




**BEATING
CANCER
IS IN
OUR BLOOD.**

**UNDERSTANDING NOVEL TREATMENT
OPTIONS FOR LYMPHOMA:
TREATMENT OPTIONS BEYOND
CHEMOTHERAPY**




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**UNDERSTANDING NOVEL TREATMENT OPTIONS FOR LYMPHOMA:
TREATMENT OPTIONS BEYOND CHEMOTHERAPY**

Jonas Paludo, MD
*Assistant Professor of Medicine and
Oncology*
Mayo Clinic
Rochester, MN

BEATING CANCER IS IN OUR BLOOD.



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UNDERSTANDING NOVEL TREATMENT OPTIONS

TREATMENT OPTIONS BEYOND CHEMOTHERAPY



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LEARNING OBJECTIVE

1. Timeline of Cancer Treatment Development
2. Immune System & Cancer
3. Immunotherapy

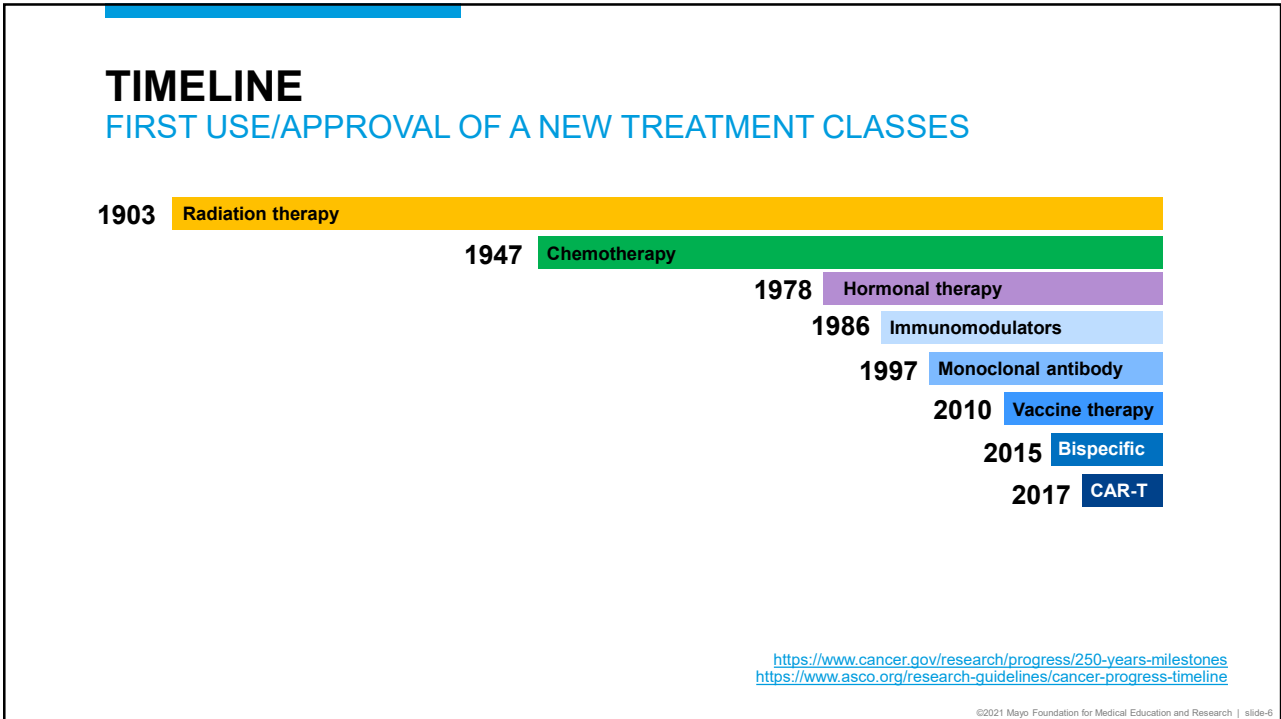
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1 TIMELINE OF CANCER TREATMENT DEVELOPMENT

