



Winter 2021

## Wonder Women

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# Wonder Women

**An artistic approach to understanding the  
female biome**

# Presentation Outline

- ❖ Terms
- ❖ Artist statement
- ❖ Microbiomes
- ❖ Overview of relevant anatomy
- ❖ The vaginal environment
- ❖ The microbiome as a garden
- ❖ Cycles
- ❖ Imbalances
- ❖ Factors impacting the microbiome
- ❖ Caring for the microbiome



# Terms to know

**Microbiome:** The community or ecosystem of different bacteria in an area on or in the body (this project focuses on the vaginal microbiome)

**Bacteria:** single celled organism that live pretty much everywhere

**Probiotics:** food or supplements containing living bacteria that help your microbiome

**pH scale:** measurement of how acidic or basic something is

**Menstruation:** during the monthly cycle (period) where the uterine lining is shed

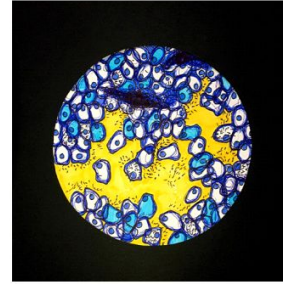
**Menopause:** the end of menstruation (usually occurs in womens' 40s - 50s)

**Ovulation:** egg is released from ovary during the monthly cycle



# Artist Statement

- ❖ Staining techniques to visualize different cells and bacteria from vaginal swabs
- ❖ Appreciation of the human microbiome, with special focus on the female microbiome
- ❖ Understanding the individual as a community
- ❖ Appreciation for the amazing diversity of the human body
- ❖ Art is universal, health is universal (Jose)
- ❖ I hope this project encourages curiosity, respect, and understanding!



# A little about microbiomes

- ❖ There are 10x more bacteria living on/in you as than your own cells according to the US National Institutes of Health
- ❖ That's 1-3% of your body weight, roughly 1-6 lbs depending on body size
- ❖ Human health is dependent on bacteria!
- ❖ Imbalances in the microbiomes can lead to opportunistic infections (bad guys waiting to strike!)
- ❖ Other microbiomes
  - Stomach
  - Colon & intestines
  - Skin
  - Nose
  - Mouth
  - Lungs
  - Genitalia



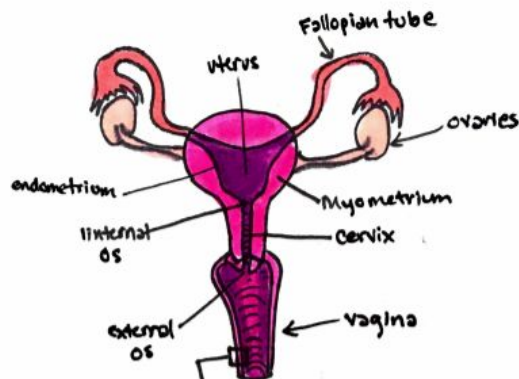
# Homage to Uniqueness

- ❖ Diversity
  - Step away from the binary
  - Appreciation of differences in cultures, anatomies (internal and external), genetics
- ❖ Identity/Sexuality
  - Biology can play a huge role in identity but it is not a determining factor
  - All identities deserve respect and care
  - Differences in anatomy/microbiome are not necessarily pathologies

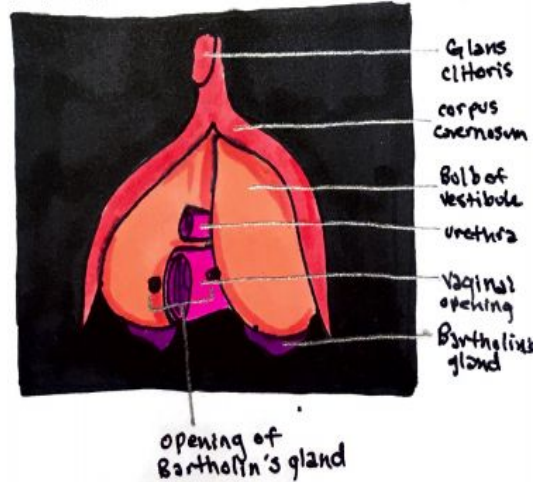


# Anatomy

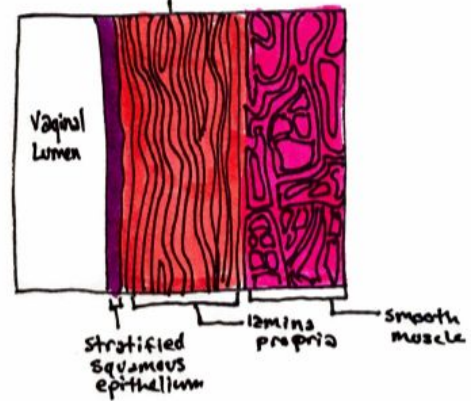
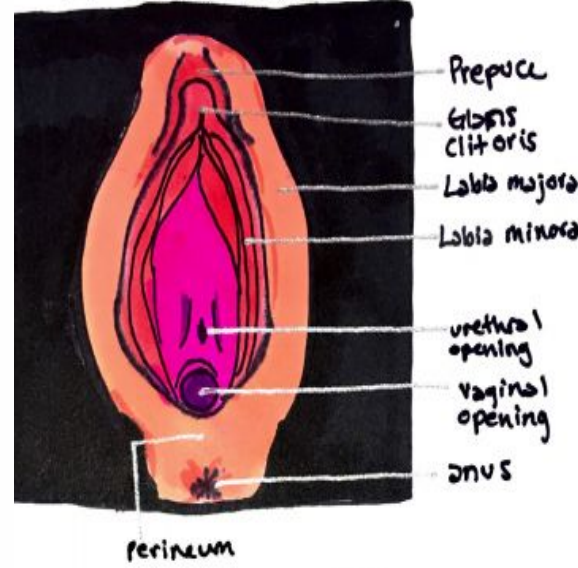
❖ The vagina is a bridge between worlds which means that it is sensitive to things occurring in both those worlds



