Johns Hopkins Engineering

Immunoengineering

Immune Response to Biomaterials: Introduction

JOHNS HOPKINS
WHITING SCHOOL
of ENGINEERING

Learning Objectives

- Describe the phases and time course of wound healing and the immune response to biomaterials
- Identify the key cellular players in the immune response to biomaterials
- Define the foreign body reaction
- Explain how protein adsorption can negatively impact biomaterials
- Describe the immune response to transplants

What is a Biomaterial?

- Any synthetic or natural substance that interacts with biological systems
- Typically used for medical purposes—either therapeutic or diagnostic
- Biodegradable vs. permanent

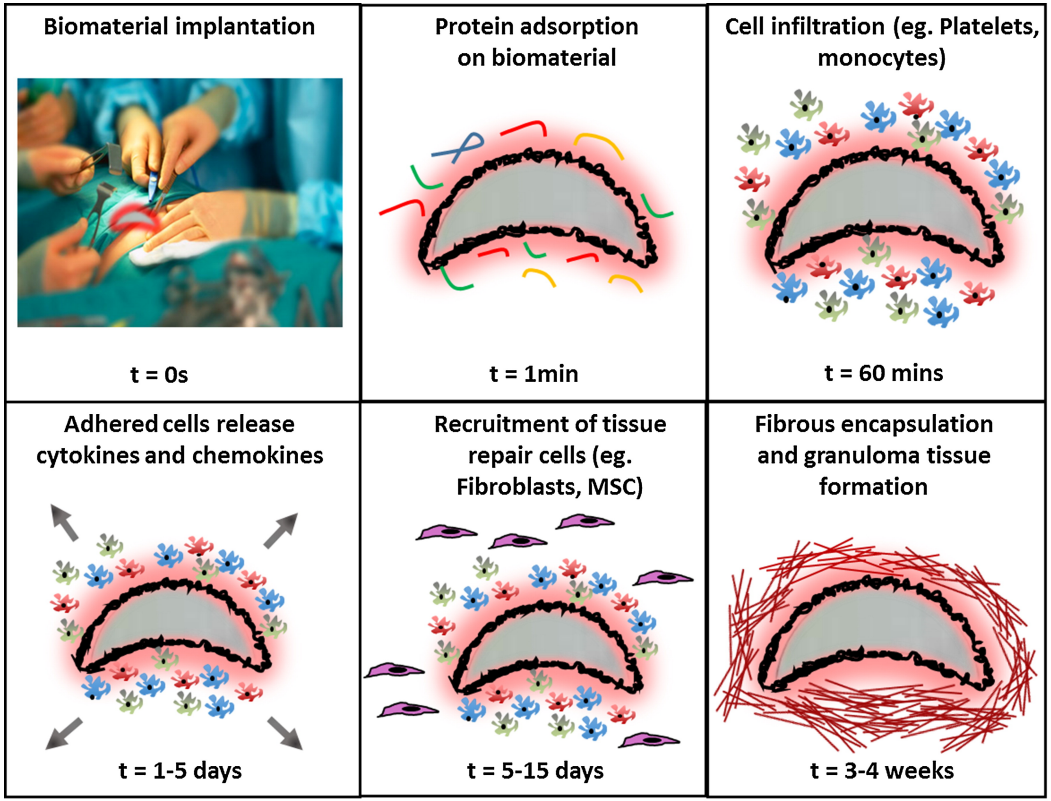
Biomaterials

- Implants
- Drug delivery systems
- Tissue engineering scaffolds
- Contact lenses
- Stents

