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Lecture: “The Inflammatory Cascade” by Dr. Geert Schmid-Schonbein, part I.
Given August 7, 2006 during the GEM4 session at MIT in Cambridge, MA.

Please use the following citation format:


Note: Please use the actual date you accessed this material in your citation.
The Inflammatory Cascade:

Shock and Multi-organ Failure
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Please see Fig. 4 in Schmid-Schonbein, et al. *Microvascular Networks: Theoretical and Experimental Studies*. Farmington, CT: S. Karger, 1986, p. 44.
Pressure-Flow Relationship in Skeletal Muscle Microcirculation

**Figure by MIT OpenCourseWare.**
Cardiovascular Disease is Accompanied By Cell Activation and Inflammation

- Infectious Diseases
- Chronic Degenerative Diseases (arthritis, retinopathy, dementia, venous disease, coeliac disease, … )
- Diabetes
- Cardiovascular Risks (smoking, obesity)
- Myocardial ischemia
- Stroke
- Atherosclerosis
- Arterial Hypertension
- Cancer
- Physiological Shock
The Inflammatory Cascade

**Trigger mechanism**

**Early Cell Responses:**
- Ion exchange
- Pseudopod formation by actin polymerization/depolymerization
- Degranulation
- Production and release of inflammatory mediators
- Enhancement of endothelial permeability
- Upregulation of membrane adhesion molecules

**Tissue Degradation:**
- Neutrophil entrapment in microvessels, transvascular migration
- Platelet attachment, aggregation, thrombosis, red cell aggregation
- Protease release and activation
- Oxygen free radical formation
- Apoptosis
- Organ dysfunction

**Initial Repair:**
- Downregulation of anti-inflammatory genes
- Upregulation of pro-inflammatory genes (cytokines, etc.)
- Monocyte and T-Lymphocyte infiltration

**Repair:**
- Release of growth factors
- Connective tissue growth
- Revascularization
- “Resolution of Inflammation”
Inflammation in the Microcirculation

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Trigger Mechanisms for Cardiovascular Cell Activation

- Inflammatory mediators (bacterial/viral/fungal sources, endotoxins, cytokines, histamine, oxidized products, complement fragments, LTB$_4$, PAF, etc.)
- Depletion of anti-inflammatory mediators (nitric oxide, IL-10, glucocorticoids, albumin, etc.)
- Fluid stress
- Transients of Gas Pressure or Temperature
- Juxtacrine Activation
- Bio-Implant Interfaces
Plasma Derived Inflammatory Mediators in Hemorrhagic Shock

Leukotaxin Peptide
Myocardial Depressing Factor
Clastogenic factor
T-Lymphocyte proliferation depression depression factor
Neutrophil activating factor
Leukocyte Chemotactic Factor
Neurin
Inflammatory Mediators in Hemorrhagic Shock

Figure by MIT OpenCourseWare.