Johns Hopkins Engineering

Immunoengineering

Immune Response to Cancer: Tumor Antigens

JOHNS HOPKINS
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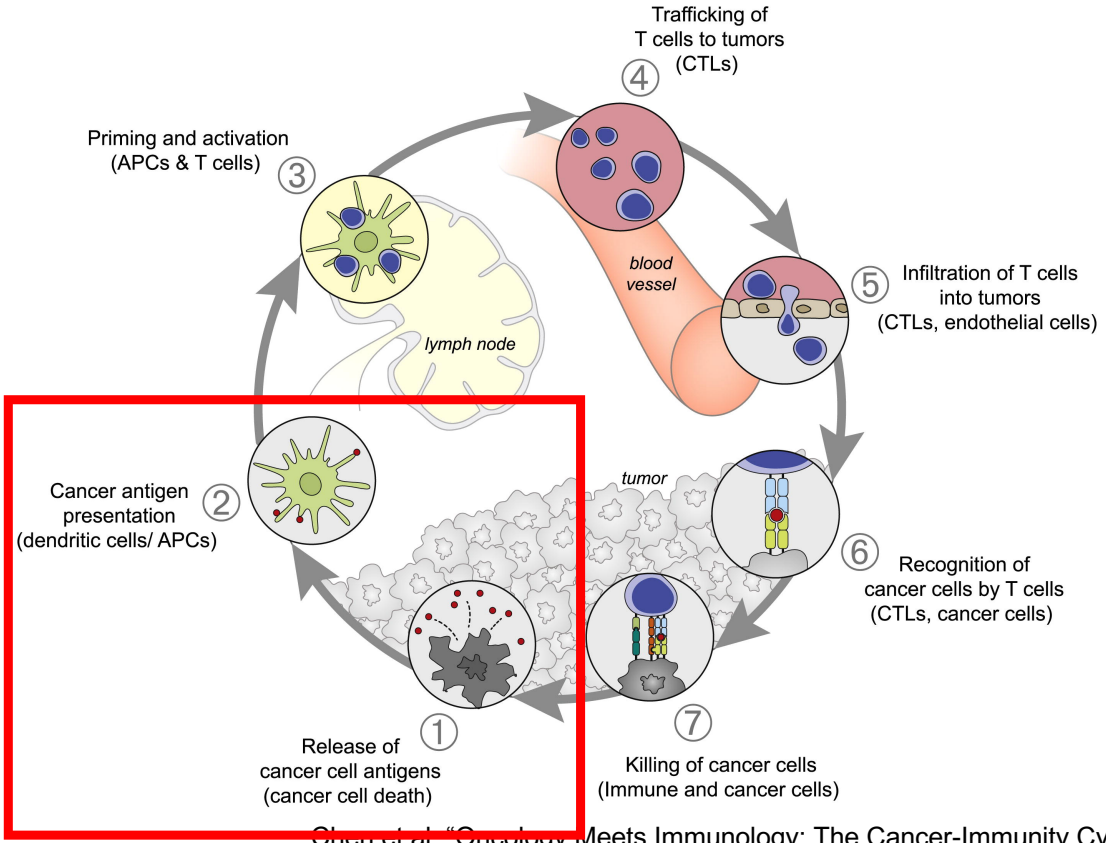
Cancer Immunity Cycle



Chen et al. "Oncology Meets Immunology: The Cancer-Immunity Cycle". *Immunity*, 39.1 (2013): 1-10.

Classes of Tumor Antigens

- Oncoviral
- Overexpression
- Germ cell
- Differentiation
- Mutations
- Abnormal posttranslational modification

Mechanisms of Immune Activation

Class of tumor antigen	Mechanism of immune activation
Germ cell	Normal expression found in immune-privileged sites (e.g. testis, placenta)
Differentiation	Antigen is expressed only in the tissue from which tumor arose
Overexpression	Level of expression in normal tissue is below threshold for T cell activation. Overexpression by cancer cells overrides tolerance.
Mutations and abnormal posttranslational modifications	A protein is generated that is foreign to the immune system
Oncoviral	Proteins associated with cancer-causing viruses (e.g. papillomaviruses implicated in cervical cancer)

