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### Microbiota's role in health and diseases.

1956

2024

TEXT AVAILABILITY

2 EI-Sayed A, Aleya L, Kamel M.

Cite Environ Sci Pollut Res Int. 2021 Jul;28(28):36967-36983. doi: 10.1007/s11356-021-14593-z. Epub 2021

PMID: 34043164 Free PMC article.

Review.

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Abstract

composition and vitality. Recent studies have indicated the tremendous influence of the microbiome on The external environment, diet, and lifestyle are the major determinants influencing the microbiome's





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Abstract

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In this Review, we highlight how the bile acid pool is manipulated by the gut **microbiota**, how it is

dependent on the metabolic capacity of the bacterial community and how external factors, such as

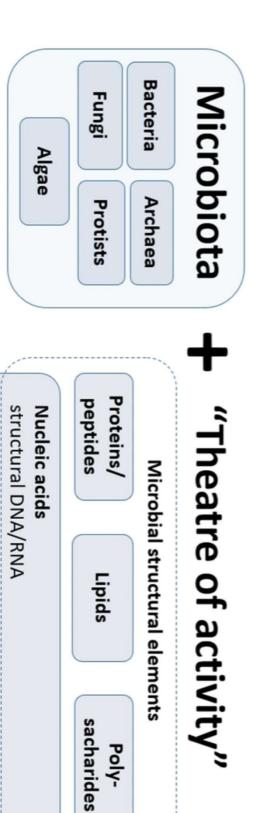
Nat Rev Microbiol. 2023 Apr;21(4):236-247. doi: 10.1038/s41579-022-00805-x. Epub 2022 Oct 17.

Bile acids and the gut microbiota: metabolic interactions and impacts on disease.

Collins SL, Stine JG, Bisanz JE, Okafor CD, Patterson AD

Cite

### Microbiome

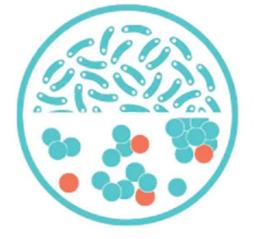


Internal/external structural elements Environmental conditions Signalling molecules incl. viruses/phages relic DNA mobile genetic elements Microbial metabolites **Toxins** (An)organic

molecules









#### **Prebiotics**

Non-digestible fiber compounds that stimulate the growth and activity of beneficial gut microorganisms.

#### **Probiotics**

Live microorganisms that inhabit the microbiome and confer health benefits when consumed in sufficient amounts.

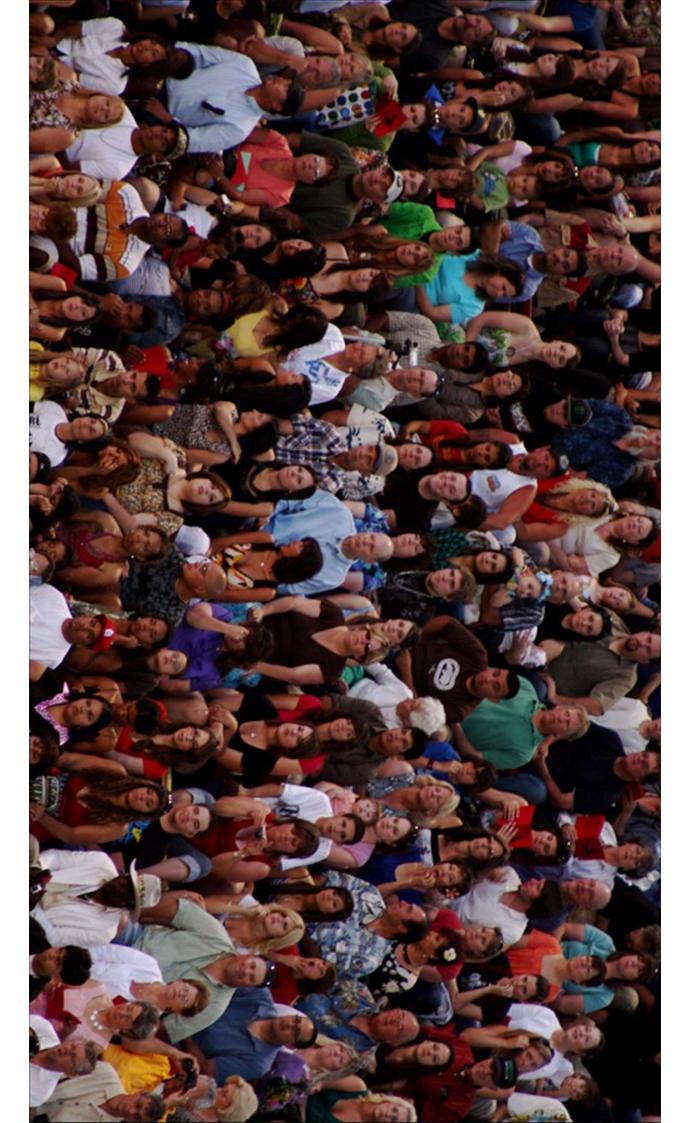
#### **Synbiotics**

A combination of prebiotics and probiotics.

