

# Een verstoord microbiom : Behandeling noodzakelijk of fantoomsymptoom?

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# Disclosures



Elisabeth De Waele, MD, PhD

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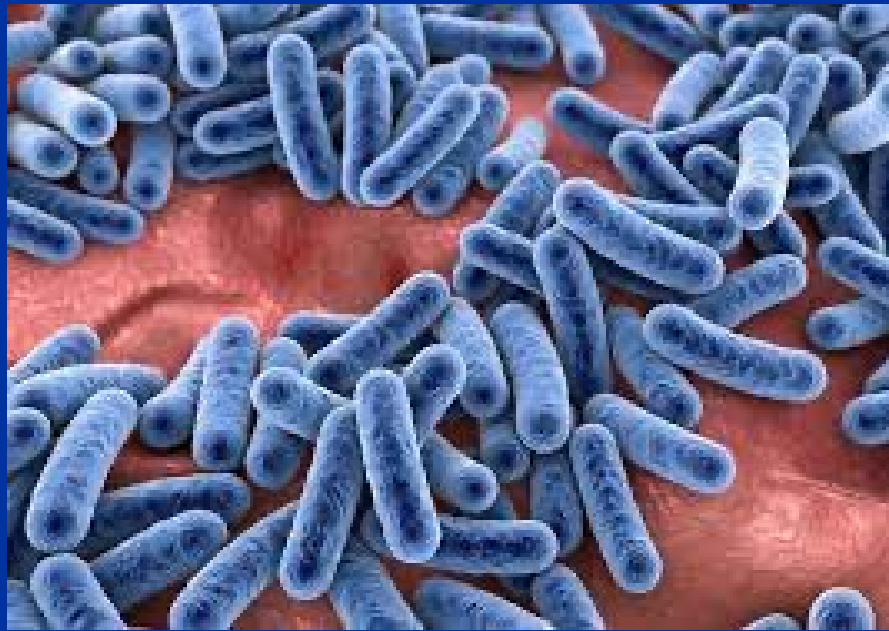
Baxter

Danone/Nutricia

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Art Medical



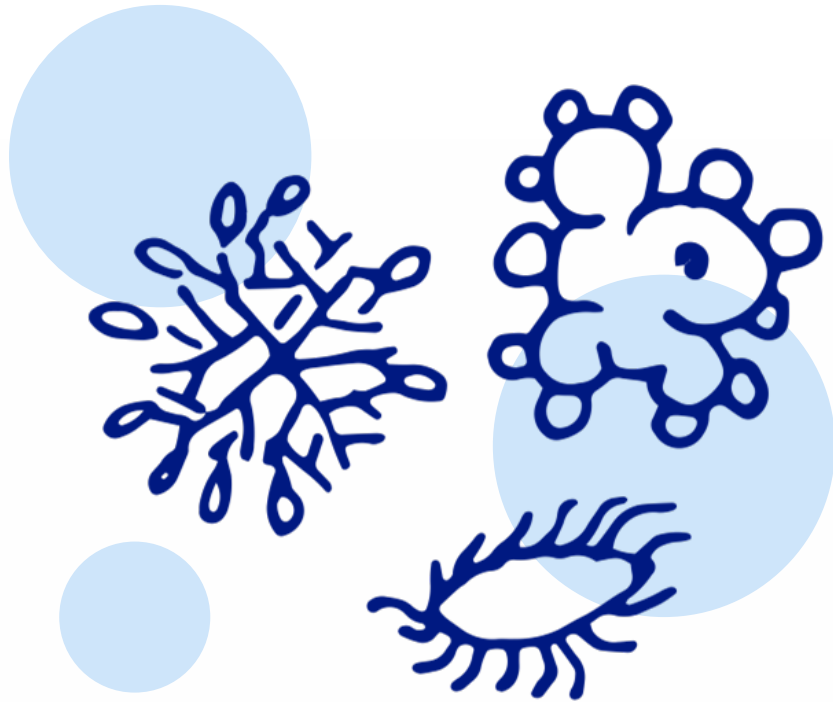
# Microbiome



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# The human microbiome

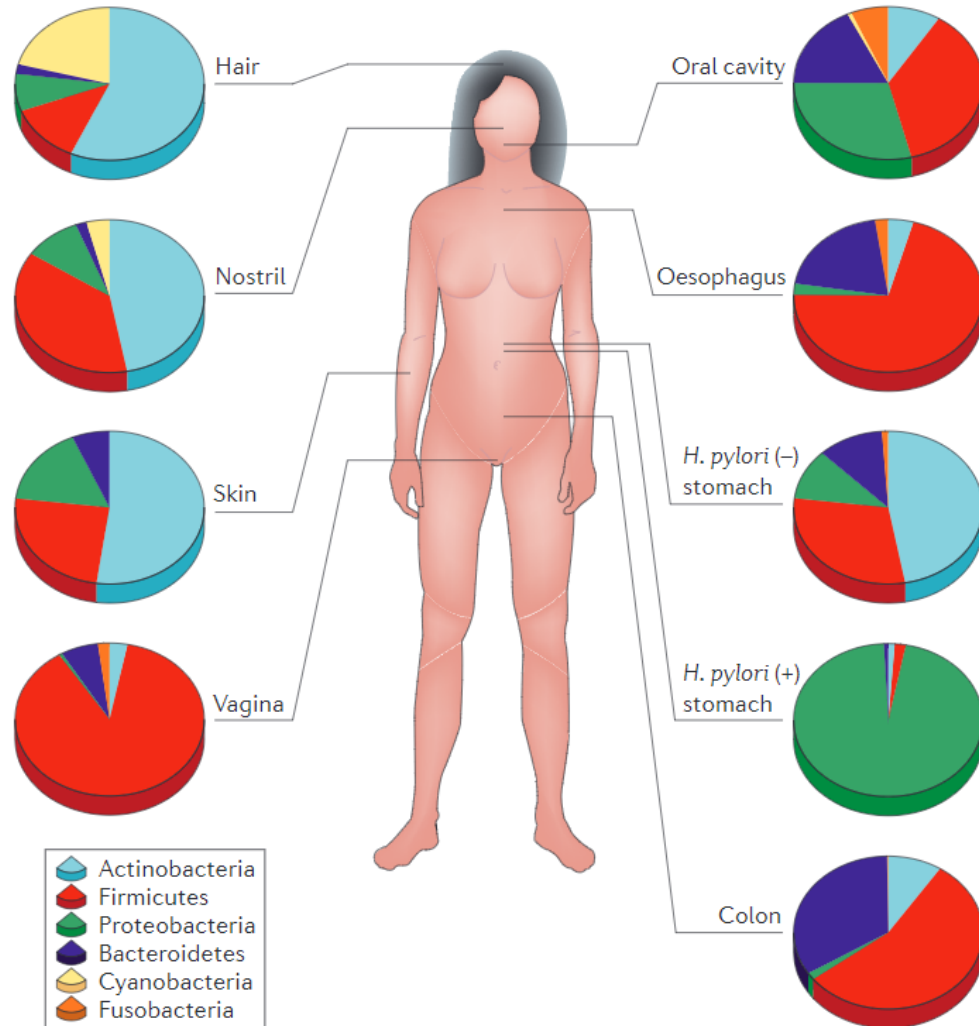


**Trillions of micro-organisms** inhabit and interact with the human body

- ▷ Reservoir of commensals
- ▷ Interface between host and environment
- ▷ Source of complex nutrients
- ▷ Regulation of the immune system
- ▷ Balance between eubiosis and dysbiosis

