A large, detailed microscopic image of a cell, likely an intestinal epithelial cell, is shown on the left side of the slide. The cell is stained green and shows various organelles and structures. It is positioned vertically, with the top of the cell near the top of the slide and the bottom near the bottom. The cell is surrounded by other similar cells, creating a dense, textured appearance.

Seminário Interdisciplinar:

# Relação entre microbiota intestinal e COVID-19

Orientador: Charles Anacleto

Alunos:

Andressa Barros

Anna Jullya Pinheiro

Caio Faria

Gabriely Martins

Iago Borborema

Isabella Monteiro

Júlia Nagem



## Review

## Gut microbiota and Covid-19- possible link and implications

 Debojyoti Dhar<sup>a,\*</sup>, Abhishek Mohanty<sup>b,\*</sup>
<sup>a</sup> *Lausine Rich Bio Pvt Ltd., Bangalore, India*
<sup>b</sup> *Rajiv Gandhi Cancer Institute and Research Centre, New Delhi, India*


## ARTICLE INFO

**Keywords:**  
 Covid-19  
 Gut microbiome  
 SARS-CoV-2  
 Immunity  
 Dysbiosis  
 Lung microbiota  
 Diet

## ABSTRACT

Covid-19 is a major pandemic facing the world today caused by SARS-CoV-2 which has implications on our understanding of infectious diseases. Although, SARS-CoV-2 primarily causes lung infection through binding of ACE2 receptors present on the alveolar epithelial cell, yet it was recently reported that SARS-CoV-2 RNA was found in the faeces of infected patients. Interestingly, the intestinal epithelial cells particularly the enterocytes of the small intestine also express ACE2 receptors. Role of the gut microbiota in influencing lung diseases has been well articulated. It is also known that respiratory virus infection causes perturbations in the gut microbiota. Diet, environmental factors and genetics play an important role in shaping gut microbiota which can influence immunity. Gut microbiota diversity is decreased in old age and Covid-19 has been mainly fatal in elderly patients which again points to the role the gut microbiota may play in this disease. Improving gut microbiota profile by personalized nutrition and supplementation known to improve immunity can be one of the prophylactic ways by which the impact of this disease can be minimized in old people and immune-compromised patients. More trials may be initiated to see the effect of co-supplementation of personalized functional food including prebiotics/probiotics along with current therapies.

## 1. Introduction

Coronavirus disease 2019 or Covid-19 is a new public health crisis threatening the humanity. Although, it originated in the Hubei province of China in late 2019 yet it has spread to many countries in the world (Wang et al., 2020). This pandemic disease is caused by the novel beta-coronavirus, now named SARS-CoV-2 (Liu et al., 2020). Covid-19 has very important clinical features such as high rates of transmission, mild to moderate clinical manifestation with more serious radiological abnormalities seen in the elderly (Yuen et al., 2020).

Coronaviruses are positive sense RNA viruses with spike like projections on its enveloped surface giving it a crown like appearance hence the term Coronavirus (Singhal, 2020). Phylogenetic diversity studies have highlighted that SARS-CoV-2 shares 79% nucleotide sequence identity with another virus of the same family SARS-CoV which caused major epidemic in 2002–2003 that resulted in 8000 cases in 26 countries (De Wit et al., 2016). Additionally, SARS-CoV-2 also displays sequence identities of 96% and 89.6%, for the envelope and nucleocapsid proteins respectively with SARS-CoV (Zhou et al., 2020b). Middle East respiratory syndrome or MERS disease in 2012 was also caused by another coronavirus called MERS-CoV. All these viruses utilize the ACE-2 receptor for their cellular entry (Zhou et al., 2020a).

Interestingly, ACE-2 receptors are also reported to be expressed in the kidney and gastrointestinal tract, tissues known to harbour SARS-CoV (Hammer et al., 2002; Leung et al., 2003). Earlier evidence suggested that SARS coronavirus viral RNA was detectable in the respiratory secretions and stool of some patients after onset of illness for more than one month but live virus could not be cultured after third week (Chan et al., 2004). Now, recent report also suggests that SARS-CoV-2 RNA can be detected in stool of some patients of Covid-19 (Wu et al., 2020). This along with the fact that some patients of this disease have diarrhoea points out towards a distinct possibility of involvement of gut-lung axis and may be the gut microbiota (Chan et al., 2020).

## 2. Gut microbiota and the gut-lung axis

The human gut microbiota consists of  $10^{14}$  resident microorganisms which include bacteria, archae, viruses and fungi (Gill et al., 2009). Primarily, the gut bacteria in healthy individuals is dominated by four phyla *Actinobacteria*, *Firmicutes*, *Proteobacteria*, and *Bacteroidetes* (Vibranueva-Millán et al., 2015). The colon harbours an extremely high density of bacteria in the families *Bacteroidaceae*, *Prevotellaceae*, *Rikenellaceae*, *Lachnospiraceae* and *Ruminococcaceae* (Hall et al., 2017). The gut microbiota plays a key role in health through its protective, trophic

\* Corresponding authors.