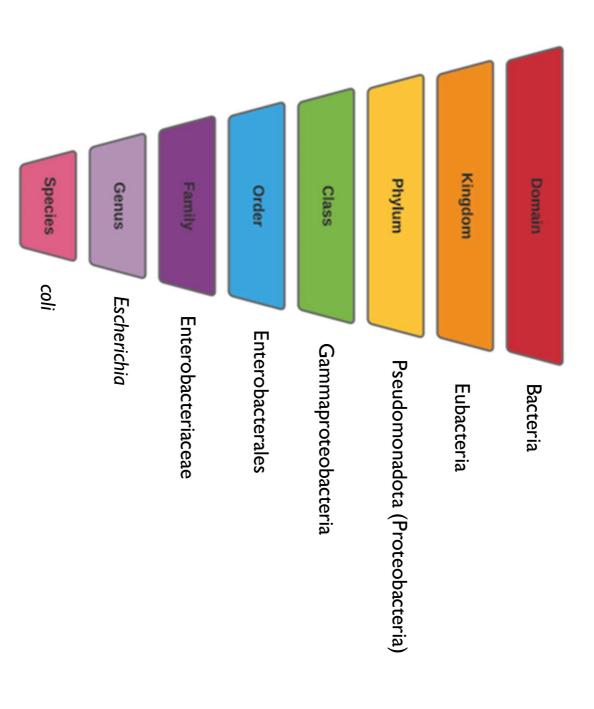
#### **Postbiotics**

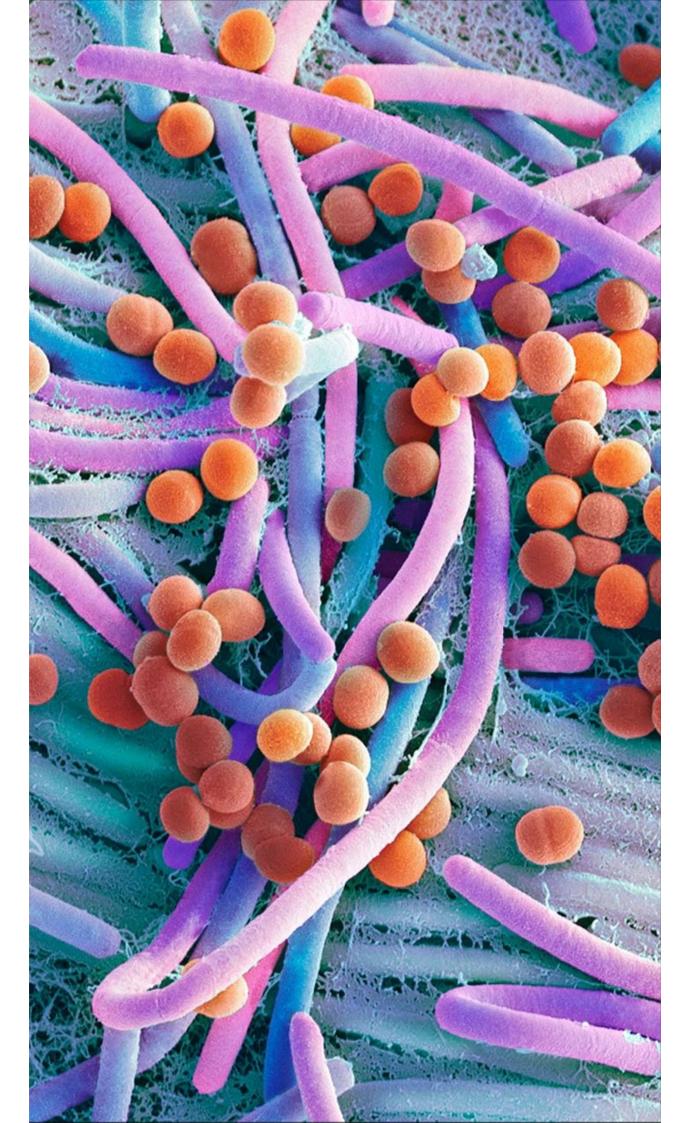
Products of prebiotic and probiotic activity that mimic some of the same benefits as probiotics, but also offer additional health benefits.