# Compositional differences in the microbiome by anatomical site

▷ Interindividual stability at taxonomic phylum level

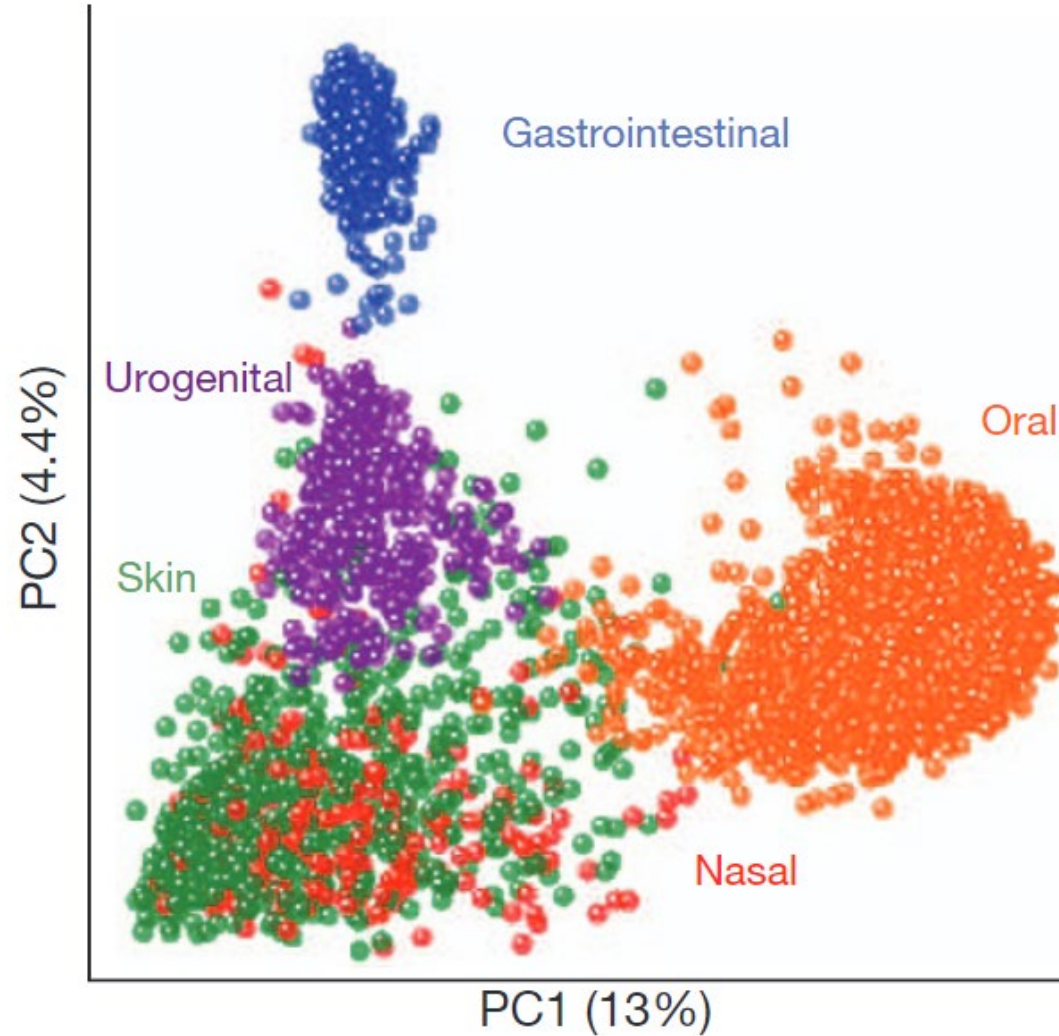


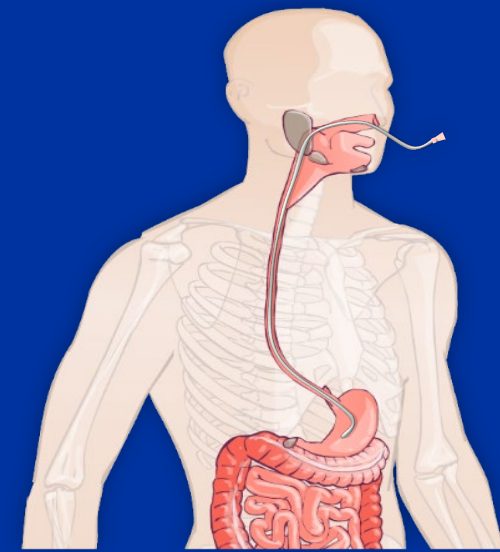
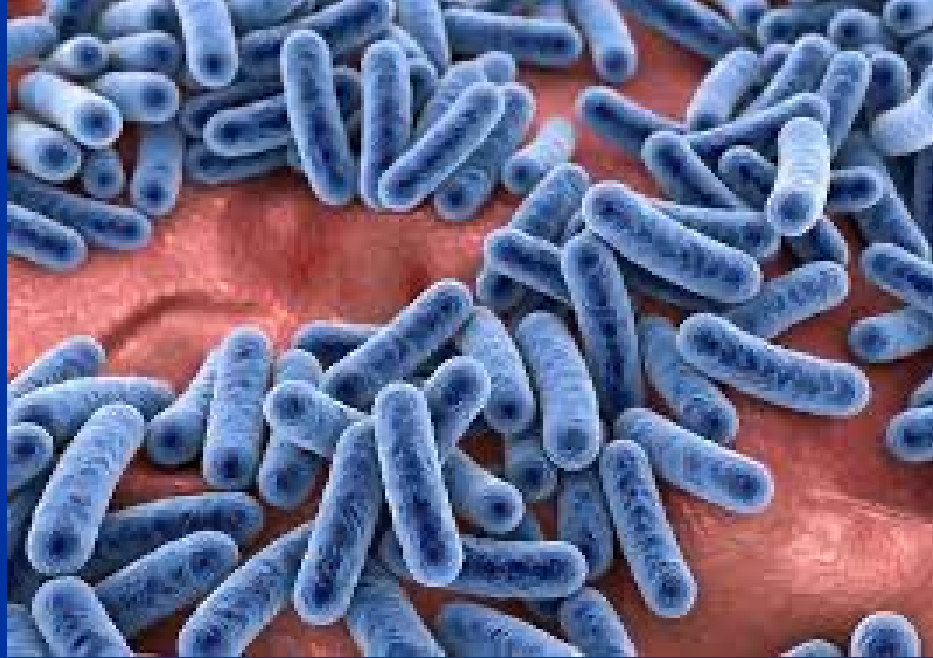
Nomenclature	Examples
Phylum	Firmicutes
Class	Bacilli
Order	Lactobacillales
Family	Lactobacillaceae
Genus	<i>Lactobacillus</i>
Species	<i>Lactobacillus acidophilus</i>

# Diversity of the human microbiome depends on microbial habitat



- ▷ Clustering of samples by body site
- ▷ Microbial taxa vary per niche
- ▷ Metabolic pathways remain stable





## Microbiome in ICU



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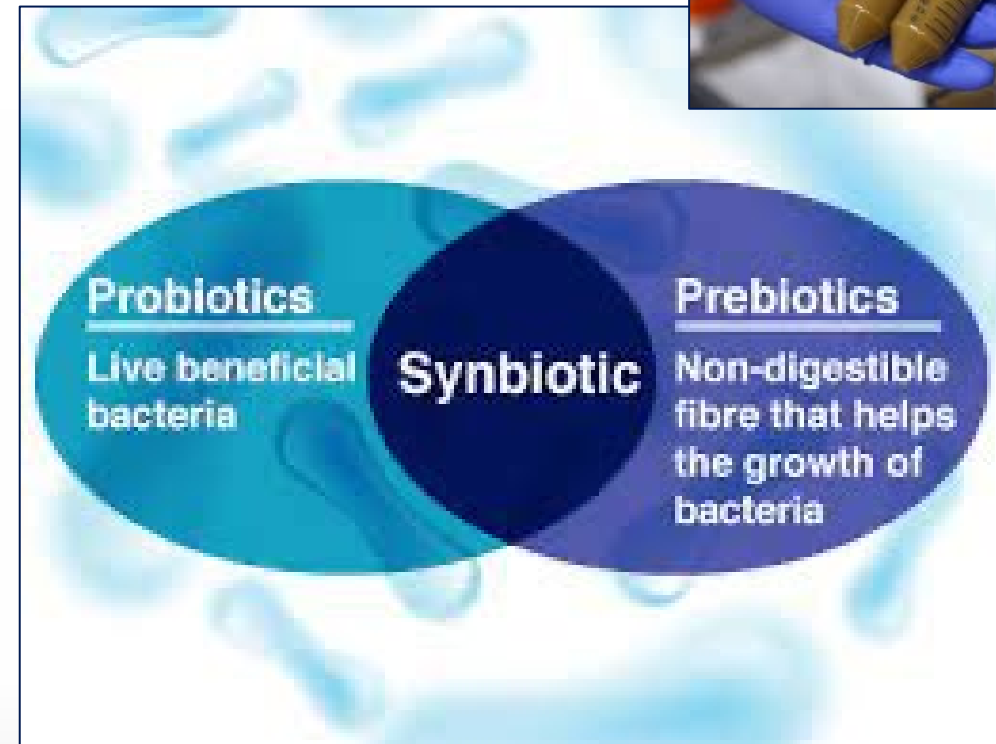
# Microbiome in Critical Care: An Unconventional and Unknown Ally

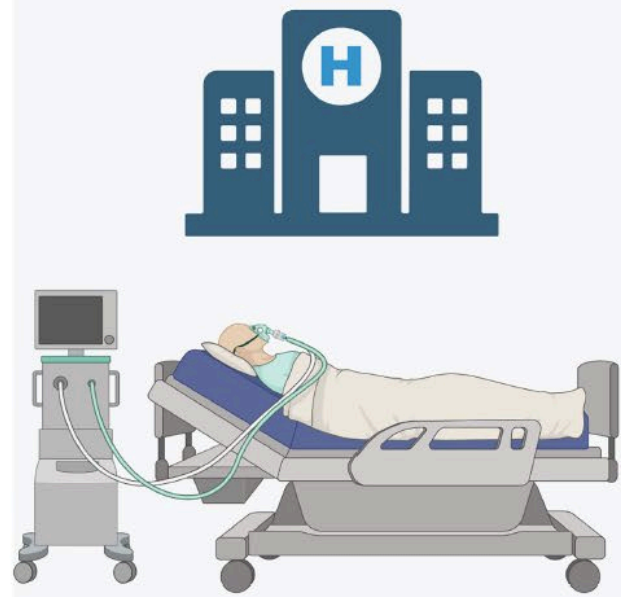
## Intestinal dysbiosis occurs within hours of ICU admission

