

**Massachusetts Institute of Technology
Harvard Medical School
Brigham and Women's Hospital
VA Boston Healthcare System**



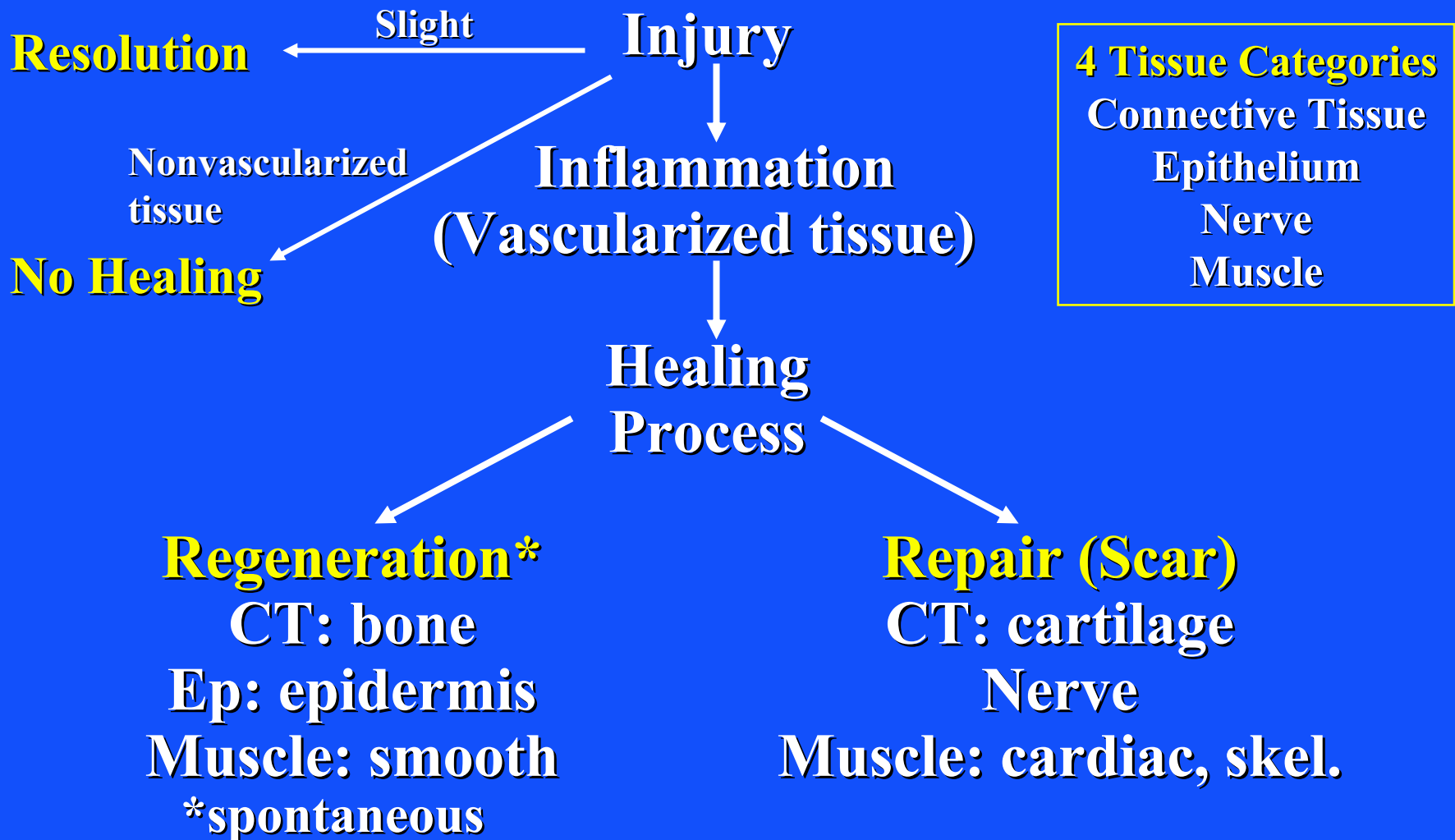