Internal Anteriolateral View



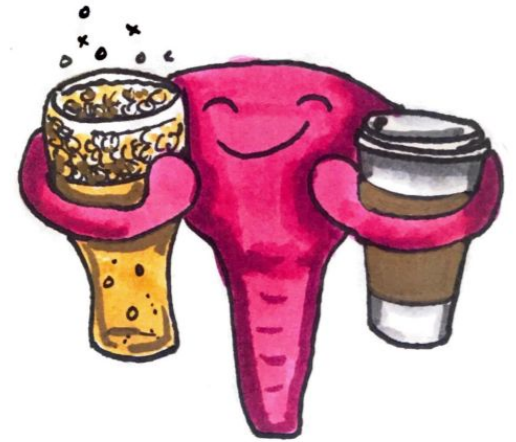
External View





# Vaginal Environment

- ❖ Vaginal pH falls between 3-4.5 on the pH scale
  - Similar pH to beer, coffee and orange juice!
- ❖ Blood has a pH around 7.4, so during menstruation vaginal pH becomes more basic
- ❖ Where you live affects how you live
- ❖ pH can affect what bacteria grow in vagina



# The Garden (the microbiome)

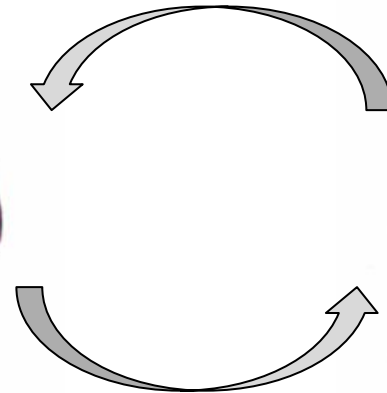
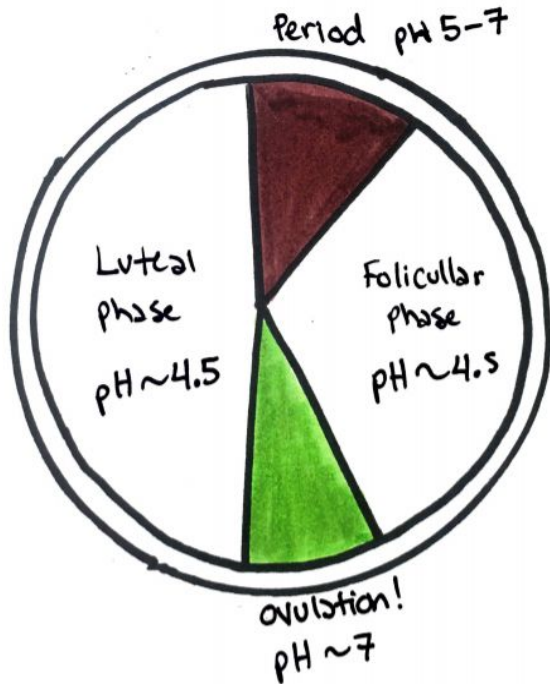
- ❖ Individuals are communities
- ❖ Healthy Gardens
  - Lactobacillus
    - $H_2O_2$  and Lactic Acid
    - Keeps the “soil” healthy
  - Other bacteria coexist but are kept in check
    - Gardnerella vaginalis, Candida
- ❖ Different “seasons”
  - In different life stages there are different bacteria



THE GARDEN

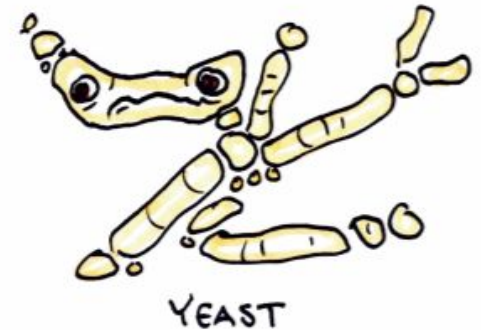
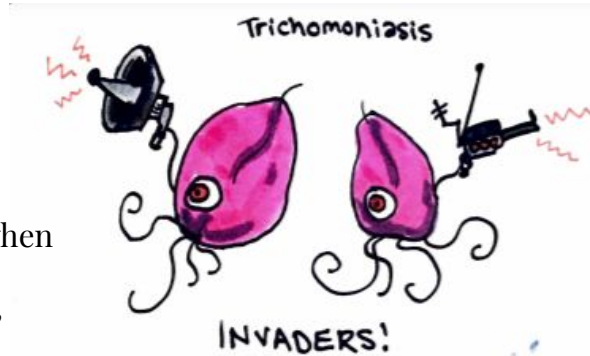
# Cycles and the microbiome