- ▷ Alterations of normal intestinal transit
- ▷ Medications
- ▷ Alterations in intestinal wall

## Microbiota

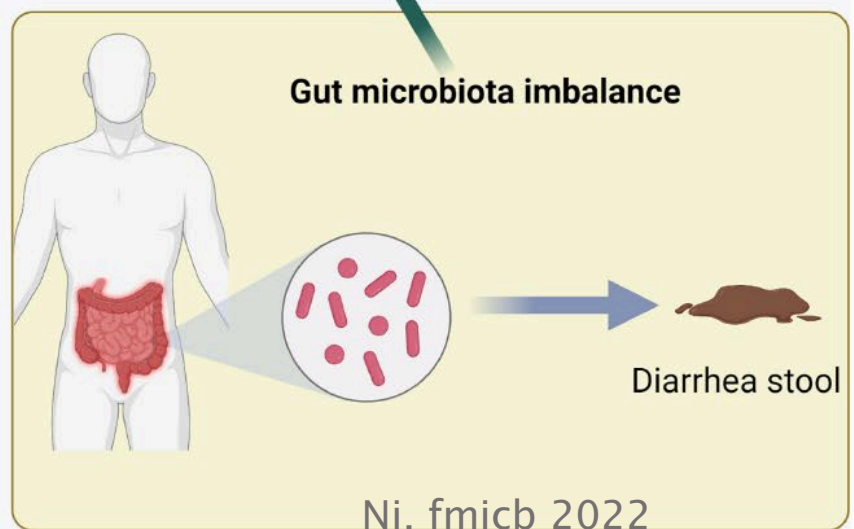
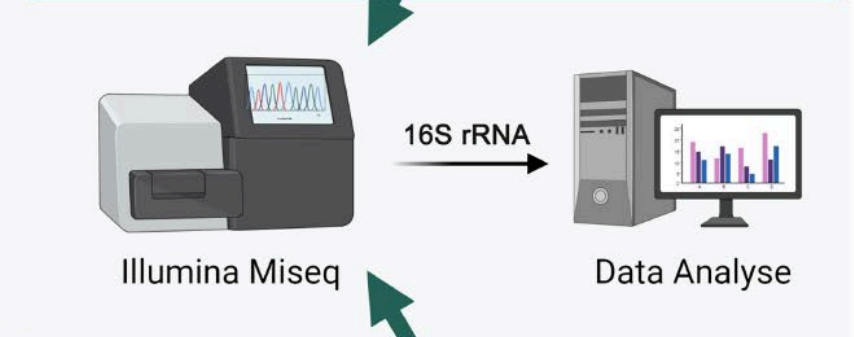
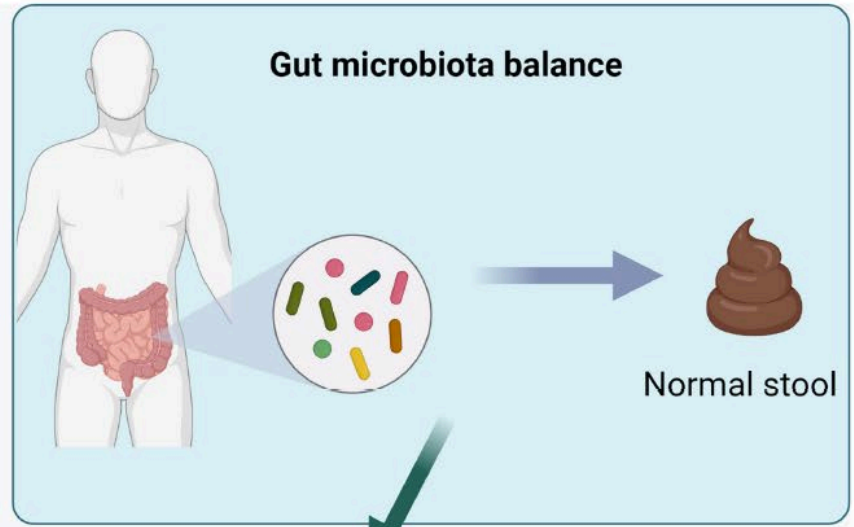
- ▷ Can worsen clinical condition
- ▷ Role in prevention of complications



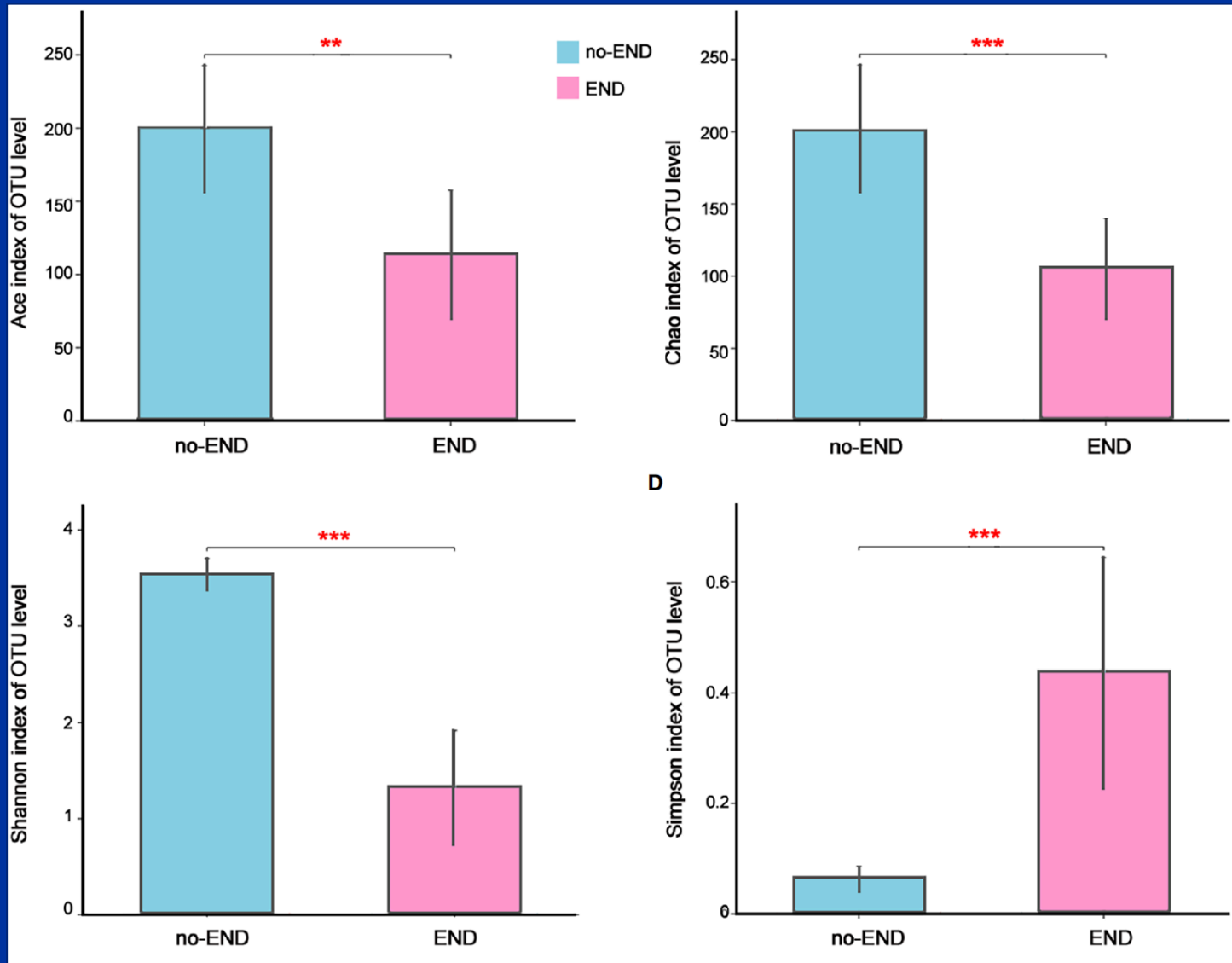


ICU patient

Enteral Nutrition

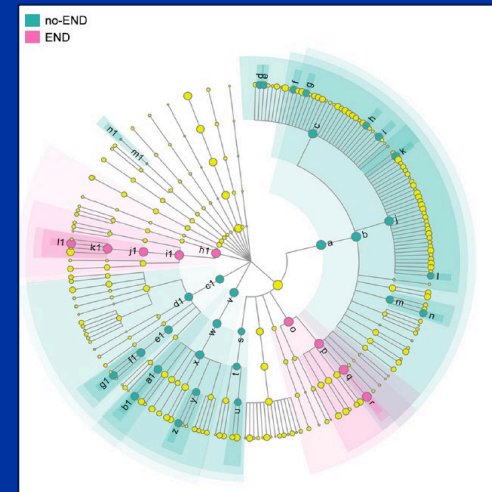


- Accompanying symptoms**
1. Disorders of consciousness
  2. Dysphagia
  3. Digestive dysfunction
  4. Malnutrition
  - .....