2.79J/3.96J/BE.441/HST522J

UNIT CELL PROCESSES ASSOCIATED WITH WOUND HEALING

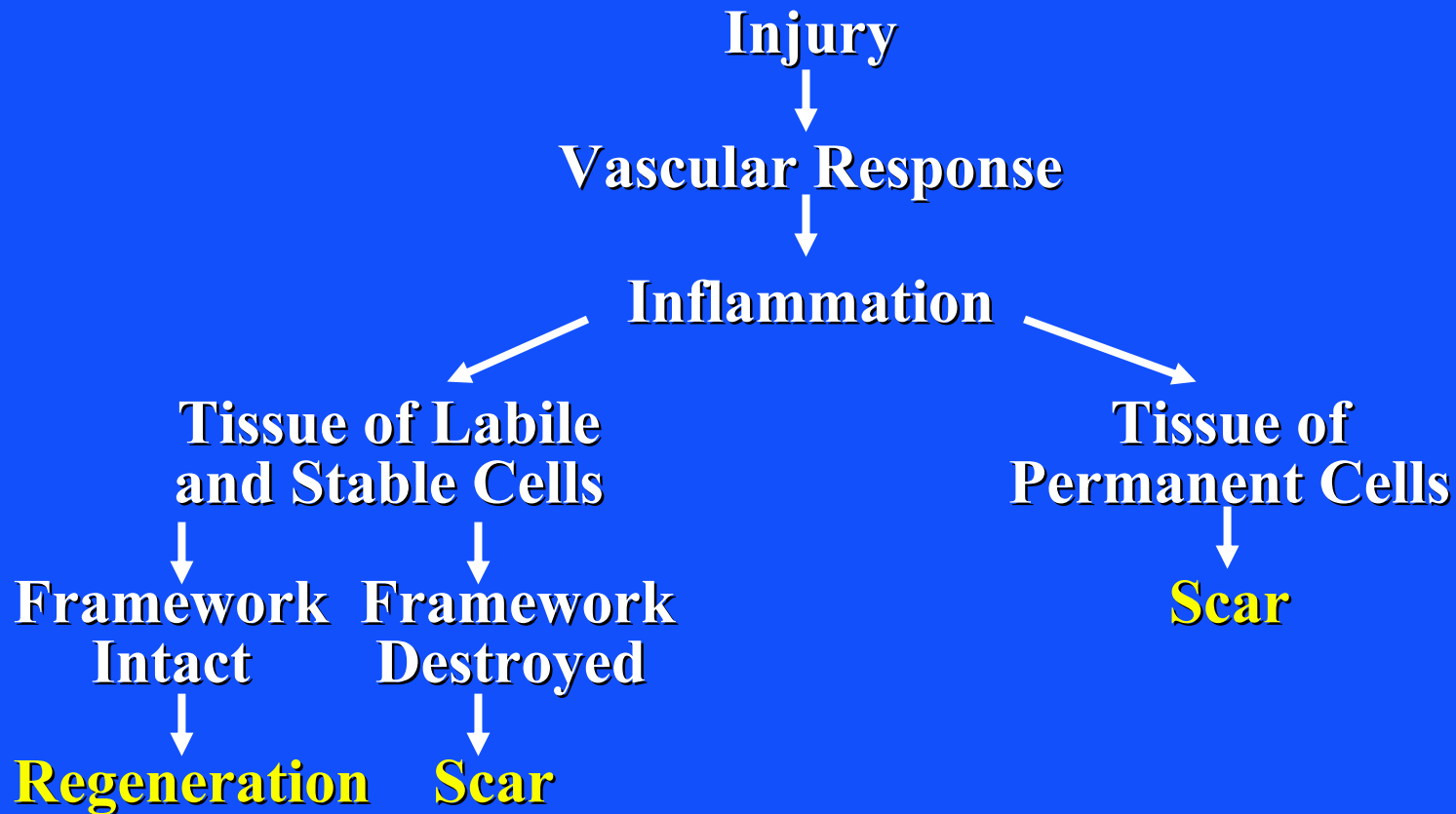
I.V. Yannas, Ph.D. and M. Spector, Ph.D.