- ❖ Menstrual cycle
  - pH of vagina changes with the cycle
- ❖ Aging
  - Different gardens at different ages
  - Premenopausal/postmenopause differences
  - Lowered levels of estrogen after menopause increase vaginal pH



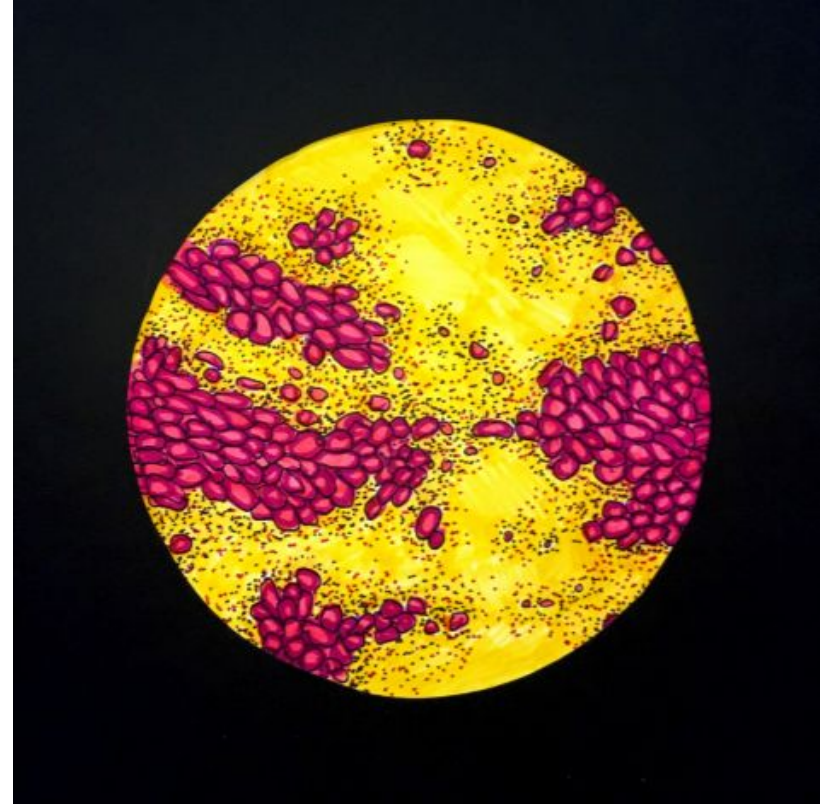
# Imbalances (Dysbiosis)

- ❖ Sexually Transmitted Infections (STI)
  - Increased susceptibility to STIs when unbalanced microbiome
  - Trichomoniasis, HPV, Chlamydia, Gonorrhea
- ❖ Urinary Tract Infections (UTIs)
  - Collision between gardens!
  - Gut E. Coli transferred to Urethra
  - 50-60% of women will experience UTIs in their lifetime
- ❖ Bacterial Vaginosis (BV)
  - Weeds that hurt the garden
  - Often times Gardnerella vaginalis and other anaerobic bacteria
- ❖ Yeast Infections
  - Candida overgrowth
  - Affects 75% of women at some point in their life



# Things that affect the garden

- ❖ Sexual contact
  - Your partner's microbiome can affect yours!
  - Lube, condoms, semen, saliva are all basic compared to vagina and can make it less acidic
- ❖ Sexually transmitted infections (STI)
  - Bad bacteria and viruses (pathogens) alter the microbiome and can cause problems, everything from discomfort to serious life threatening conditions
- ❖ Birth control
  - Affects hormonal balance



# Things that affect the garden continued

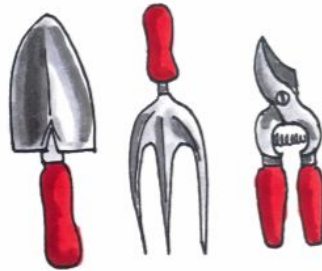
- ❖ Genital hygiene
  - Vaginal douching changes pH
  - Soaps/detergents can also harm the microbiome
- ❖ Antibiotics
  - Antibiotics prevent the growth of harmful bacteria, which also means that they can prevent the growth of the good guys!
  - Very common to get yeast infections
  - Affects the stomach microbiome as well
- ❖ Diet & Lifestyle
  - Eating excessive sugar can increase likelihood of yeast infection
  - Smoking increases chance of BV
  - Stress & sleep deprivation



**The pH of soap is between 8-10  
This means that it is  
1,000,000 times more basic  
than your vagina.**

# Garden Tools: What you can do for your vagina

- ❖ Rinse vulva with warm water but steer clear of vaginal douching and dry thoroughly
- ❖ Use protection during sex and avoid glycerin and petroleum based lubes
- ❖ Avoiding eating excessive amounts of sugar
- ❖ Get tested for STIs
- ❖ Pee after sexual intercourse
- ❖ Wipe front to back
- ❖ Eat foods high in vitamin C like oranges or take a supplement help acidify urine and keep away UTIs
- ❖ Eat probiotic foods (yogurt, kombucha, kimchi, etc.)
- ❖ Regularly change tampons & pads
- ❖ Avoid smoking
- ❖ Boric acid/lactic acid suppositories can help balance pH
- ❖ Love yourself!



# For everyone

- ❖ You know your body best, if something is wrong advocate for your health!
- ❖ Healthy habits are not necessarily one size fit all, something that works for someone else may not work for you
- ❖ Your body is yours! You deserve to be healthy and happy





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❖ Special thanks to my mentor Jose Serrano–Moreno and to all the wonderful women who donated their cells to science and art!