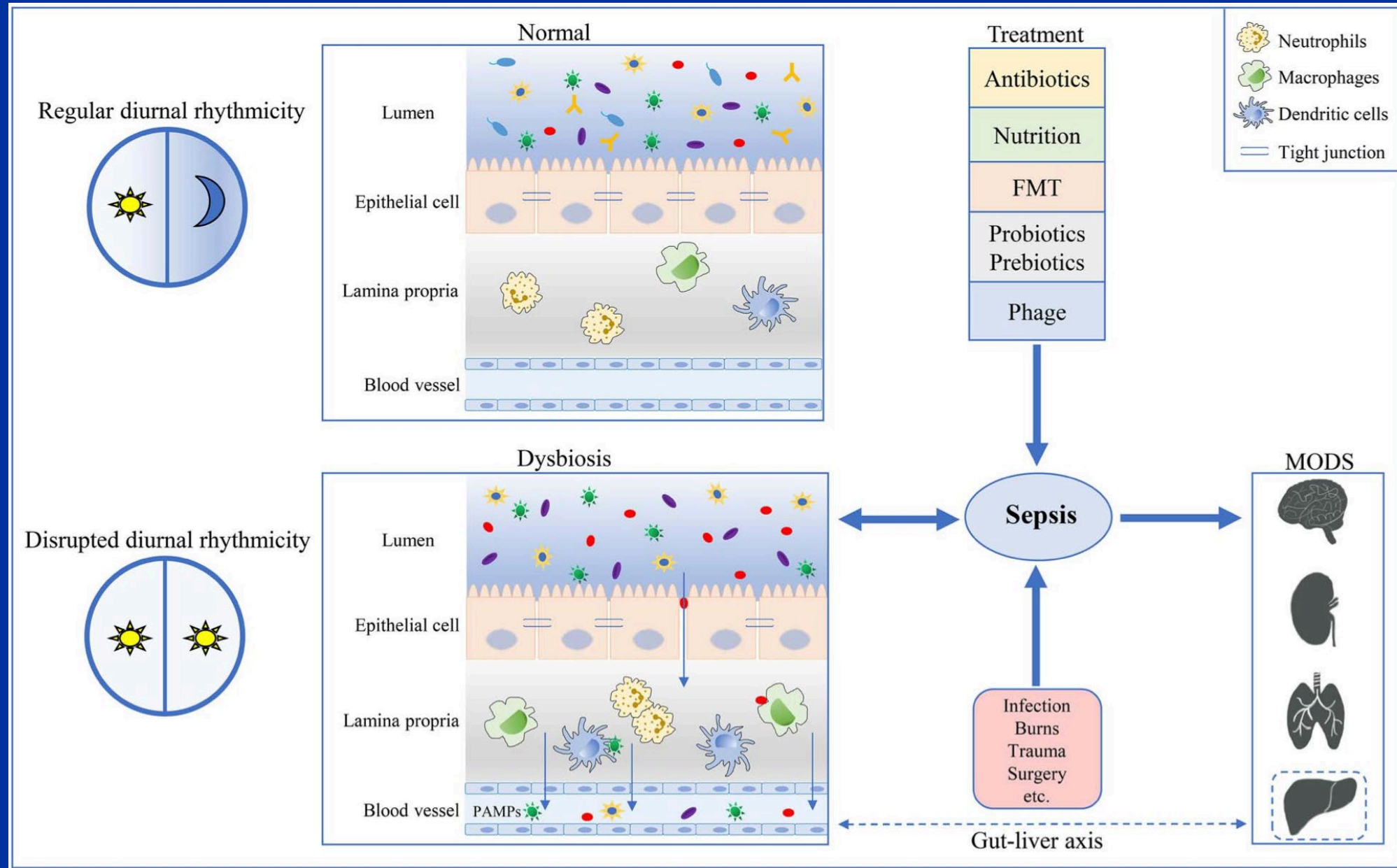


## Enteral Nutrition associated Diarrhea ICU patients :

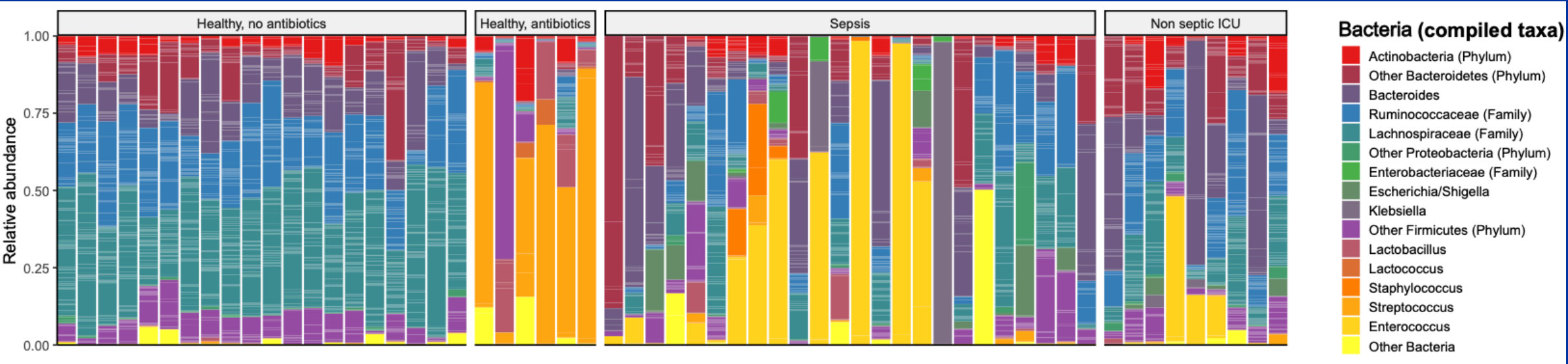
- ▷ Gut Microbiota disturbed
- ▷ Richness reduced \*
- ▷ Diversity in bacteria reduced \*



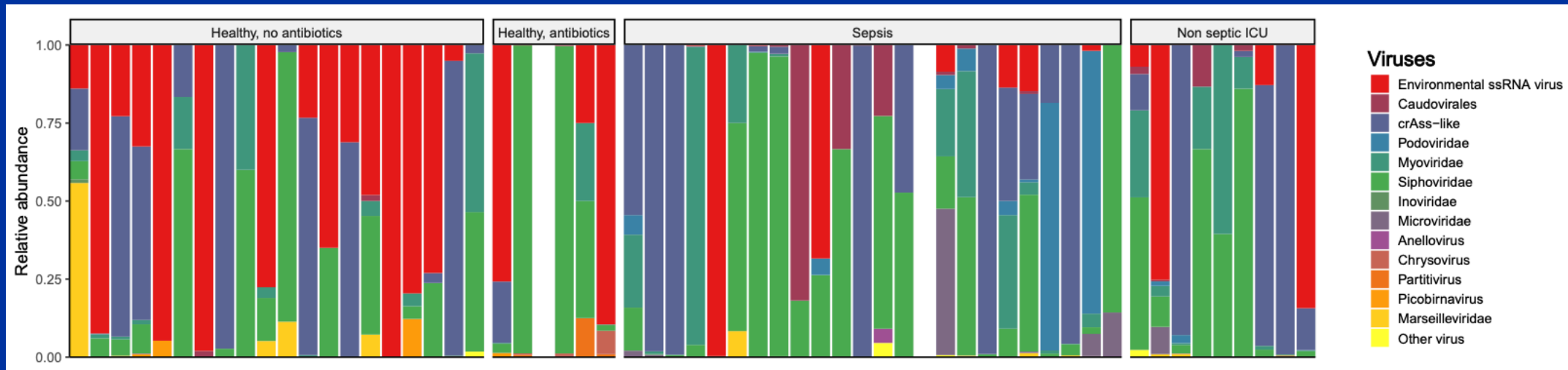
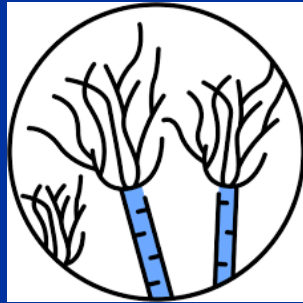
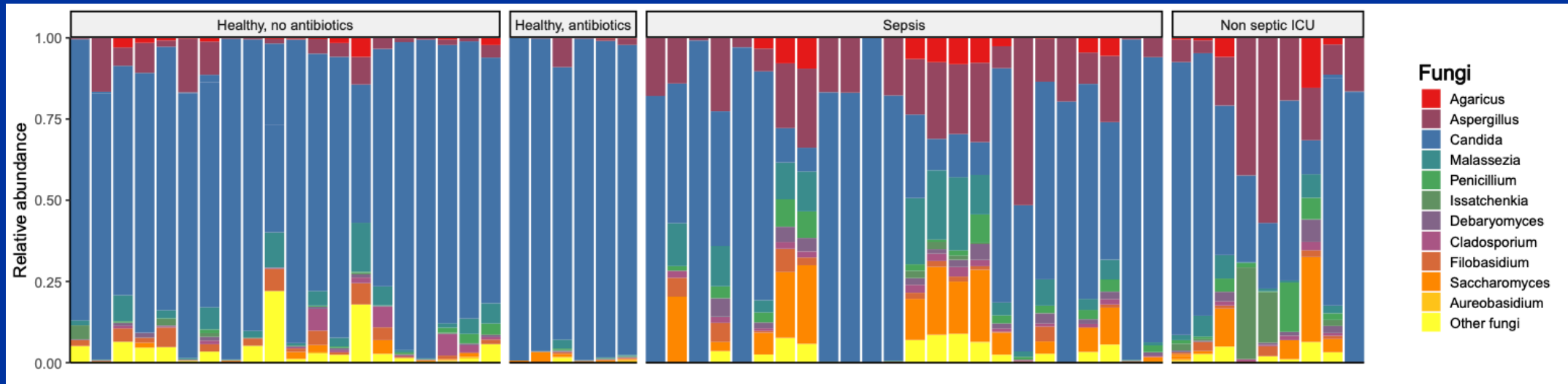
# Crosstalk between gut microbiota and sepsis



