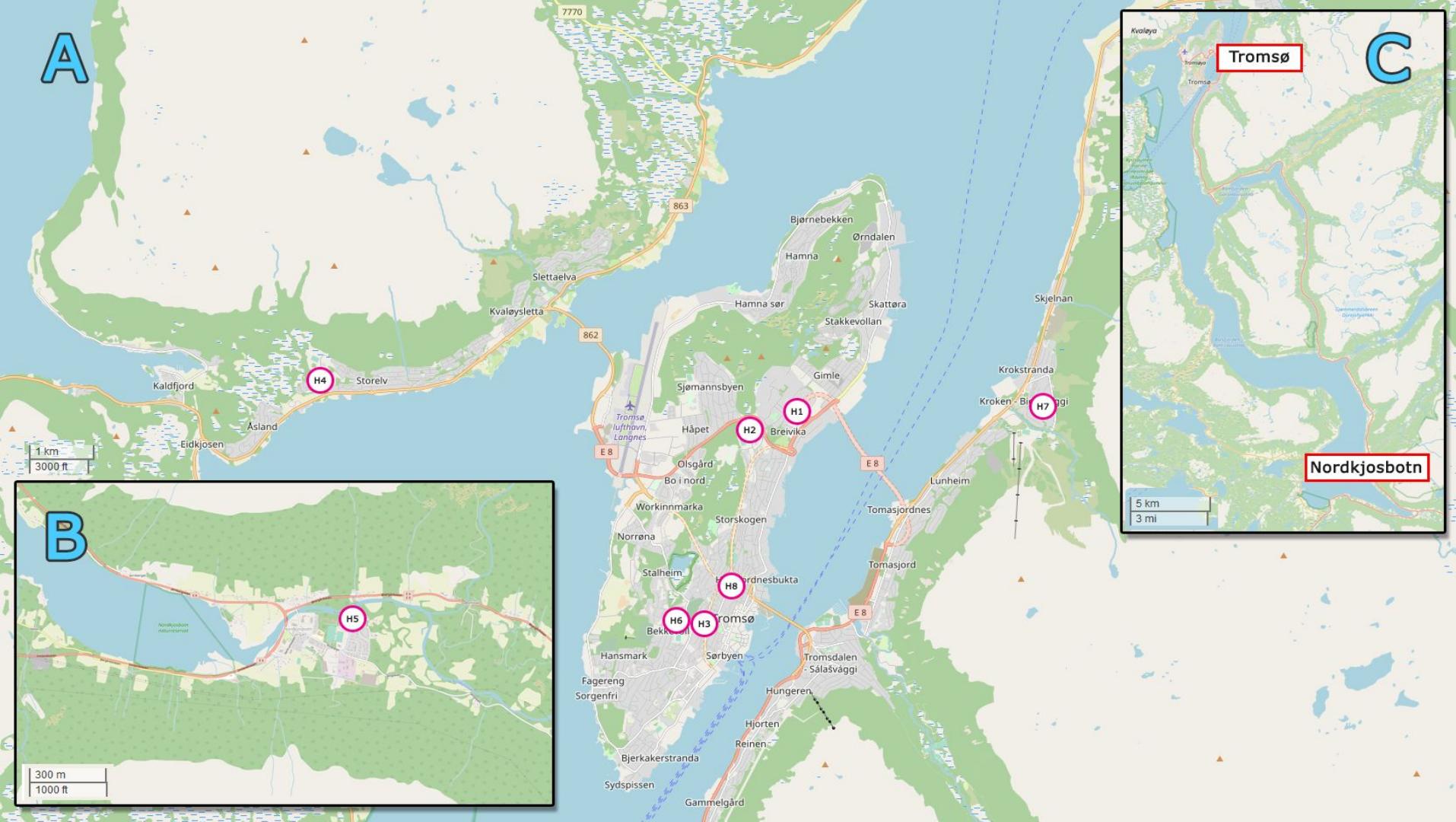
Blocks UVB but not UVA



Blocks UVA

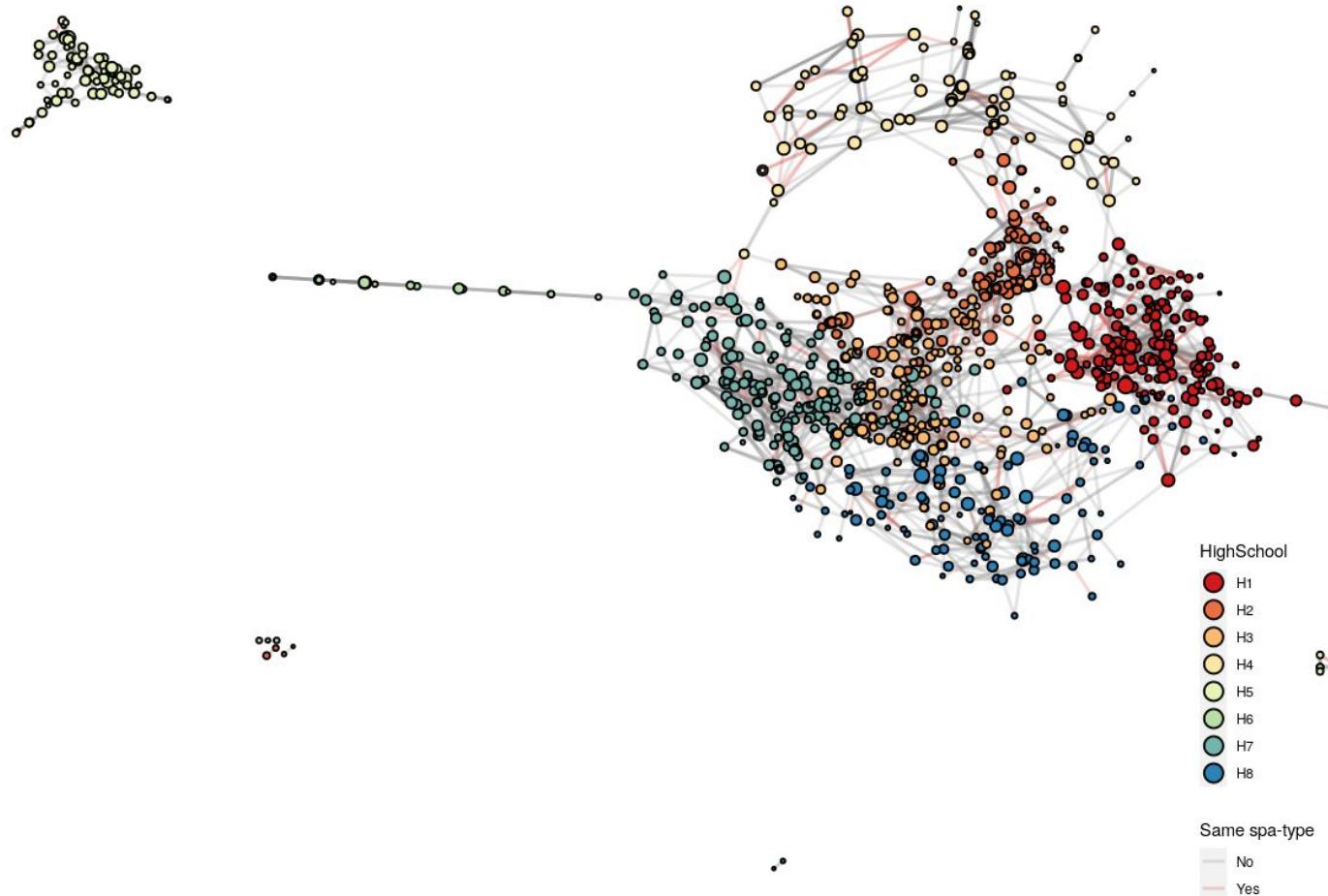


Results



School network, highschools in nodes and same spa-type in edges.

MDS layout, with isolated nodes hidden (n = 21)



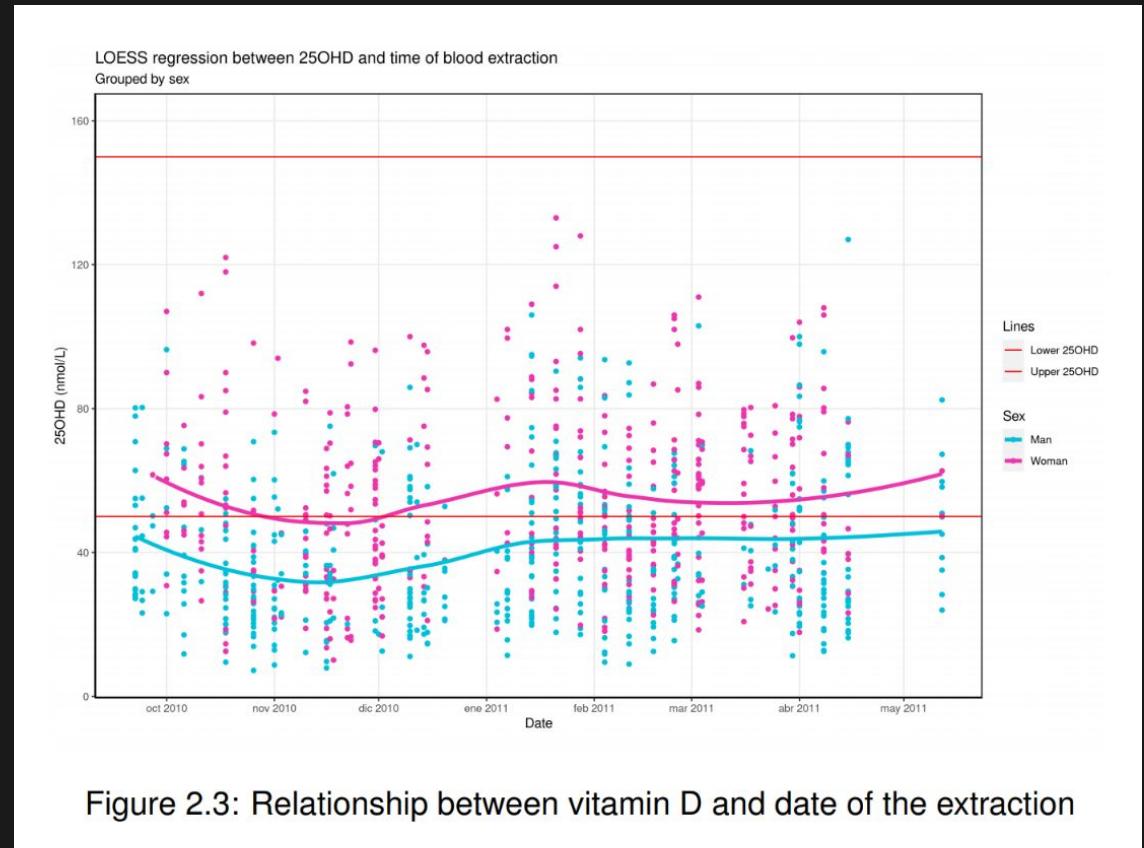
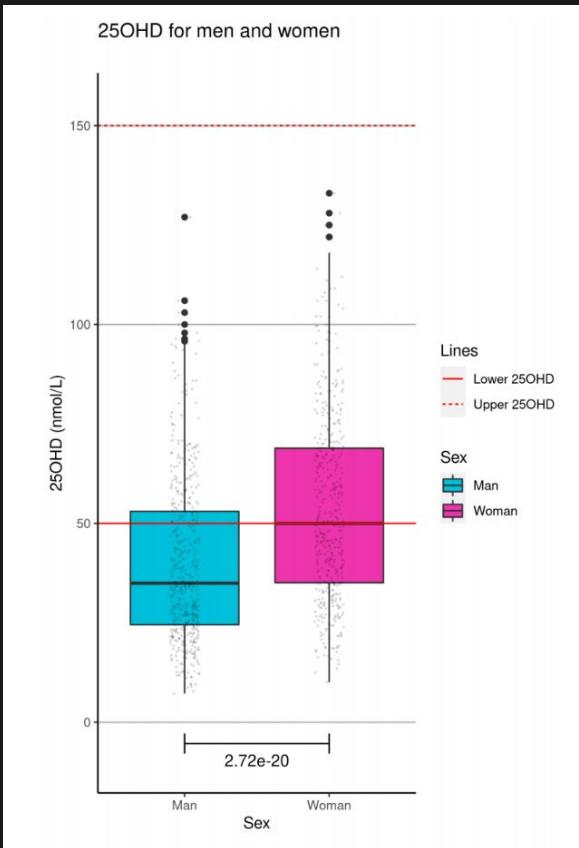
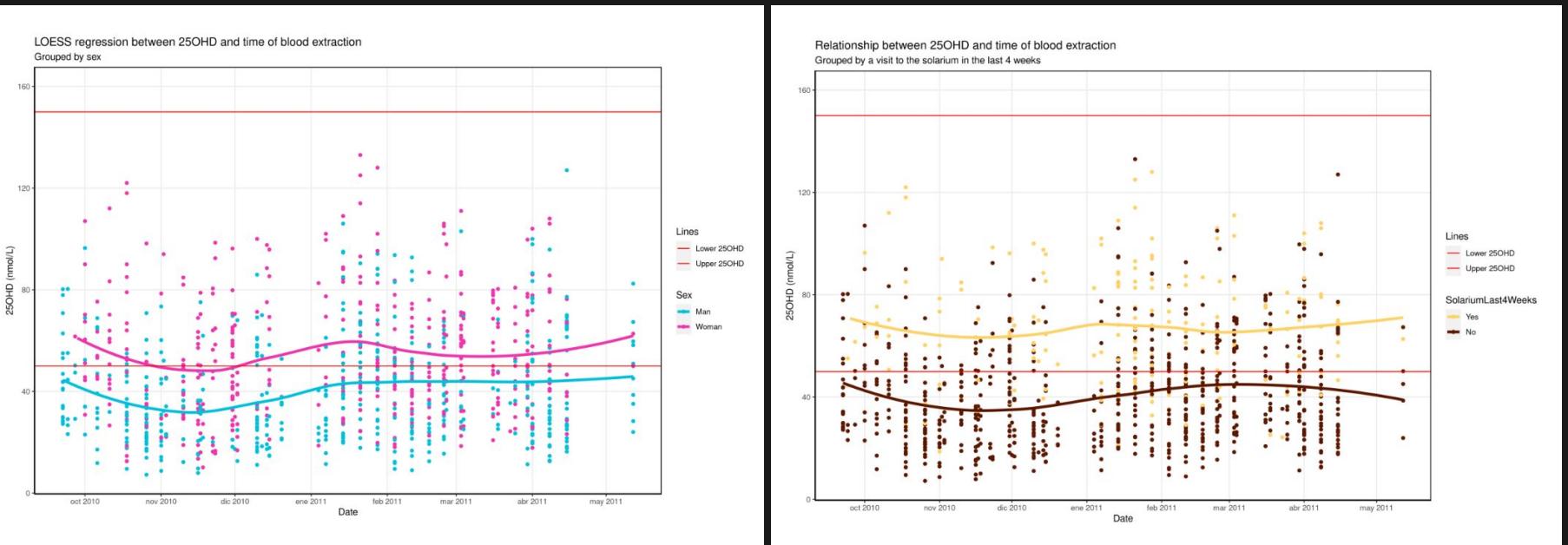
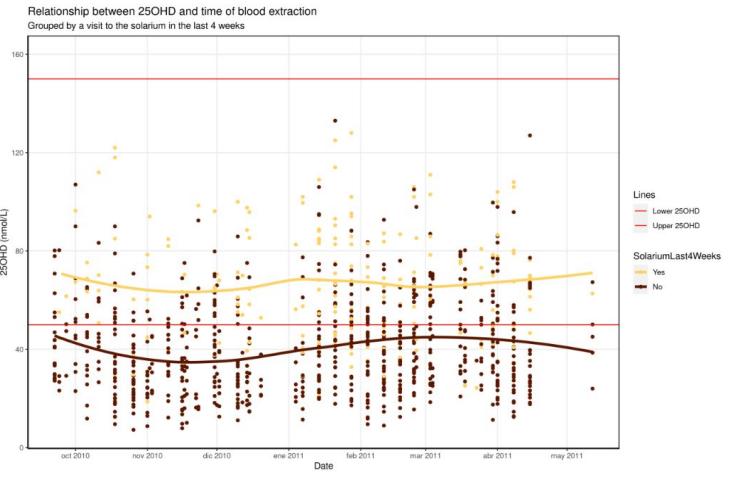
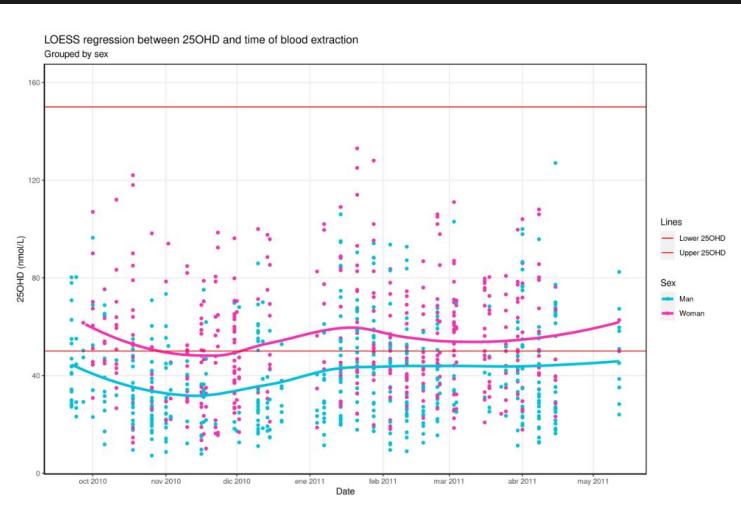