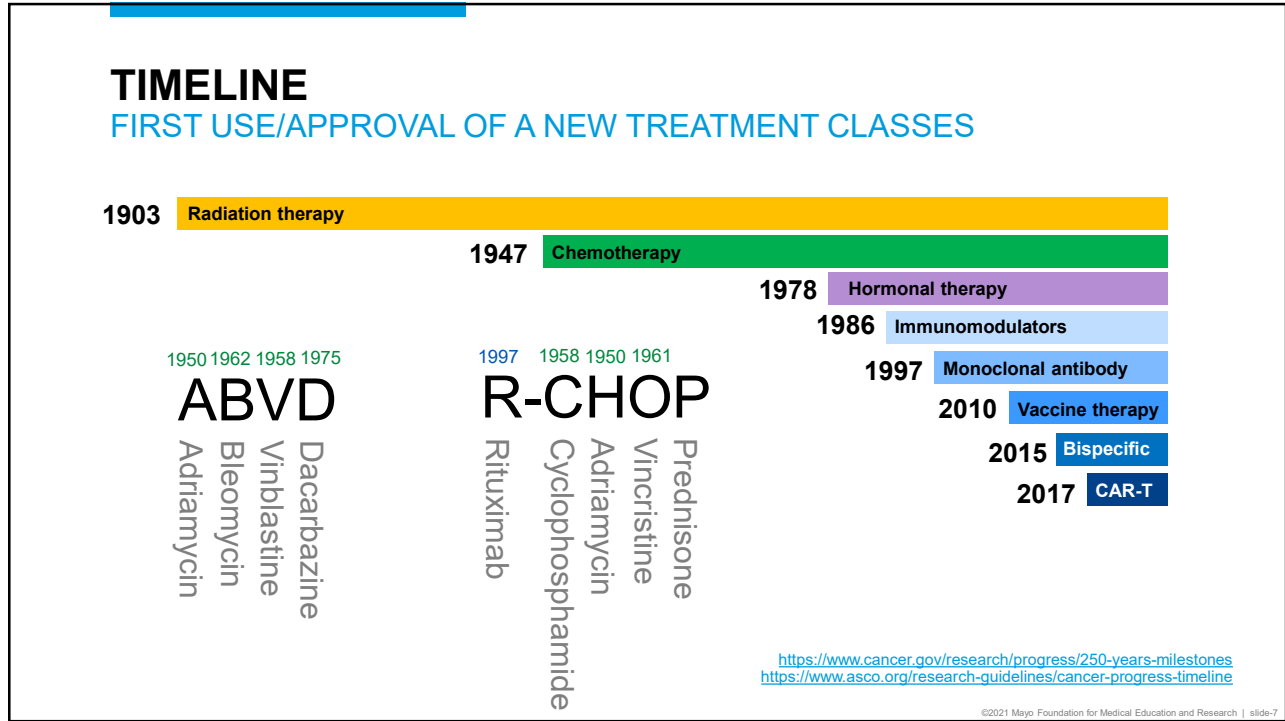
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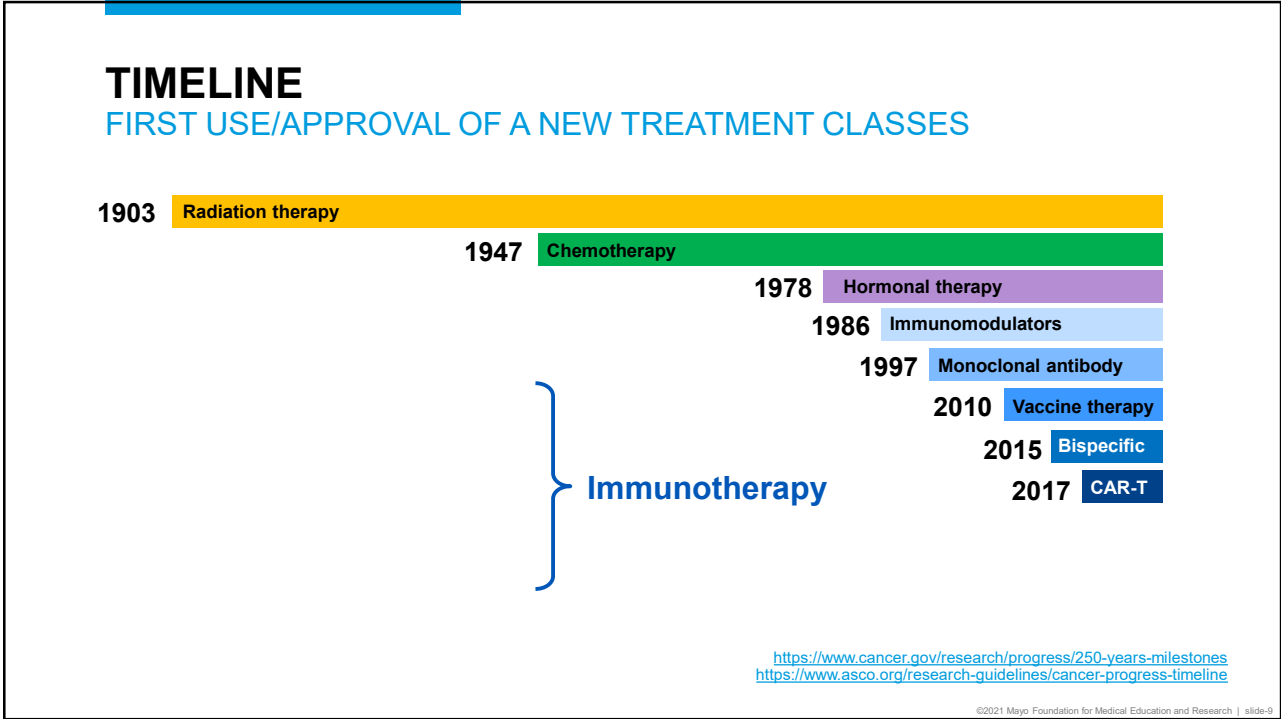