# Integrative Transkingdom Analysis of the Gut Microbiome in Antibiotic Perturbation and Critical Illness



- Bacterial microbiome of healthy volunteers prior to antibiotic exposure: predominated by the anaerobic bacterial families Lachnospiraceae and Ruminococcaceae
- ICU patients and volunteers following antibiotics : individualized loss of these anaerobic communities



- Antibiotics disrupt bacterial microbiome
- BUT also enables overgrowth of potentially invasive fungi and viruses

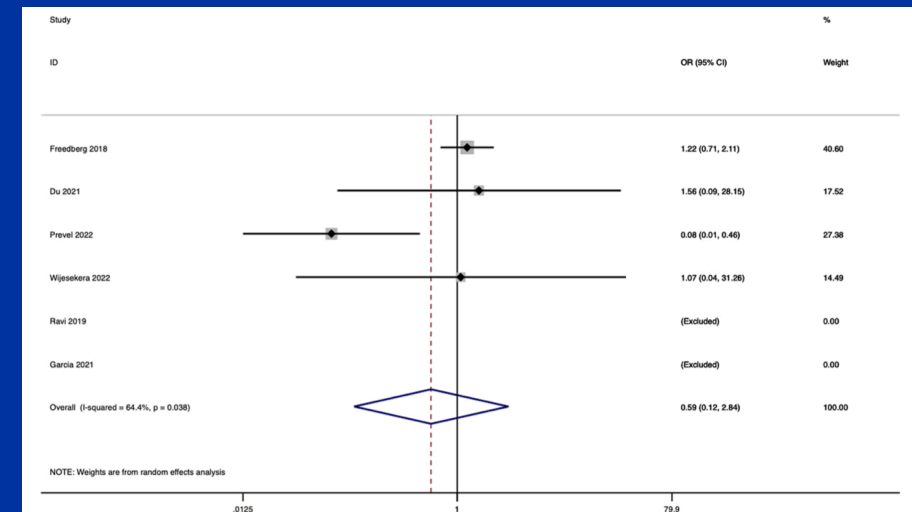


# Lower gut dysbiosis and mortality in acute critical illness: a systematic review and meta-analysis

- ▷ No effect of alpha diversity on in-hospital mortality
- ▷ Pathogen dominance & commensal depletion associated with
  - ▷ In-hospital mortality
  - ▷ Adverse clinical and ecological sequelae
  - ▷ Especially overabundance of Enterococcus

## Conclusion

- ▷ Paucity of studies



**Fig. 2** Forest plot displaying aggregate meta-analysis of binary odds ratio of 28-day all-cause mortality in high versus low alpha diversity groups, represented by Shannon index more than 3 or less than 2.99, respectively

## The microbiome and nutrition in critical illness

### Nutrition directly alters microbiome in health

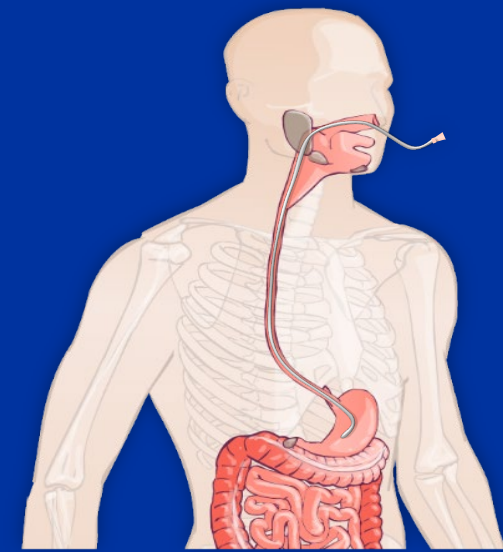
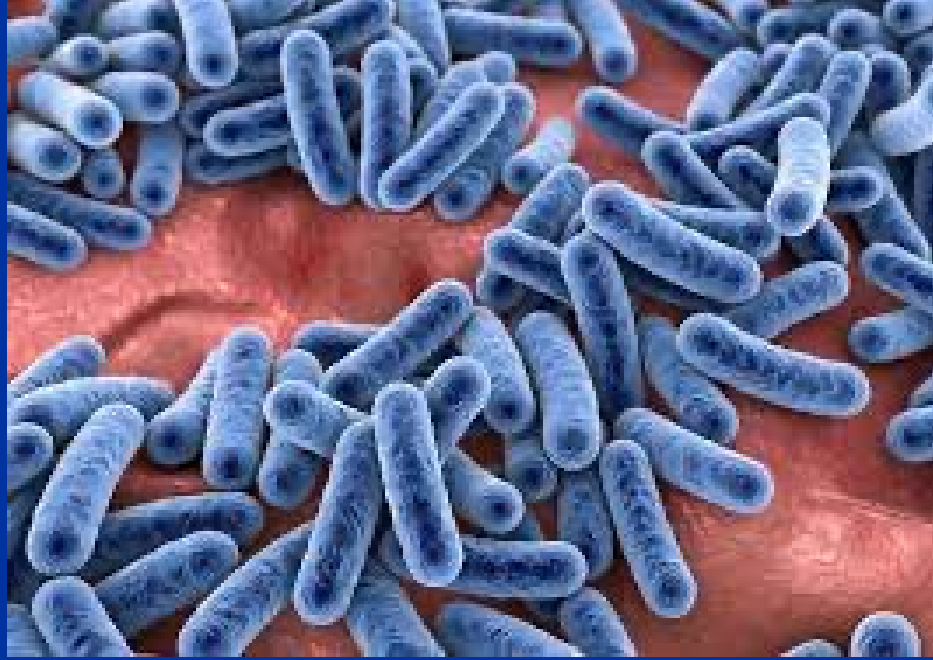
### Does nutrition impacts pathobiome in critical illness?

- ▷ No evidence
- ▷ Medications

### Optimal nutrition and therapy to restore a healthy microbiome

- ▷ further research
- ▷ Mechanistic links ?
- ▷ Real-time monitoring of gut microbiota is an opportunity