Tumor Antigens: Mutations

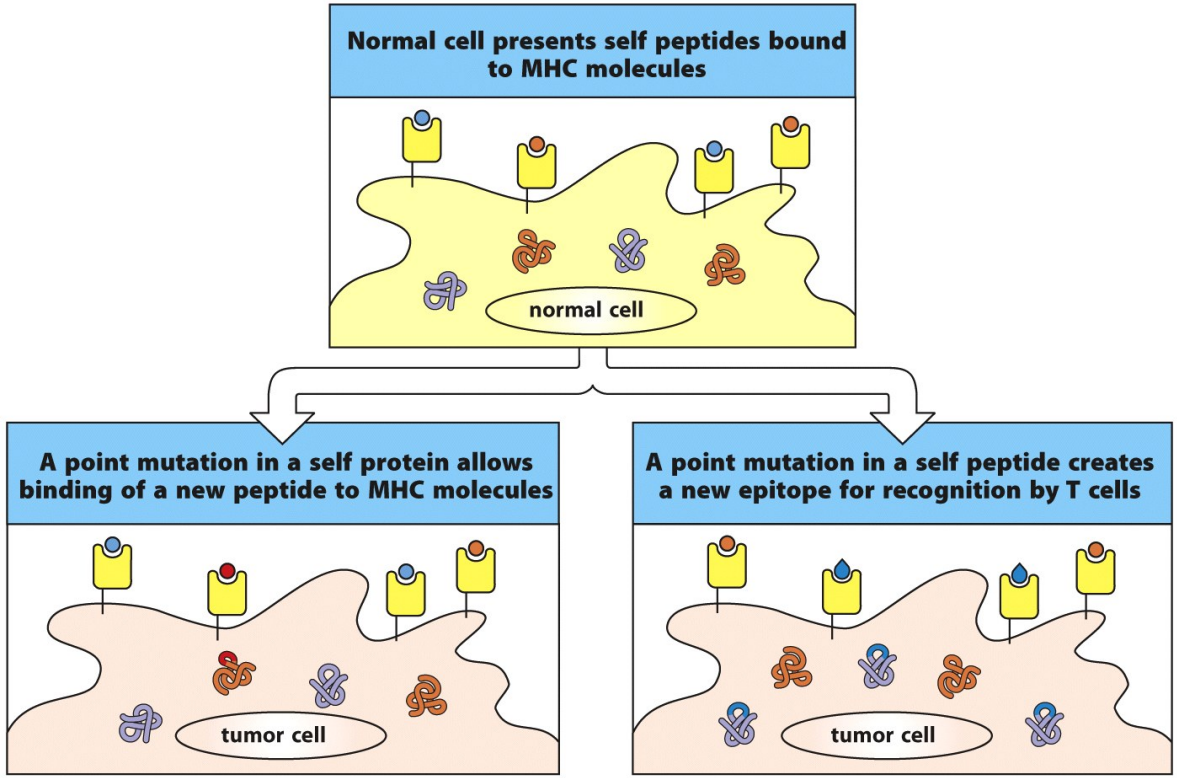
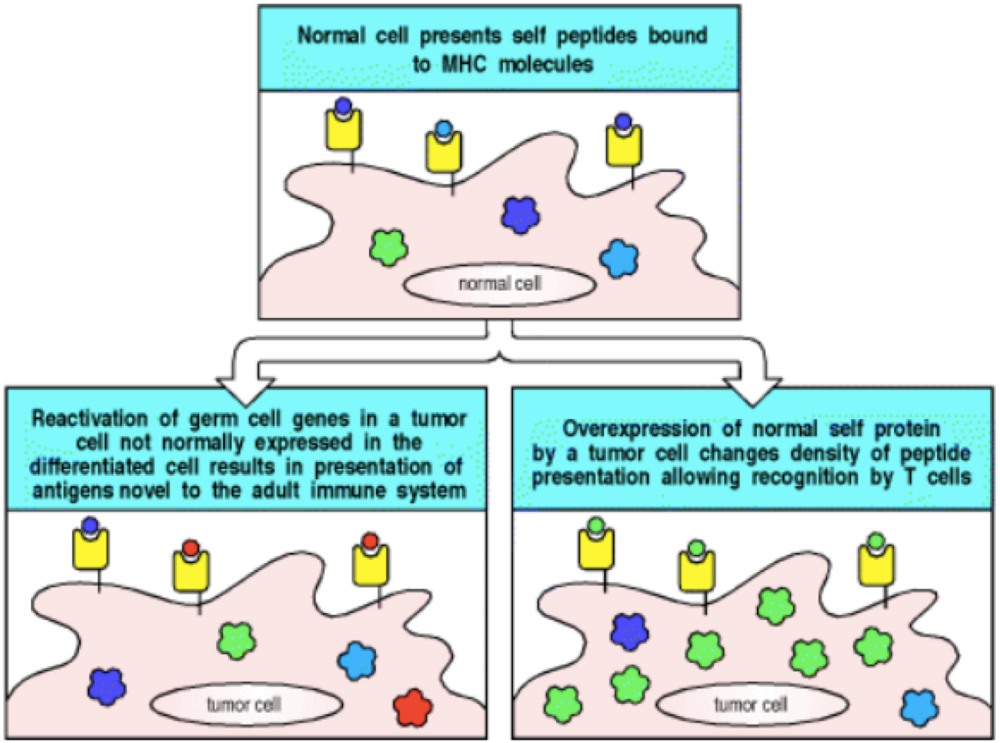