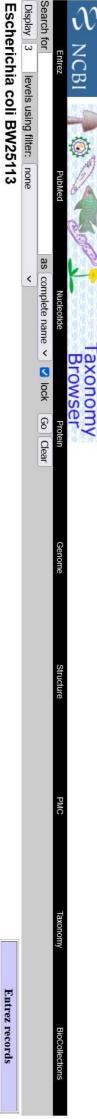












Taxonomy ID: 679895 (for references in articles please use NCBI.txid679895)

-current name

Escherichia coli BW25113

equivalent: 

Escherichia coli str. BW25113

NCBI BLAST name: enterobacteria

Rank: no rank Genetic code: Translation table 11 (Bacterial, Archaeal and Plant Plastid)

Host: bacteria vertebrates

Lineage(full)

cellular organisms; Bacteria; Pseudomonadota; Gammaproteobacteria; Enterobacteriales; Enterobacteriaceae; Escherichia; Escherichia coli; Escherichia coli K-12

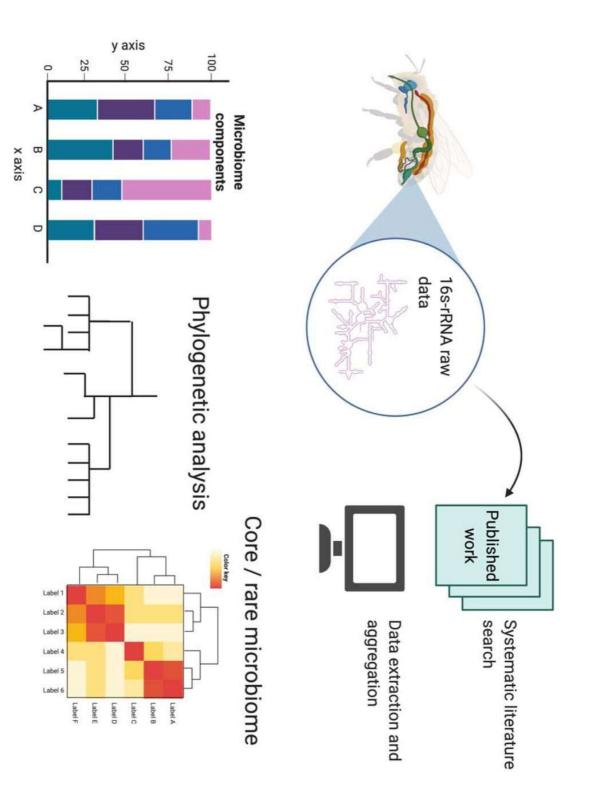
#### SRA Experiments Nucleotide PubChem BioAssay PubMed Central Structure Protein Assembly BioSample BioProject Identical Protein Groups GEO Datasets Genome Database name Direct links 25,687

#### Comments and References:

genome sequence Determination of the DNA genome sequence of this strain has been or is being determined either in whole or in part.

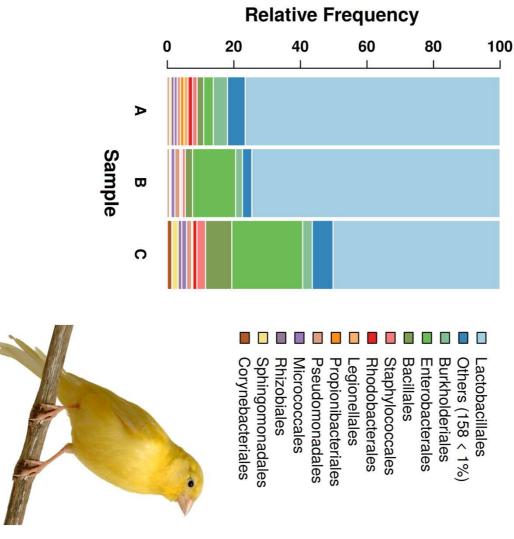
#### External Information Resources (NCBI LinkOut)

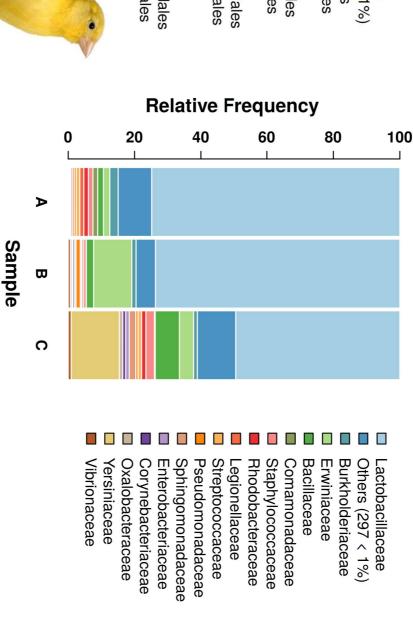
LinkOut	Subject	LinkOut Provider
Escherichia coli K-12 substr. BW25113	organism-specific	<u>BioCyc</u>
4 records from this provider	organism-specific	Genomes On Line Database
2 records from provider	organism-specific	Integrated Microbial Genomes



