

CARDIOLOGY
2024

LYMPHATICS 101: REDISCOVERING WHAT WAS ALWAYS THERE

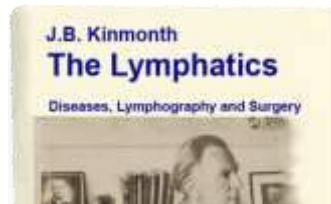
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Children's Hospital of Philadelphia
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DISCLOSURES

- None

LYMPHATICS?



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IN THE NEWS...



Brazilian Lymphatic Drainage



Key Benefits

- Reduce scar tissue
- Boost your immune system
- Prevent acne & breakouts
- Combat fine lines & premature aging
- Minimize dark circles & puffiness



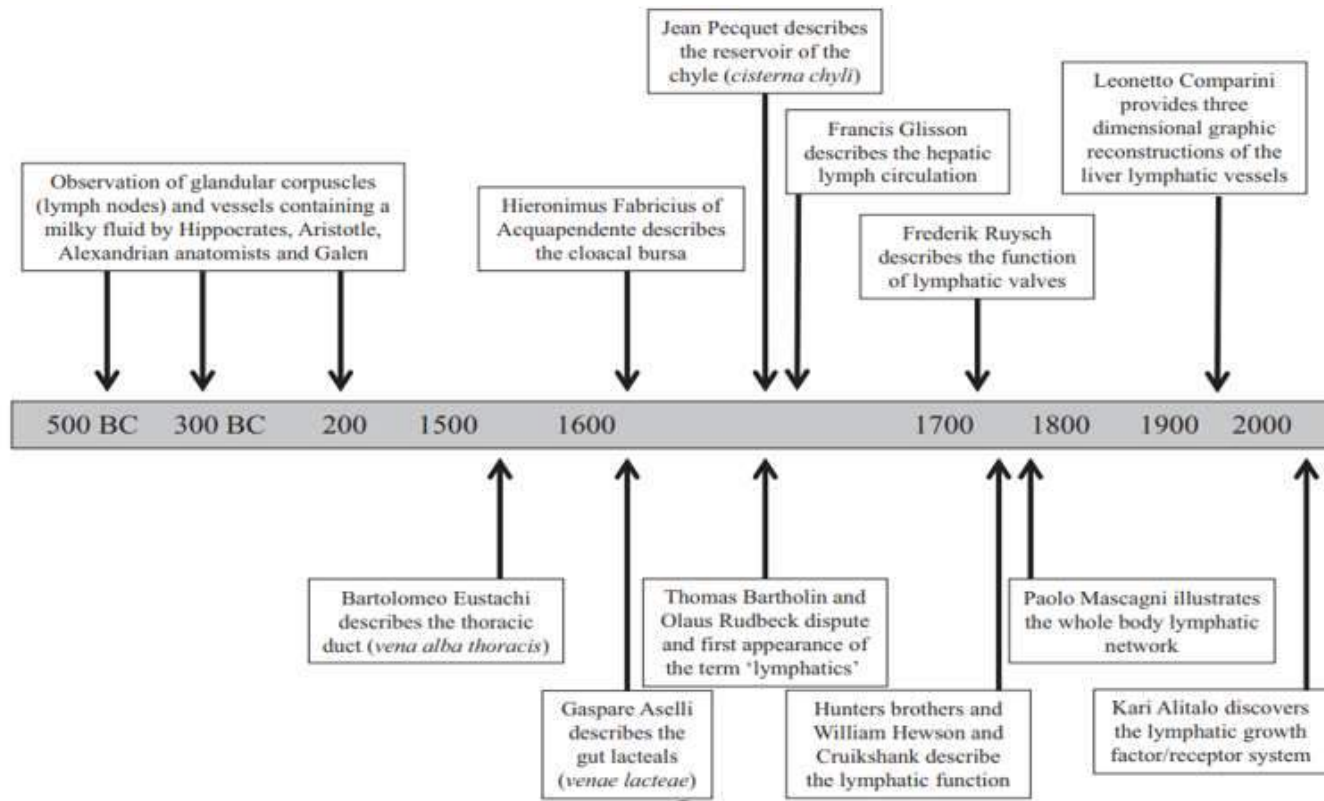
supermodel-worthy glow.