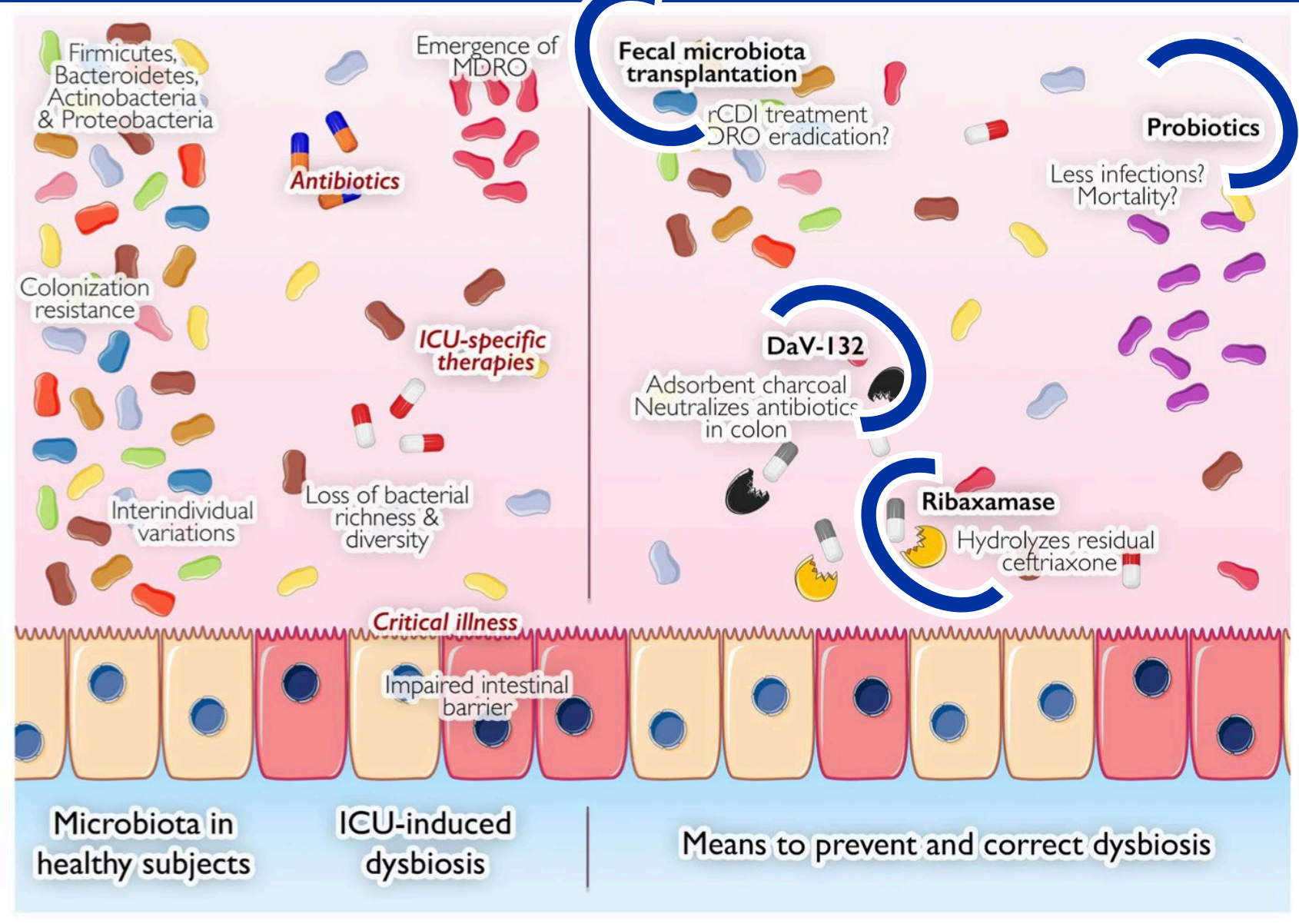




## Microbiome in ICU : what to do ?



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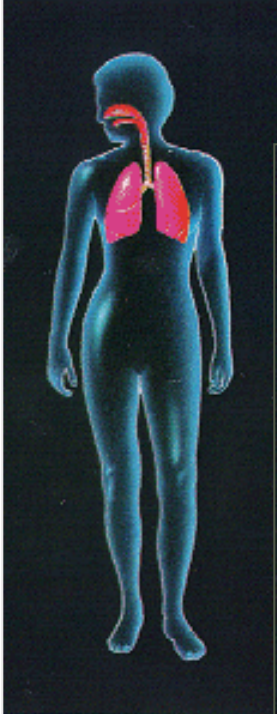