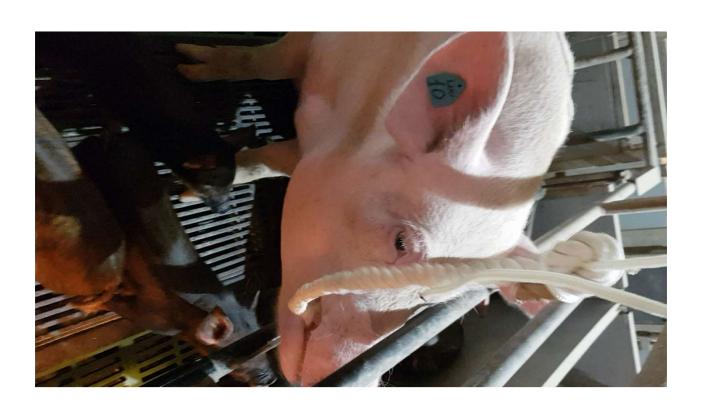
https://www.biorxiv.org/content/10.1101/2021.12.18.473299v1

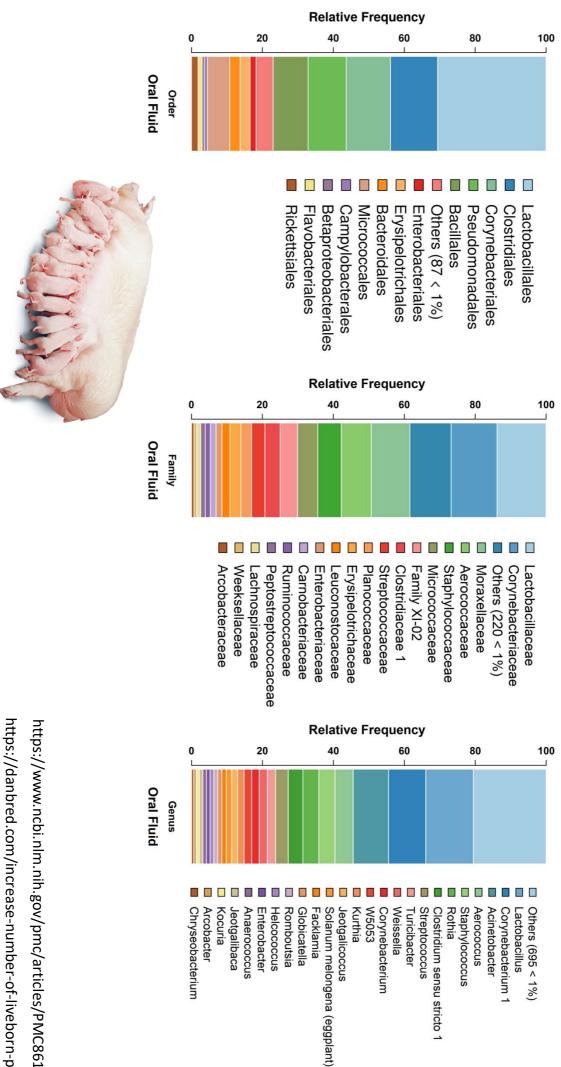




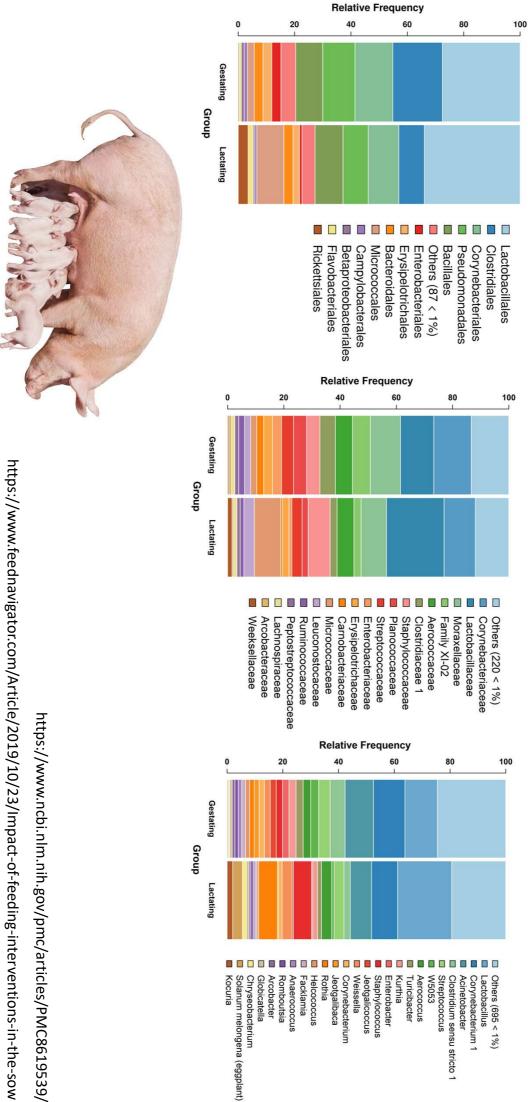


https://www.mdpi.com/2076-2607/11/9/2289 https://naturalworldpets.co.uk/blogs/pet-advice/guide-to-caring-for-canaries





https://danbred.com/increase-number-of-liveborn-piglets/ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8619539/