WOUND HEALING

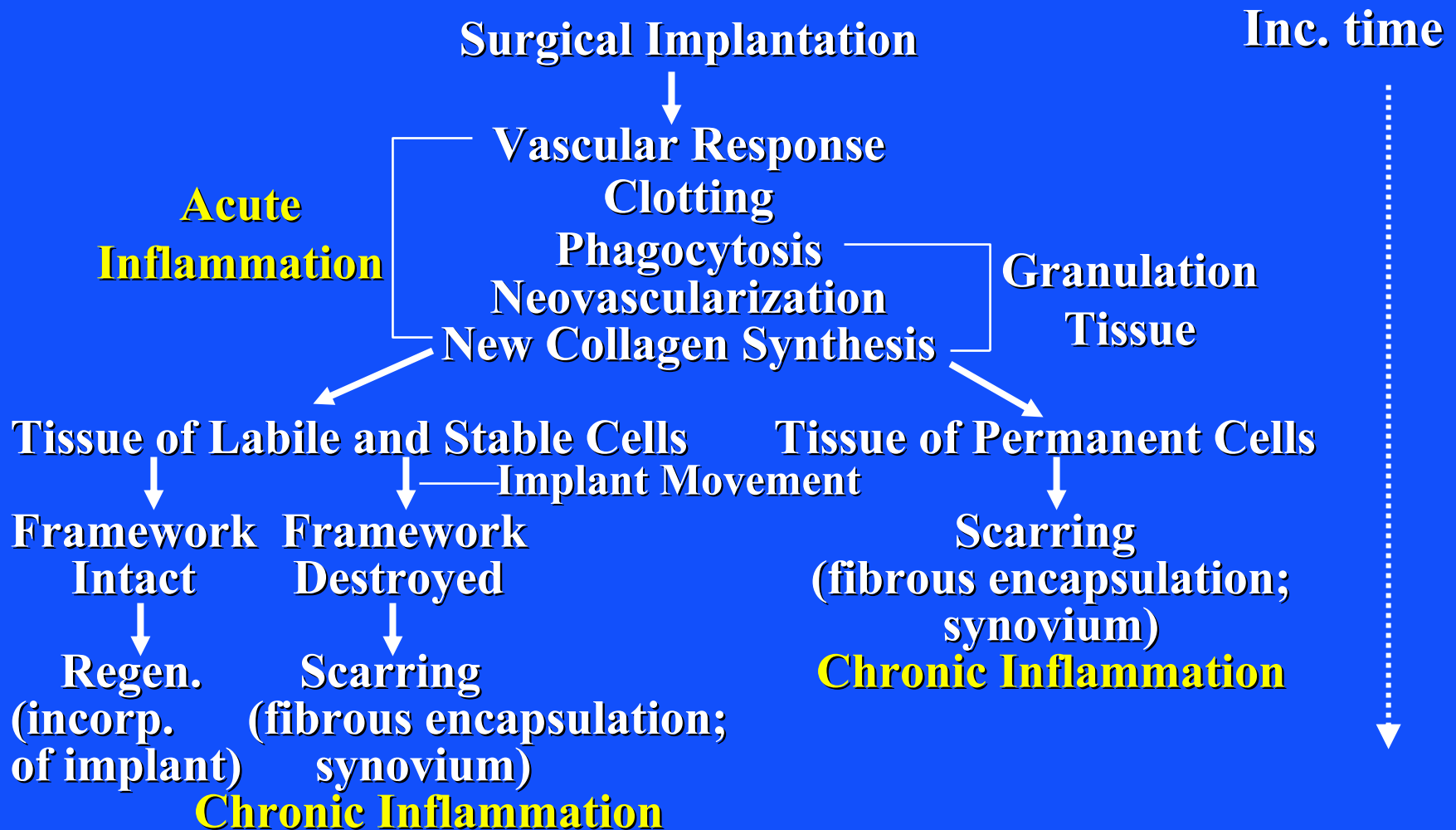
Roots of the Tissue Response



RESPONSE TO IMPLANTS: WOUND HEALING



RESPONSE TO IMPLANTS: WOUND HEALING



UNIT CELL PROCESSES

Regulator



Cell + Matrix

UCP



Product + Regulator

Connective
Tissue
Epithelia
Muscle
Nerve

Integrin

ECM
Adhesion
Protein
Collagen
Biomaterial

Mitosis
Synthesis
Migration
Contraction
Endocytosis
Exocytosis



UNIT CELL PROCESSES

VASCULAR RESPONSE

Contraction

Endothelial Cell + Basal Lamina \longrightarrow Leakage + Reg.