# Nutritional Intervention



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Respiratory System



Urinary System



Circulatory System



Nervous System





**Respiratory System**



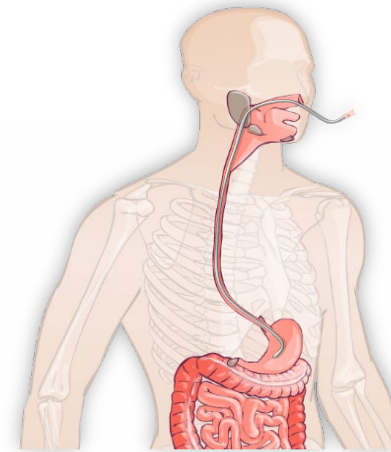
**Urinary System**



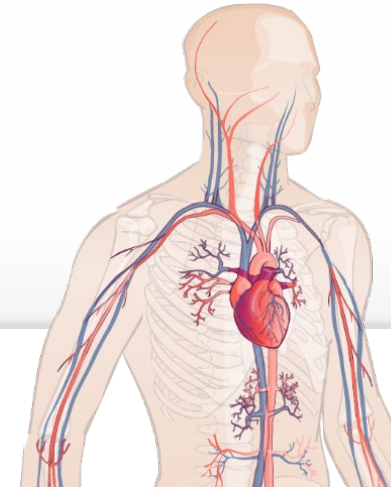
**Circulatory System**



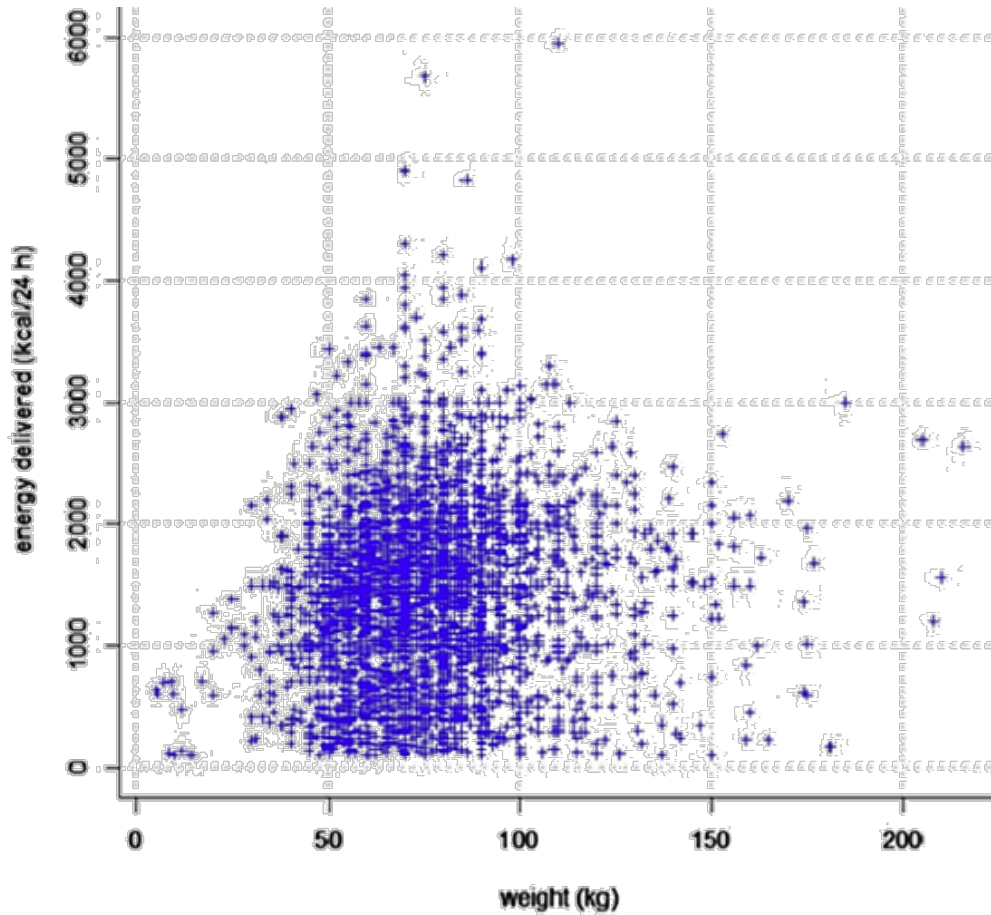
**Nervous System**



**Digestive System**

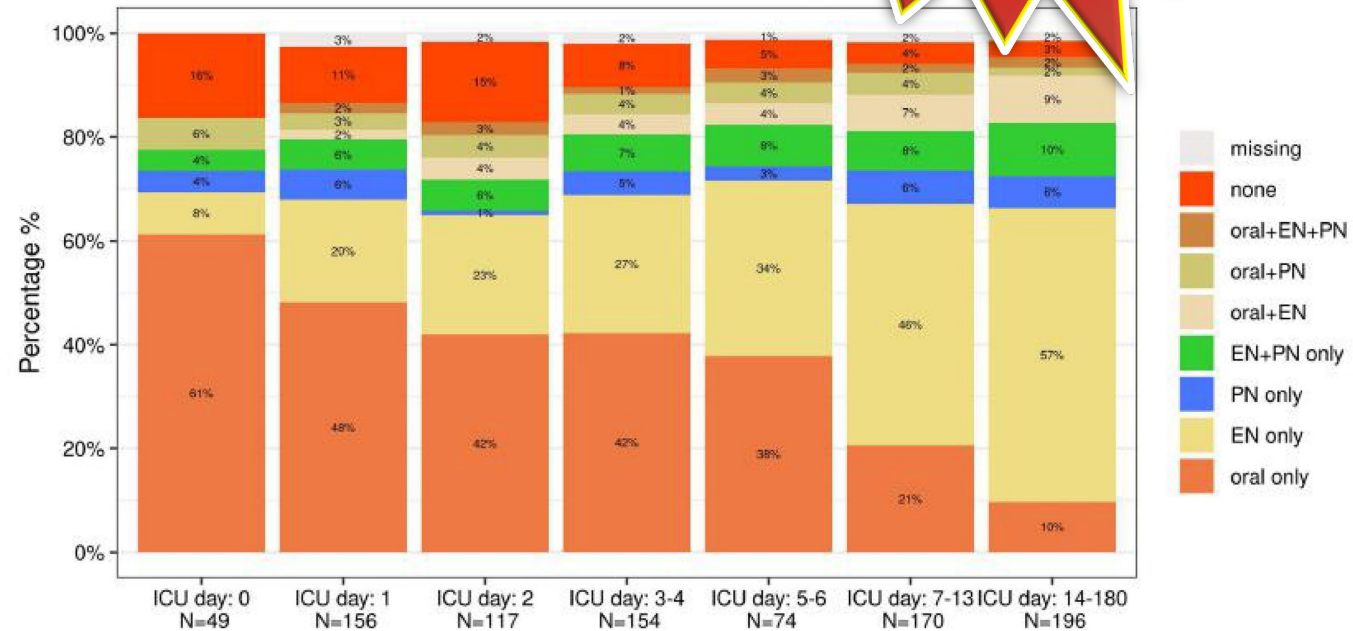


# REAL WORLD DATA: NUTRITION DAY



Energy delivery in kcal/24h to days in ICU

**NUTRITION  
IN ICU IS A  
CHALLENGE**



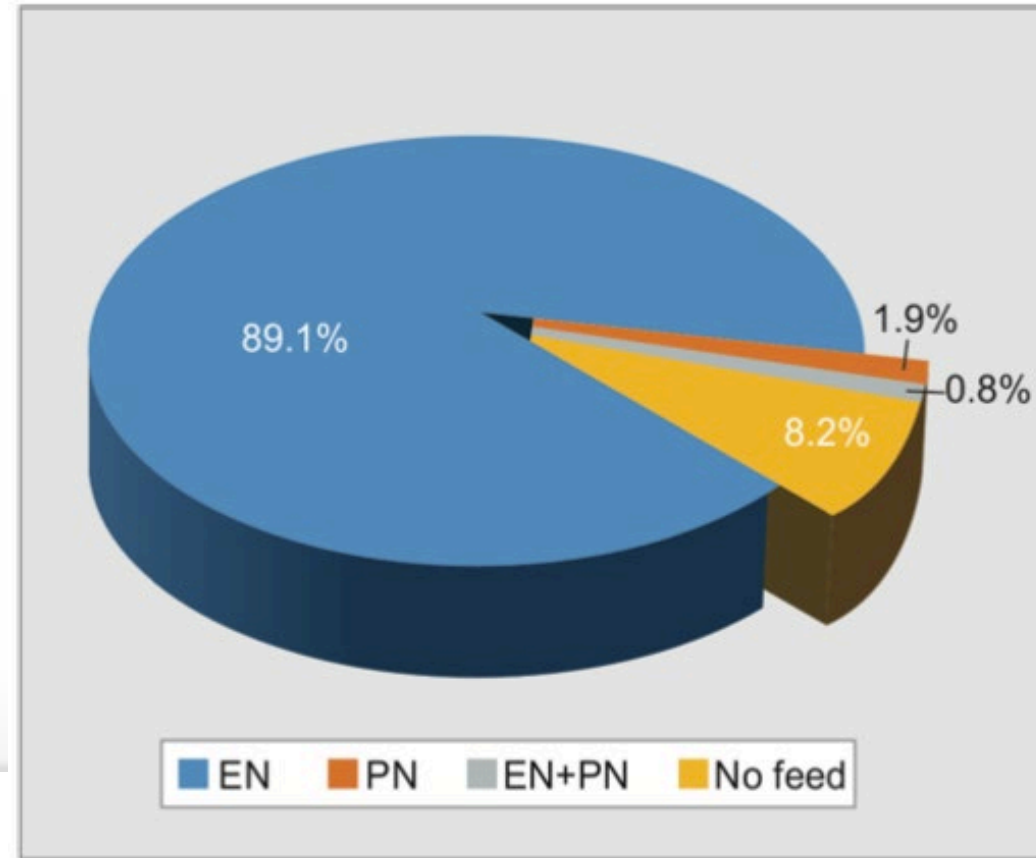
Route of feeding to days in ICU

## Adequacy of feeding

### Enteral feeding does not cover energy needs

- n = 662
- M Ventilated
- 89% EN
- 29.6% nutritional adequacy
- 63% calories
- 57% proteins

$$\text{Energy adequacy (\%)} = \frac{\text{[Sum of percentage of calories received/ prescribed each day]}}{\text{Total number of evaluable nutrition days.}}$$
$$\text{Protein adequacy (\%)} = \frac{\text{[Sum of percentage of protein received/ prescribed each day]}}{\text{Total number of evaluable nutrition days.}}$$

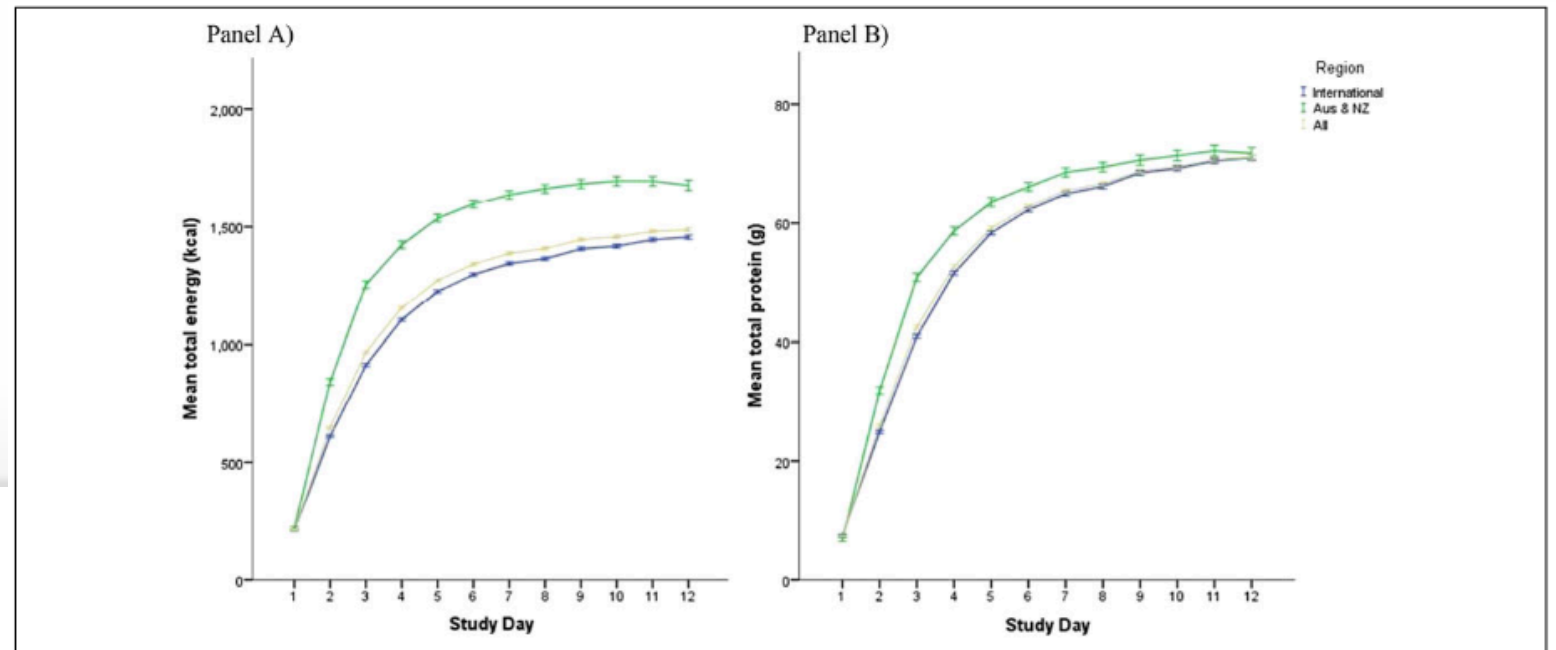


## Adequacy of feeding

All over the world iatrogenic underfeeding of ventilated patients happens

	Energy	Proteins	Population/setting
Kalaiselvan	63 % (1025 kcal)	57 % (41 g)	ICU India
Cahill	59 %	60.3 %	ICU 20 countries
Ridley	56 % (1133 kcal)	(46 g)	Australia NZ