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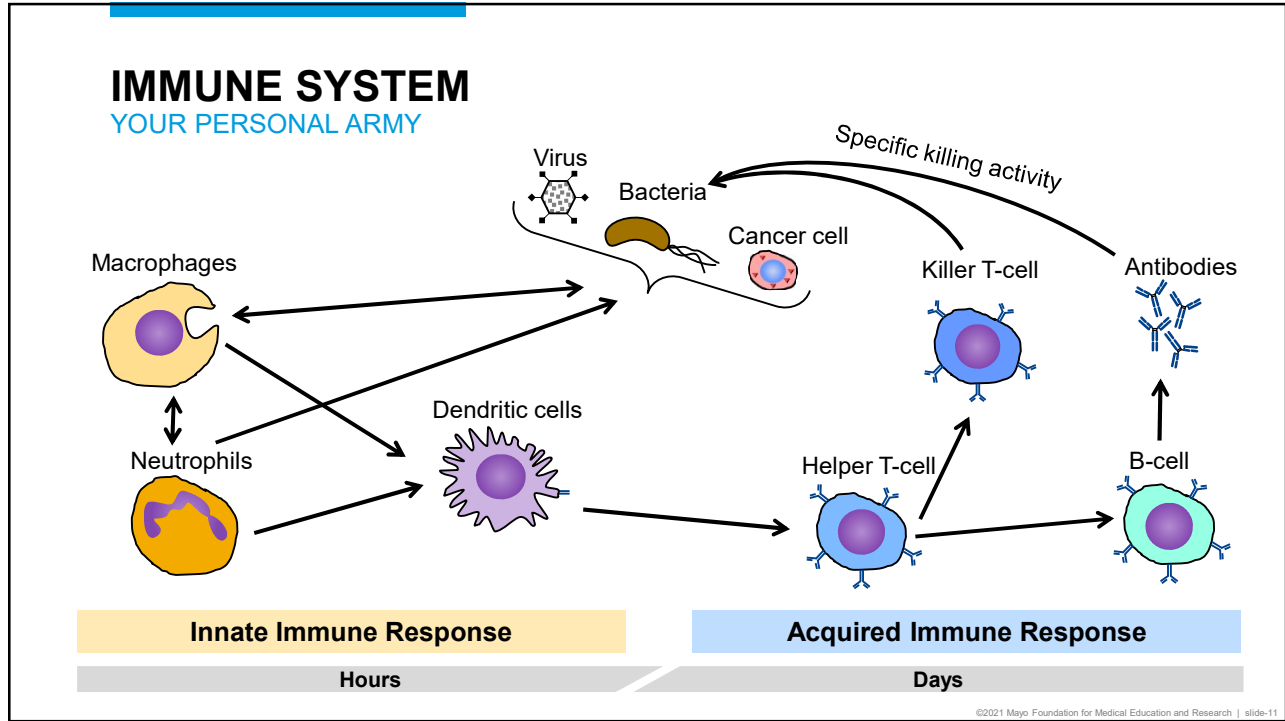