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# Questions?



Captions:

### Artist Statement

*Wonder Women* is an artistic depiction of vaginal swabs from 7 different women who volunteered for this project. To acquire the diversity and range of colors and visualizations of the cells and bacteria I used several different stains, staining techniques, and various levels of magnification on a four objective microscope. The inspiration behind this project was the hope that people could gain a new interest and awareness of the human biome, in particular the female microbiome. The female microbiome has been continually abused and altered without many people even realizing it. Birth control, diet, antibiotics, sexual health, stress, hormones, lifestyle and hygiene all impact vaginal health, yet not many people understand what it can mean for a woman's quality of life. It was my hope that by using art to investigate this issue that has been stigmatized and overlooked that it would become approachable, and even more than that; beautiful. In the words of Jose Serrano Moreno, "an individual is a community". It may sound bizarre, but you are so much more than yourself. You are a part of an intricate network that extends beyond you, within you, and through you. You are a host to a fertile garden and have the ability to cultivate the flora with care and appreciation. I hope this project has given people the opportunity for curiosity about themselves and others and an understanding of the beauty in biology and the artistry in nature!

Before we start talking about anatomy, it is important to note that we are not talking about gender. We need to step away from the gender binary in order to fully appreciate the beautiful diversity of humankind! There is a vast array of different anatomies including internal, external, and chromosomal and even more than that, every personal identity is different! With that being said, this project was based in a sample group of 7 cis gendered women but this project is not meant to present that as a standard. Identity and personal normality is based on the individual. Every human being has multiple different biomes within the human body. Do what is right for you and your health and if something feels off, investigate and advocate!

### Terms to Know:

**Microbiome:** The community or ecosystem of different bacteria in an area on or in the body (this project focuses on the vaginal microbiome)

**Bacteria:** single celled organism that live pretty much everywhere

**Probiotics:** food or supplements containing living bacteria that help your microbiome

**pH scale:** measurement of how acidic or basic something is

**Menstruation:** during the monthly cycle (period) where the uterine lining is shed

**Menopause:** the end of menstruation (usually occurs in womens' 40s - 50s)

**Ovulation:** egg is released from ovary during the monthly cycle

It is important to understand the basic anatomy when considering the microbiome. Where you live affects what you're doing and the same basic principle applies to the microbiome and the bacteria that compose it! The vagina is a crucial part of female health, it is an entry point, a bridge between two worlds: the inside and the outside. This means that female health is incredibly sensitive to even small changes between these worlds. The vagina has a pH of 3-4.5 during a majority of the cycle (the follicular and luteal phases) which rises during menstruation as the pH of blood is around 7.4. The pH also changes during ovulation to around 7 to allow for the survival of sperm for fertilization. The pH of the vagina is a very important part of female health and it influences what bacteria can happily live in the vagina.

Humans are living communities. You have an ecosystem of different bacteria living on and inside you. Pretty much if you can name a body part, there's a microbiome there helping you out. There are 10x more bacteria living on/in you than your own cells according to the US National Institutes of Health which means that 1-3% of your body weight, roughly 1-6 lbs is bacteria! That's the size of a small dog! Human health is dependent on bacteria. We rely on bacteria as an important part of our immune system. This means that imbalances in the microbiomes can lead to opportunistic infections (bad guys waiting to strike).

- ❖ Other microbiomes
  - Stomach
  - Colon & intestines
  - Skin
  - Nose
  - Mouth
  - Lungs
  - Genitalia

Imbalances (dysbiosis) are very common to the female microbiome considering the fact that the vagina is a bridge between the internal and external world. Generally the healthy vaginal microbiome in actively reproductive females is one that is dominated by *Lactobacillus*, however many things can upset this balance and cause dysbiosis. pH is a major factor in dysbiosis. When the pH becomes too basic, pathogenic (bad) bacteria and fungi like