17TH CENTURY— “GOLDEN AGE FOR THE INVESTIGATION OF THE LYMPHATIC SYSTEM”

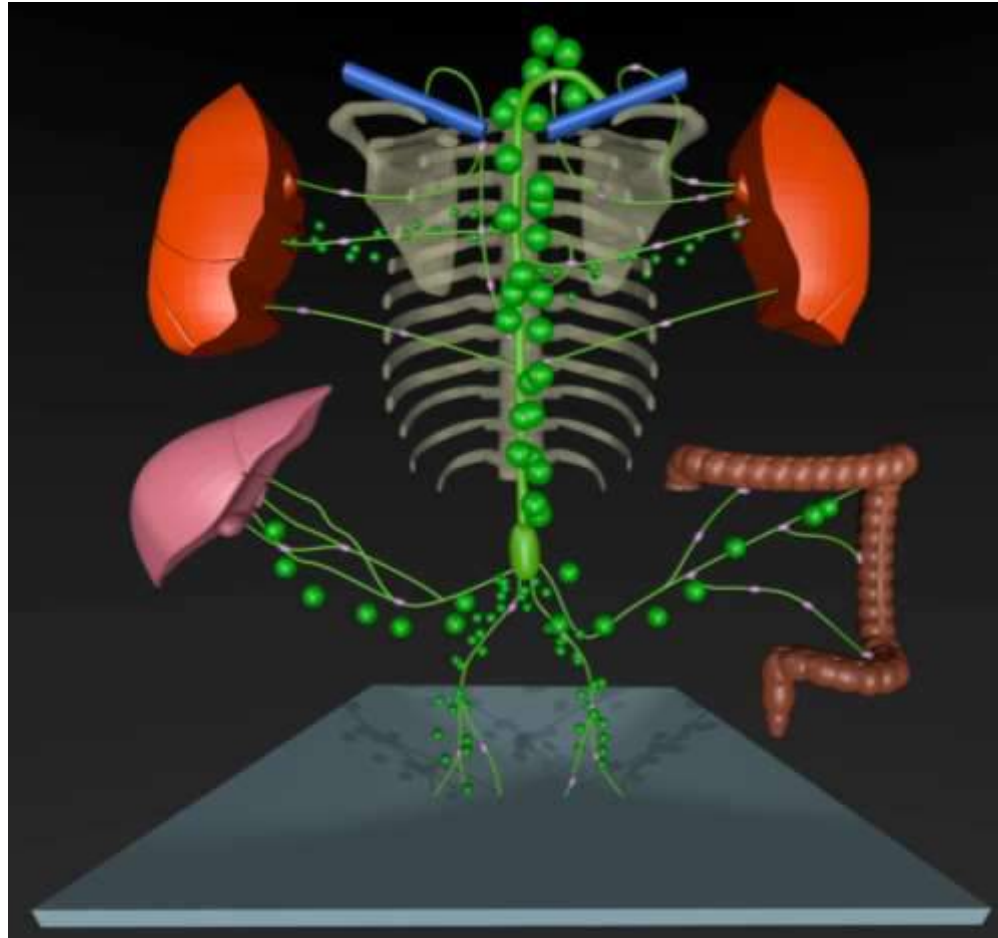
- Hippocrates (460-377 BC) – Describes “White blood”
- Aristotle (384-322 BC) – “Sanies” transparent fluid
- Gaspare Aselli (1581 – 1626) – Lacteal vessels
- Thomas Bartholin (1652) – “Lympha” (clear fluid)