Figure 2.3: Relationship between vitamin D and date of the extraction





| | 2e-08 | Man | Woman | Total | Freq | |
|-------|--------------|------------|--------------|--------------|-------------|------|
| Yes | 73/106 | — | 144/103 | +++ | 217 | 0.21 |
| No | 436/386 | +++ | 352/376 | — | 788 | 0.76 |
| Total | 509 | | 496 | | 1038 | |
| Freq | 0.49 | | 0.48 | | 1 | |

Table 2.4: Xi-square test for solarium habits of men and women

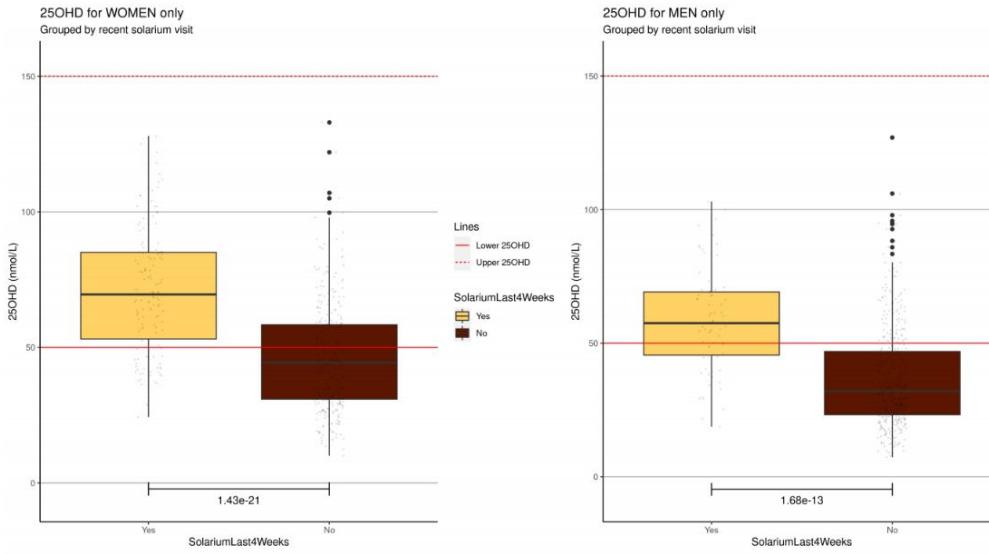
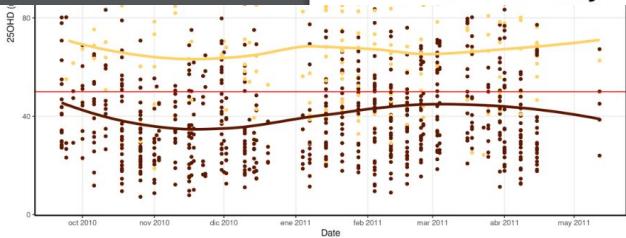
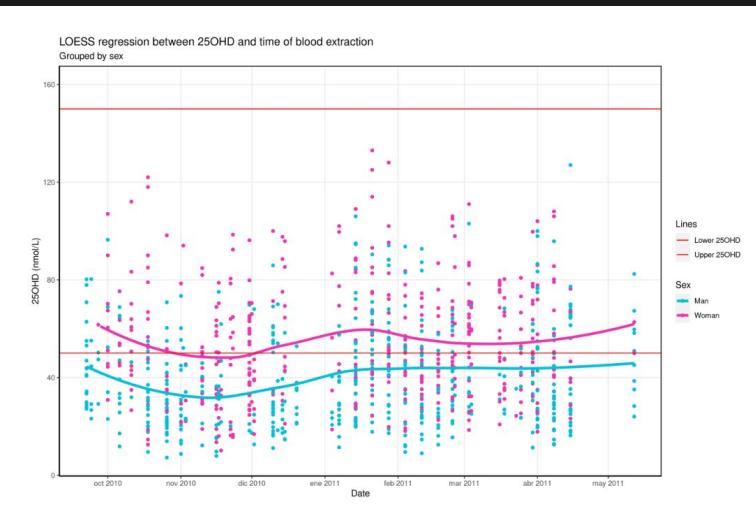


Figure 2.5: Differences in 25OHD levels for men and women visiting the solarium

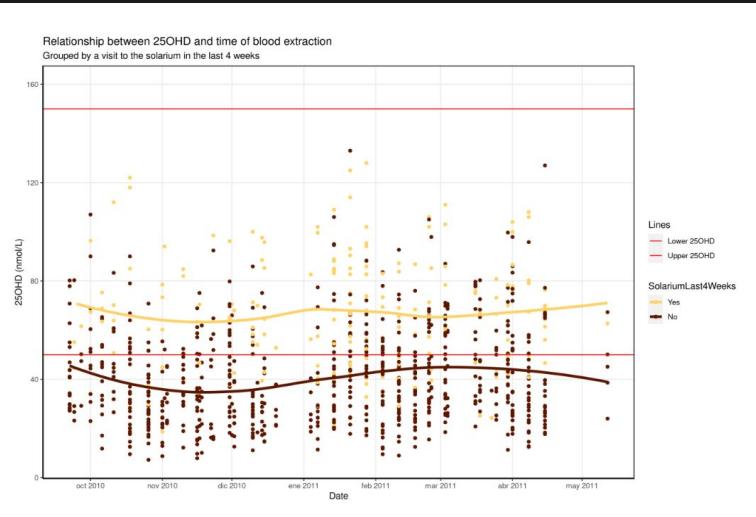
Activate Windows
Go to Settings to activate Windows.

2.4 Ethnicity





People are friends with people with same solarium habits. ($p_v = 0.008$)



Women do influence other women into going to the solarium. ($p_v = 0.0002$)

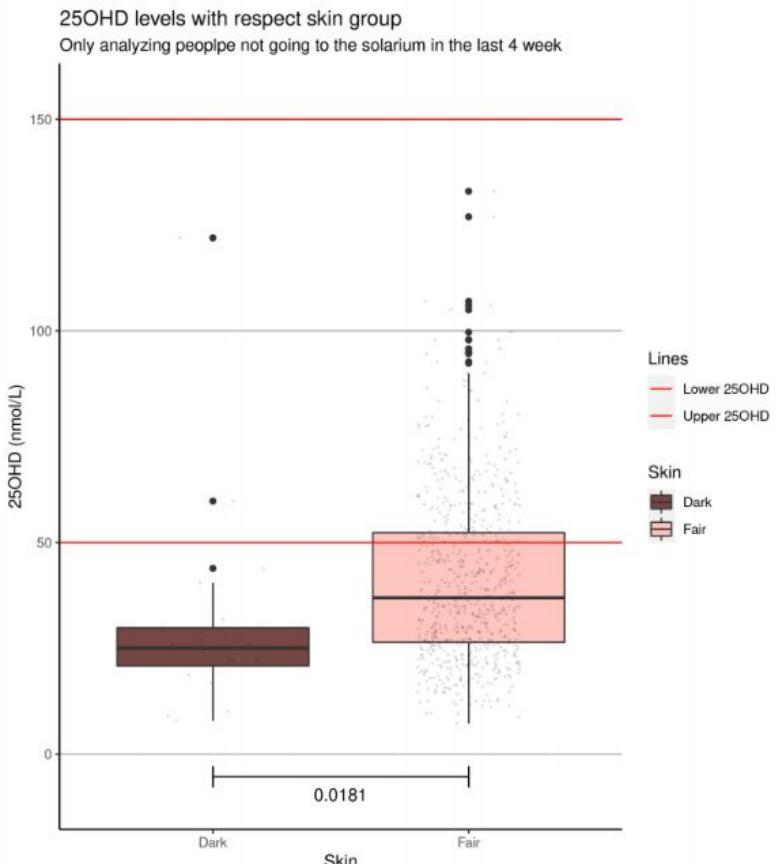
Very few friendships between men and women to tell cross influence.



DON'T GO TO THE SOLARIUM

*Prevalence of Indoor Tanning Among Teenagers in Norway Before and After Enforcement of Ban for Ages Under 18 Years
Short communication, Trude E. ROBSAHM, Jo S. STENEHJEM, Leon A.M. BERGEI and Marit B. VEIERØD*

*(NOWAC) Association of Lifetime Indoor Tanning and Subsequent Risk of Cutaneous Squamous Cell Carcinoma
JAMA Dermatology*



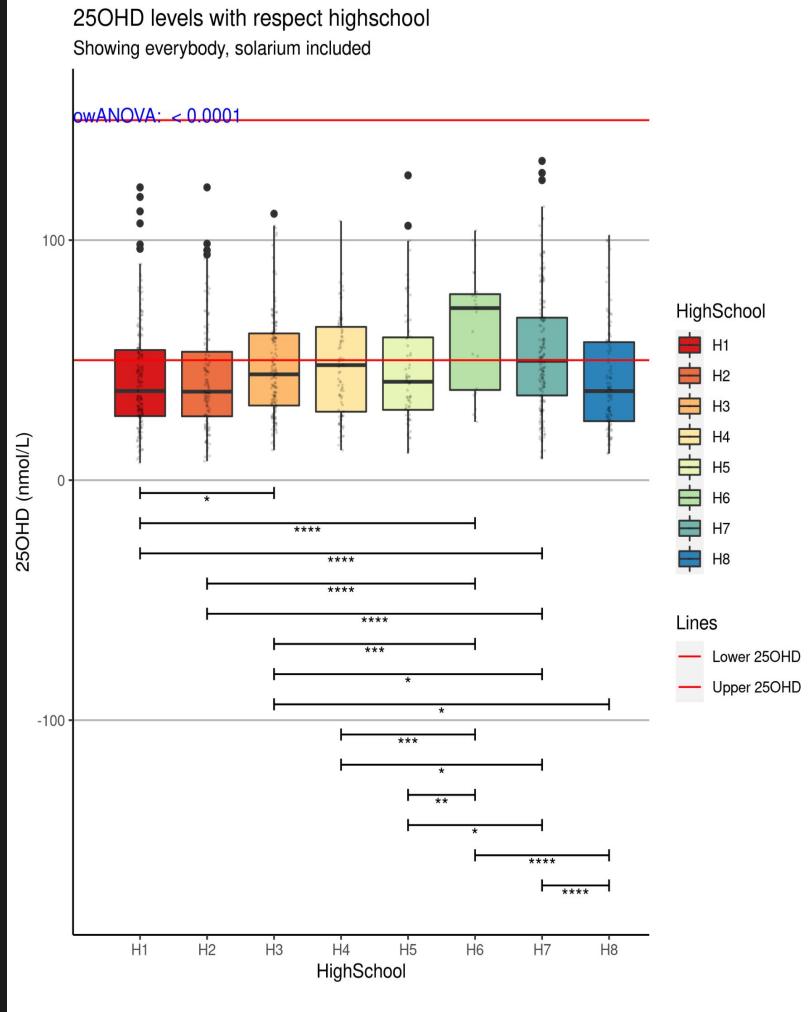
| | 0.5 | Fair | Dark | Total | Freq |
|-------|---------|------|------|-------|------|
| H1 | 190/192 | 7/4 | 197 | 0.19 | |
| H2 | 135/136 | 5/3 | 140 | 0.14 | |
| H3 | 164/163 | 3/3 | 167 | 0.16 | |
| H4 | 95/94 | 2/2 | 97 | 0.1 | |
| H5 | 81/79 | 0/1 | 81 | 0.08 | |
| H6 | 26/25 | 0/0 | 26 | 0.03 | |
| H7 | 188/186 | 3/4 | 191 | 0.19 | |
| H8 | 117/116 | 2/2 | 119 | 0.12 | |
| Total | 996 | 22 | 1018 | | |
| Freq | 0.98 | 0.02 | | | 1 |