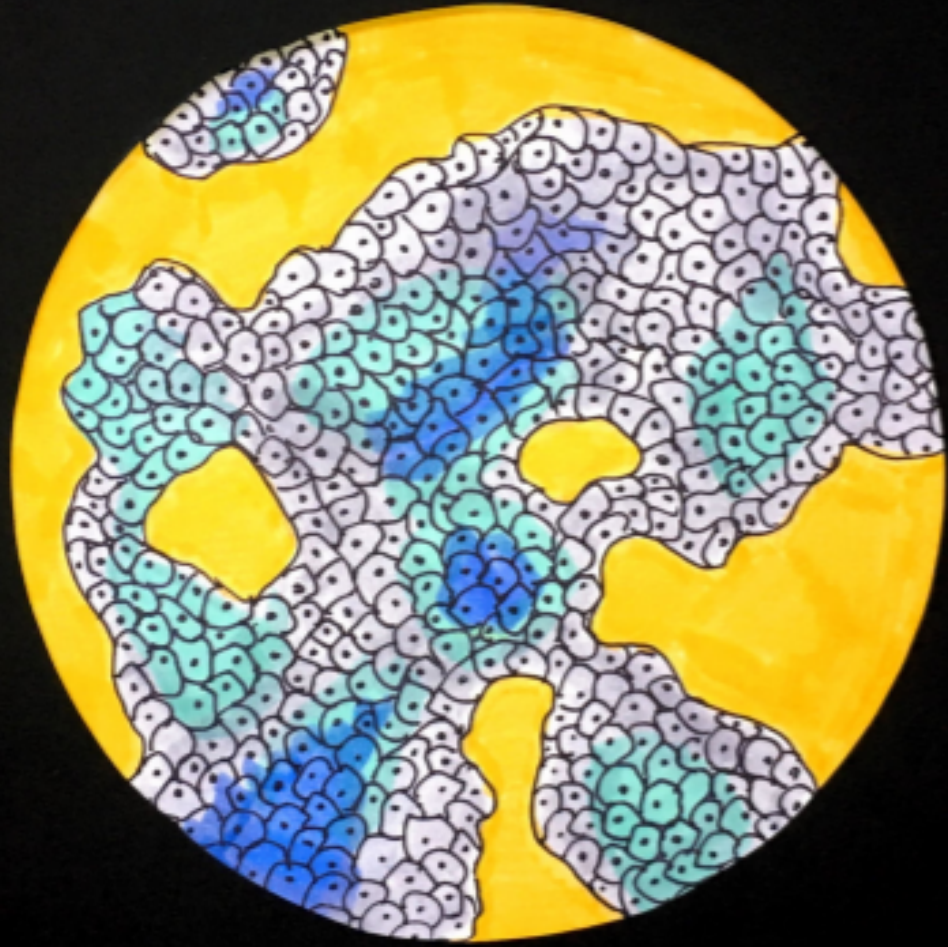
Gardenella and candida respectively, can over grow. The results of this are conditions like Bacterial Vaginosis, yeast infections and vaginitis which can greatly decrease the quality of life causing itching, redness, swelling, changes in discharge color and smell, painful urination and burning and can lead to threatening illness that affect fertility.

Here are some things that end up affecting the female microbiome:

- Sexually Transmitted Infections
- Sexual Habits (Lube, condoms, semen, saliva, spermicide, sex toys, and even your sexual partner's biome (and vice versa) can alter the biome)
- Genital Hygiene (soap can be up to 1,000,000 times more basic than the vagina!)
- Genital Hygiene of sexual partner/partners
- Genetics
- Diet (eating more sugar can feed the yeast in the microbiome, BV has an epidemiological association with obesity)
- Antibiotics (women frequently get yeast infections after a course of antibiotics, as they are hard on the vaginal biome as well as the digestive biome. It's a good idea to take a probiotic or eat probiotic foods during the course of antibiotics as a countermeasure)
- Birth Control (oral birth control can lesser the chance of BV, while IUD can increase the chances of BV due to intermittent bleeding)
- Medication
- Age
- Menopause
- Other changes in hormones (decreases in estrogen can cause increase in vaginal pH)
- Smoking (a study by NCBI found a very strong correlation between smoking and the occurrence of BV)

What is normal varies from individual to individual and not everything that is healthy for one person will affect everyone the same. That being said there are some helpful guidelines for caring for the female microbiome. Hygiene is very important, cleaning the vulva (the external parts of the vagina) with warm water and drying thoroughly is a great place to begin, however douching can adversely affect vaginal health as it increases pH. Eating a diverse diet of whole foods which contain a multitude of different vitamins and minerals and eating probiotic foods (generally fermented foods like greek yogurt, kimchi, miso, kombucha especially those that contain live colonies) can help keep the colonies of bacteria balanced. Maintaining safe sex habits like the use of protection and urinating after sex as well as avoiding lubes that are

glycerin and petroleum based can keep both partners healthy and happy. Regularly change tampons and pads is very important. Avoiding eating excessive sugar and avoiding smoking can also help balance the vaginal microbiome, just like with baking bread, yeast love sugar and if there is more sugar in the body then there is more food for the yeast. Over the counter suppositories can help women balance their biome: boric acid, vitamin C and lactic acid suppositories can be helpful options! Also, don't put soaps, perfumes, and deodorants in the vagina as they can kill off your good bacteria. Most importantly, love yourself! You deserve to be healthy.