Figure 16.17 Janeway's Immunobiology, 8ed. (© Garland Science 2012)

Souce?

Tumor Antigens: Normal Genes



Janeway's Immunobiology (Garland Science 2012)

Tumor Antigen Examples

Potential tumor rejection antigens have a variety of origins			
Class of antigen	**Antigen**	**Nature of antigen**	**Tumor type**
Tumor-specific mutated oncogene or tumor suppressor	Cyclin-dependent kinase 4	Cell-cycle regulator	Melanoma
	β-Catenin	Relay in signal transduction pathway	Melanoma
	Caspase 8	Regulator of apoptosis	Squamous cell carcinoma
	Surface Ig/ Idiotype	Specific antibody after gene rearrangements in B-cell clone	Lymphoma
Cancer-testis antigens	MAGE-1 MAGE-3 NY-ESO-1	Normal testicular proteins	Melanoma Breast Glioma
Differentiation	Tyrosinase	Enzyme in pathway of melanin synthesis	Melanoma

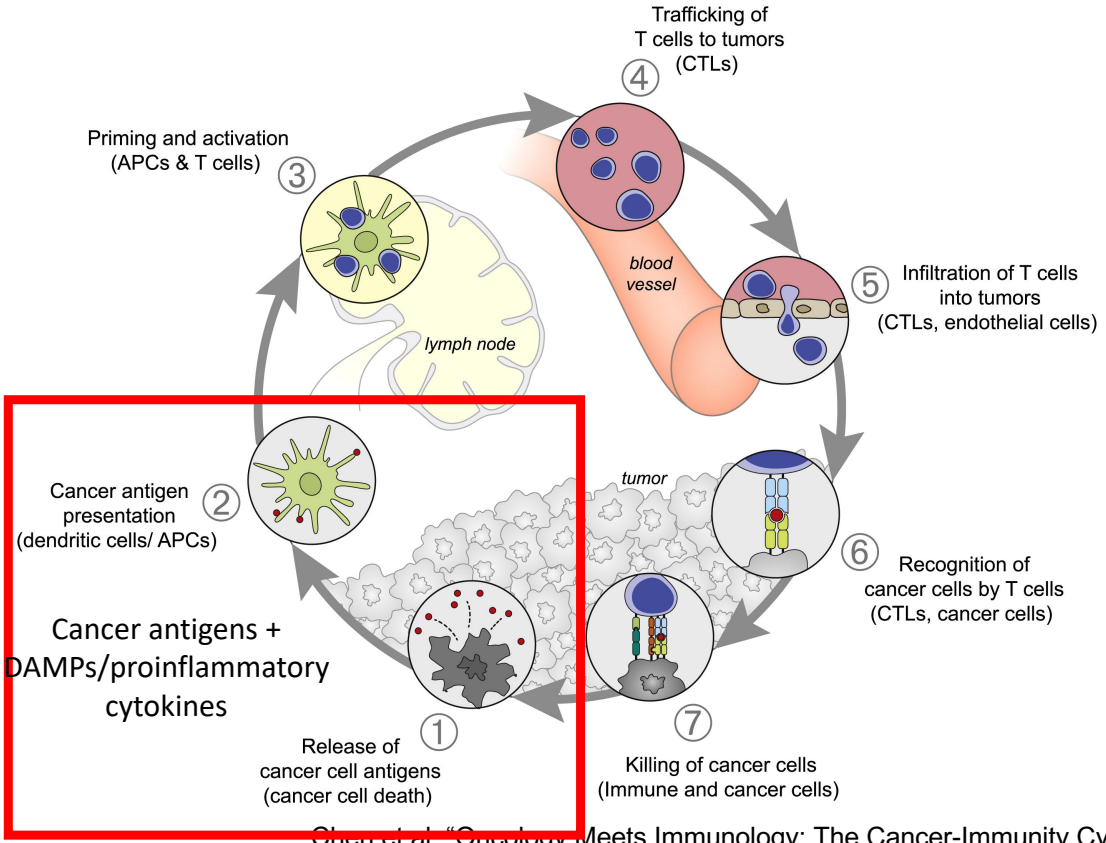
Figure 16.16 part 1 of 2 Janeway's Immunobiology, 8ed. (© Garland Science 2012)