Table 2.6: Chi-square test skin group and high-school

25OHD levels with respect highschool

Showing everybody, solarium included

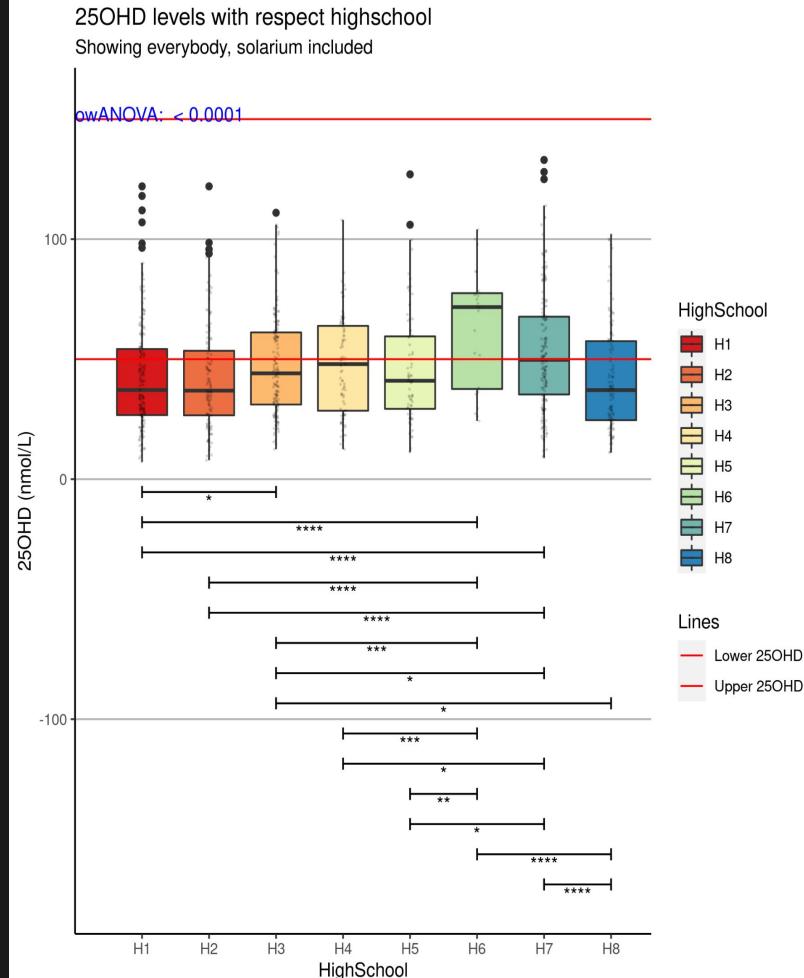
swANOVA: < 0.0001



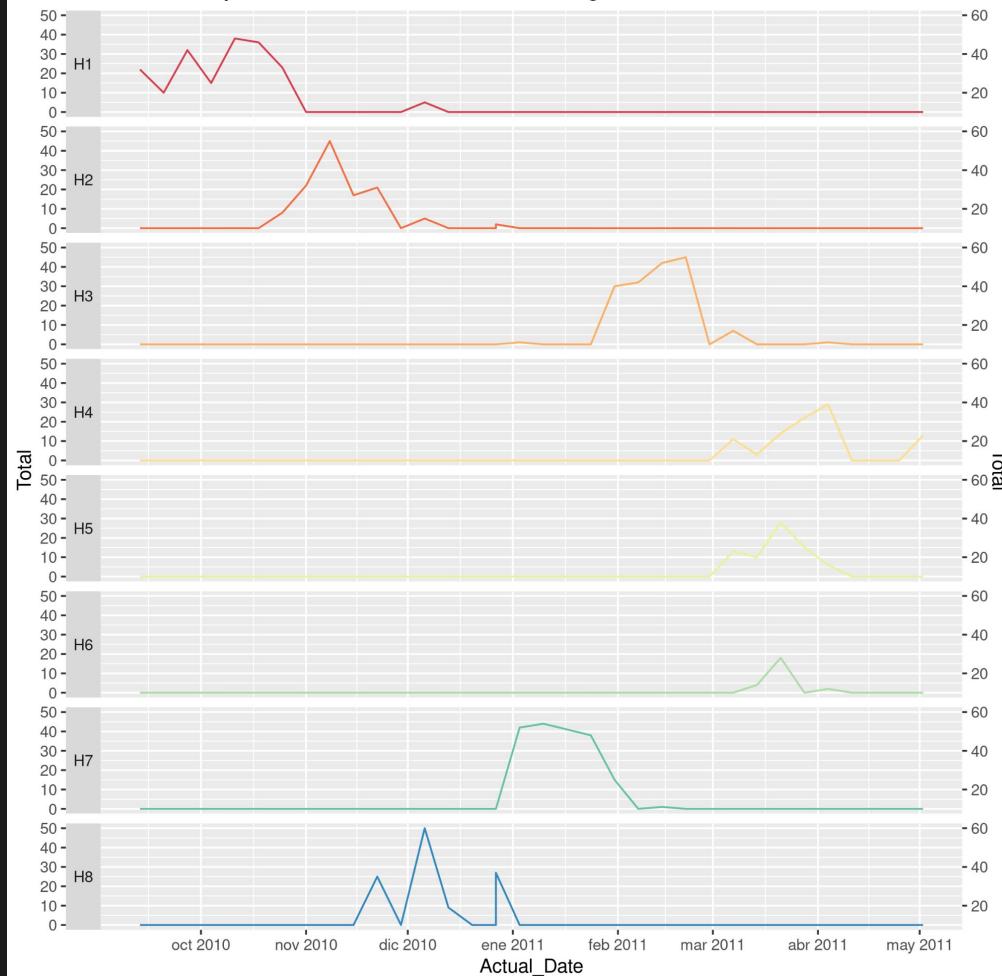
25OHD levels with respect highschool

Showing everybody, solarium included

ANOVA: < 0.0001

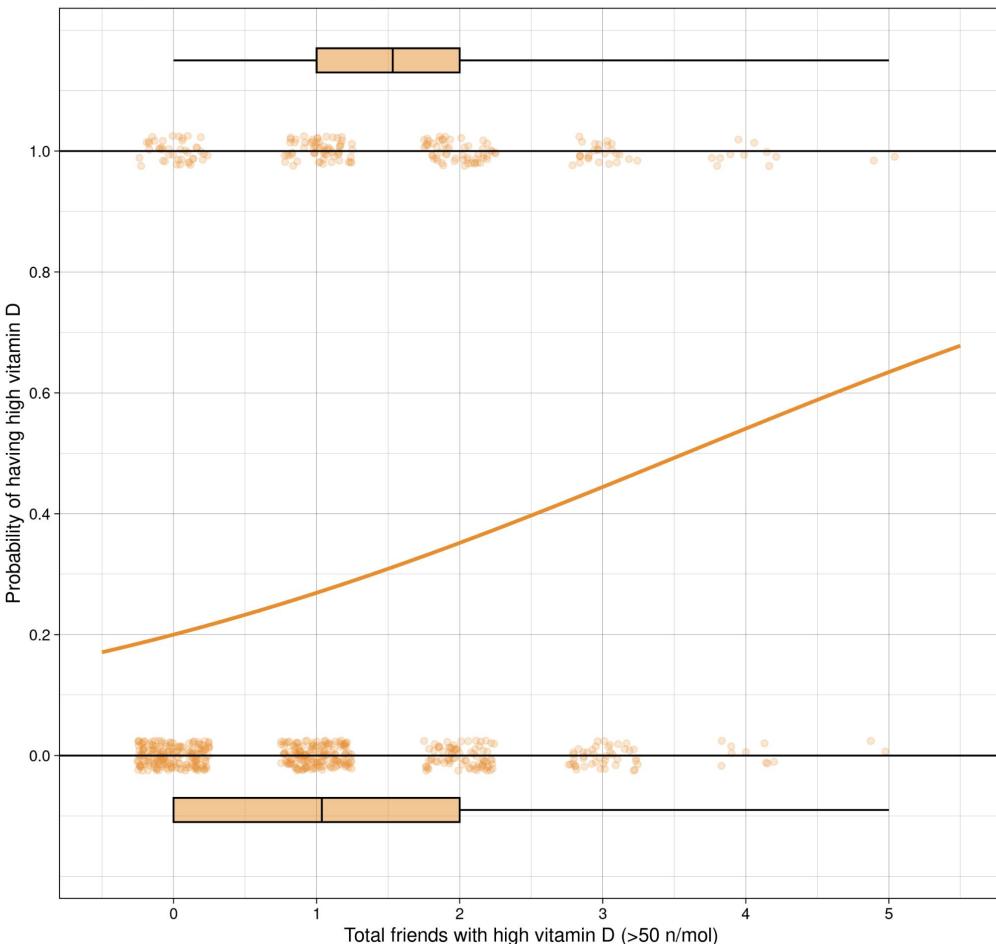


Time of the year for blood extraction for each high-school



Logit Regression between total high vitamin D friends and probability of high vitamin D status

Only people with friends are shown, p-value < 0.0001

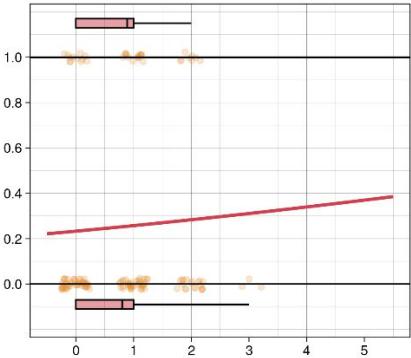


Logistic regression shows high vitamin D correlation levels between friends, meaning if you have friends with high (or low) vitamin D, you are likely to share their levels.

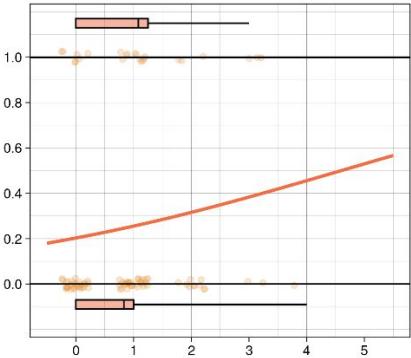
This is true even after correcting for people who don't go to the solarium.

χ^2 analysis also show vitamin D levels correlate (pv: 0.003) with high-schools independently of time of the year during blood extraction.

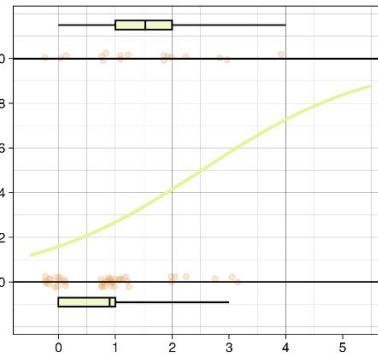
H1 and logit for vitamin D status
p-value = 0.5797



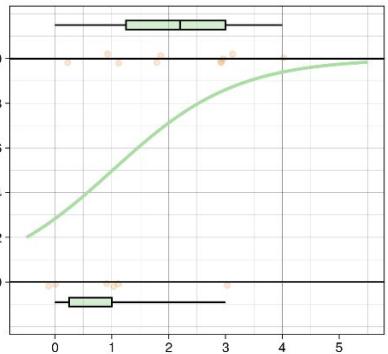
H2 and logit for vitamin D status
p-value = 0.2395



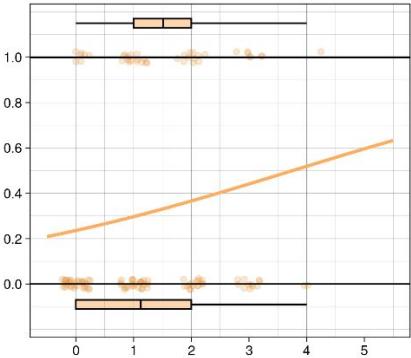
H5 and logit for vitamin D status
p-value = 0.025



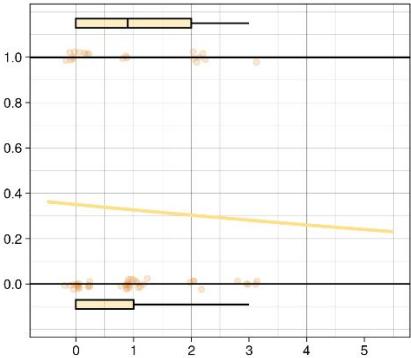
H6 and logit for vitamin D status
p-value = 0.0697



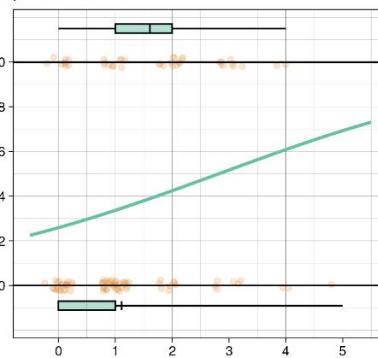
H3 and logit for vitamin D status
p-value = 0.0651



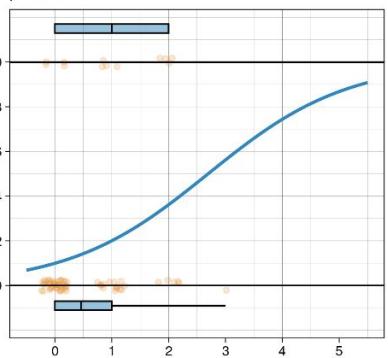
H4 and logit for vitamin D status
p-value = 0.7124



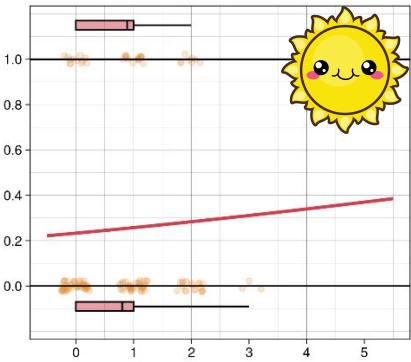
H7 and logit for vitamin D status
p-value = 0.0282



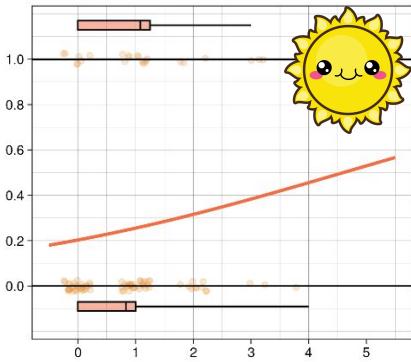
H8 and logit for vitamin D status
p-value = 0.024



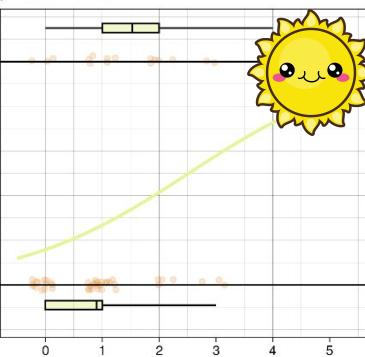
H1 and logit for vitamin D status
p-value = 0.5797



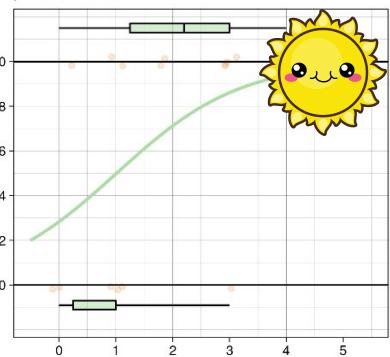
H2 and logit for vitamin D status
p-value = 0.2395



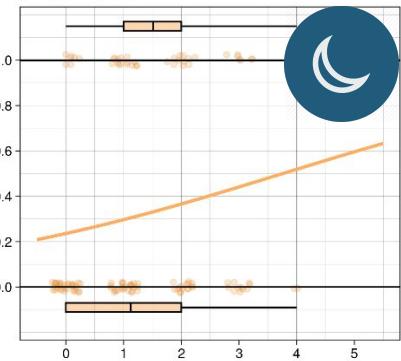
H5 and logit for vitamin D status
p-value = 0.025



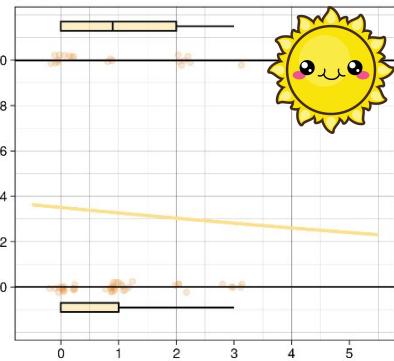
H6 and logit for vitamin D status
p-value = 0.0697



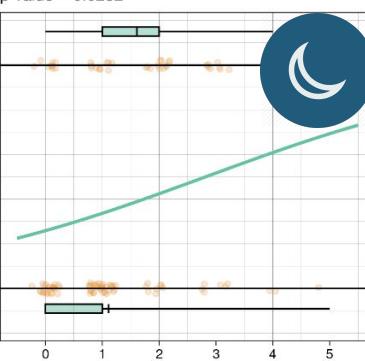
H3 and logit for vitamin D status
p-value = 0.0651



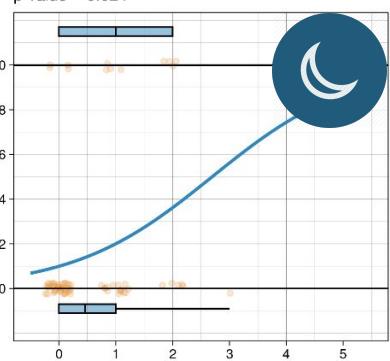
H4 and logit for vitamin D status
p-value = 0.7124



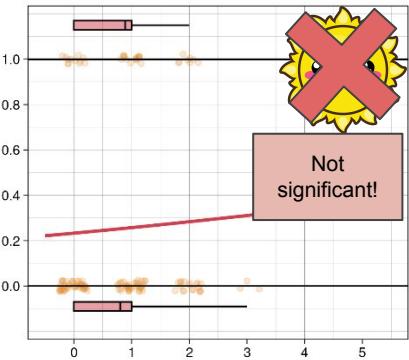
H7 and logit for vitamin D status
p-value = 0.0282



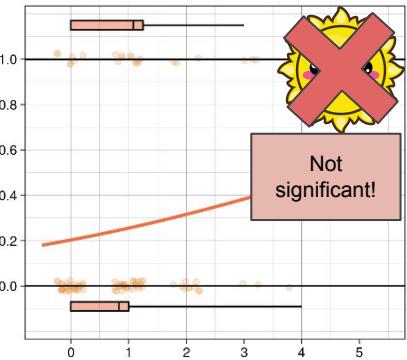
H8 and logit for vitamin D status
p-value = 0.024



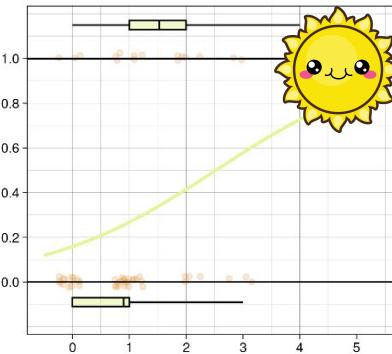
H1 and logit for vitamin D status
p-value = 0.5797



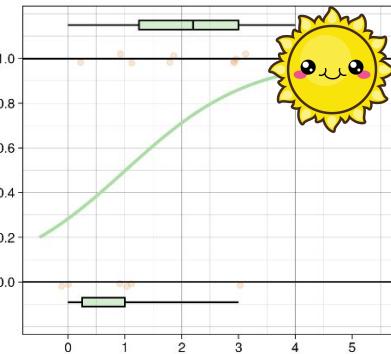
H2 and logit for vitamin D status
p-value = 0.2395



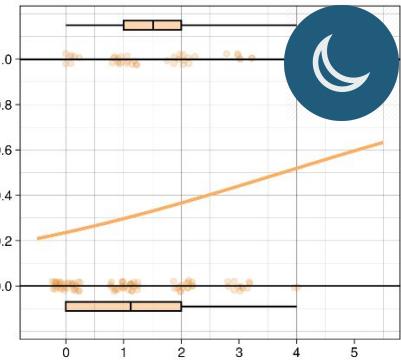
H5 and logit for vitamin D status
p-value = 0.025



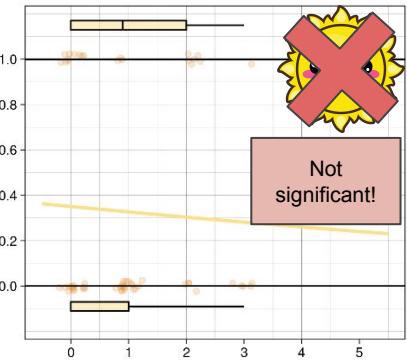
H6 and logit for vitamin D status
p-value = 0.0697



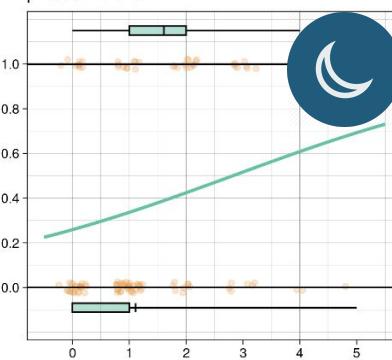
H3 and logit for vitamin D status
p-value = 0.0651



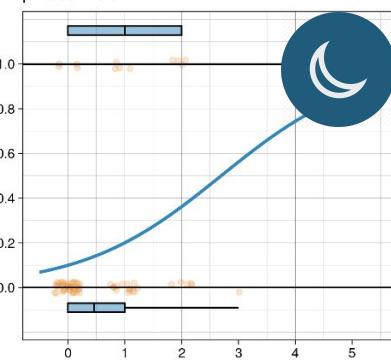
H4 and logit for vitamin D status
p-value = 0.7124