TIMELINE OF SCIENTIFIC PROGRESS OF KNOWLEDGE OF LYMPHATIC SYSTEM



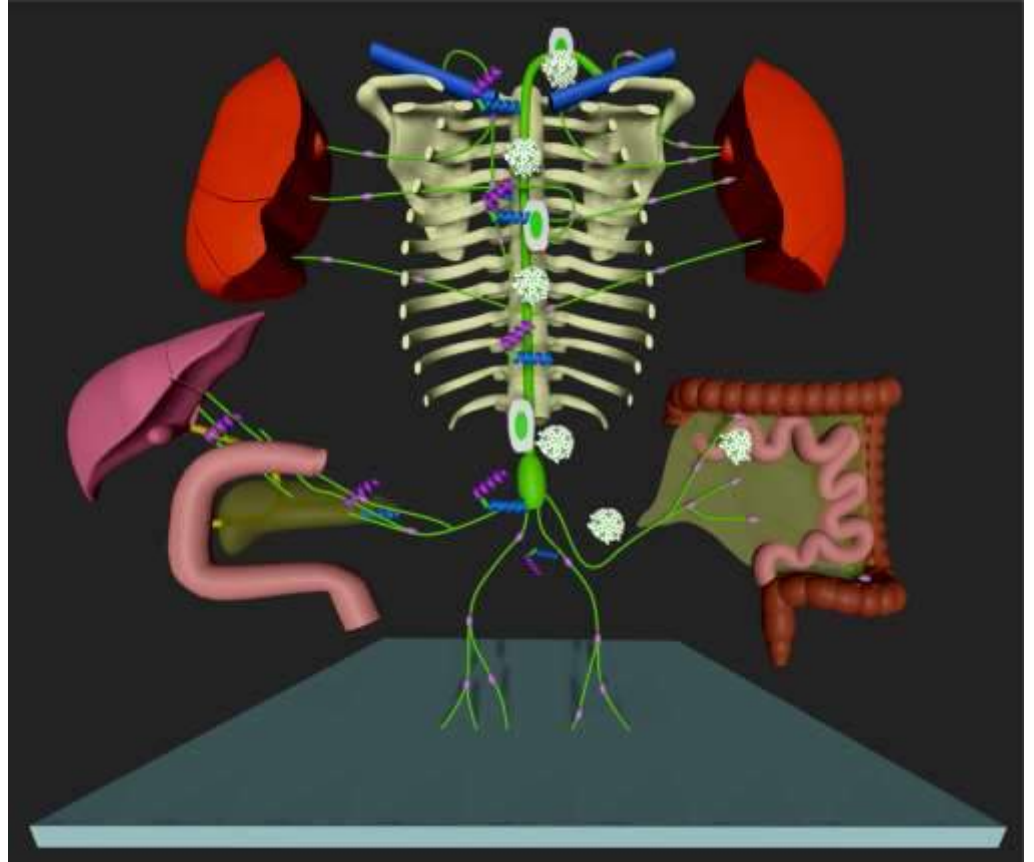
LYMPHATIC SYSTEM ANATOMY AND FLOW



WHAT EXACTLY IS IN LYMPHATIC FLUID?

Lymph contains a variety of substances:

- Proteins
- Salts
- Glucose
- Fats
- Water
- White blood cells
- Coagulation factors
- Chylomicrons