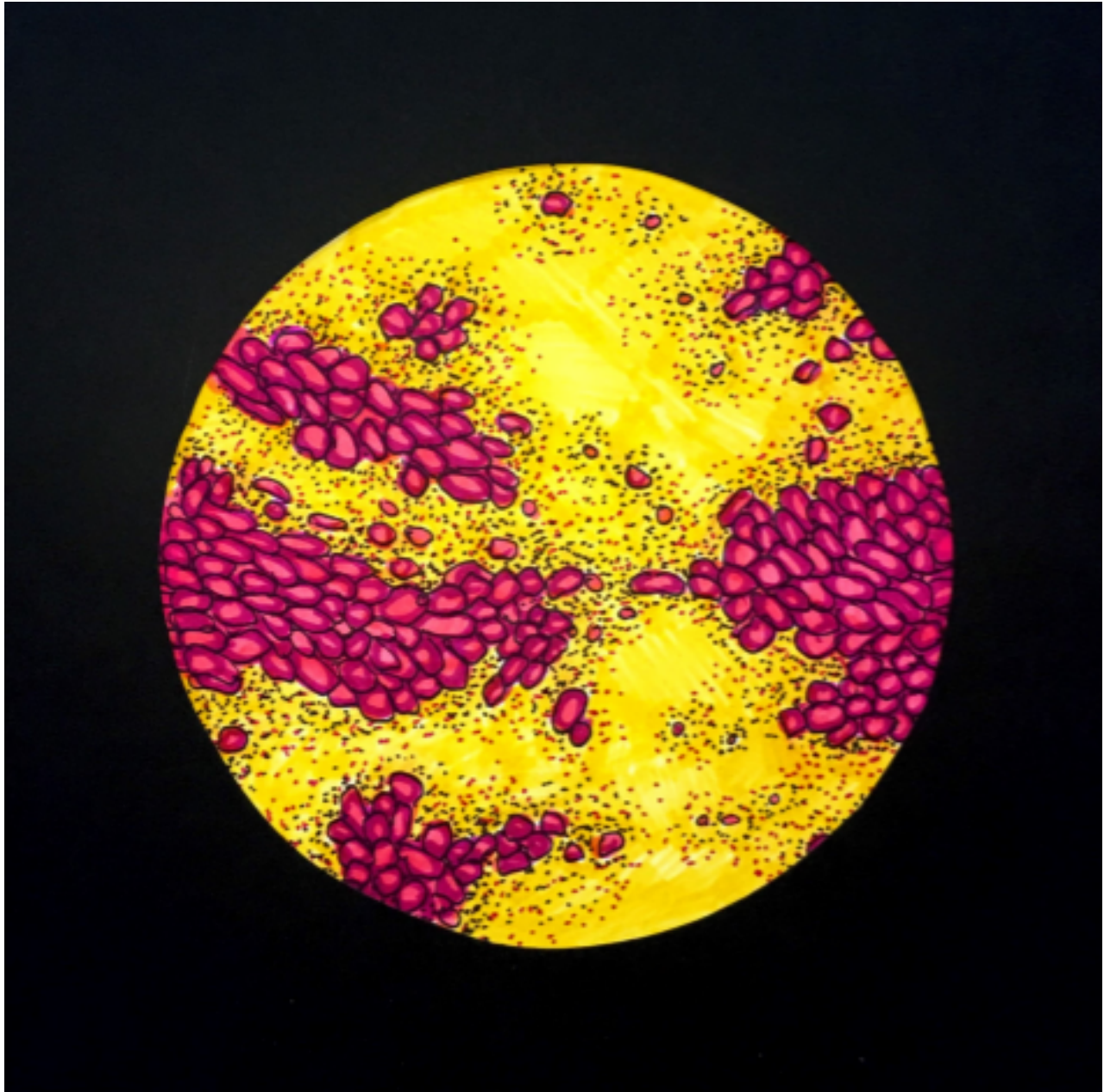


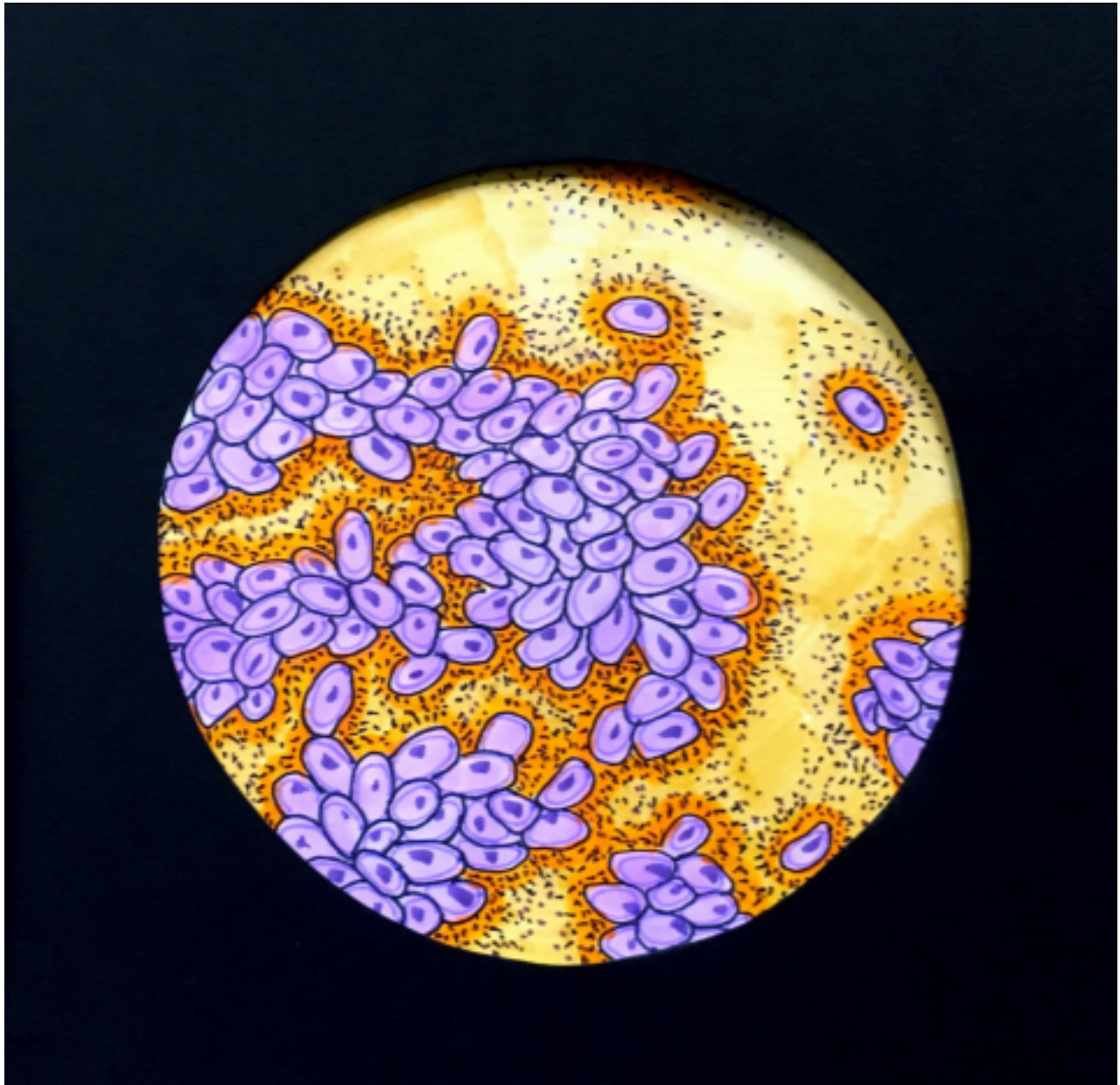


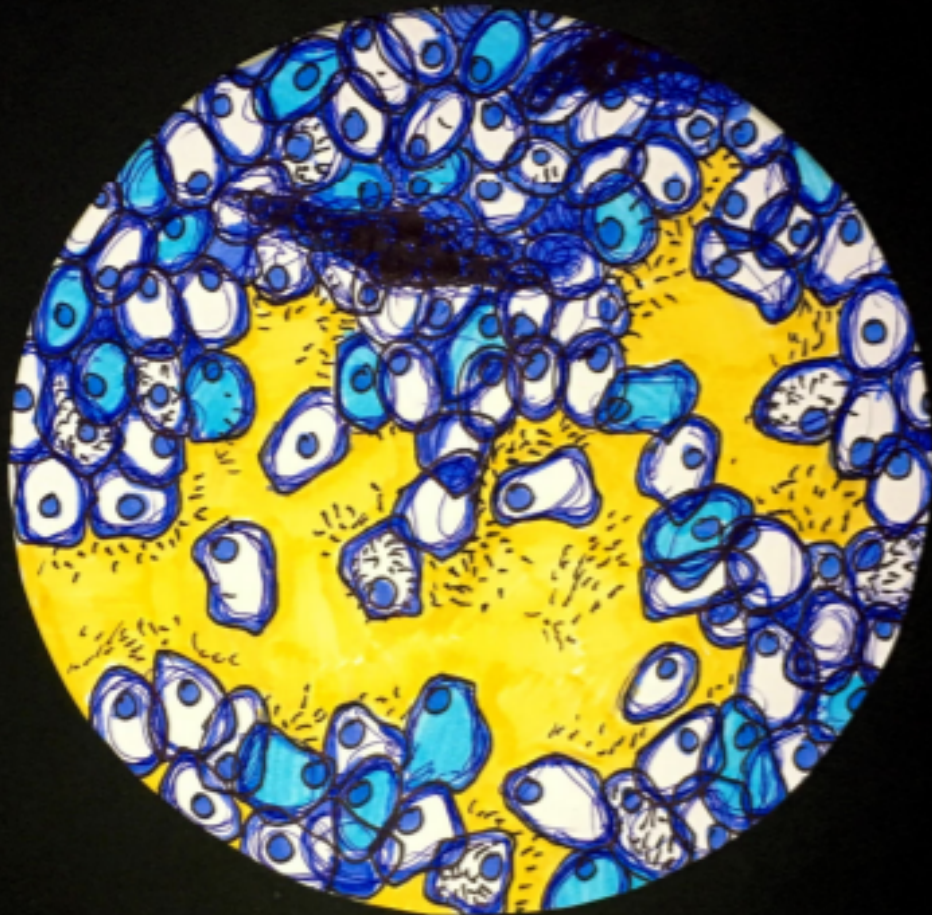


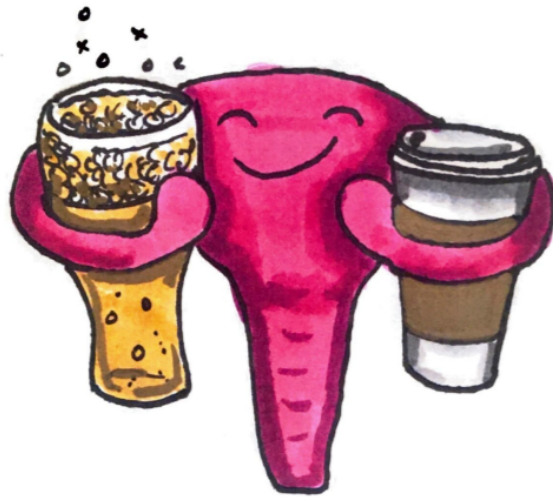




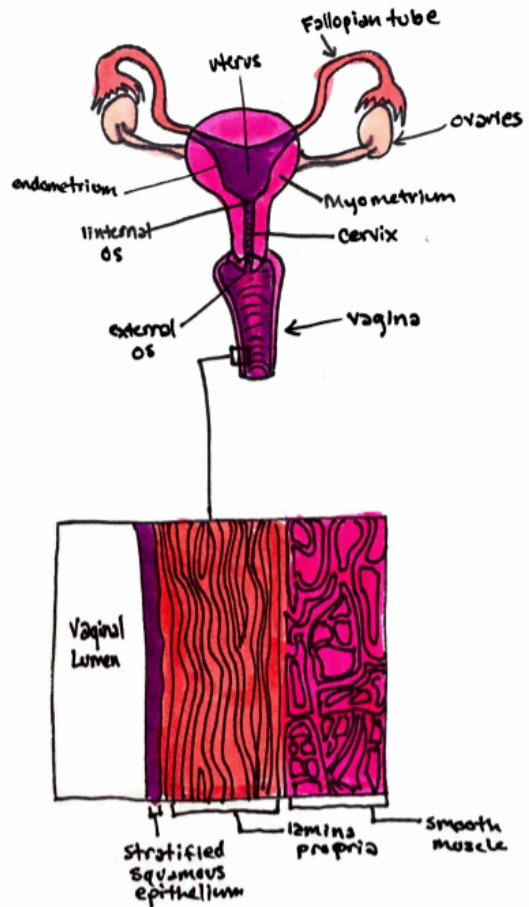




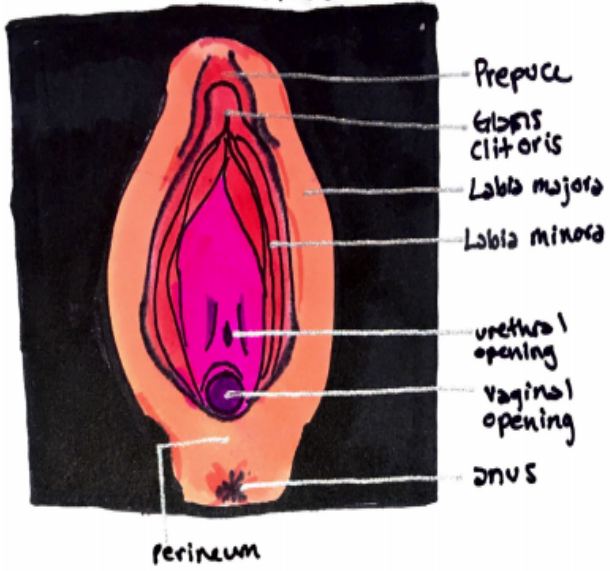