H7 and logit for vitamin D status
p-value = 0.0282

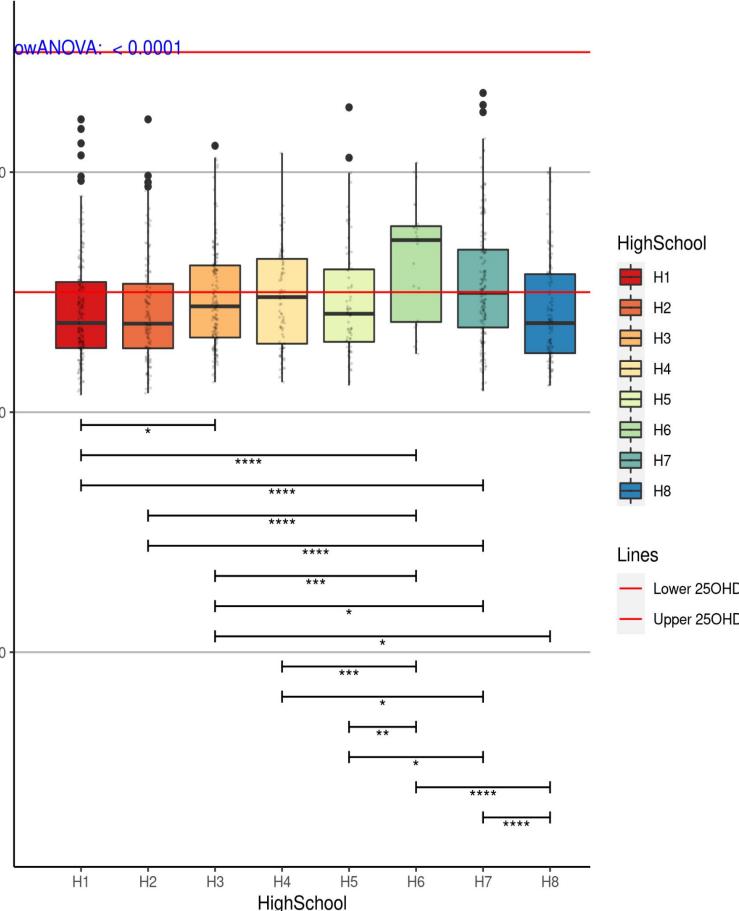


H8 and logit for vitamin D status
p-value = 0.024



25OHD levels with respect highschool

Showing everybody, solarium included



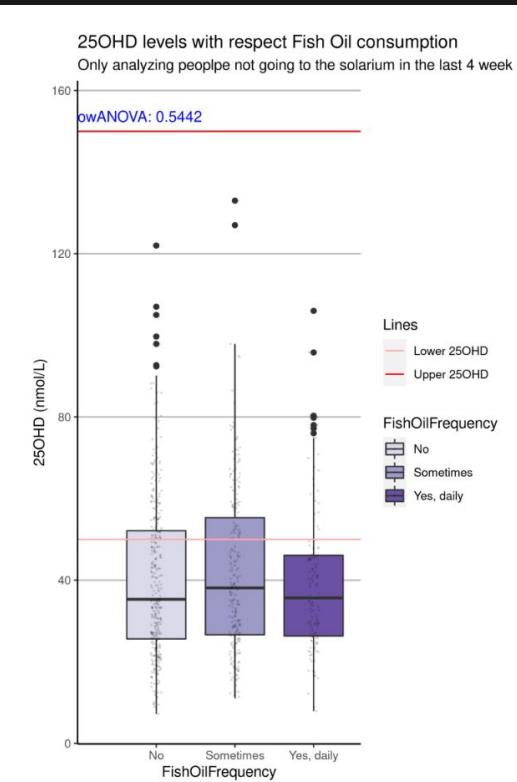
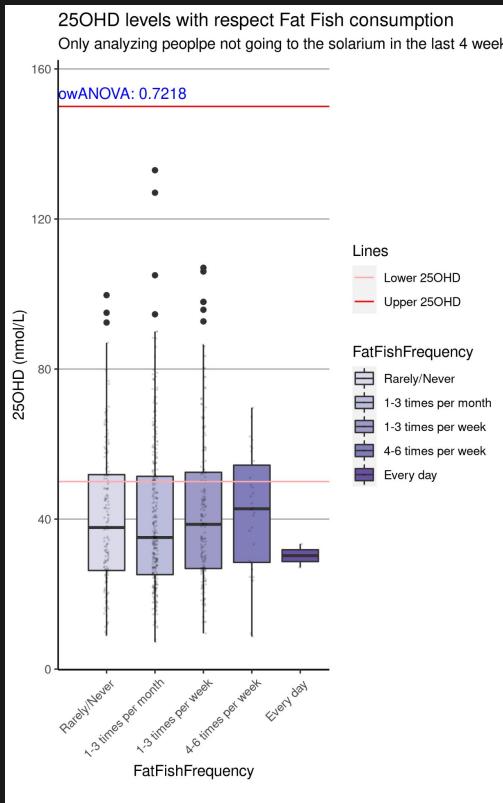
| Variable | Homophily | Frequency | Significance | Overview |
|------------|-----------|-----------|--------------|----------|
| HighSchool | 0.87 | | | 6.22 |
| H1 | 0.76 | 0.2 | **** | 6.77 |
| H2 | 0.78 | 0.14 | **** | 7.2 |
| H3 | 0.76 | 0.16 | **** | 5.84 |
| H4 | 0.77 | 0.09 | **** | 5.54 |
| H5 | 0.96 | 0.08 | **** | 5.55 |
| H6 | 0.76 | 0.03 | **** | 5.73 |
| H7 | 0.79 | 0.18 | **** | 5.8 |
| H8 | 0.72 | 0.12 | **** | 6.42 |

Table 3.2: Highschools and friendship overview

Friendship is very highly correlated within highschool

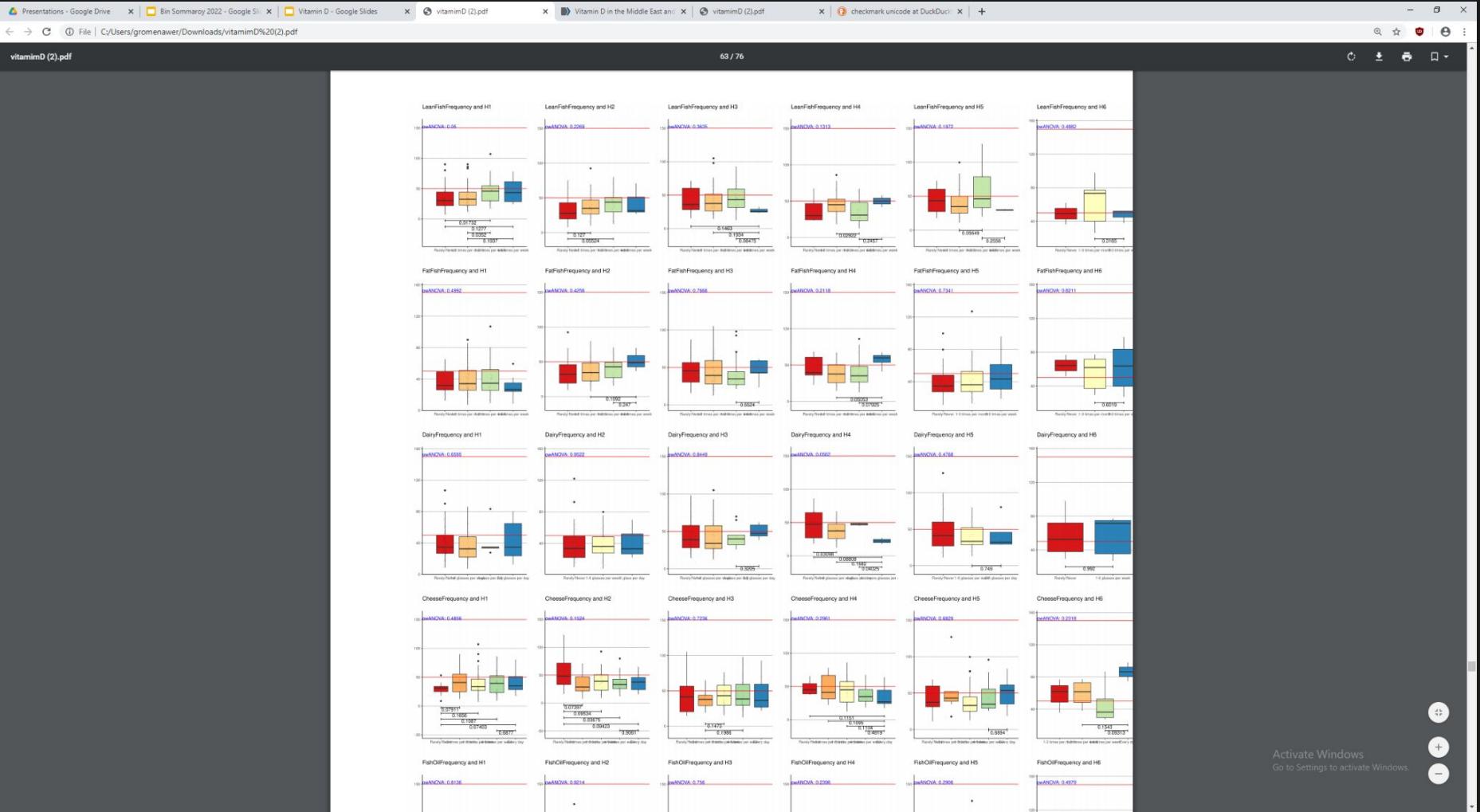
NUTRITIONAL DATA SUCKS!

Nutritional data has no validation and not proper 72h follow up!



North-Norway's salmon don't have vitamin D!

Teenagers in Tromso don't have a liver !! :O



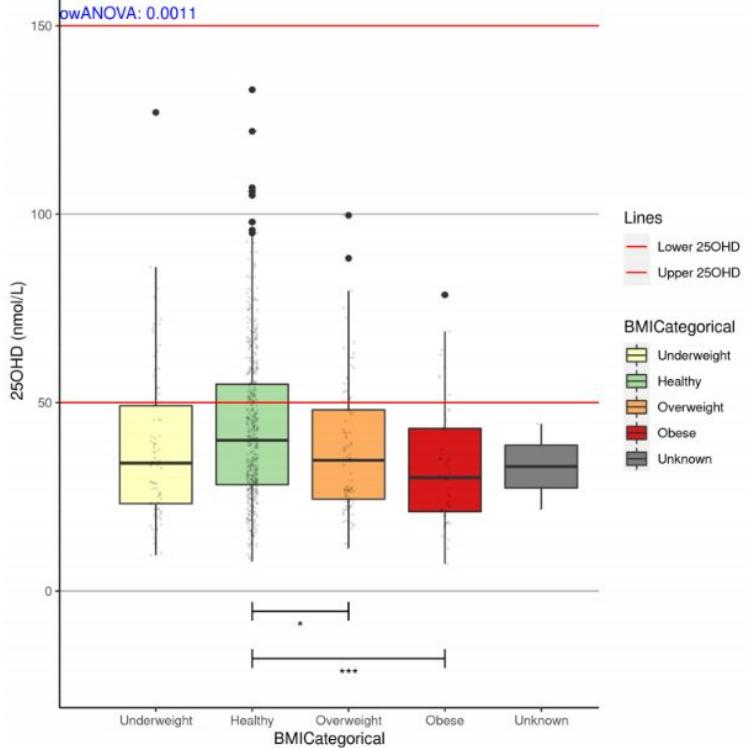
| DietConcept | Total Relationships | Equal Relationships | MIN | Q1 | Median | Average | Q3 | MAX | SD | p-value |
|-------------------|---------------------|---------------------|------|------|--------|---------|------|------|-------|---------|
| LeanFishFrequency | 3547 | 1232 | 1086 | 1173 | 1209.5 | 1210.65 | 1246 | 1346 | 51.35 | 0.34 |
| FatFishFrequency | 3583 | 1230 | 1114 | 1189 | 1219 | 1218.15 | 1247 | 1376 | 42.98 | 0.39 |
| DairyFrequency | 3618 | 1536 | 1382 | 1486 | 1518.5 | 1517.68 | 1551 | 1603 | 49.63 | 0.36 |
| CheeseFrequency | 3610 | 951 | 898 | 952 | 973.5 | 980.44 | 1015 | 1078 | 43.21 | 0.75 |
| FishOilFrequency | 3587 | 1393 | 1244 | 1343 | 1371 | 1370.14 | 1400 | 1463 | 43.2 | 0.3 |
| VitaminsFrequency | 3592 | 1322 | 1173 | 1272 | 1295 | 1295.4 | 1319 | 1368 | 38.58 | 0.25 |

Table 3.3: Influence of friends towards same food frequency by vitamin D related foods

Teenagers don't influence what other teenagers eat, at least food with relevant vitamin D content

25OHD levels with respect BMI

Only analyzing people not going to the solarium in the last 4 week



Obesity sequester vitamin D (as expected)

Relationship between PTH and Vitamin D

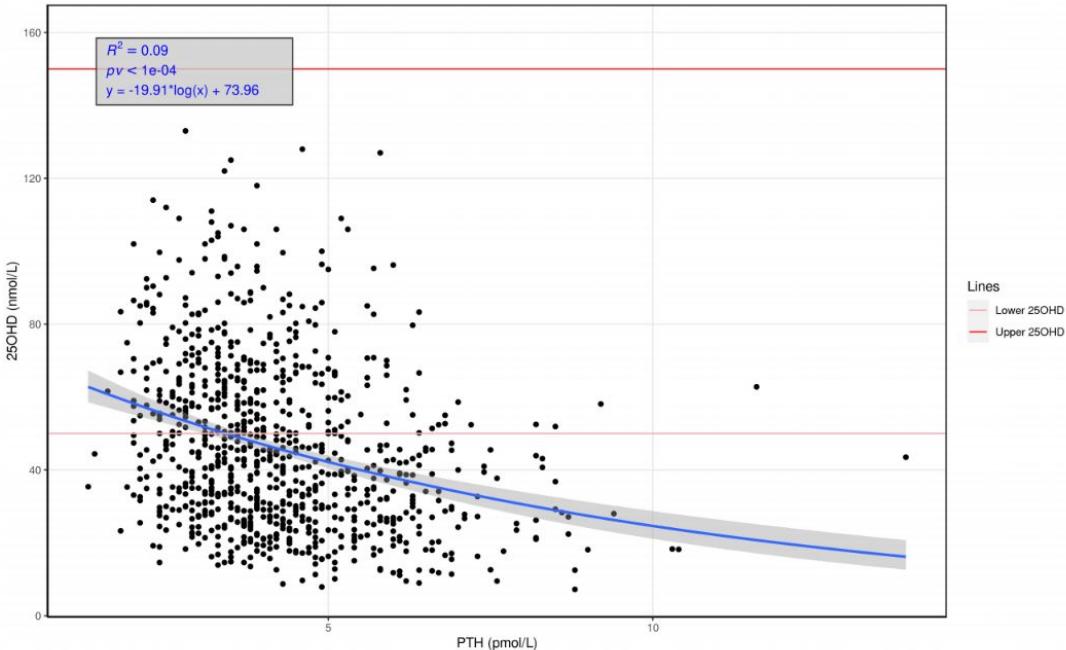


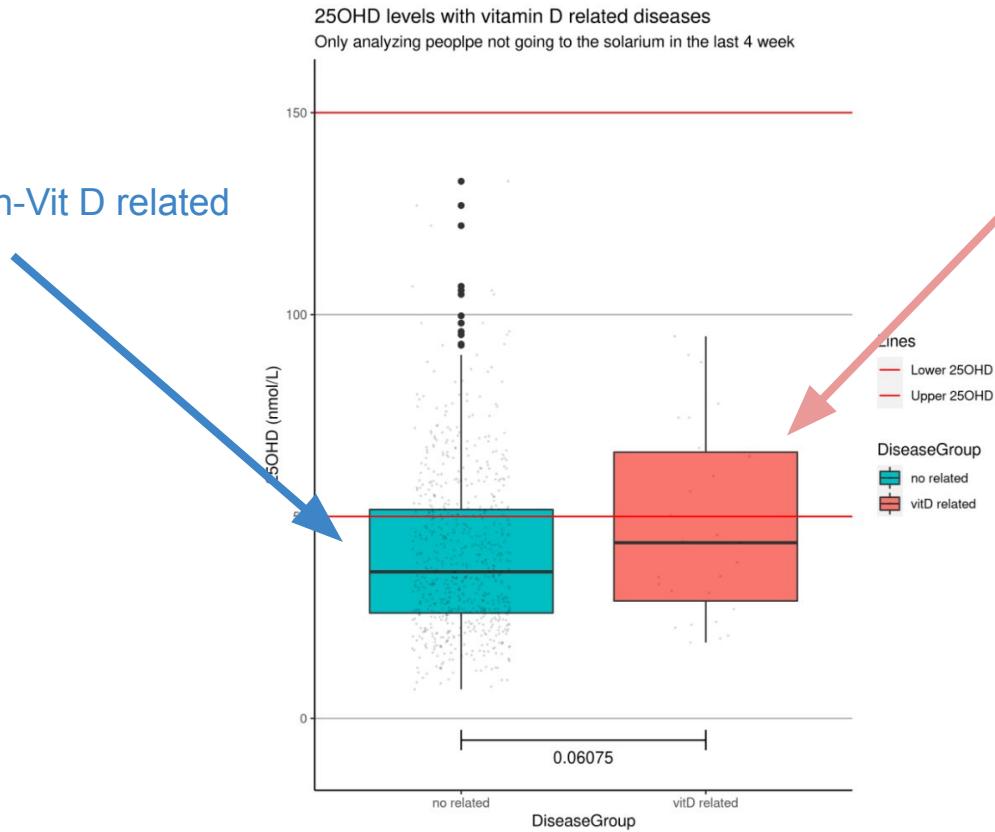
Figure 2.27: Relationship between PTH and 25OHD in blood.

More vitamin D = More Calcium.