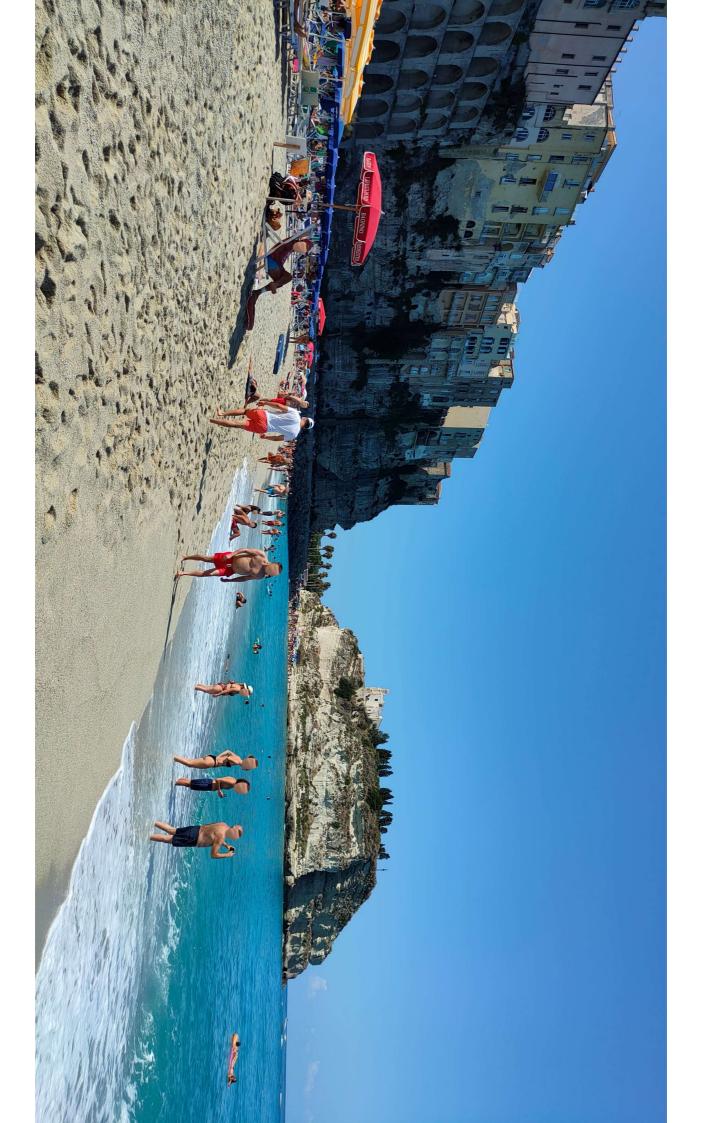


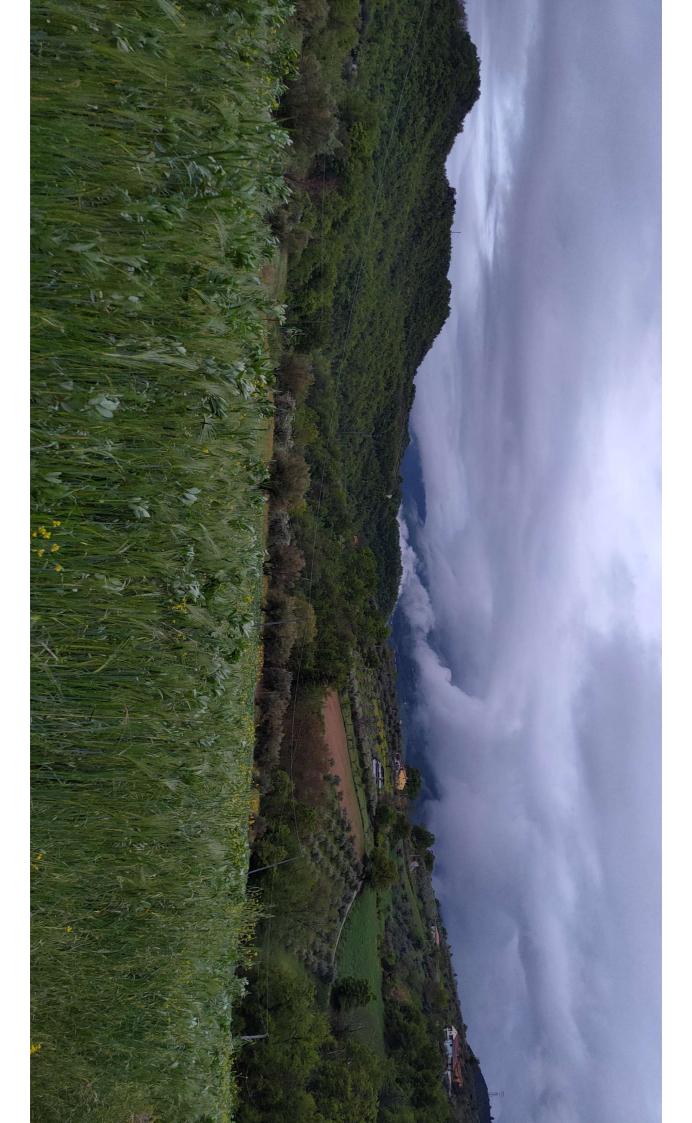


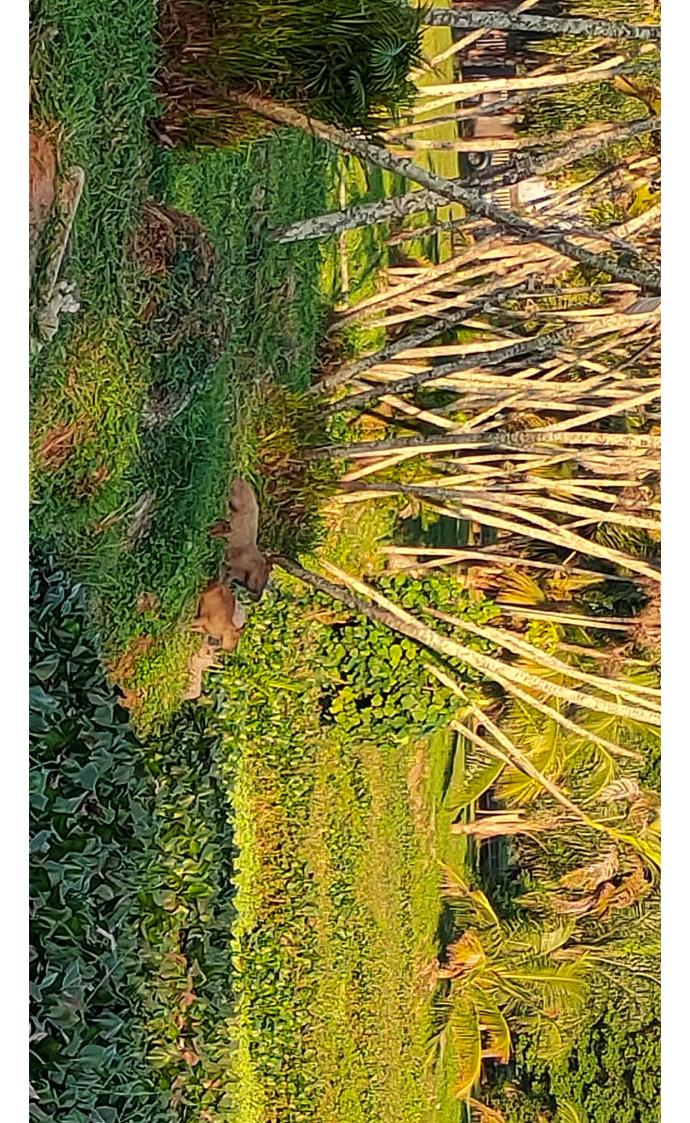




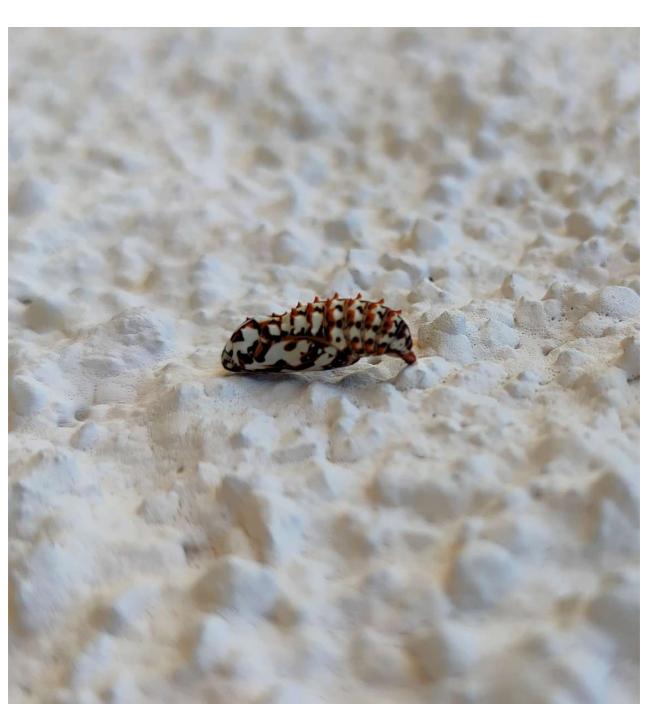