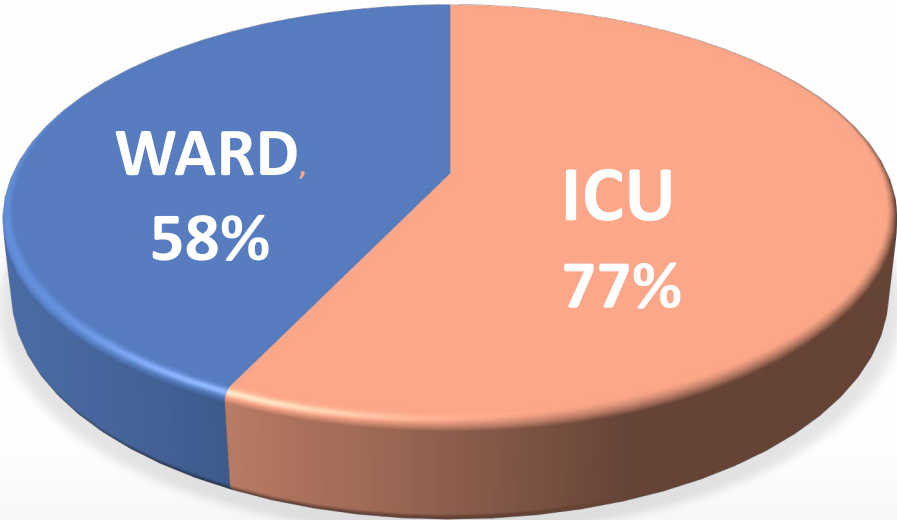
**Energy 59 %  
Protein 59%**



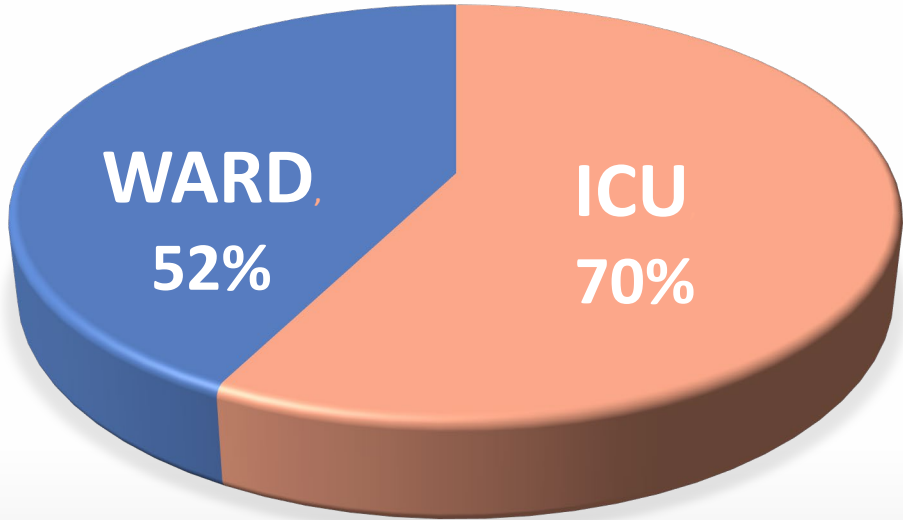
Adequacy of feeding

Iatrogenic underfeeding is more prevalent on the ward

ADEQUACY ENERGY OVERALL

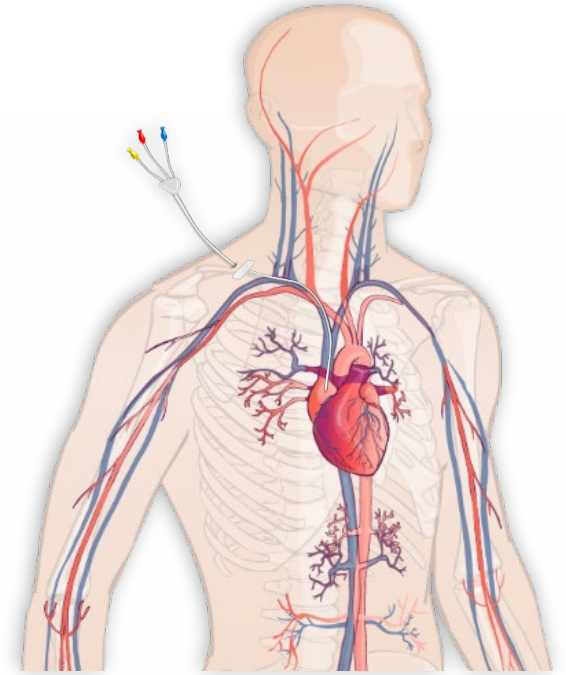
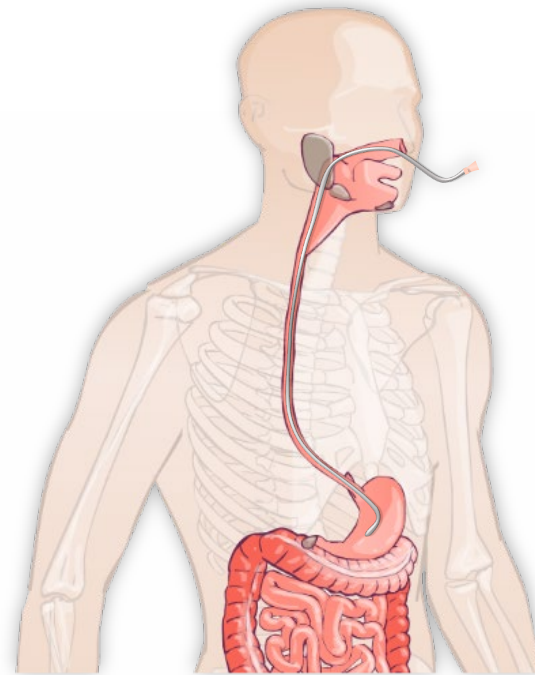


ADEQUACY PROTEINS OVERALL



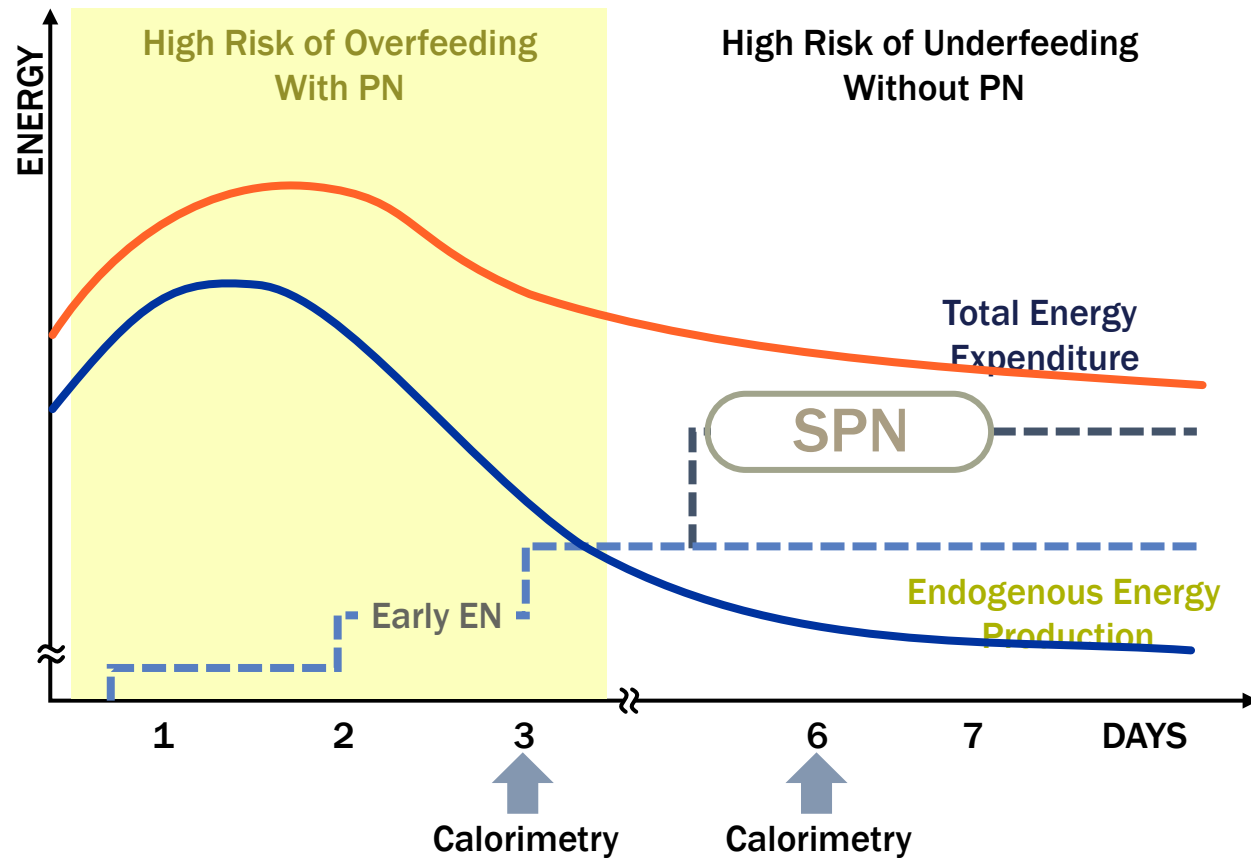
# Nutritional therapy based on metabolism

## Oral – Enteral – (supplemental) Parenteral



# Nutritional therapy based on metabolism

## Combined feeding strategies – possible key to success



# THANK YOU !

ESPEN Expert Course  
ICU Nutrition

Brussels Belgium  
May 9-10 2023

More info:  
[espen.org/education/espen-courses](https://espen.org/education/espen-courses)

Registration:



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Organising Committee: Elisabeth De Waele – Pierre Singer – Michael Hiesmayr – Claude Pichard