More Calcium = Less PTH

But very weak data correlation :/

Healthy or non-Vit D related



Celiac disease,
Food allergy
Lactose intolerance

...
Osteomyelitis
Juvenile arthritis
Chronic kidney disease,
stage 2 (mild)

Data shows no change
in diets or vitamin D
medicines :(

Figure 2.31: 25OHD levels with respect people who have vitamin D related diseases

Some conclusions:

- The power of friendship includes vitamin D!
- Food questionnaires are really bad
- Theory, observational studies, and clinical trials are going to keep contradicting each others. When metareviewing, check for proper dieting filtering!
- The Sun is trying to kill you all the time ☀️

the  end



Explain heart here

Essential

Essential

Water



Essential

Water

Macronutrients



Essential

Water

Macronutrients

Vitamins



Essential

Water

Macronutrients

Vitamins



Essential

Water

Macronutrients

Vitamins



B1 B2 B3 B4
B6 B7 B9 B12
C

A
D1 D2 D3
D4 D5
E
K1 K2 K3

Essential

Water

Macronutrients

Vitamins

Minerals



B1 B2 B3 B4
B6 B7 B9 B12
C

A
D1 D2 D3
D4 D5
E
K1 K2 K3

Essential

Water

Macronutrients

Vitamins

Minerals



**B1 B2 B3 B4
B6 B7 B9 B12
C**

**A
D1 D2 D3
D4 D5
E
K1 K2 K3**

Hydrogen
Carbon
Nitrogen
Oxygen } 95,6%

Essential

Water

Macronutrients

Vitamins

Minerals



**B1 B2 B3 B4
B6 B7 B9 B12
C**

**A
D1 D2 D3
D4 D5
E
K1 K2 K3**

Hydrogen
Carbon
Nitrogen
Oxygen

Calcium 1.2%

Essential

Water

Macronutrients

Vitamins

Minerals



**B1 B2 B3 B4
B6 B7 B9 B12
C**

**A
D1 D2 D3
D4 D5
E
K1 K2 K3**

Hydrogen
Carbon
Nitrogen
Oxygen

Calcium
Phosphorus
Potassium
Sodium
Magnesium

1.2%

3%

Essential

Water

Macronutrients

Vitamins

Minerals



**B1 B2 B3 B4
B6 B7 B9 B12
C**

**A
D1 D2 D3
D4 D5
E
K1 K2 K3**

Hydrogen
Carbon
Nitrogen
Oxygen

Calcium
Phosphorus
Potassium
Sodium
Magnesium

Iron, Chlorine, Cobalt,
Copper, Zinc, 0.01%
Manganese,
Molybdenum, Iodine,
Selenium.

+ Others

Essential

Water

Macronutrients

Vitamins

Minerals

Choline



**B1 B2 B3 B4
B6 B7 B9 B12
C**

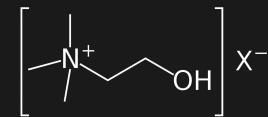
**A
D1 D2 D3
D4 D5
E
K1 K2 K3**

Hydrogen
Carbon
Nitrogen
Oxygen

Calcium
Phosphorus
Potassium
Sodium
Magnesium

Iron, Chlorine, Cobalt,
Copper, Zinc, 0.01%
Manganese,
Molybdenum, Iodine,
Selenium.

+ Others



Essential

Water

Macronutrients

Vitamins

Minerals

Choline



**B1 B2 B3 B4
B6 B7 B9 B12
C**

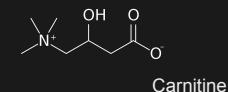
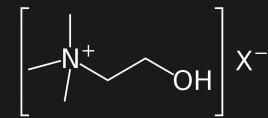
**A
D1 D2 D3
D4 D5
E
K1 K2 K3**

Hydrogen
Carbon
Nitrogen
Oxygen

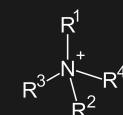
Calcium
Phosphorus
Potassium
Sodium
Magnesium

Iron, Chlorine, Cobalt,
Copper, Zinc, 0.01%
Manganese,
Molybdenum, Iodine,
Selenium.

+ Others



Carnitine



Q4-Ammonium

Vitamin

Mineral

Essential

Water

Macronutrients

Vitamins

Minerals

Choline



B1 B2 B3 B4

B6 B7 B9 B12

C

A
D1 D2 D3
D4 D5

E
K1 K2 K3

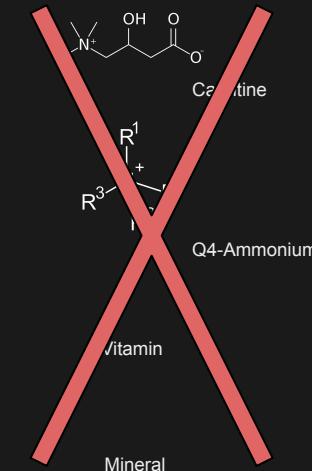
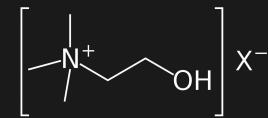
Hydrogen
Carbon
Nitrogen
Oxygen

Calcium 1.2%

Phosphorus
Potassium
Sodium
Magnesium

Iron, Chlorine, Cobalt,
Copper, Zinc, 0.01%
Manganese,
Molybdenum, Iodine,
Selenium.

+ Others



Essential

Water

Macronutrients

Vitamins

Minerals

Choline



B1 B2 B3 B4

B6 B7 B9 B12

C

A
D1 D2 D3
D4 D5

E
K1 K2 K3

Hydrogen
Carbon
Nitrogen
Oxygen

} 95,6%

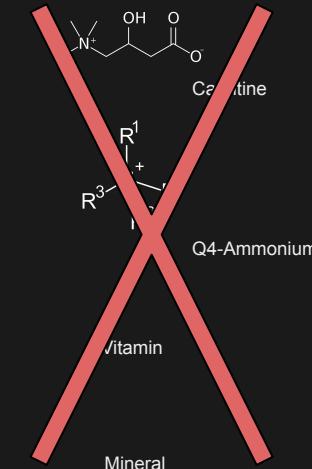
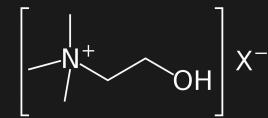
Calcium 1.2%

Phosphorus
Potassium
Sodium
Magnesium

} 3%

Iron, Chlorine, Cobalt,
Copper, Zinc, 0.01%
Manganese,
Molybdenum, Iodine,
Selenium.

+ Others



Essential

Water



Macronutrients



Vitamins

**B1 B2 B3 B4
B6 B7 B9 B12
C
A
D1 D2 D3
D4 D5
E
K1 K2 K3**

Minerals

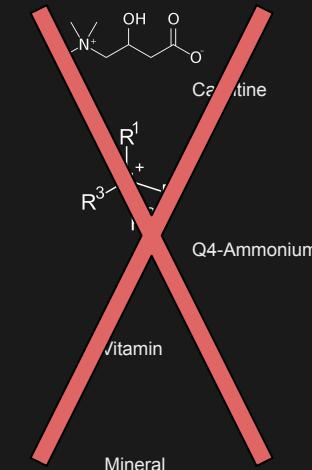
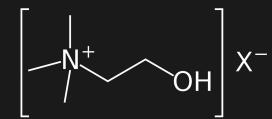
Hydrogen
Carbon
Nitrogen
Oxygen

Calcium
Phosphorus
Potassium
Sodium
Magnesium

Iron, Chlorine, Cobalt,
Copper, Zinc, 0.01%
Manganese,
Molybdenum, Iodine,
Selenium.

+ Others

Choline



Essential

Water



Macronutrients



Non Essential



Vitamins

**B1 B2 B3 B4
B6 B7 B9 B12
C
A
D1 D2 D3
D4 D5
E
K1 K2 K3**

Minerals

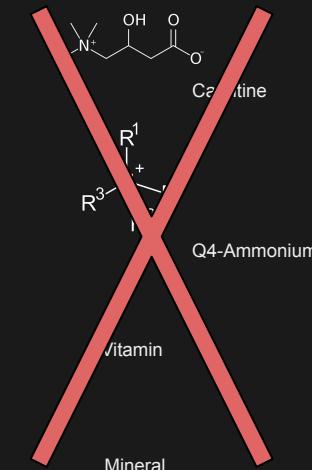
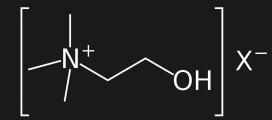
Hydrogen
Carbon
Nitrogen
Oxygen

Calcium
Phosphorus
Potassium
Sodium
Magnesium

Iron, Chlorine, Cobalt,
Copper, Zinc, 0.01%
Manganese,
Molybdenum, Iodine,
Selenium.

+ Others

Choline



Essential

Water



Macronutrients



Vitamins

**B1 B2 B3 B4
B6 B7 B9 B12
C
A
D1 D2 D3
D4 D5
E
K1 K2 K3**

Minerals

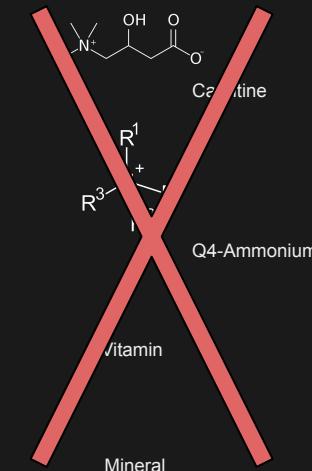
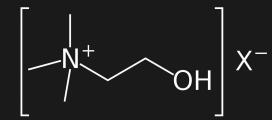
Hydrogen
Carbon
Nitrogen
Oxygen

Calcium
Phosphorus
Potassium
Sodium
Magnesium

Iron, Chlorine, Cobalt,
Copper, Zinc, 0.01%
Manganese,
Molybdenum, Iodine,
Selenium.

+ Others

Choline

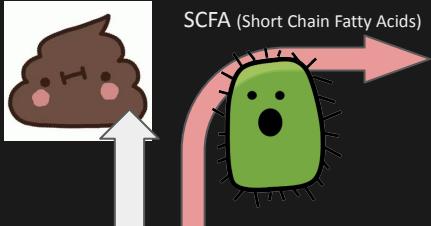


Essential

Water



Macronutrients



Non Essential



Vitamins

**B1 B2 B3 B4
B6 B7 B9 B12
C
A
D1 D2 D3
D4 D5
E
K1 K2 K3**

Minerals

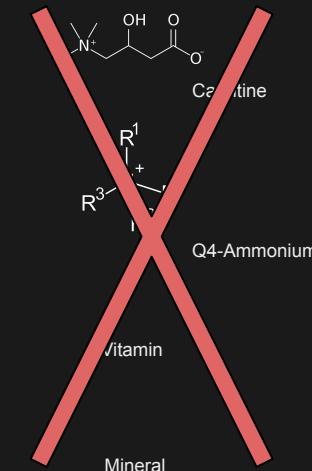
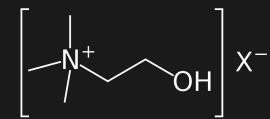
Hydrogen
Carbon
Nitrogen
Oxygen

Calcium
Phosphorus
Potassium
Sodium
Magnesium

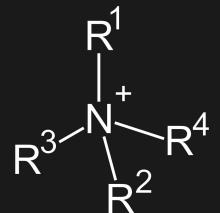
Iron, Chlorine, Cobalt,
Copper, Zinc, 0.01%
Manganese,
Molybdenum, Iodine,
Selenium.

+ Others

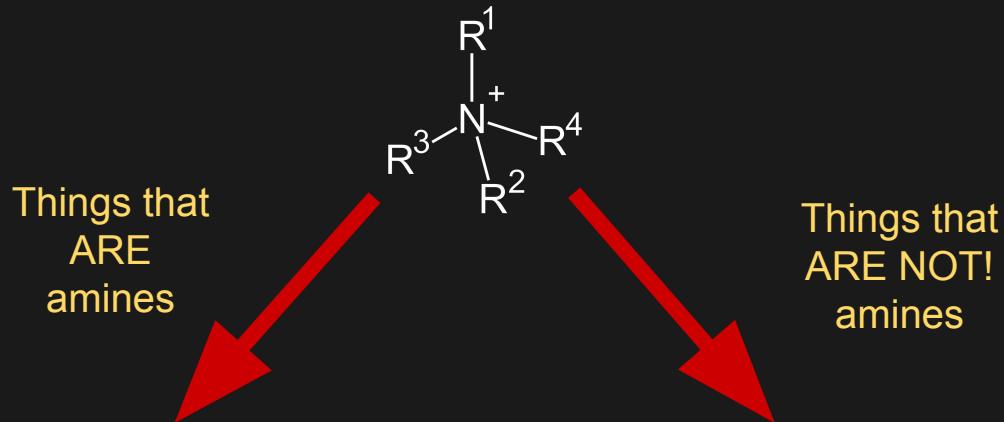
Choline



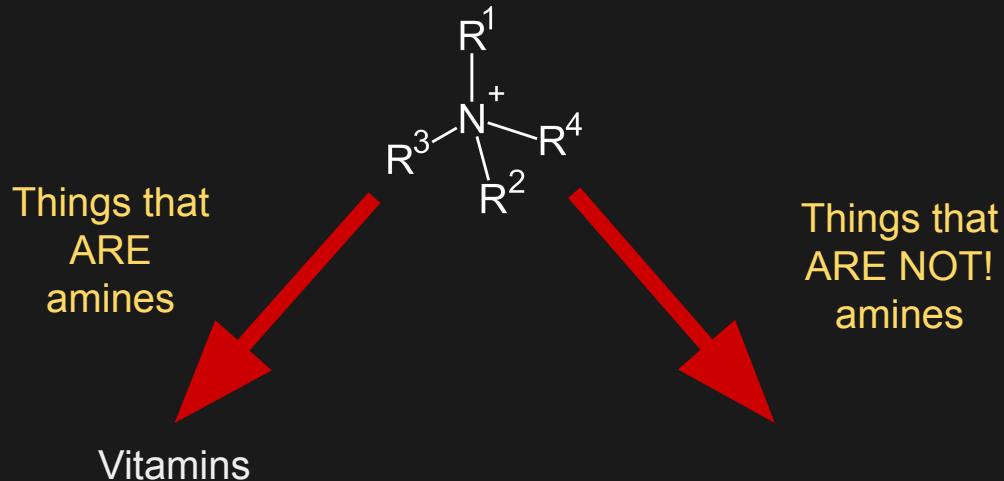
Vital Amines



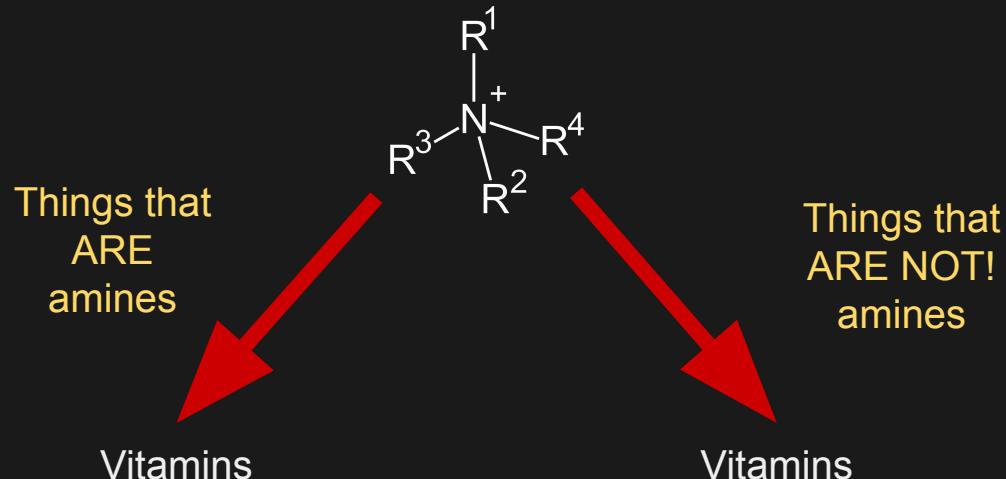
Vital Amines



Vital Amines



Vital Amines



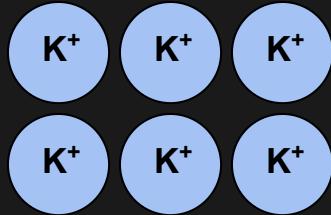
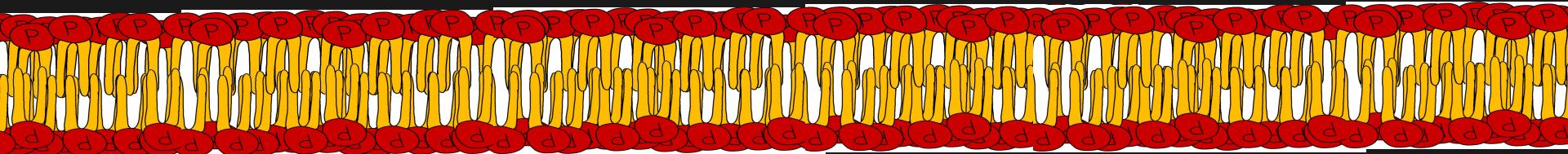
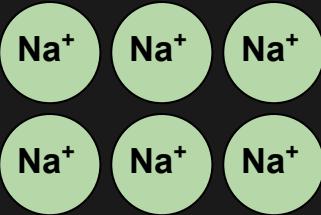
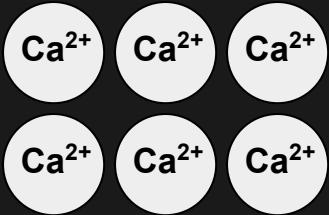
Vitamins

