

PATHOPHYSIOLOGY

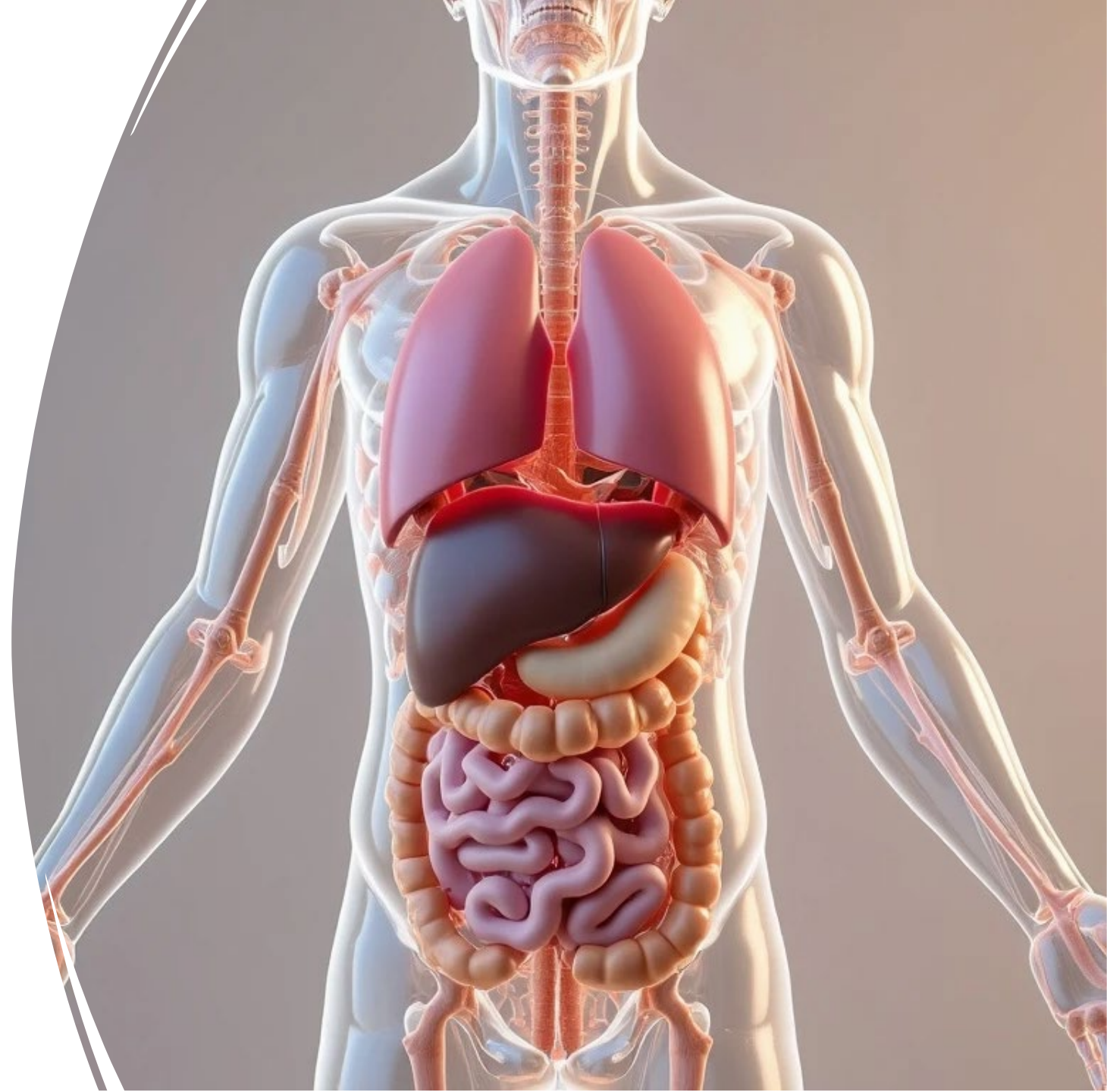
mechanisms of diseases, focusing on
organ dysfunction

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- 3rd year, II semester.