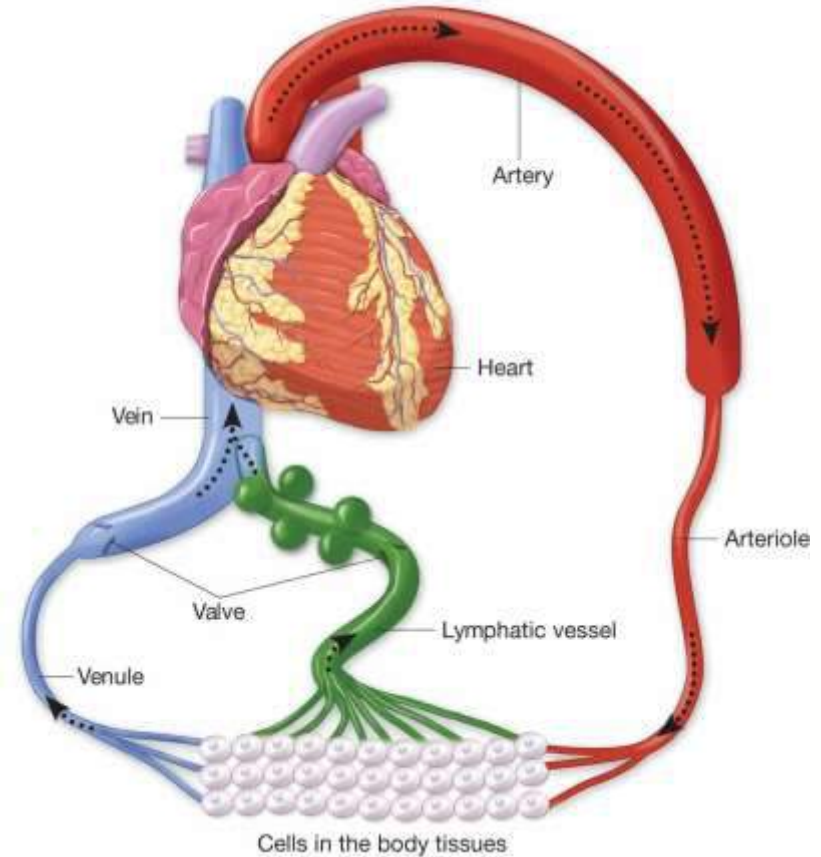


LYMPHATIC SYSTEM FUNCTIONS

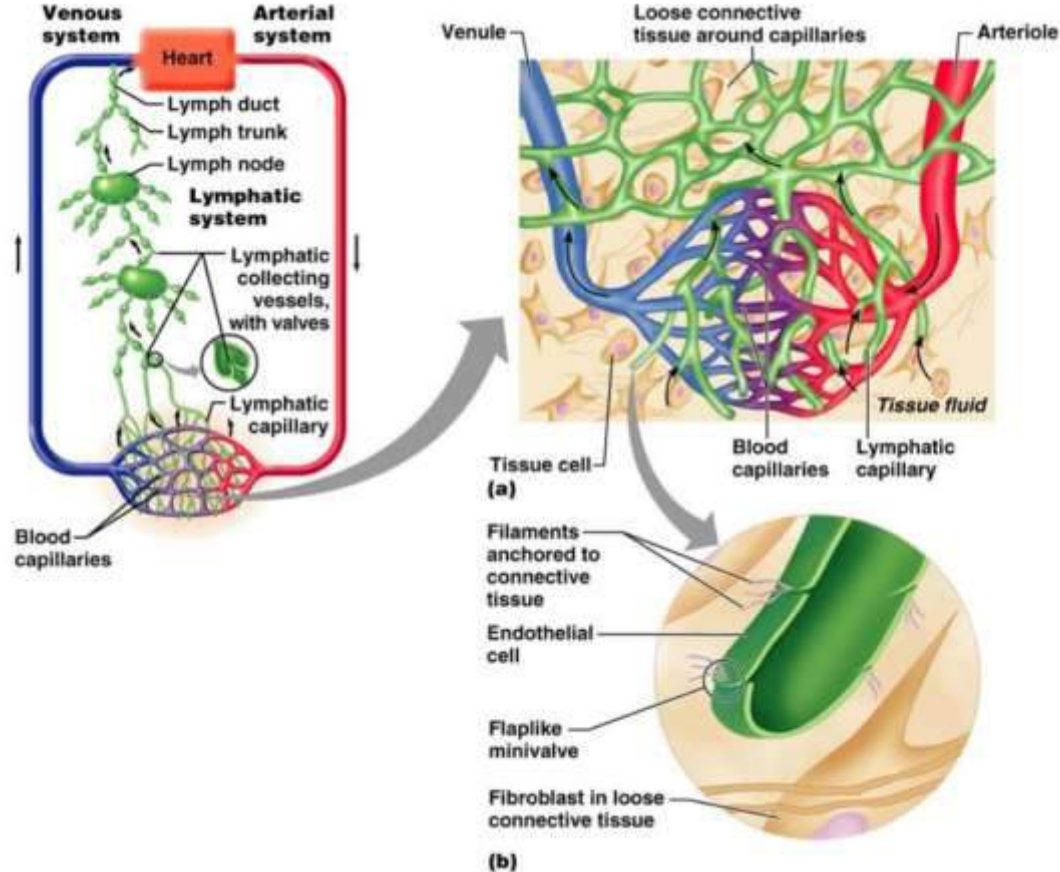
Defense – key role in immune system

Transport - cells, fatty acids, protein,