D1
D2
D3
D4
D5

D2
D3

Pacemaker myocite

OUTSIDE



INSIDE



Gamma rays



X rays



Ultraviolet



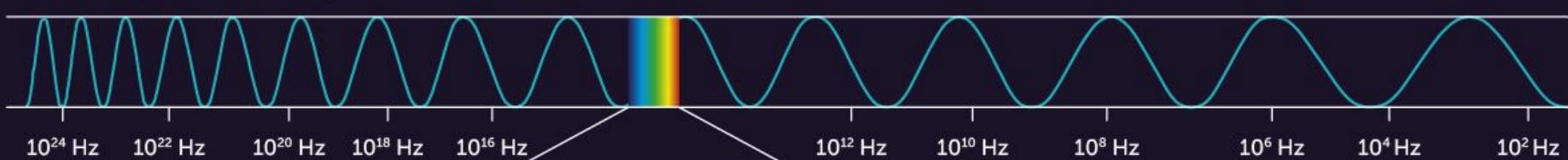
Infrared



Microwaves



Radio waves



High frequency

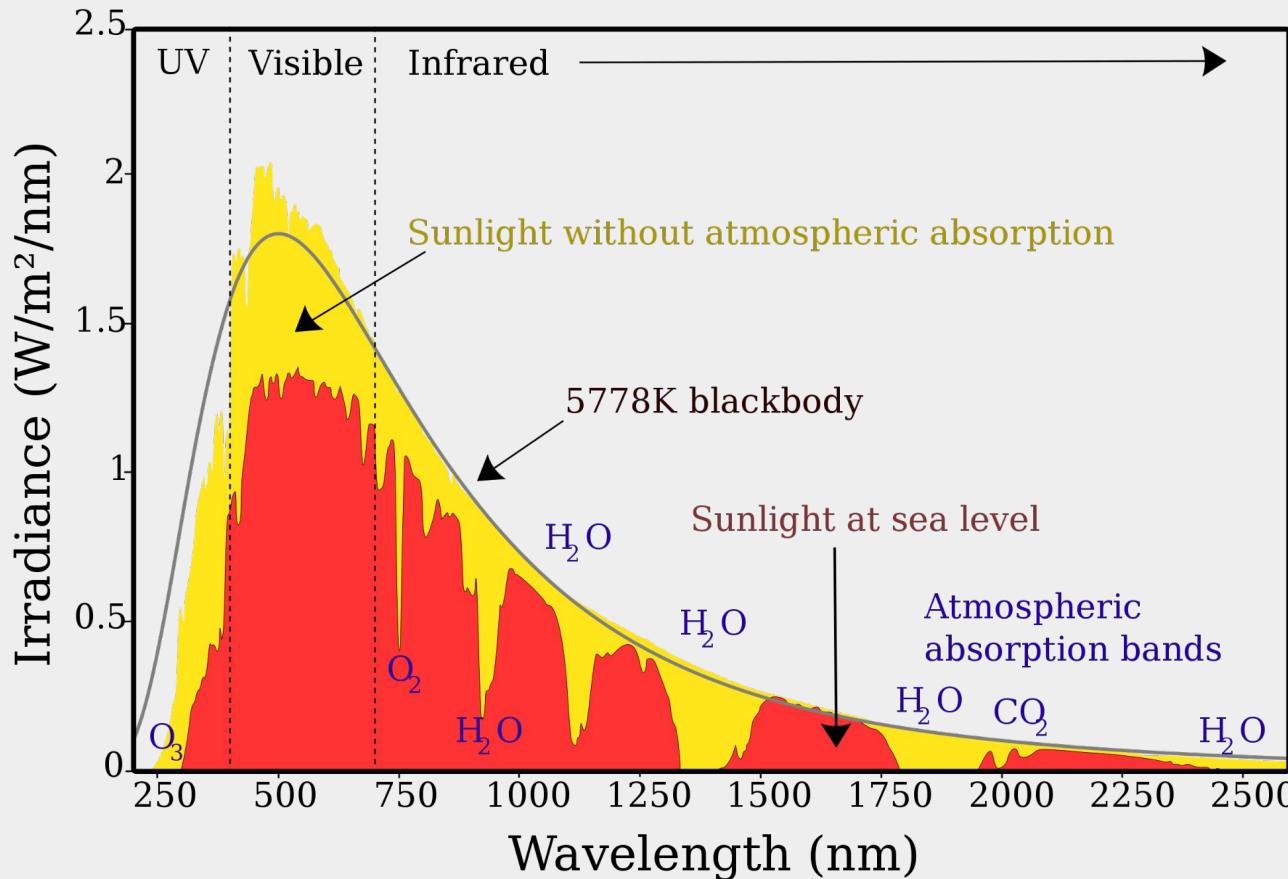
Low frequency

Visible light

7×10^{14} Hz

4×10^{14} Hz

Spectrum of Solar Radiation (Earth)





Create
your own
sunshine

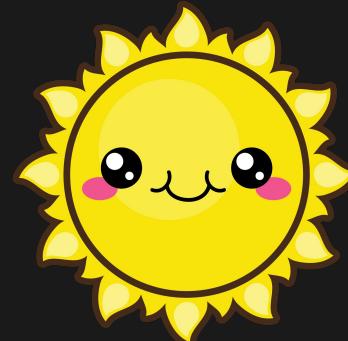


HAPPINESS IS



...the sun
on your face
on a cold day.