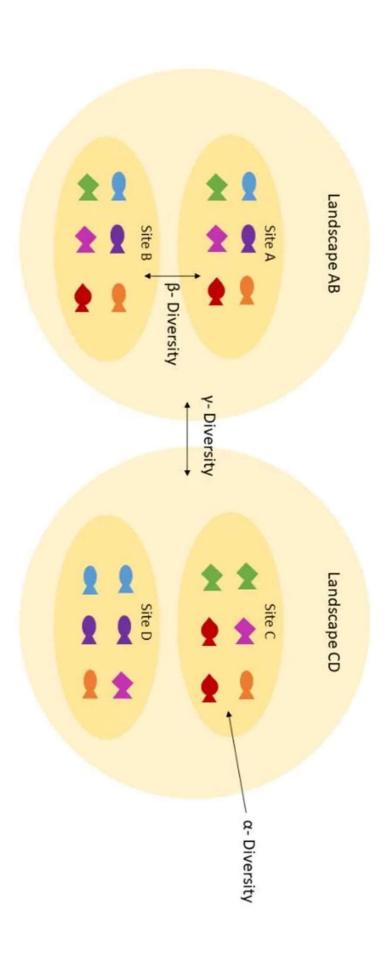




The study of the relationships between living organisms and their physical environment

