BME341 Biomaterials

Biomaterial Implantation and Acute Inflammation

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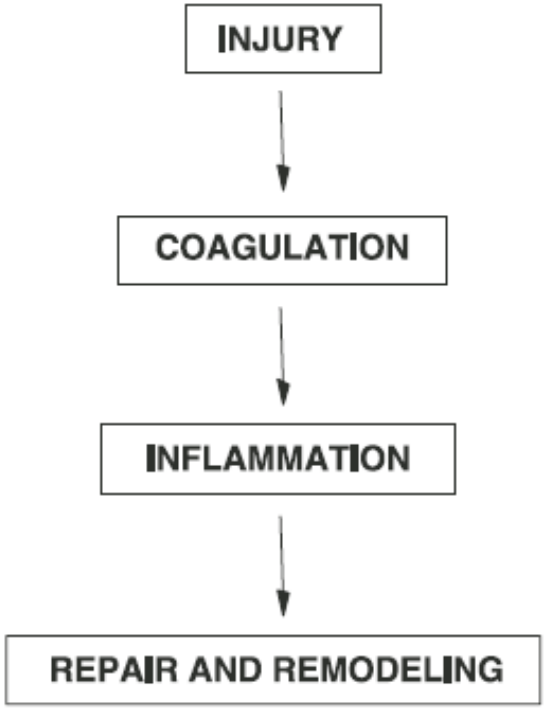
Cell death, disruption/denaturation of the extracellular matrix, and loss of blood vessel integrity are some of the events that can directly trigger wound healing, starting with the first phase: coagulation.



Blood Cells

Blood is a mixture of plasma and various cell types

- Platelets
- Leukocytes
- Erythrocytes

Blood cells originate by hematopoiesis.

Erythrocytes

No nucleus
Extremely deformable
Function is to transport gases within blood
Minimal role in blood-material interactions

Platelets (Thrombocytes)

No nucleus
Contain contractile proteins
Active cells that interact with RGD peptide
Upon injury, they adhere to a surface

Coagulation cascades

Activation of clotting factors following platelet aggregation
Vascular spasm
Intrinsic and Extrinsic coagulation pathways

The extrinsic pathway is a coagulation cascade that begins with trauma to vascular walls and surrounding tissues

The intrinsic pathway is a coagulation cascade that begins with the exposure of blood to a foreign surface

ANTICOAGULANTS AND FIBRINOLYSIS

Biomedical engineers seeking to understand and control coagulation may benefit from strategies similar to some of the biological mechanisms that keep the coagulation reactions in check.

For example, activation of factors XII and XI is surface mediated and provides a localized (immobilized on the surface) stimulus for coagulation to occur.

BIOMATERIALS, DEVICES, AND THROMBOSIS

When considering the function of a blood-contacting material or device, scientists and engineers should be aware of the potential effects of adsorption of blood components (such as proteins, lipids, or calcium) onto (or deposition into) the surface of the material, as well as adhesion of blood cells or components of blood cells onto the surface of the material.