48 hours

lectures - seminars



With every breath, we inhale thousands of bacteria—many of them potentially harmful. So why aren't we constantly sick?"

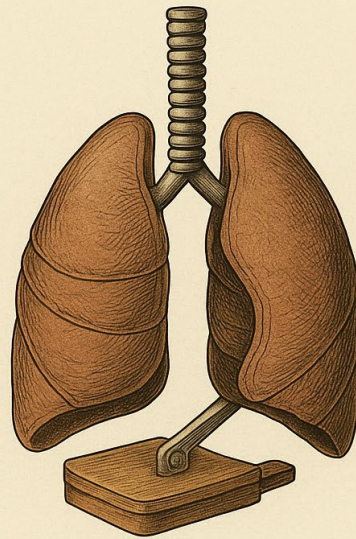
Because most of us have a remarkable system of defense. From the nose to the alveoli, our lungs are protected by layers of surveillance and cleaning: mucus traps invaders, cilia sweep them out, and immune cells like macrophages patrol the airways. But in some people, this defense system is weakened. In the elderly, cilia slow down. In smokers, the lining is damaged. In the immunosuppressed, the cells that fight infection may be missing or impaired. So while we all breathe in the same air, not all bodies defend it the same way—and that's what tips the balance from exposure to infection."

We usually think of athletes as the healthiest people—fit, strong, highly trained. So how is it possible that, in rare cases, their heart suddenly stops during training or competition?"

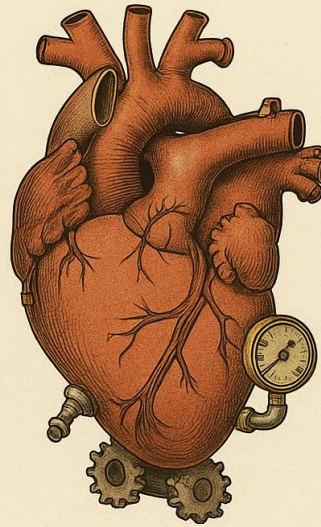
The answer lies not in the strength of the heart muscle, but in the hidden architecture of its electrical system. Some people—often unknowingly—carry silent cardiac conditions that affect how the heart's rhythm is controlled. During intense exertion, when adrenaline surges and the heart beats faster, these hidden defects can suddenly trigger fatal arrhythmias.

In this course, we'll approach the human body as a system of regulated biological machines. Each organ functions like a complex device—with sensors, regulators, valves, and feedback circuits. When these machines run smoothly, we stay healthy. When they malfunction, disease begins.