(c) lastLemon.com

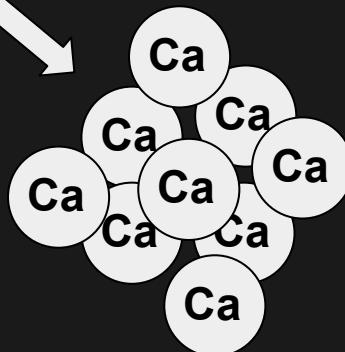


SUNSHINE IS THE BEST
MEDICINE



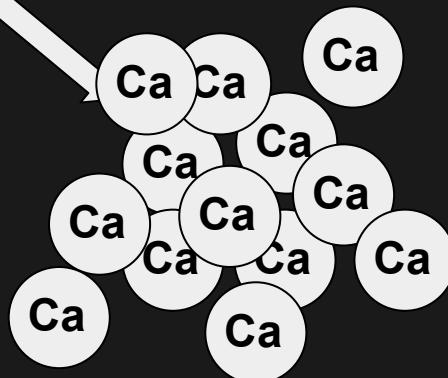


$1,25\text{OH}_2\text{D}$



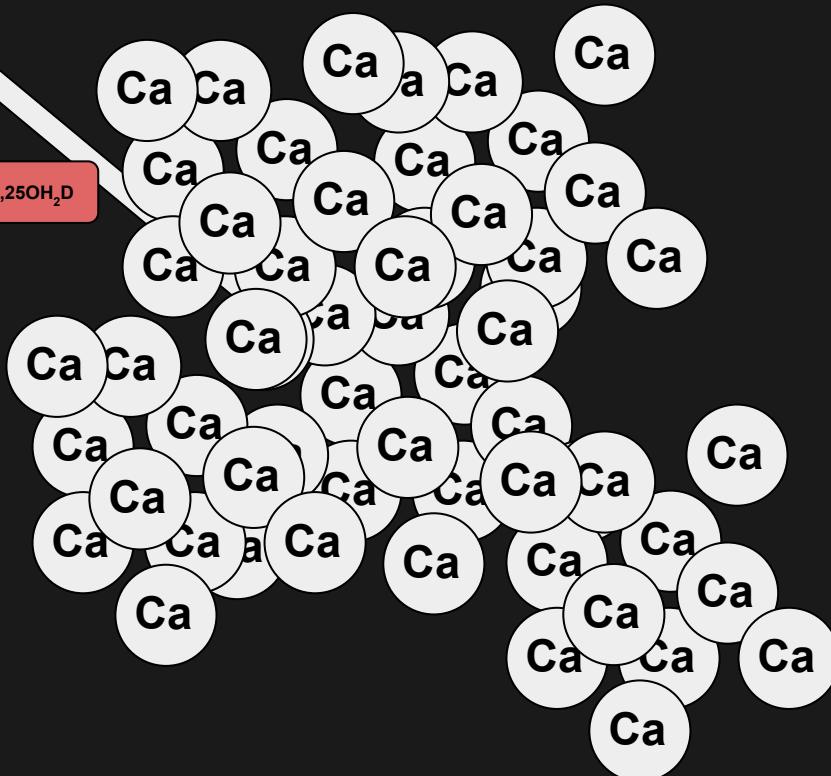


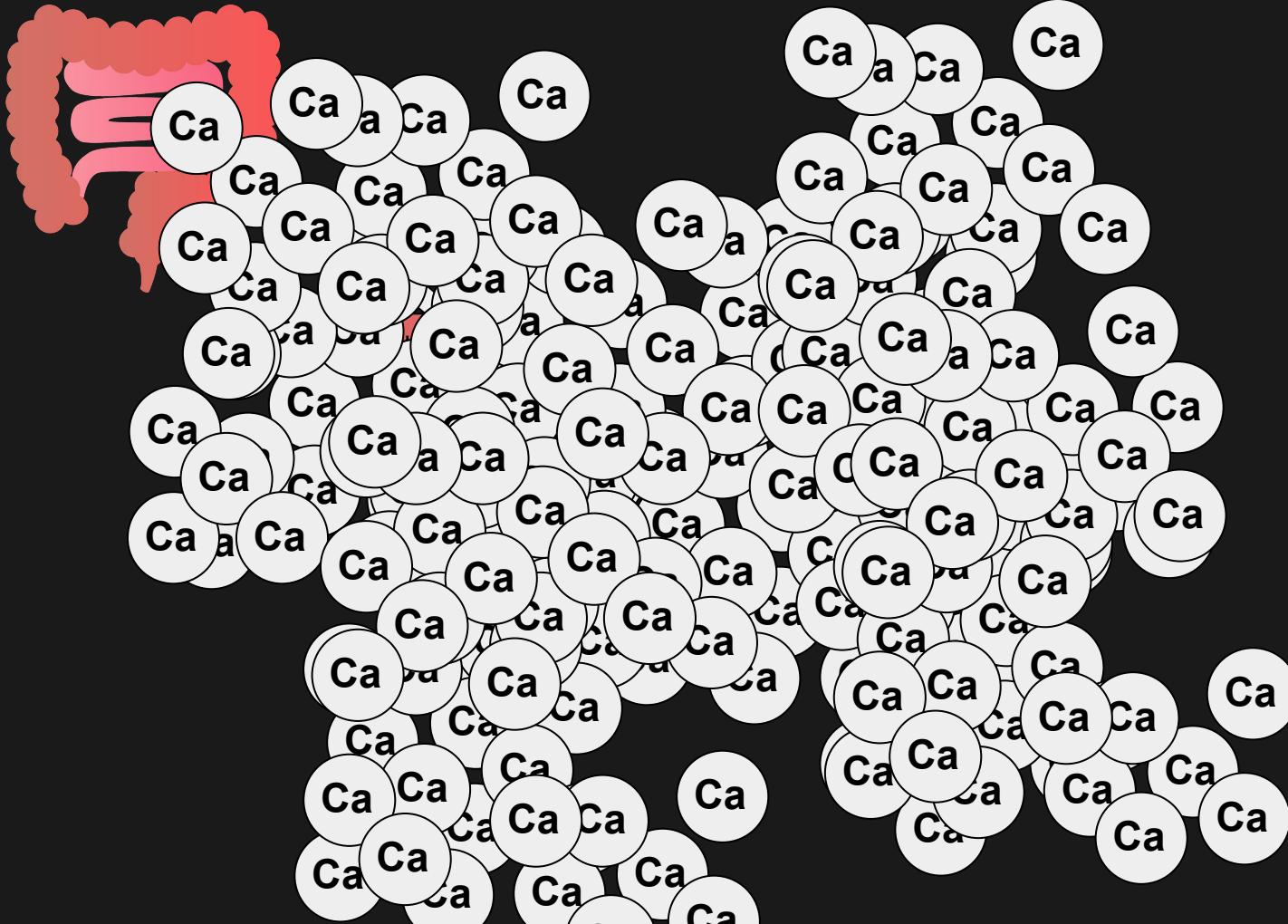
$1,25\text{OH}_2\text{D}$



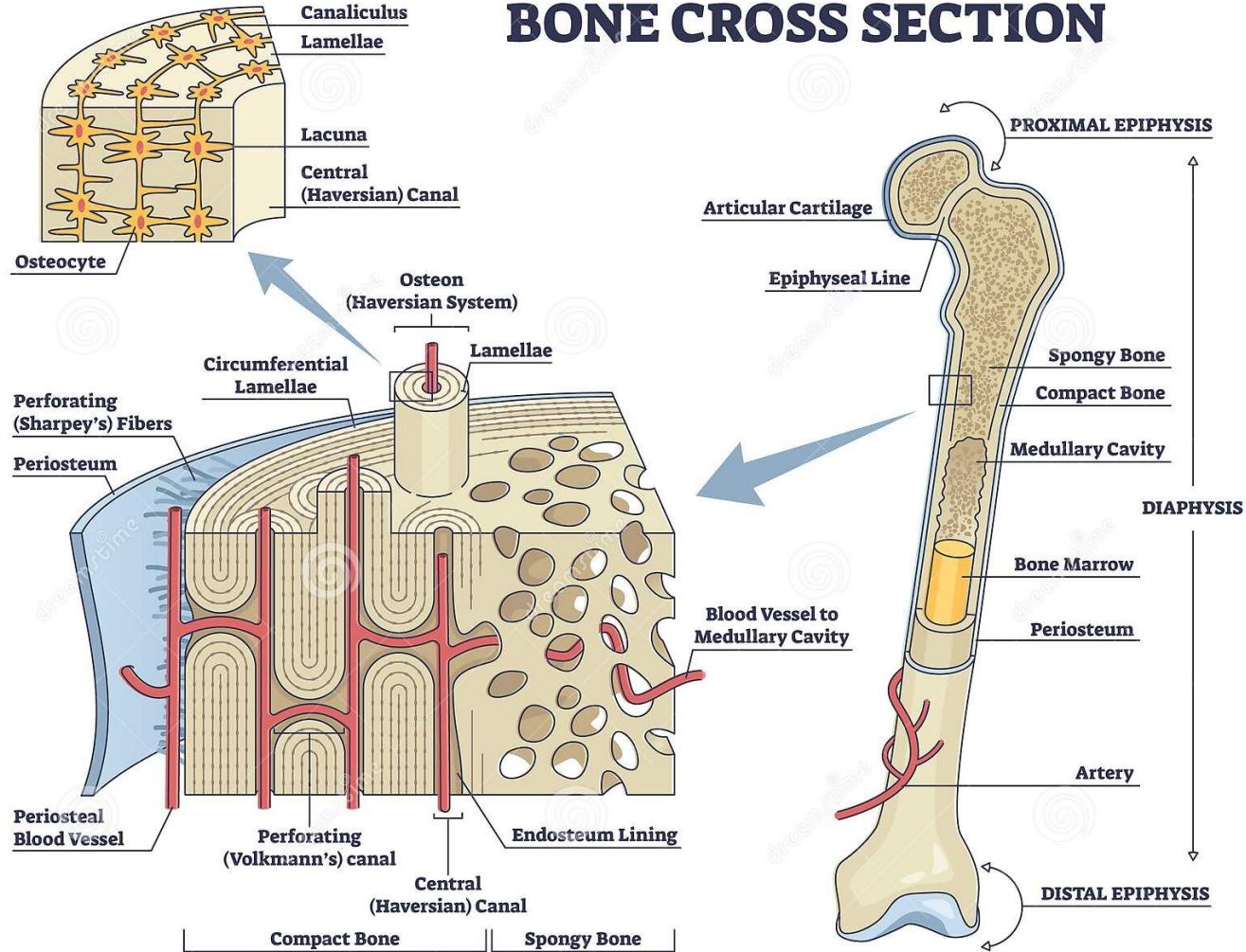


1,25OH₂D

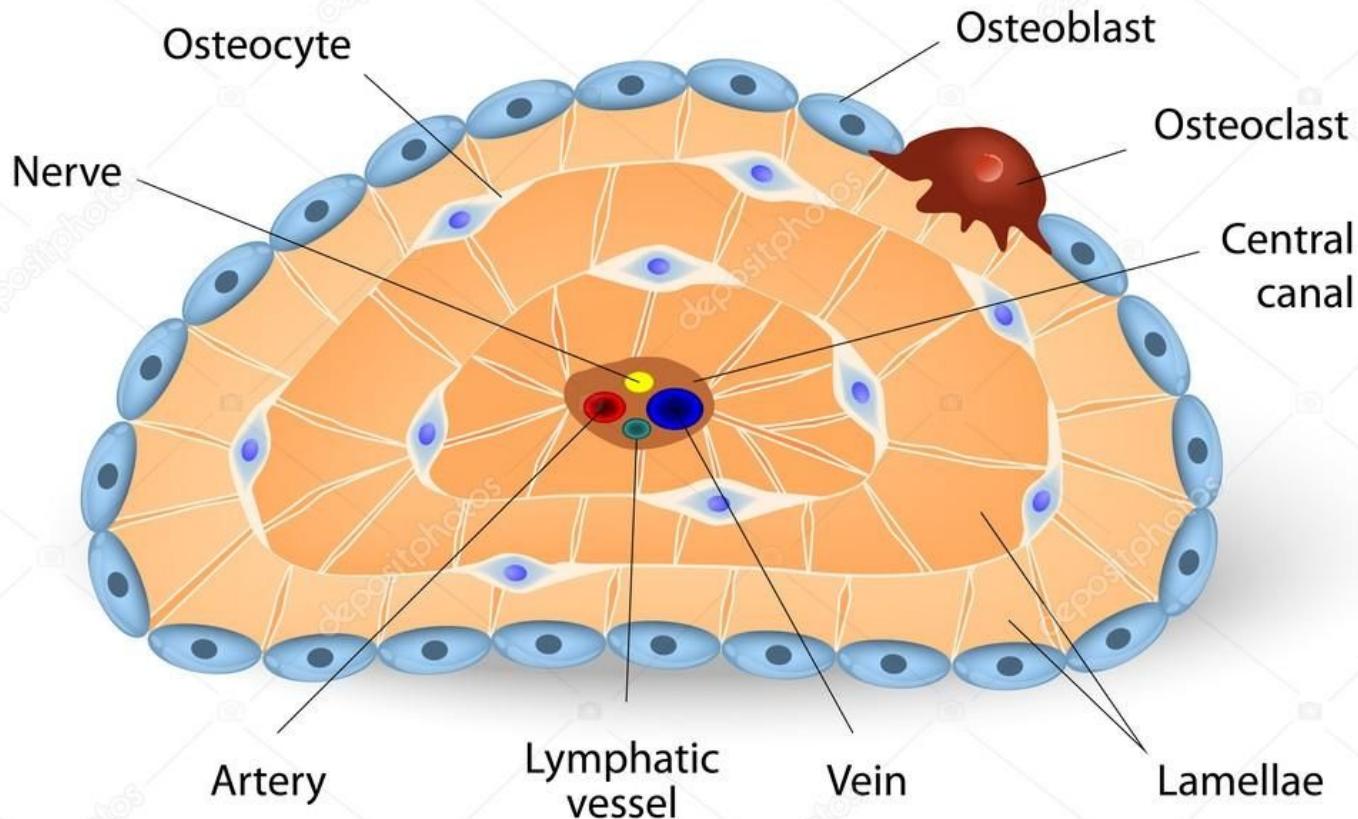




BONE CROSS SECTION

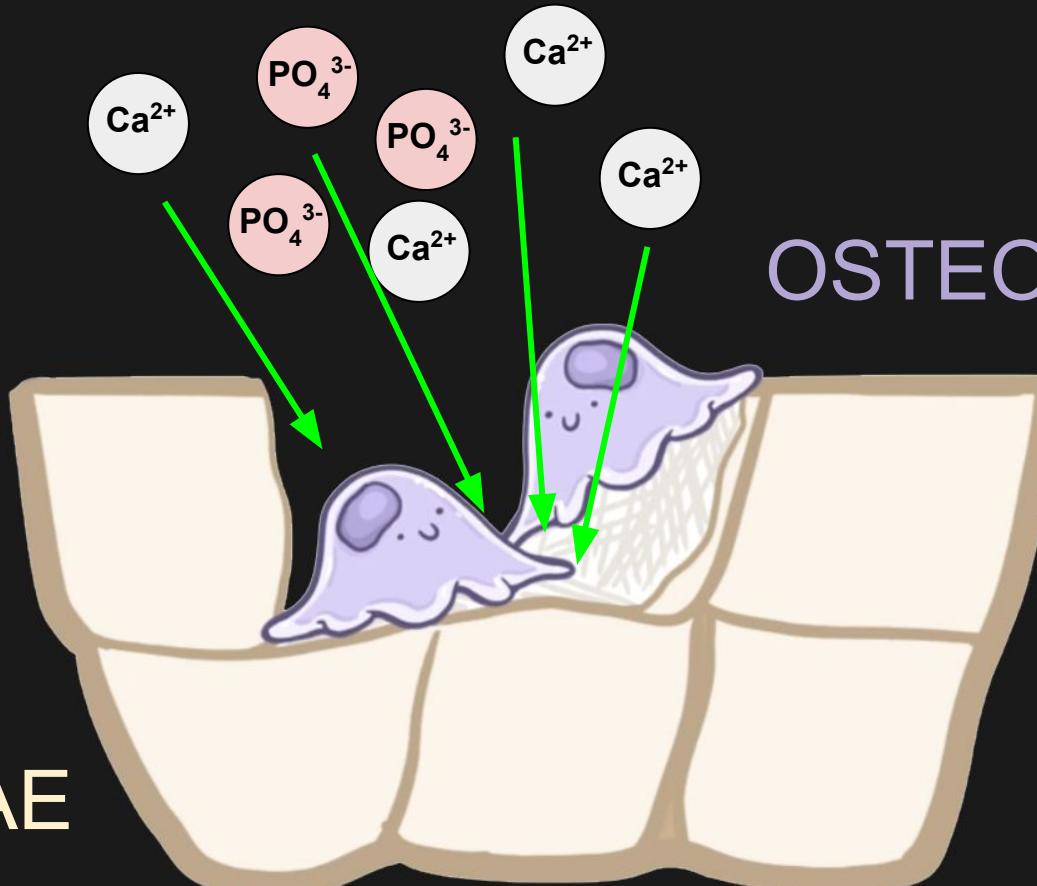


OSTEON



LAMELLAE

OSTEOBLAST

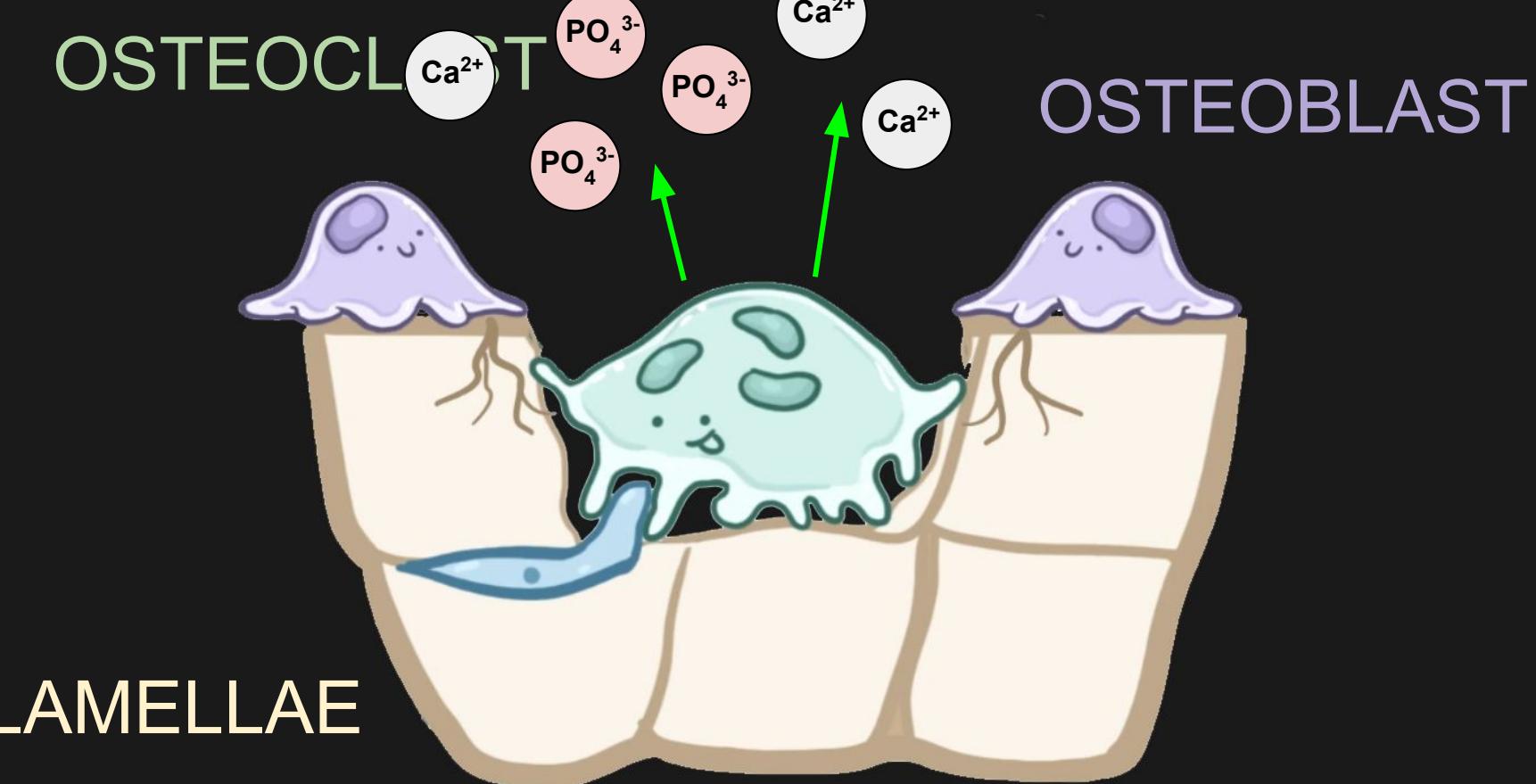


OSTEOCLAST

OSTEOBLAST



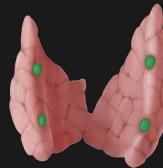
LAMELLAE



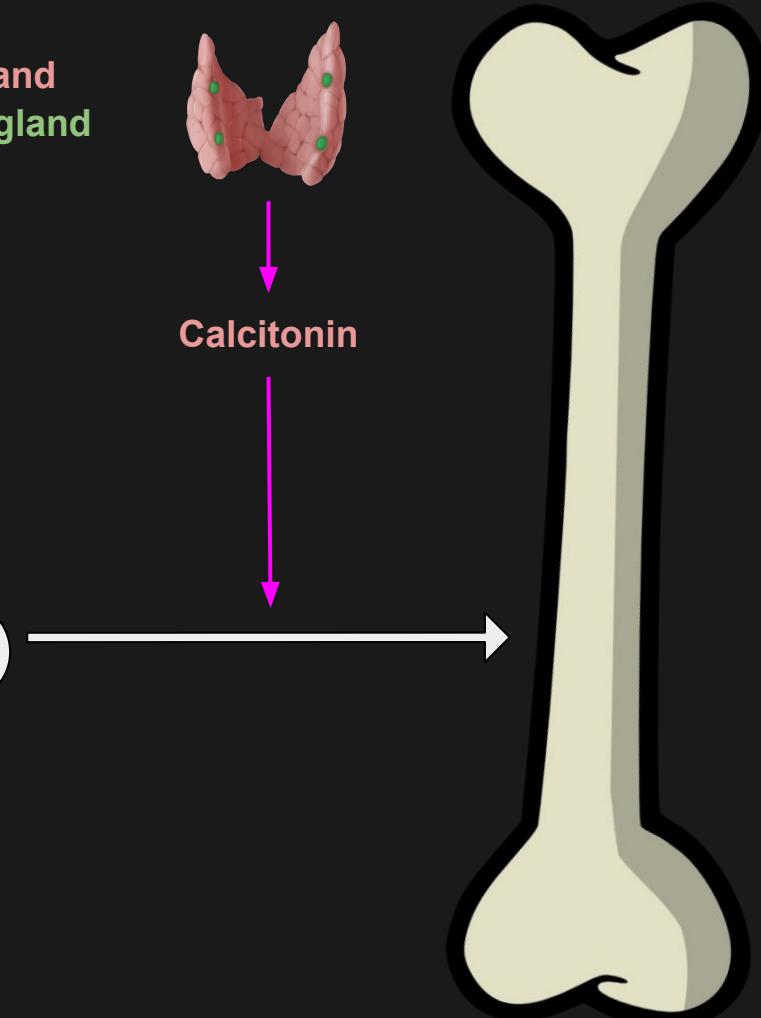
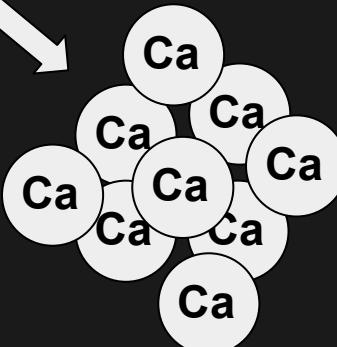