macromolecules

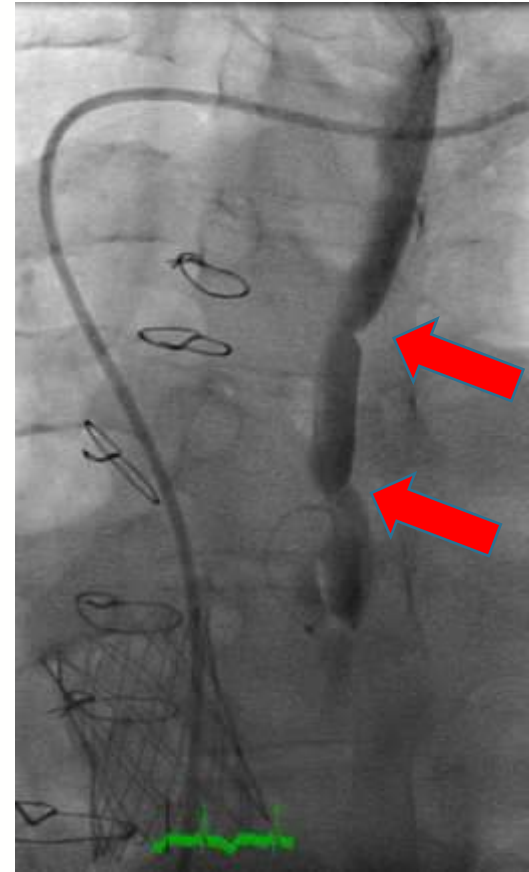
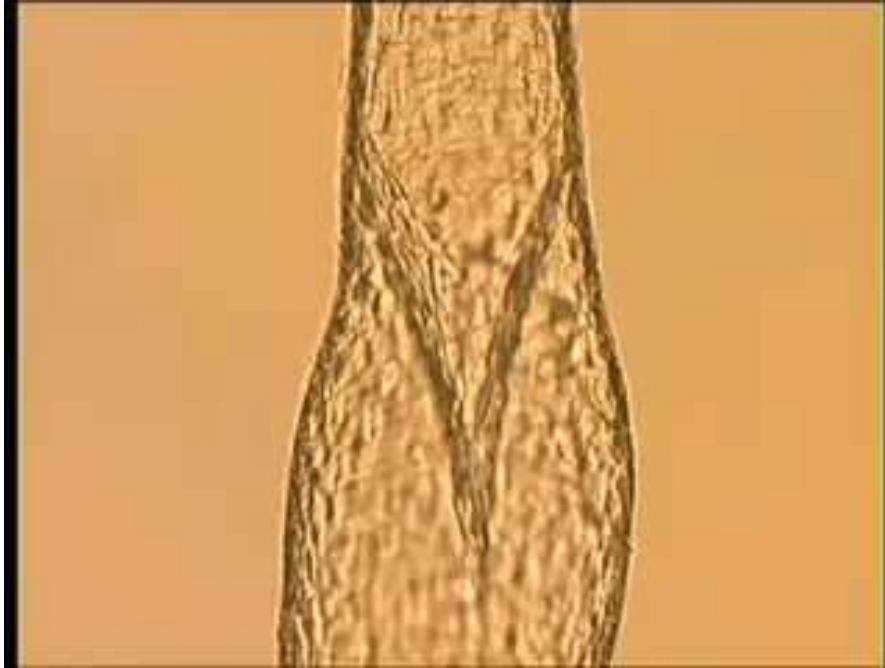
Circulatory - returns excess interstitial
fluid to veins