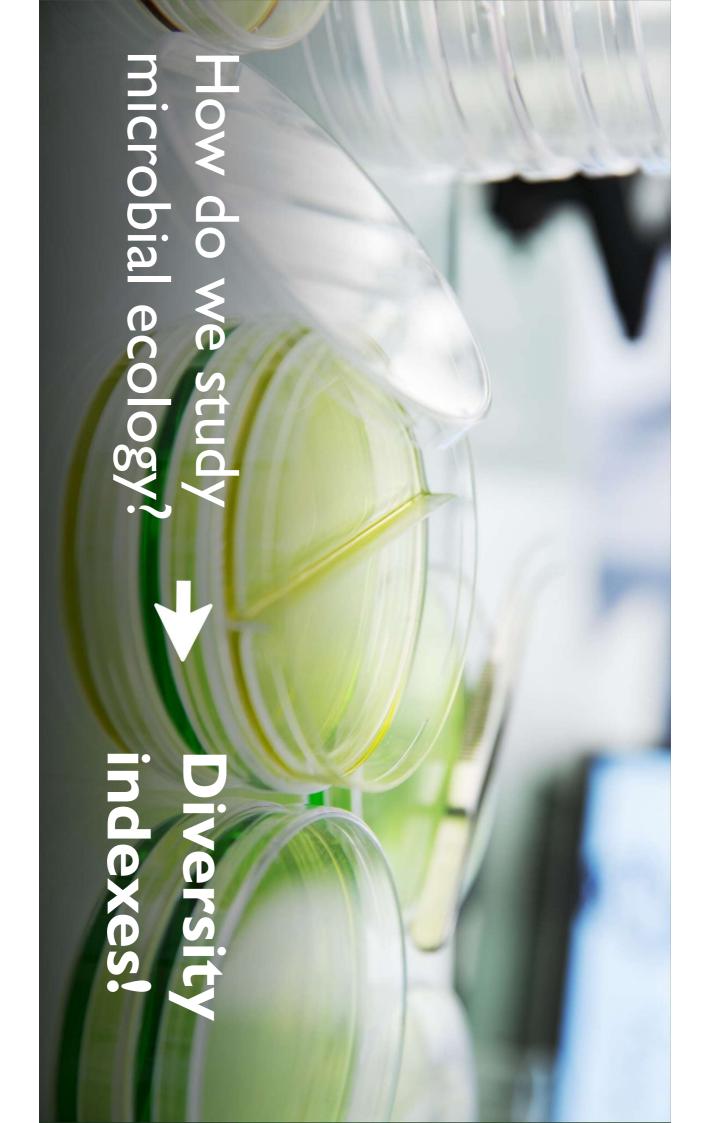






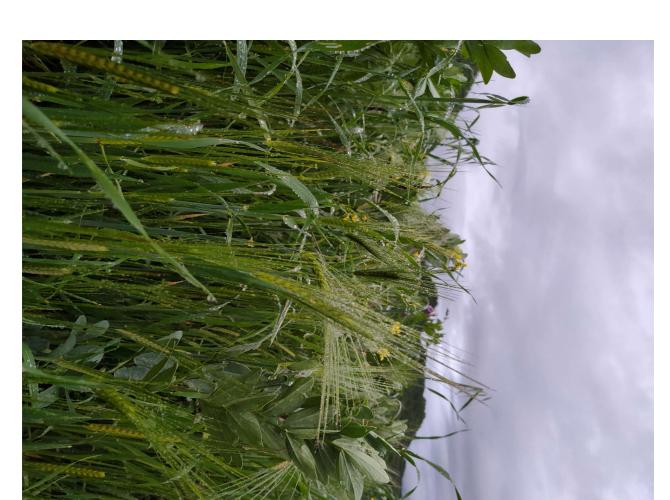
https://www.differencebetween.com/what-is-the-difference-between-alpha-beta-and-gamma-diversity