UNIT CELL PROCESSES

VASCULAR RESPONSE

(circulation)
Platelet + serum $\xrightarrow{\text{Exocytosis}}$ **Reg.**

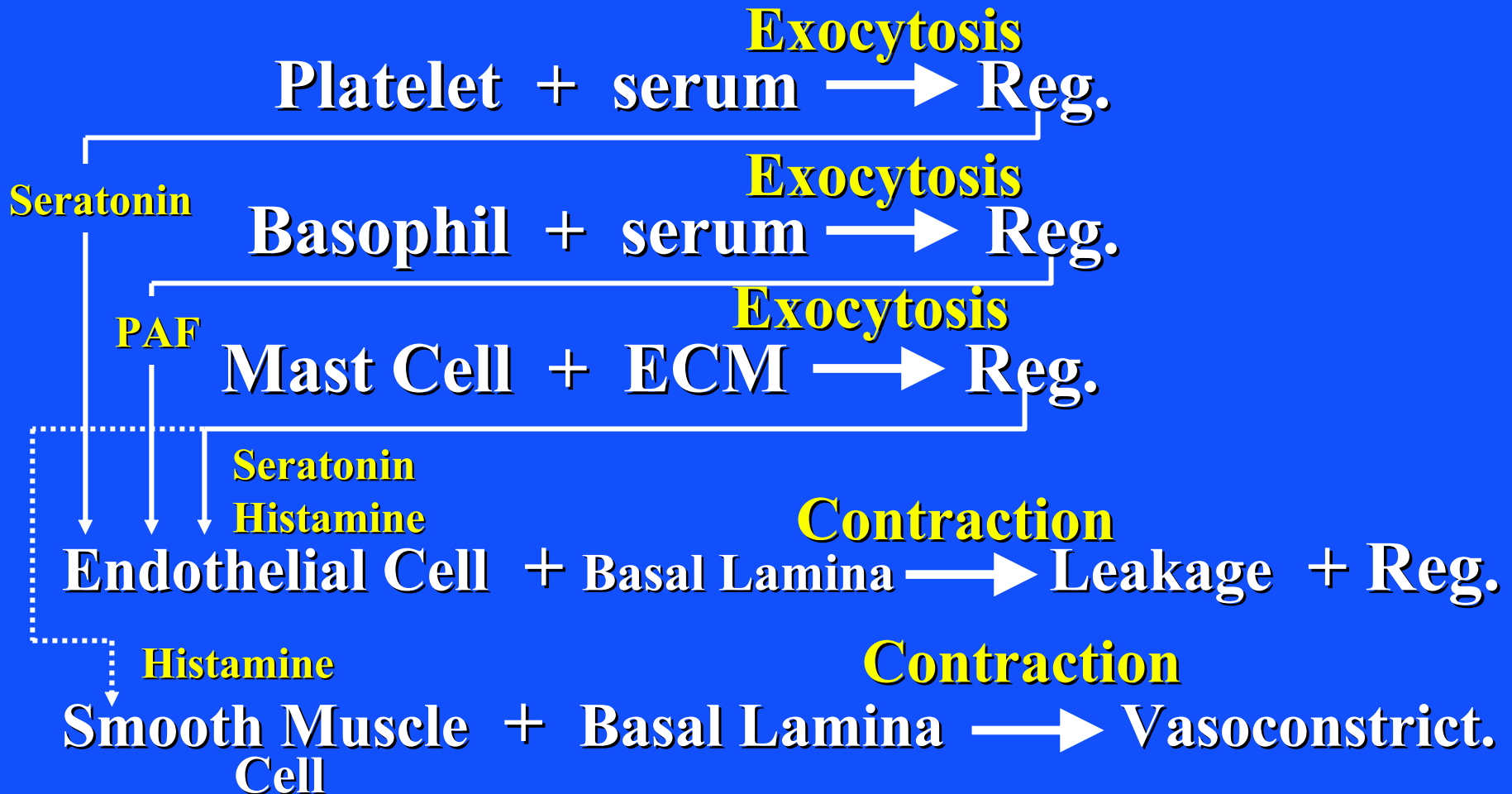
(circulation)
Basophil + serum $\xrightarrow{\text{Exocytosis}}$ **Reg.**

(tissue)
Mast Cell + ECM $\xrightarrow{\text{Exocytosis}}$ **Reg.**

Serotonin
PAF
Serotonin
Histamine
Endothelial Cell + Basal Lamina $\xrightarrow{\text{Contraction}}$ **Leakage + Reg.**