Important Features for Biomaterials

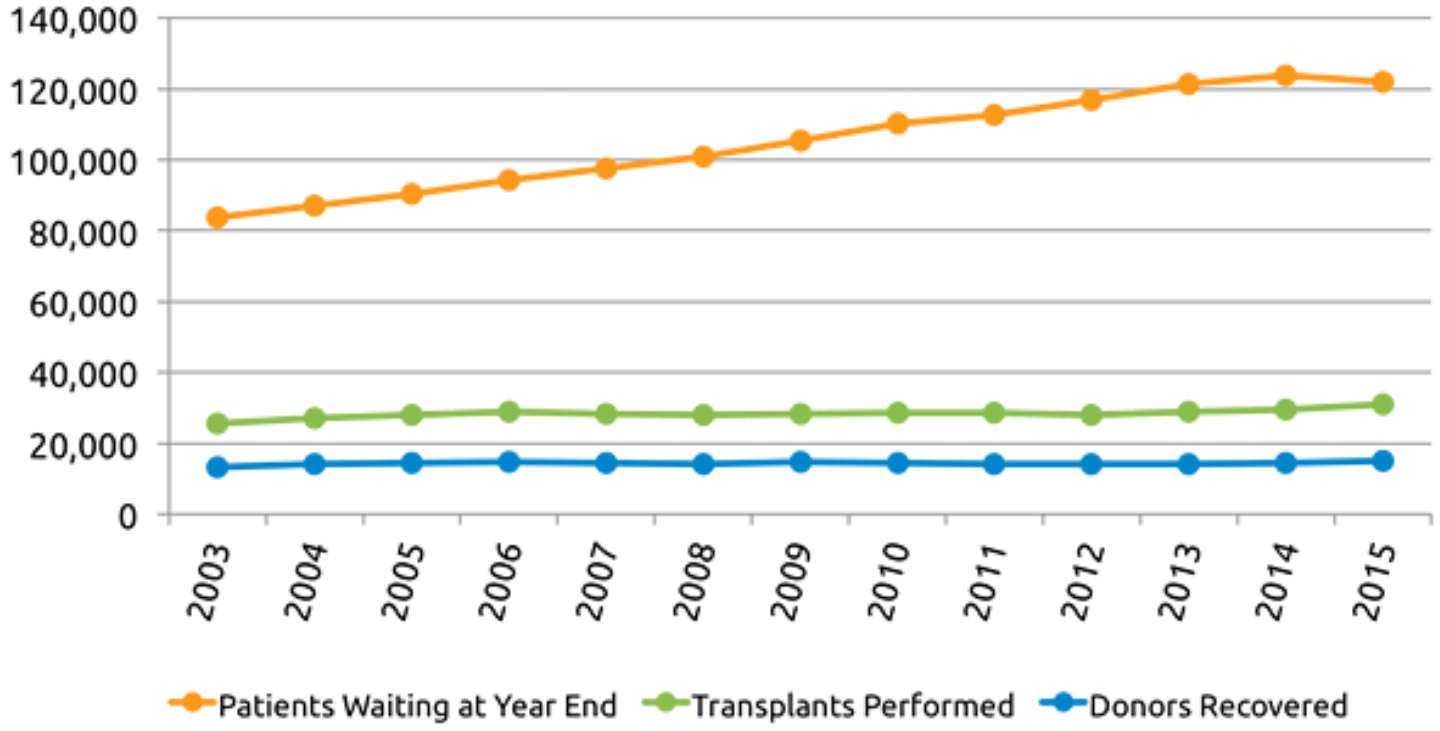
- Biocompatible
- Non-toxic
- Non-carcinogenic
- Non-immunogenic

Inflammatory Response to Biomaterials



Sridharan et al. “Biomaterial based modulation of macrophage polarization: a review and suggested design principles”. *Materials Today*, 18.6 (2015): 313-325

Transplantation



https://optn.transplant.hrsa.gov/

Graft Survival Rates

Tissue transplanted	No. of grafts in USA (2009)*	5-year graft survival
Kidney	17,683	81.4%#
Liver	6,320	68.3%
Heart	2,241	74.0%
Pancreas and pancreas/ kidney	1,233	53.4%†
Lung	1,690	50.6%
Intestine	180	~ 48.4%
Cornea	~40,000	~ 70%
HSC transplants	15,000‡	40%/60%‡

Figure 15.47 Janeway's Immunobiology, 8ed. (© Garland Science 2012)