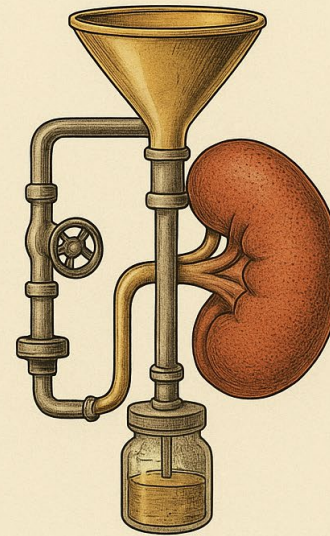
Organs as Biological Machines



LUNGS
BELLOWS

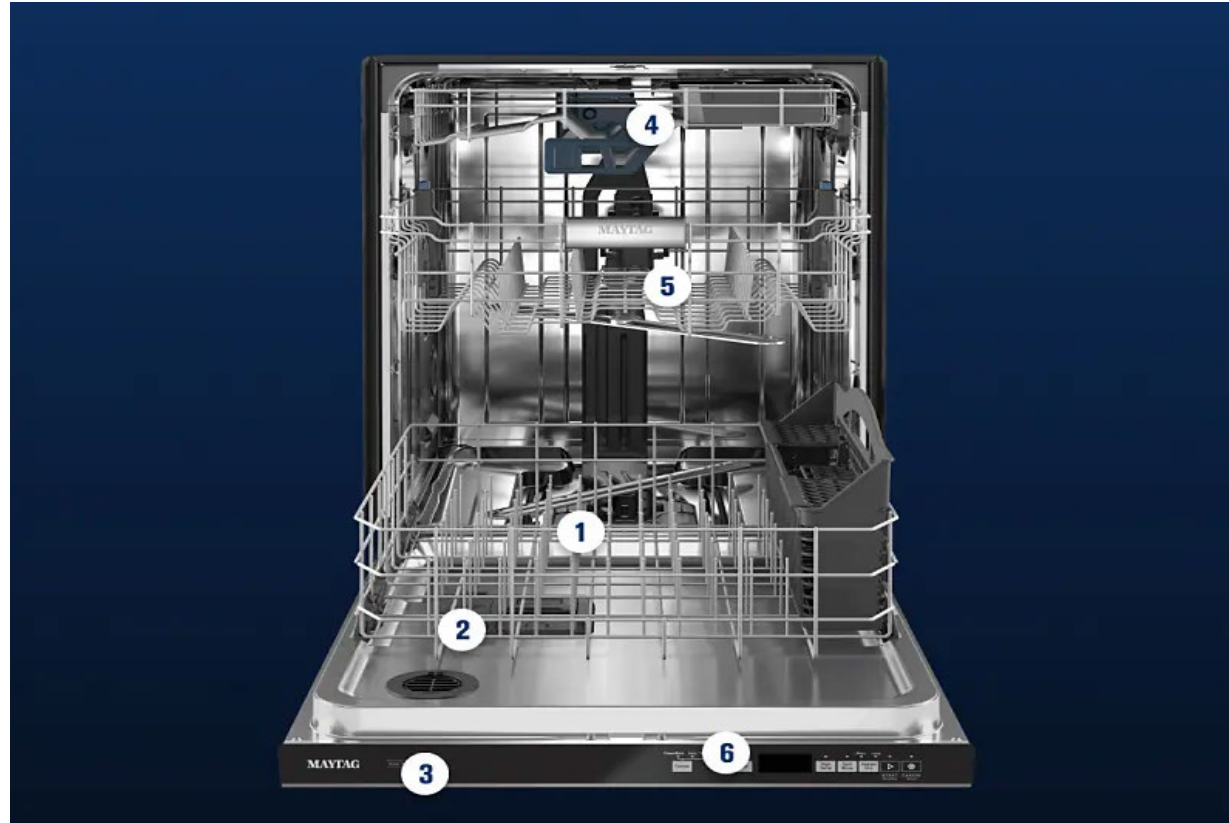


HEART
PUMP



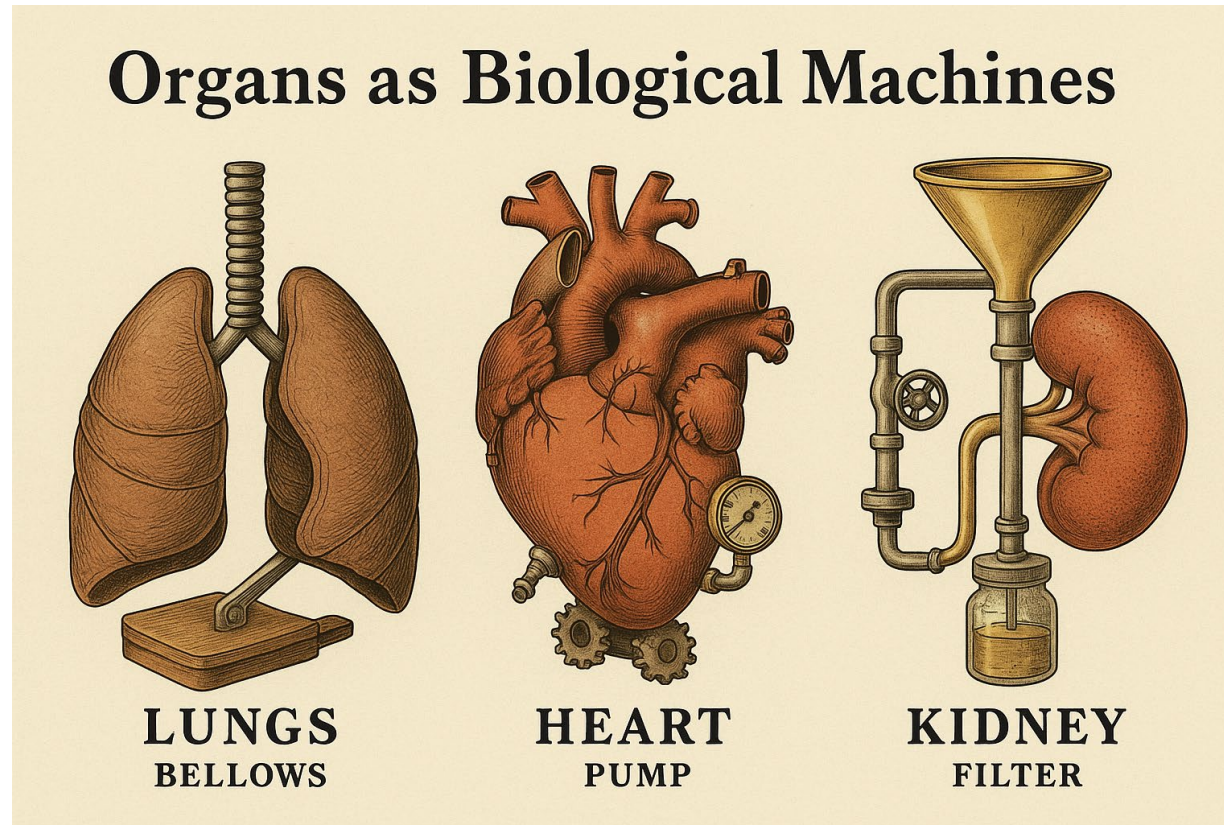
KIDNEY
FILTER

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To understand why a machine stops working correctly, we need to know how it is made, and how it is regulated. This is necessary if we want to fix it...

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To understand this, we'll build on what you've already learned—cell biology, physiology, molecular biology, and genetics—and apply it to whole-organ systems. This is the core of pathophysiology: understanding how the normal machinery works, and what happens when it breaks down.”

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mechanisms of diseases, focusing on organ dysfunction

By the end of this course, students will be able to:

- 1. Describe the molecular and cellular mechanisms** underlying common human diseases
- 2. Explain how altered physiological processes** in major organ systems (cardiovascular, respiratory, renal, nervous, endocrine, immune, and metabolic) lead to dysfunction and clinical disease.
- 3. Identify the key etiological factors**—genetic, environmental, infectious, and lifestyle-related—that contribute to disease onset and progression in high-prevalence conditions (e.g., atherosclerosis, diabetes, COPD, renal disease, liver failure,).
- 4. Understand disease progression** by linking early functional alterations (e.g., endothelial dysfunction, insulin resistance) to later tissue damage and systemic failure.

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Systems Addressed

- Cardiovascular:** mechanisms of hypertension, heart failure, ischemia
- Respiratory:** inflammation, airway remodeling, gas exchange failure
- Renal:** filtration loss, fluid–electrolyte imbalances, progression to chronic failure
- Nervous system:** neurovascular injury, neurodegeneration, excitotoxicity
- Endocrine/metabolic:** hormone dysregulation in diabetes, thyroid disorders, obesity