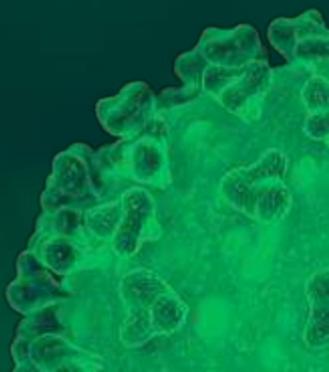
 E-mail addresses: [ddhar@lausinerichbio.com](mailto:ddhar@lausinerichbio.com) (D. Dhar), [pm@rgcic.org](mailto:pm@rgcic.org) (A. Mohanty).

<https://doi.org/10.1016/j.virusres.2020.198618>

Received 24 April 2020; Received in revised form 8 May 2020; Accepted 8 May 2020

Available online 13 May 2020

0168-1702/ © 2020 Elsevier B.V. All rights reserved.



# Introdução

- A COVID-19 é causada pelo novo betacoronavírus, denominado SARS-CoV2.
- Características clínicas do coronavírus:

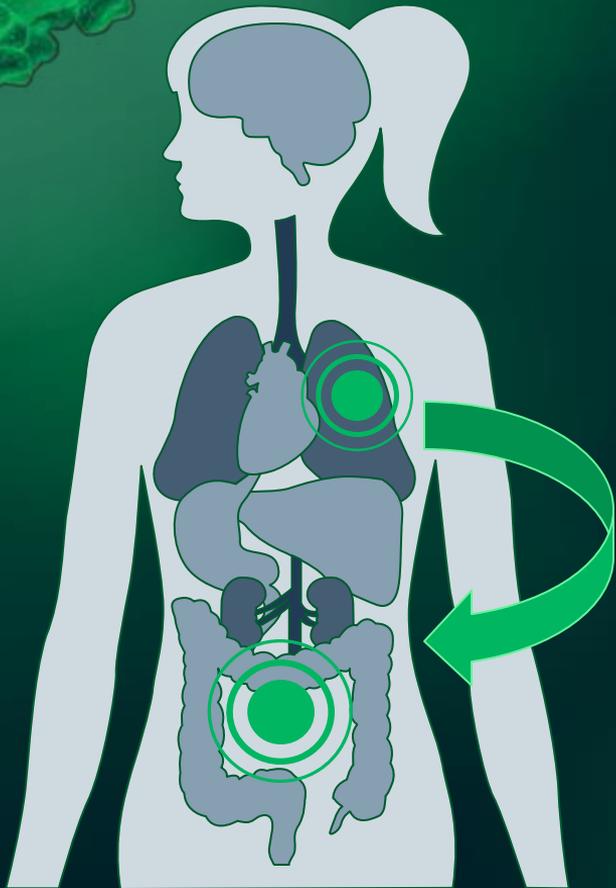


Altas taxas de transmissão



Manifestação de leve a moderada  
(sendo mais grave em alguns grupos)

# Introdução



- Alguns pacientes com esta doença têm diarreia:
  - Possibilidade de envolvimento do eixo intestino-pulmão
    - Pode estar relacionado à microbiota intestinal.

# Microbiota Intestinal



Composta por:

- Bactérias
- Vírus
- Fungos



Fundamental na saúde:

- Efeito barreira
- Efeito nutricional
- Estimulador do sistema imune

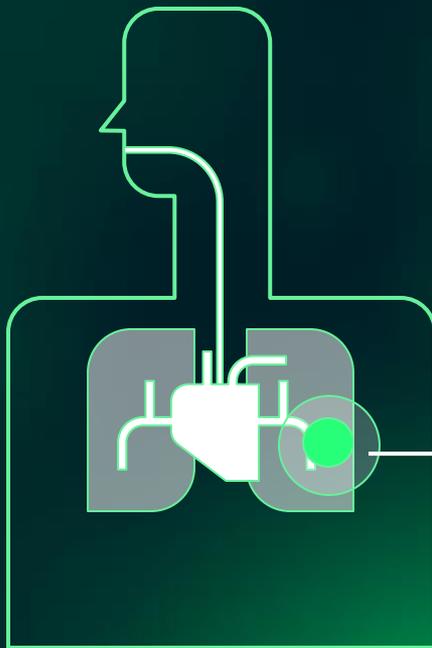


Afeta a saúde pulmonar:

- Eixo intestino-pulmão

# Microbiota Intestinal e Eixo Intestino-Pulmão

- Existem microrganismos no pulmão:

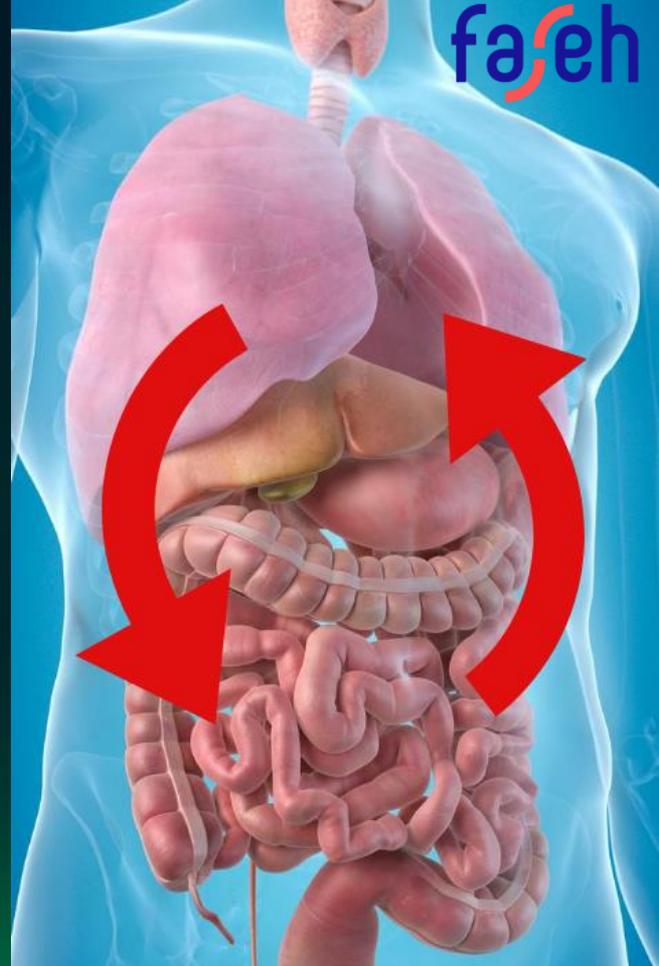


Predominam:

- Bacteroidetes
- Firmicutes
- Proteobactérias

# Microbiota Intestinal e Eixo Intestino-Pulmão

- O eixo intestino-pulmão é bidirecional:
  - Endotoxinas e metabólitos microbianos podem impactar o pulmão (Dumas et al., 2018);
  - Inflamação no pulmão pode afetar a microbiota intestinal (Dumas et al., 2018).



# Microbiota Intestinal e Eixo Intestino-Pulmão



O novo SARS-Cov2 pode afetar a microbiota intestinal

- Isso influencia nas manifestações clínicas, principalmente em idosos e imunocomprometidos.

# Microbiota Intestinal – Papel na Imunidade

- Secreção de peptídeos antimicrobianos, competição por nutrientes e pelo local do habitat;
- Participação nas respostas pró e anti-inflamatórias;
- Prevenção de reações imunológicas excessivas.

# Nutrição e microbiota intestinal

01.

Fatores ambientais, junto com a dieta, podem modular a composição da microbiota intestinal.

02.

Estudo dos prebióticos no contexto da modificação da microbiota intestinal humana.

03.

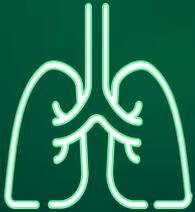
O papel dos probióticos.



# Considerações Finais



Manifestações gastrointestinais graves da COVID-19 afetam de 3% a 79% dos pacientes (LIN L; RIPHAGEN S, 2020).



Os prebióticos são conhecidos por aumentar os níveis de butirato, reduzir a inflamação e melhorar as condições de asma e fibrose cística.



Como estratégia terapêutica, faz-se necessário ingerir alimentos fermentados, probióticos e prebióticos que são capazes de modular o intestino em pacientes com sintomas gastrointestinais relacionados à COVID-19 (Infusino et al., 2020).

# Referências Bibliográficas

ANTUNES, A. E. *et al.* Contribuição potencial de micróbios benéficos para enfrentar a pandemia COVID-19. Food Research International. São Paulo, v. 136, n. 1, p 1-10, dez./2005. Disponível em: <<https://www.sciencedirect.com/Science/article/pii/S0963996920306025>>. Acesso em: 07 nov. 2020

OBA, J. *et al.* Sintomas gastrintestinais e abordagem nutricional durante a pandemia de COVID-19: guia prático para pediatras. Instituto Israelita de Ensino e Pesquisa Albert Einstein. São Paulo, v. 19, n. 1, p 1-8, dez./2005. Disponível em: <<https://www.scielo.br/pdf/eins/v18/2317-6385-eins-18-eRW5774.pdf>>. Acesso em: 07 nov. 2020

# OBRIKADO!

fa:eh