Tumor Antigen Examples

Potential tumor rejection antigens have a variety of origins			
Class of antigen	**Antigen**	**Nature of antigen**	**Tumor type**
Abnormal gene expression	HER-2/neu	Receptor tyrosine kinase	Breast Ovary
	Wilms' tumor	Transcription factor	Leukemia
Abnormal post-translational modification	MUC-1	Underglycosylated mucin	Breast Pancreas
Abnormal post-transcriptional modification	GP100 TRP2	Retention of introns in the mRNA	Melanoma
Oncoviral protein	HPV type 16, E6 and E7 proteins	Viral transforming gene products	Cervical carcinoma

Figure 16.16 part 2 of 2 Janeway's Immunobiology, 8ed. (© Garland Science 2012)

Cancer Immunity Cycle



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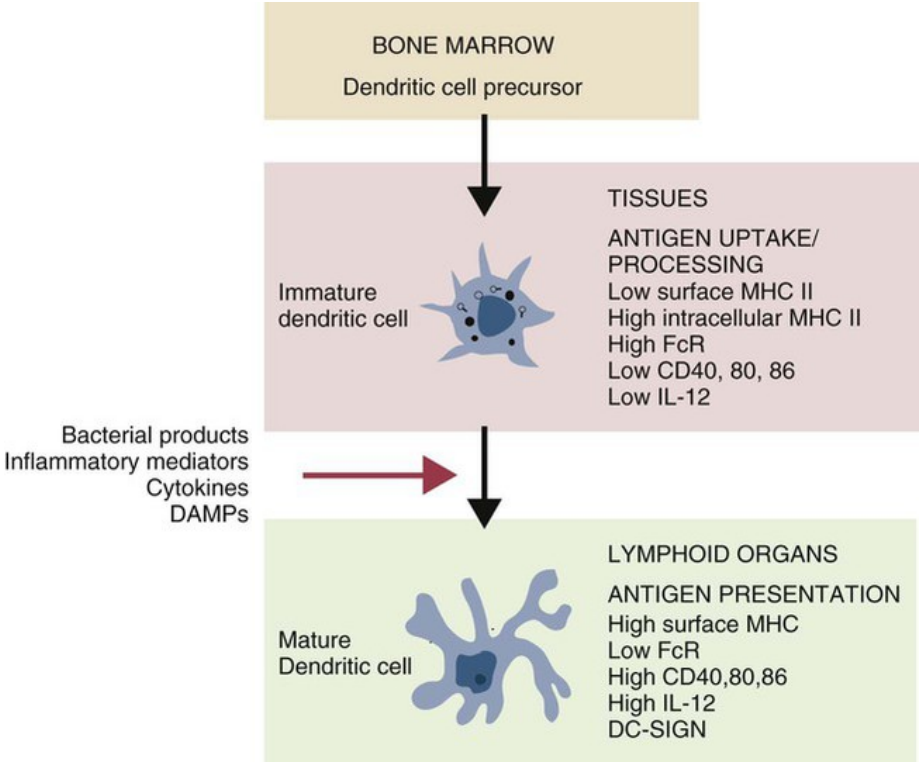
Dendritic Cell Maturation



https://veteriankey.com/dendritic-cells-and-antigen-processing/