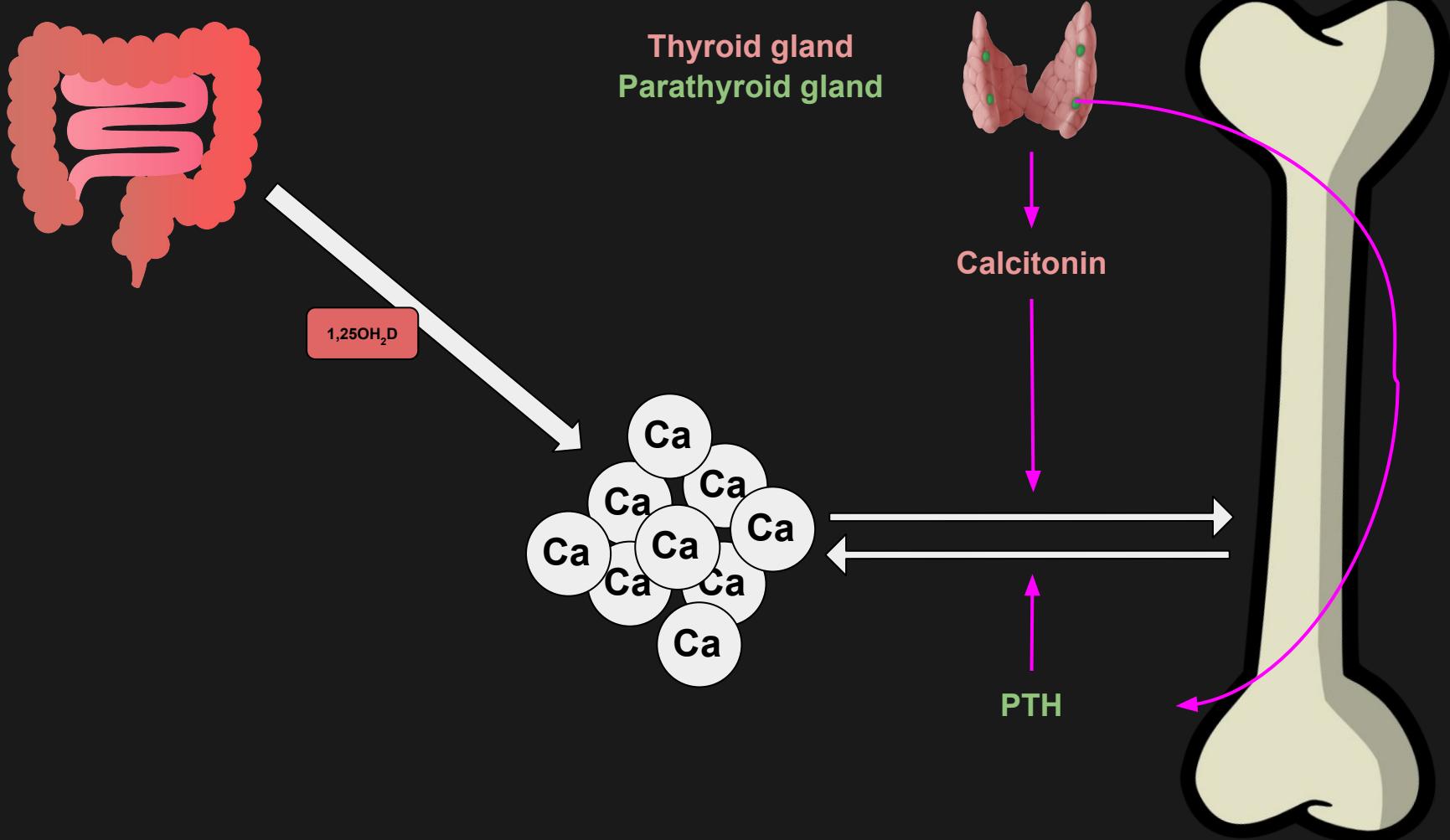
$1,25\text{OH}_2\text{D}$

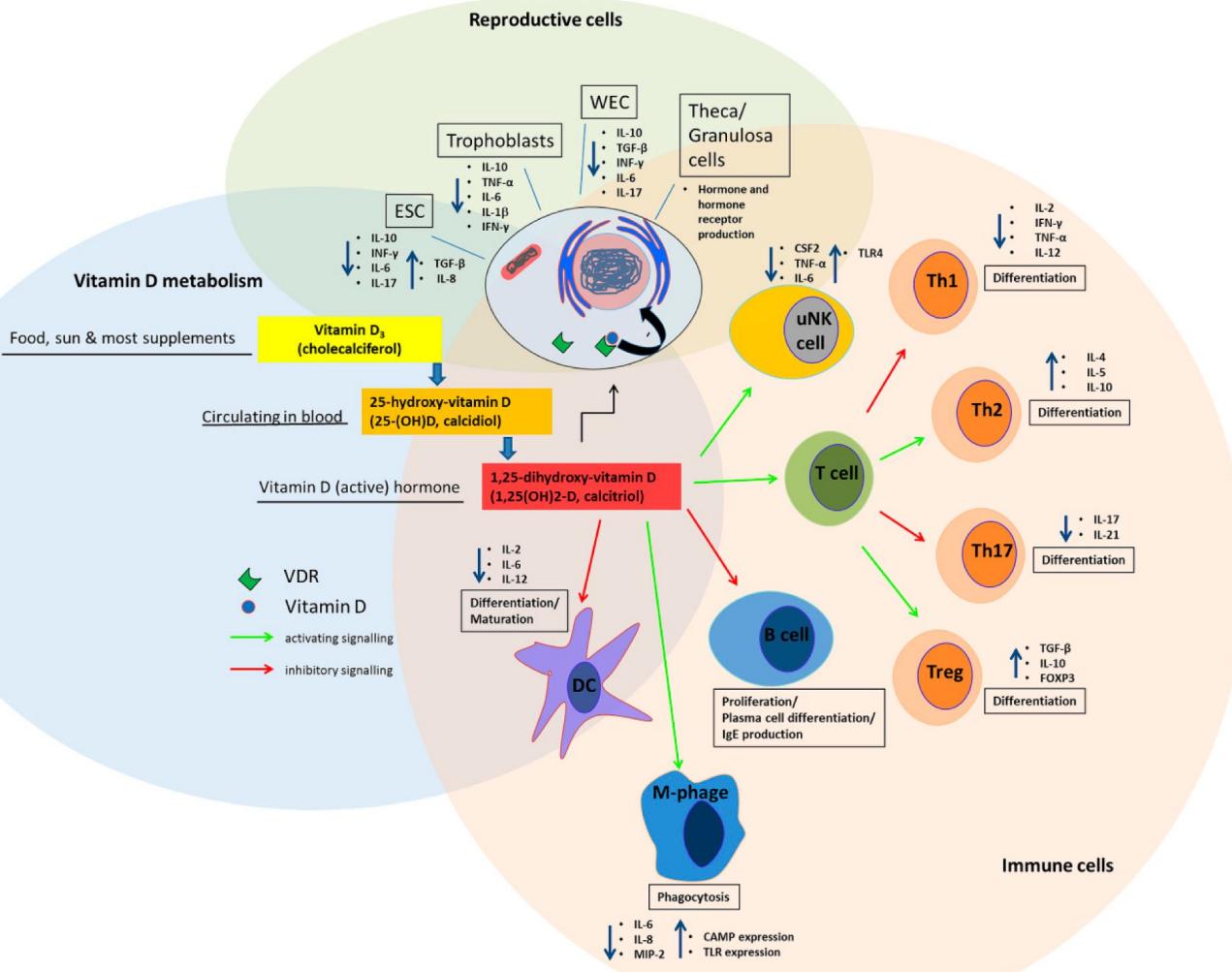
Thyroid gland
Parathyroid gland



Calcitonin



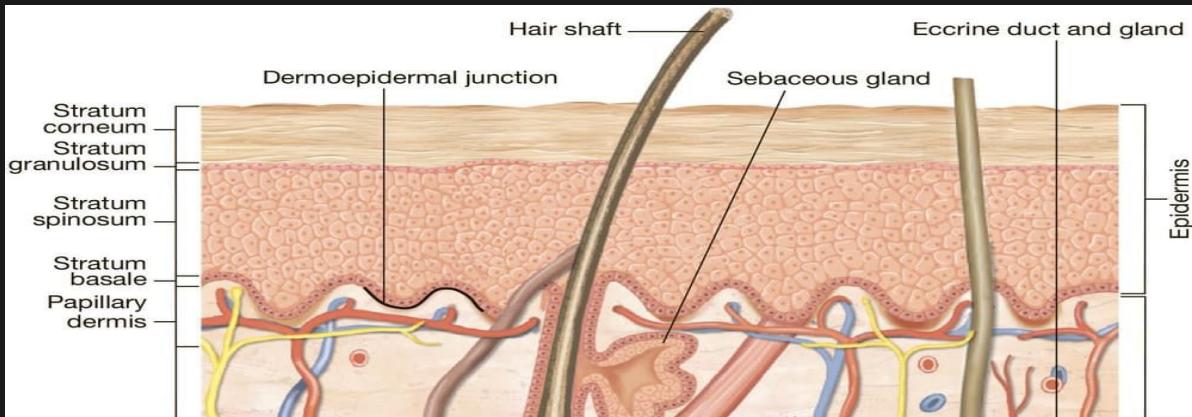






Ultraviolet B

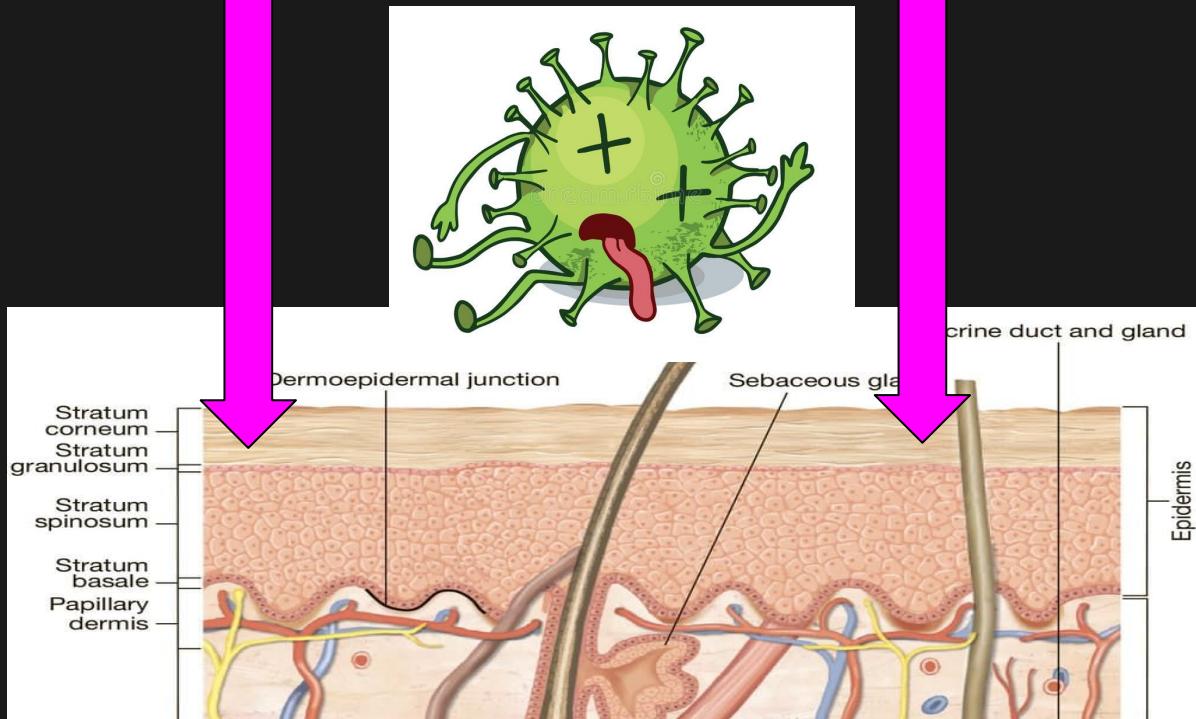
Ultraviolet A





Ultraviolet B

Ultraviolet A





Ultraviolet C



O_3 Ozone Layer

Siskiyous Vital Medicine

OZONE THERAPY NOW AVAILABLE

Ozone therapy is a restorative therapy used to regenerate damaged tissues, stimulate energy production, and eliminate chronic inflammation.

Ozone therapy is beneficial for:

- Osteoarthritis
- Sports Injuries
- Low Back Pain
- Disc Herniation
- Joint Pain
- Chronic Pain Syndrome

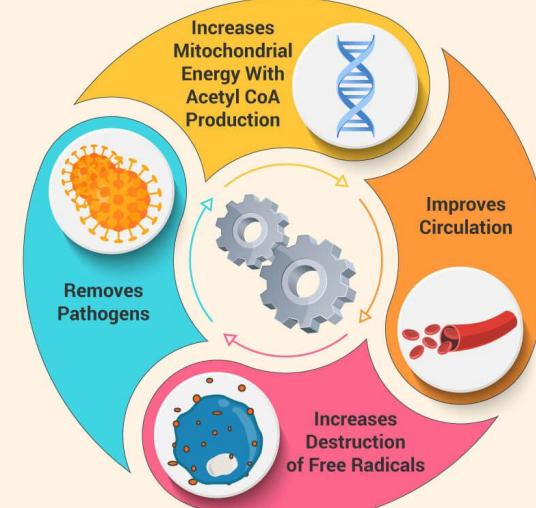
Safe & Effective

McClane Duncan, ND
Southern Oregon's Ozone Specialist
www.siskiyuvitalmedicine.com

Because You Deserve a Better Healthcare Experience™

541.210.5687

HOW OZONE THERAPY BOOSTS DETOXIFICATION



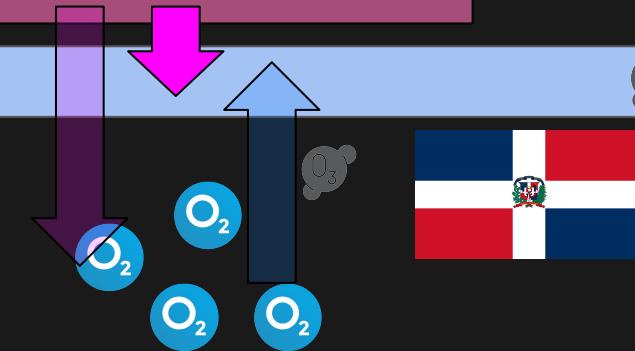


Ultraviolet C





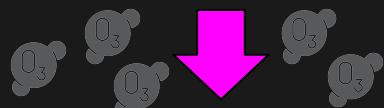
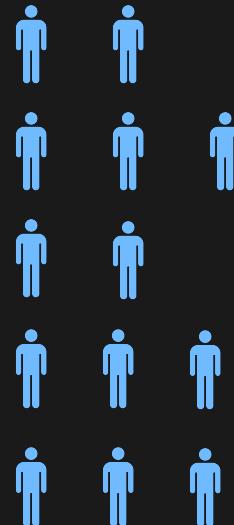
Ultraviolet C



O_3 Ozone Layer

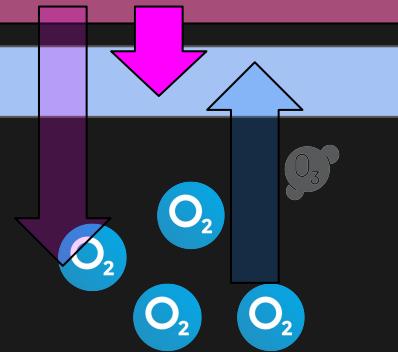


CANCER FREE! :D





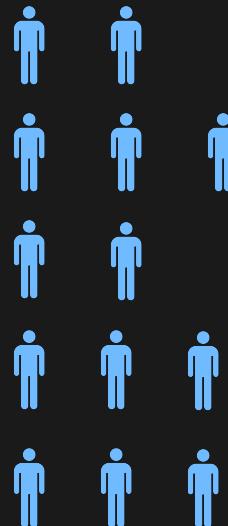
Ultraviolet C



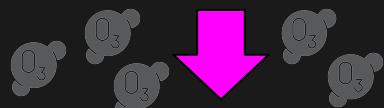
O_3 Ozone Layer



CANCER FREE! :D

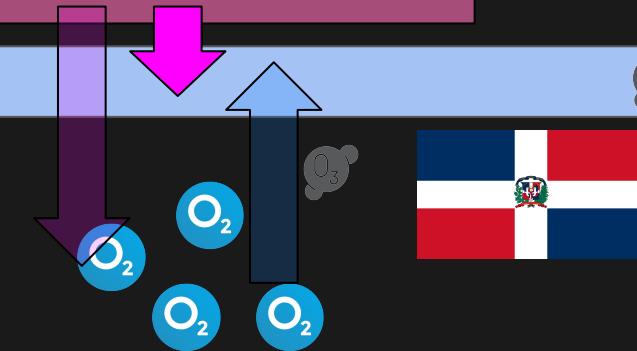


Died of cancer 💀





Ultraviolet C



O_3 Ozone Layer

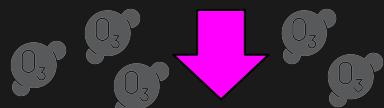
CANCER FREE! :D



Died of cancer 💀

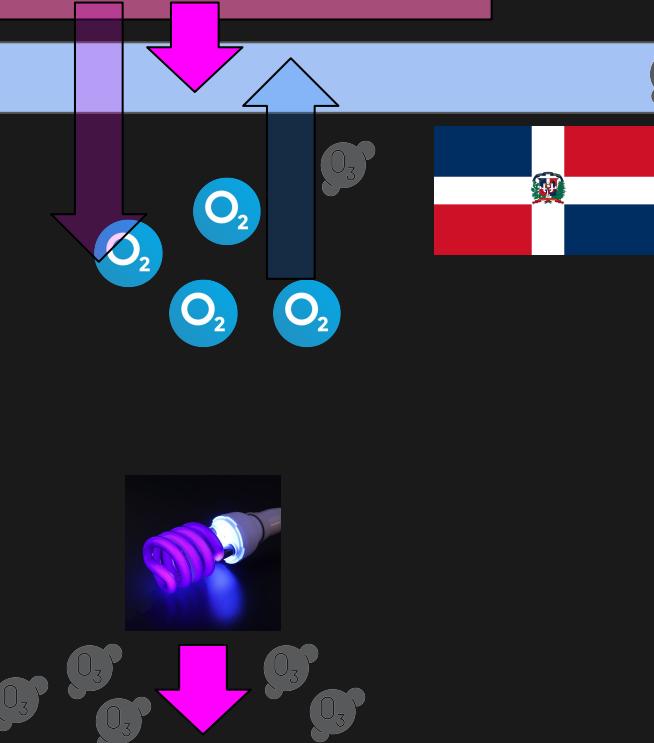


Missing





Ultraviolet C



O_3 Ozone Layer



CANCER FREE! :D



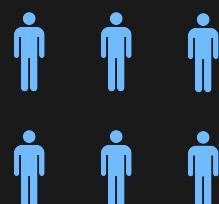
Died of cancer 💀



Missing



Refuse an interview





Ultraviolet C



O_3 Ozone Layer



CANCER FREE! :D



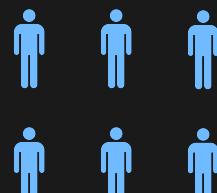
Died of cancer 💀



Missing



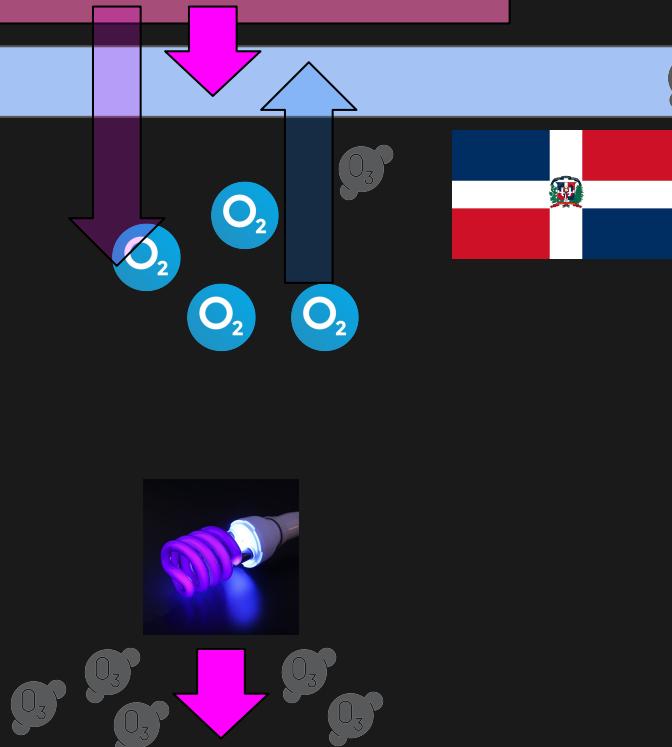
Refuse an interview



Alive,



Ultraviolet C



O_3 Ozone Layer

CANCER FREE! :D



Died of cancer 💀



Missing



Refuse an interview

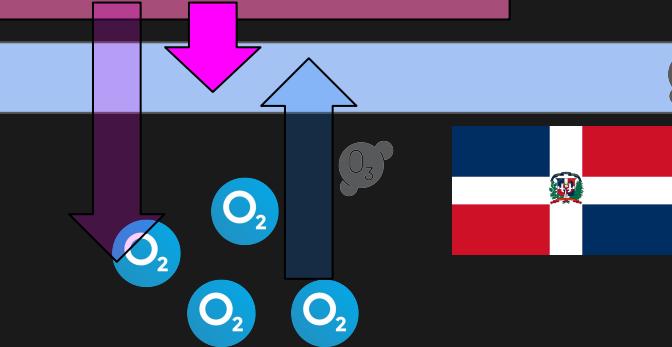


Alive, but still have cancer





Ultraviolet C



O_3 Ozone Layer

CANCER FREE! :D



Died of cancer 💀



Missing



Refuse an interview



Alive, but still have cancer



Never got cancer