### Alpha diversity

"[...] is a measure of species diversity in a particular area or an ecosystem"



### Alpha diversity

- Diversity within a particular area or ecosystem.
- Usually expressed in terms of the number of species.
- It provides information about the species richness and evenness within a specific habitat or community.
- The higher the number of species in a particular area, the higher the alpha diversity.
- Alpha diversity is a local measure of species diversity and focuses on the diversity within a specific location.

# Alpha diversity: Shannon index



abundances in the string of interest, the more difficult it is to predict which letter will be the next one in the letters present, and the more equal their proportional "Also known as Shannon entropy. The more different string"

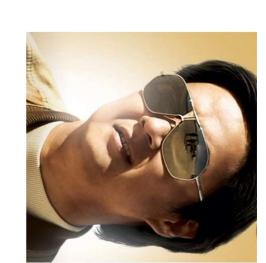
# Alpha diversity: Simpson index

to the probability of the two entities taken at random from individuals are classified into types. Simpson index is equal "Is the measure of the degree of concentration when the dataset of interest represent the same type"



https://www.cd-genomics.com/microbioseq/the-use-and-types-of-alpha-diversity-metrics-in-microbial-ngs.html

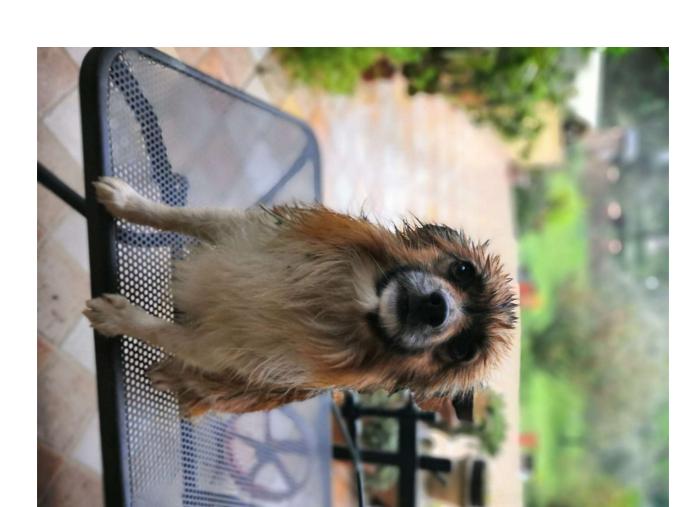
# Alpha diversity: Chao 1 and 2



samples belonging to a certain class. Chao 2 is an estimator based on the incidence; thus, it requires data that specifies requires data that refers to the abundance of individual Chao's index is for the estimation of species richness." "Chao 1 is an estimator based on abundance; thus, it the absence or presence of a species in a sample

### Beta diversity

"[...] refers to the change in species diversity between communities or ecosystems. Hence, beta diversity allows the comparison of biodiversity between ecosystems"



## Beta diversity

- Comparison of diversity between ecosystems and different communities.
- It measures the change in the amount of species between different habitats or communities
- It provides information about the turnover or replacement of species between different locations.
- It helps us understand how different habitats or communities are distinct from each other in terms of species composition.
- It is calculated by comparing the number of species shared between two or more habitats or communities
- The higher the beta diversity, the greater the difference in species composition between habitats or communities.

# Beta diversity: Bray-Curtis dissimilarity

compositional dissimilarity between two different sites, based on counts at each "It is a statistic used to quantify the

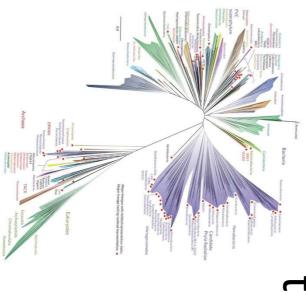
$$BC_d = \frac{\sum |x_i - x_j|}{\sum (x_i + x_j)}$$

Bray, J. Roger; Curtis, J. T. (1957). "An Ordination of the Upland Forest Communities of Southern Wisconsin". Ecological Monographs. 27 (4): 325–349. doi:10.2307/1942268. ISSN 0012-9615. JSTOR 1942268

## Beta diversity: Uni-Frac (Weighted vs Un-Weighted)

the distance between communities based or It is a phylogenetic method that measures

the lineages they contain.



# Gamma diversity



total diversity of every ecosystem in region. Therefore, it measures the biodiversity in a large geographic "[...] is the measure of overall that region"