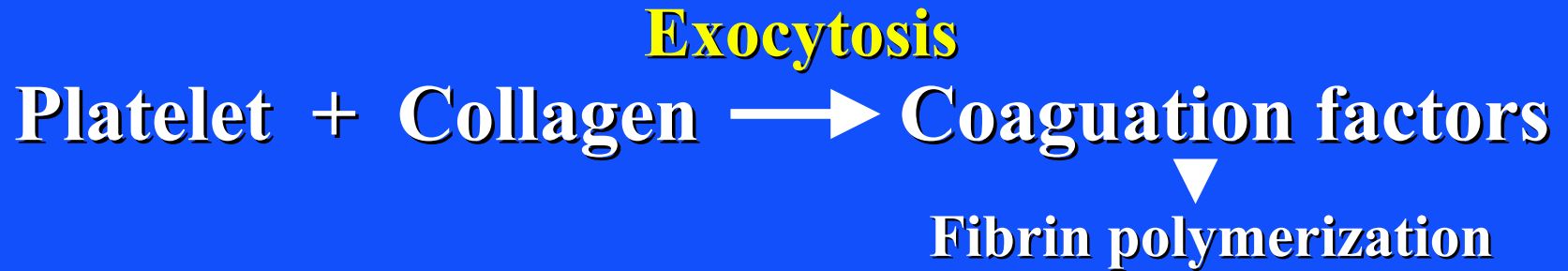
UNIT CELL PROCESSES

VASCULAR RESPONSE



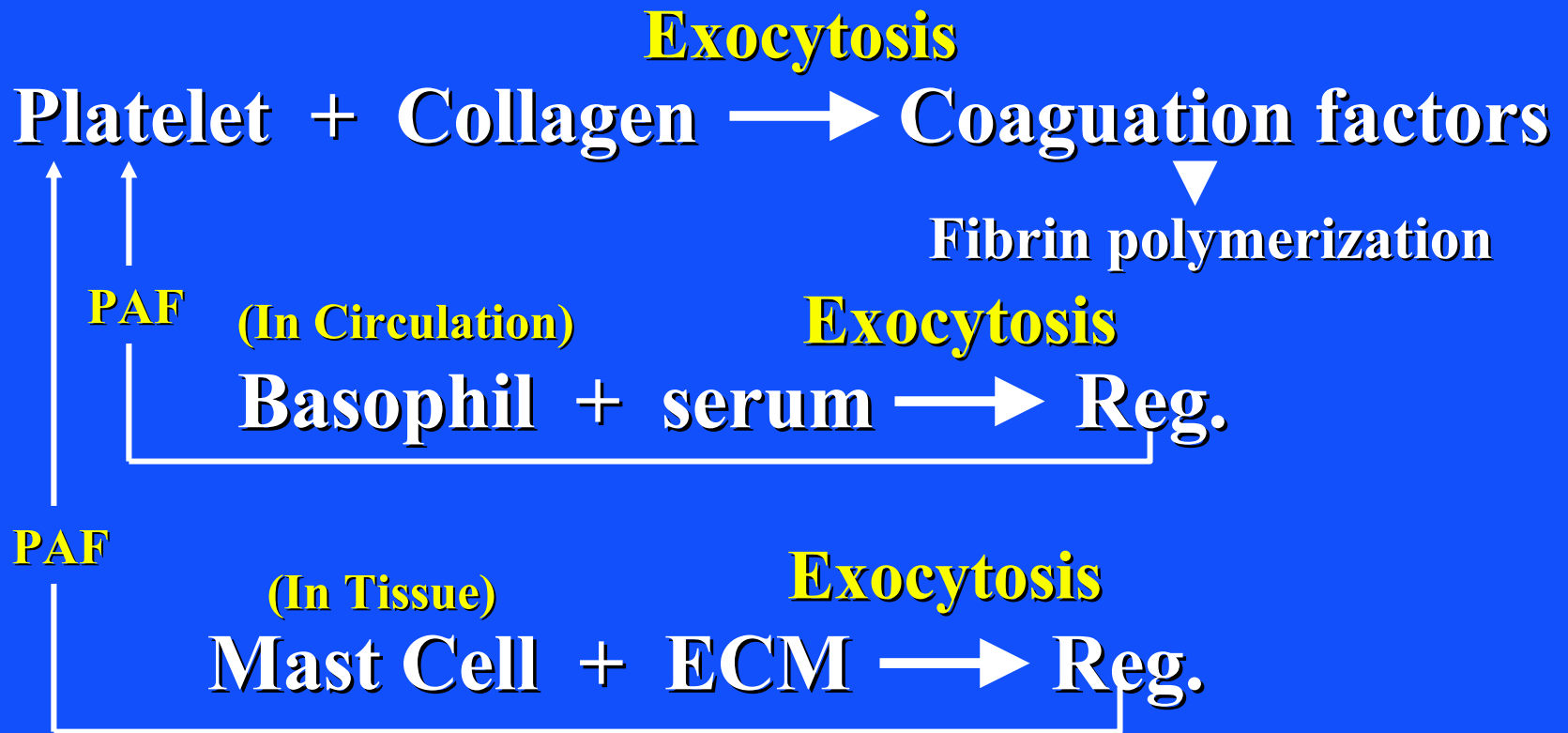
UNIT CELL PROCESSES

CLOTTING



UNIT CELL PROCESSES

CLOTTING



UNIT CELL PROCESSES

PHAGOCYTOSIS

Endocytosis

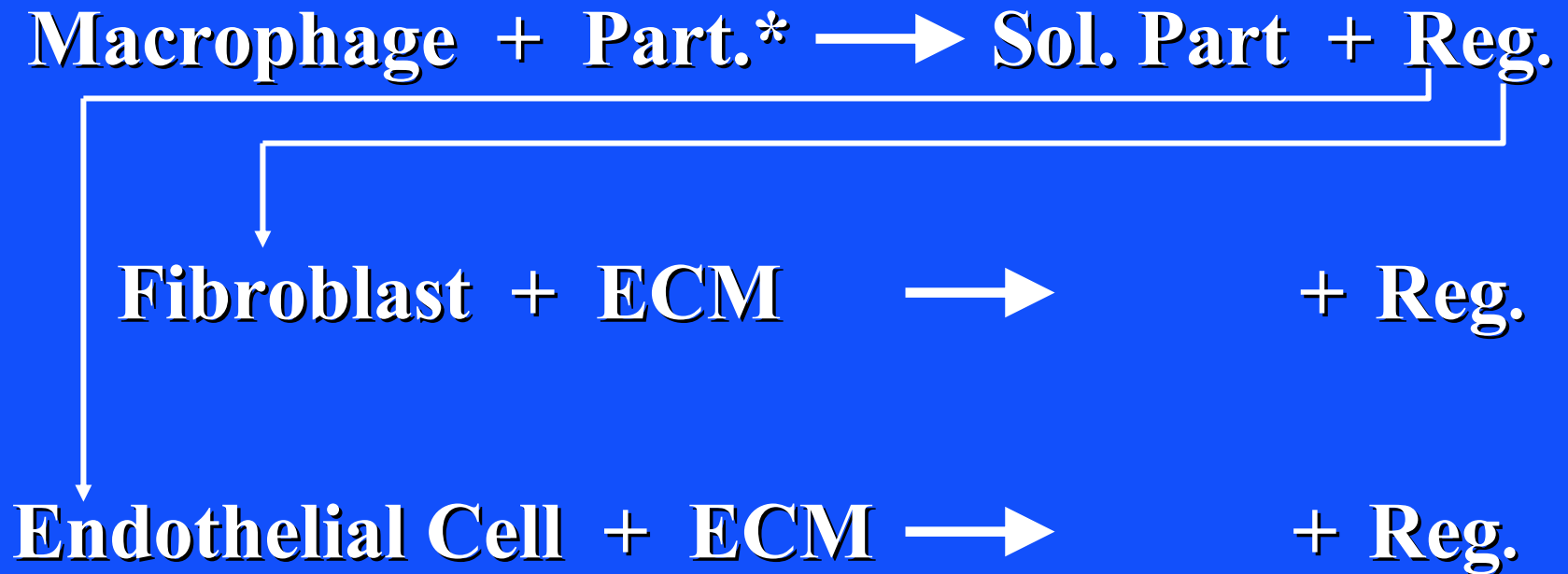
Macrophage + Part.* \longrightarrow Sol. Part + Reg.

* Cell debris and degraded ECM

UNIT CELL PROCESSES

PHAGOCYTOSIS

Endocytosis



* Cell debris and degraded ECM

UNIT CELL PROCESSES

NEOVASCULARIZATION

Synthesis: enzymes

Endothelial Cell + Basal Lamina → **+ Reg.**

Migration

Endothelial Cell + ECM → **+ Reg.**

Mitosis

Endothelial Cell + ECM → **+ Reg.**

UNIT CELL PROCESSES

NEW COLLAGEN SYNTHESIS

Fibroblast + ECM $\xrightarrow{\text{Migration}}$ **+ Reg.**

Fibroblast + ECM $\xrightarrow{\text{Mitosis}}$ **+ Reg.**

Fibroblast + ECM $\xrightarrow{\text{Synthesis}}$ **+ Reg.**

Fibroblast* + ECM $\xrightarrow{\text{Contraction}}$ **+ Reg.**

***Myofibroblast**

UNIT CELL PROCESSES

TGF- β 1



Contraction

Fibroblast + Collagen \longrightarrow Contracture + Reg.