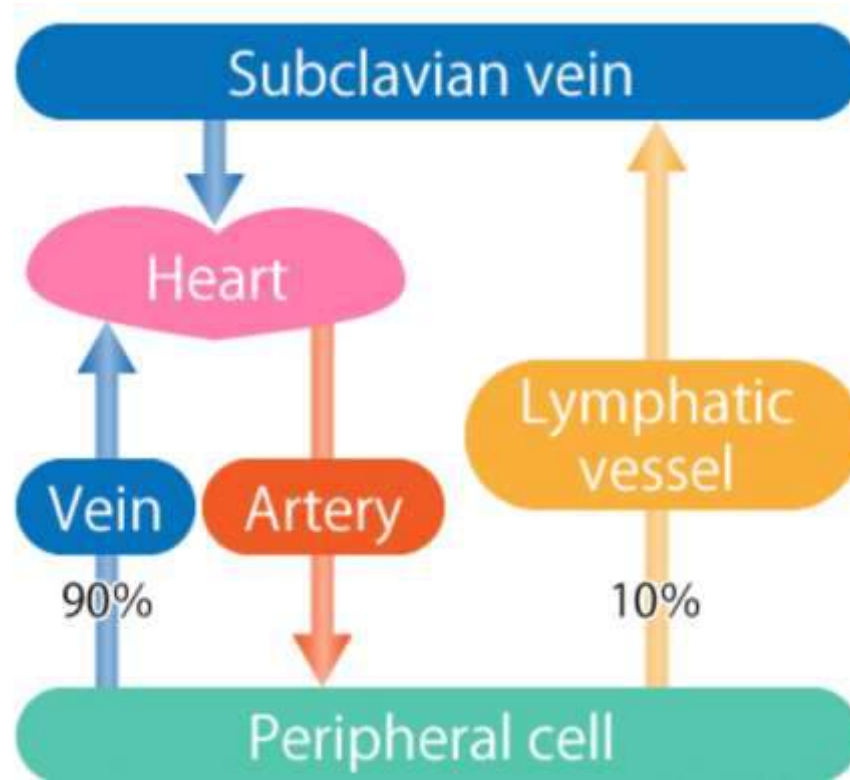
LYMPHATIC CAPILLARIES



VALVES WITH UNIDIRECTIONAL FLOW



DIVISION OF RETURN



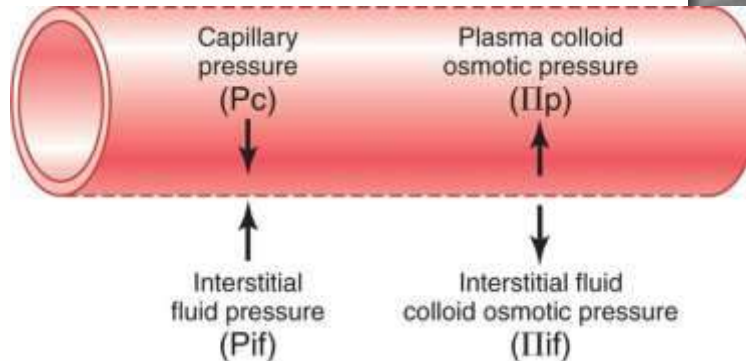
CIRCULATORY SYSTEM COMPARISON



	CV System	Lymphatic System
Flow	3-4 l/min/m ²	2-3 l/day
Mean Pressure (mmHg)	Arterial: 100, Venous: 5	? (~ venous)
Fluid Composition	More uniform	Depends on source
Pumping source	Heart	Vessel walls, muscle, resp
System type	Closed system	Open system
Purpose	Transport blood to tissue	Collect fluid from tissue

FACTORS AFFECTING LYMPHATIC FLOW

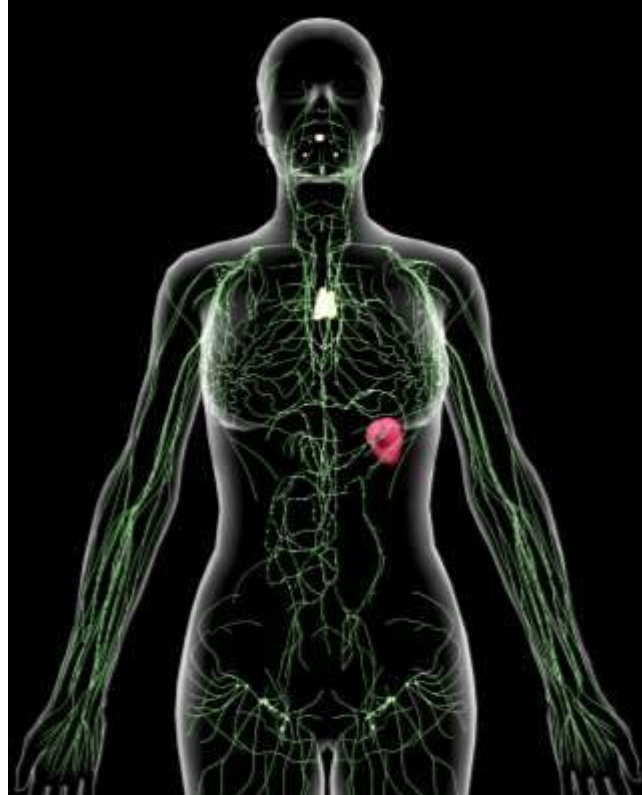
- Pulmonary blood flow
- Intrathoracic pressure
- CVP
- Starling: $J_v = K[(P_c - P_{if}) + \sigma(\Pi_p - \Pi_{if})]$
- Channelopathies
- Medications
- Activity
- Feeding / Fluids