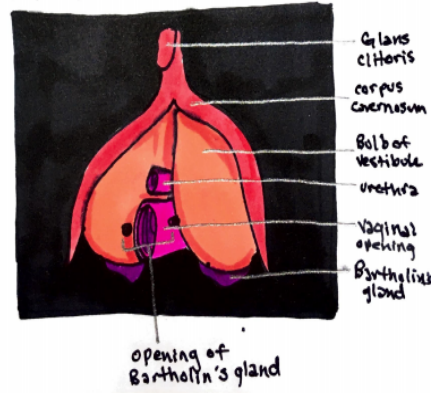
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14	Drano
13	Bleach
12	Hair relaxer
11	Ammonia
10	Detergent
9	Toothpaste
8	Ocean H <sub>2</sub> O
7	Pure H <sub>2</sub> O, Blood
6	Urine, milk
5	Coffee
4	Beer
3	Orange Juice
2	Vinegar
1	Stomach Acid
ACIDIC	



# External View

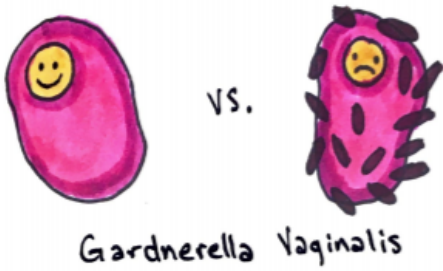
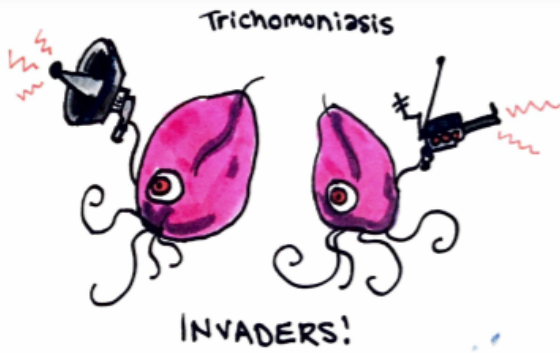


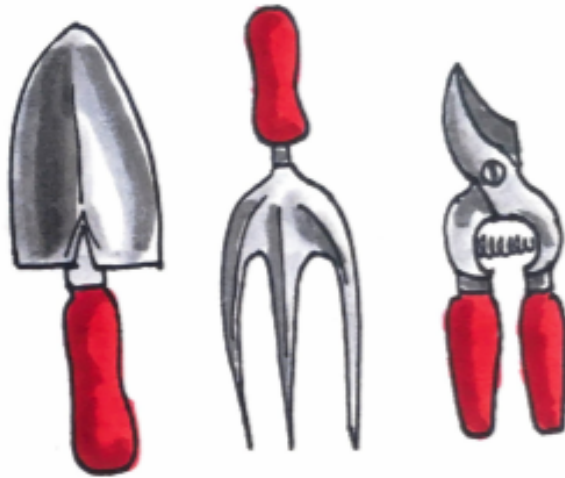
# Internal Anteriolateral View



THE GARDEN







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