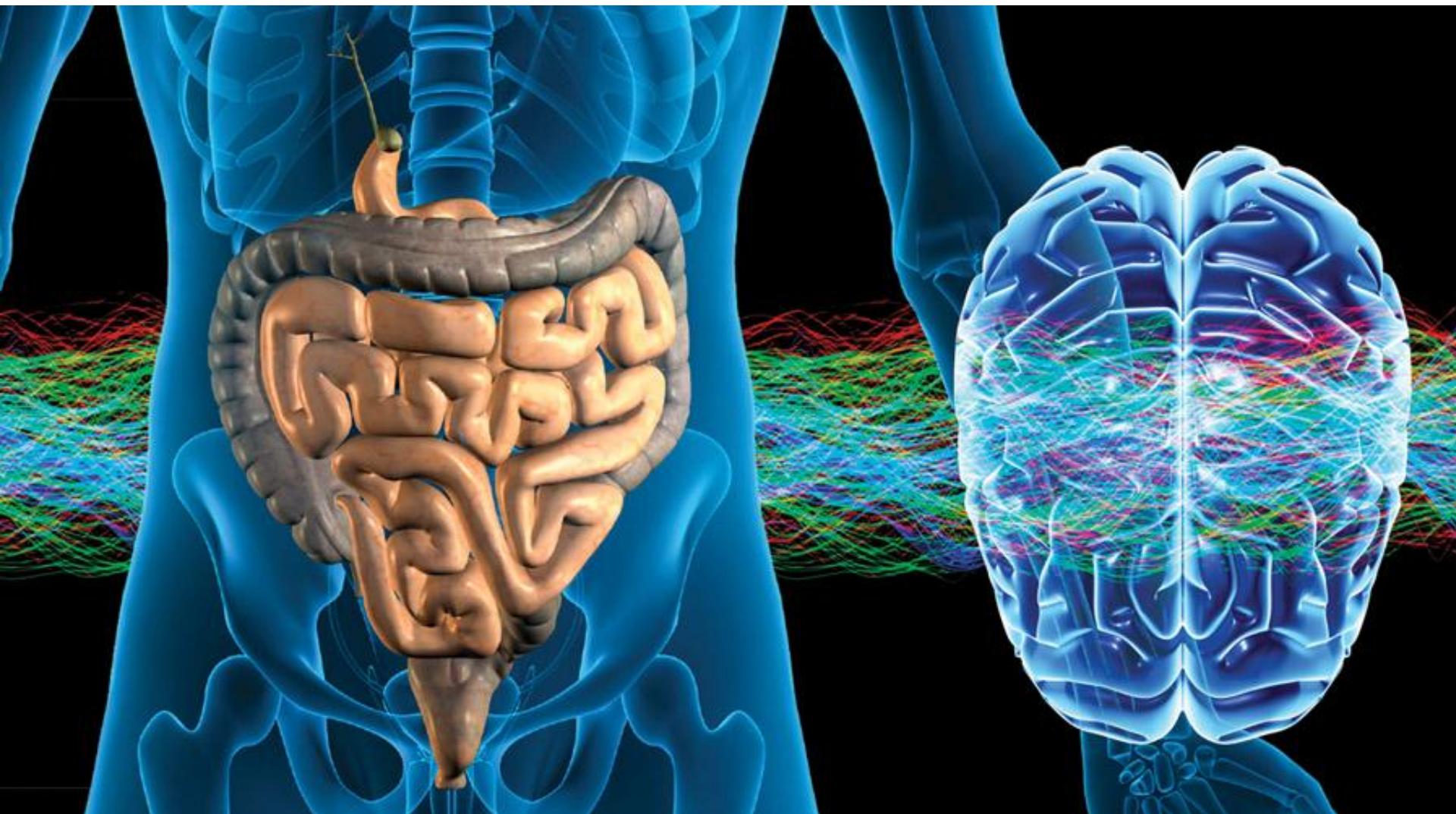


# Gut feelings



The second brain

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# The microbiome

- trillions of bacterial cells (10x more than human)
- up to 2 kg (double the average human brain)
- mainly in the gut
- enteric nervous system
  - 100 million neurons in the gut
  - more than 30 neurotransmitters
  - 95% of serotonin
  - ‘the second brain’

**the gut-brain axis**

## **Brain to gut**

- meditation -> IBS symptoms improved

## **Gut to brain**

- anxiety and depression
- stress levels
- autism
- neurodegeneration
- mood
- decision-making

# Bacterial brain

Bacteria communicate through electrical signaling mechanisms similar to those used by neurons in the human brain. ('ion channels')

!

- Evolutionary perspective
- Potential for treating mental disorders

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