WHAT TO DO NOW?

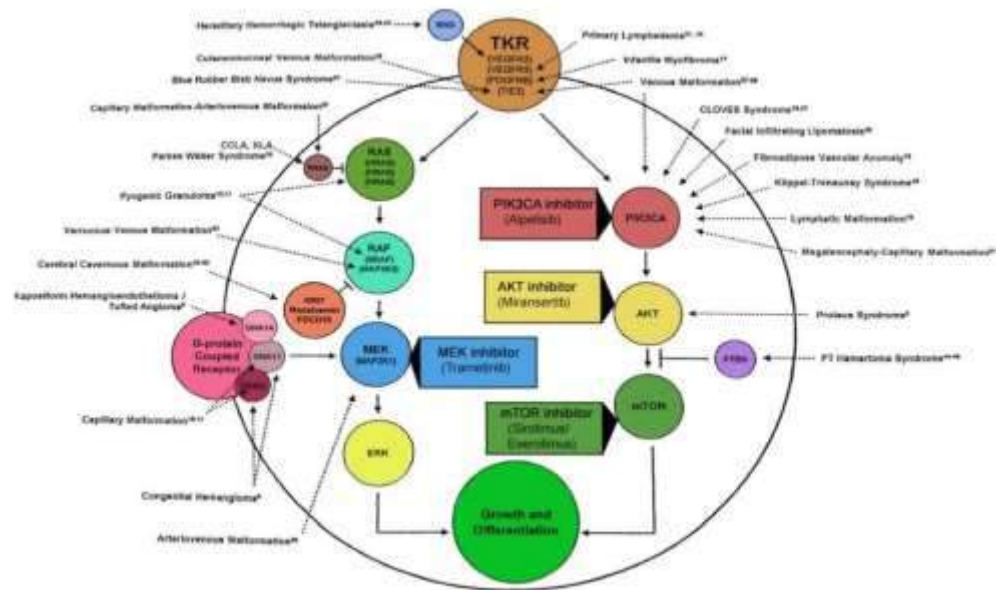
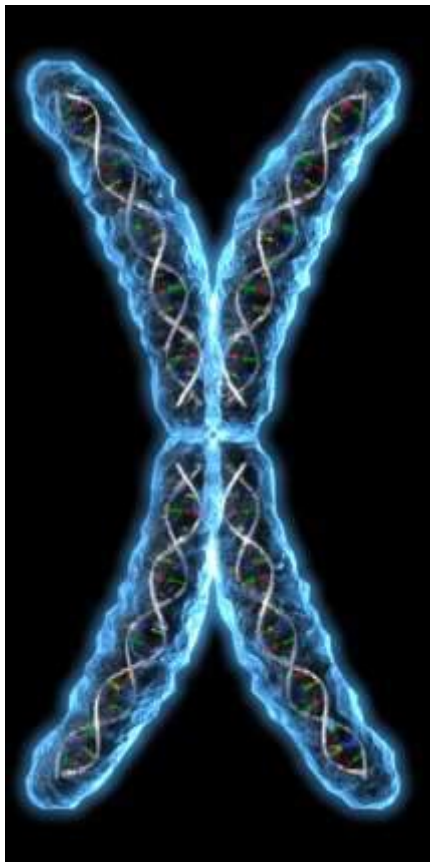


Phenotype



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✓ Genotype



WHAT DOES THAT TRANSLATE INTO?

- Medical treatments
- Percutaneous lymphatic interventions
- Percutaneous cardiac cath/lymphatic interventions
- Surgical interventions
- Hybrid procedures



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Thank you!