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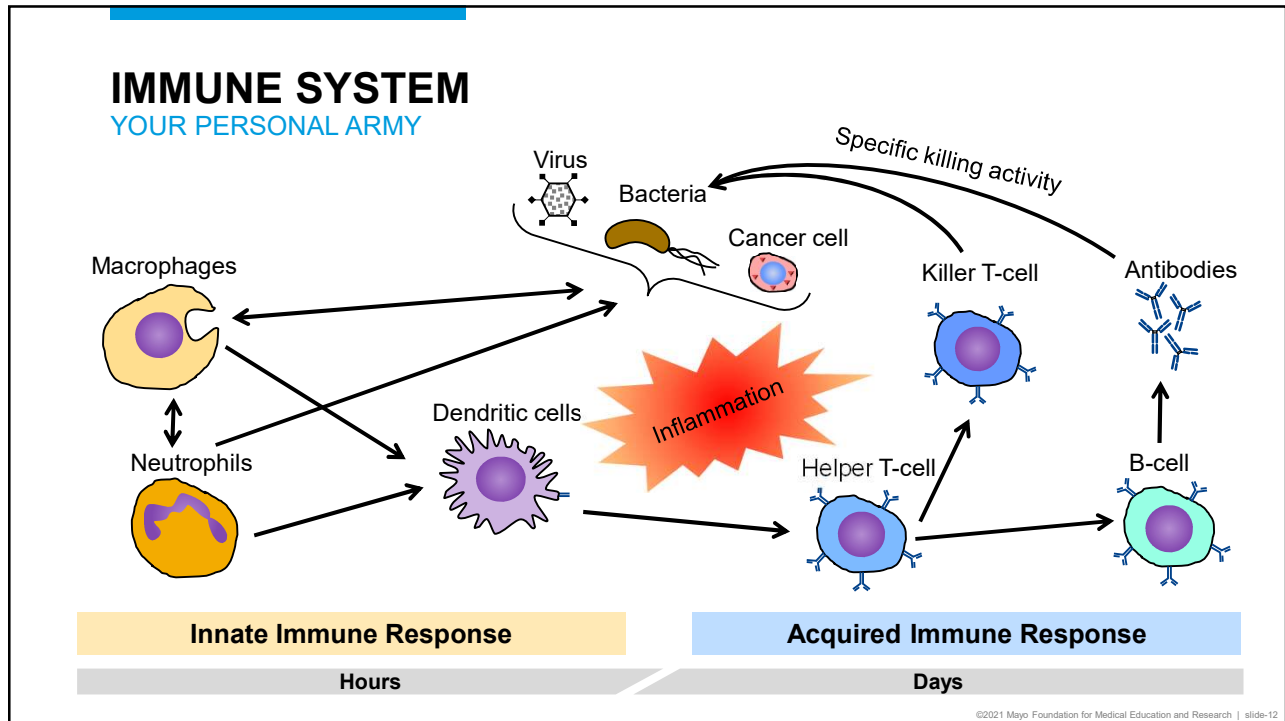
2 IMMUNE SYSTEM & CANCER: A BATTLE BETWEEN GOOD AND EVIL

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IMMUNE SYSTEM

YOUR PERSONAL ARMY

- Constant fight against the enemy, fighting off cancer cells, virus, bacteria...
- **If the immune system is so effective, then why we develop cancer??**

Chen DS, Mellman I. Oncology meets immunology: the cancer-immunity cycle. *Immunity*. 2013 Jul 25;39(1):1-10. doi: 10.1016/j.immuni.2013.07.012. PMID: 23890059.

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CANCER IMMUNE EVASION

HOW CANCER GETS AWAY

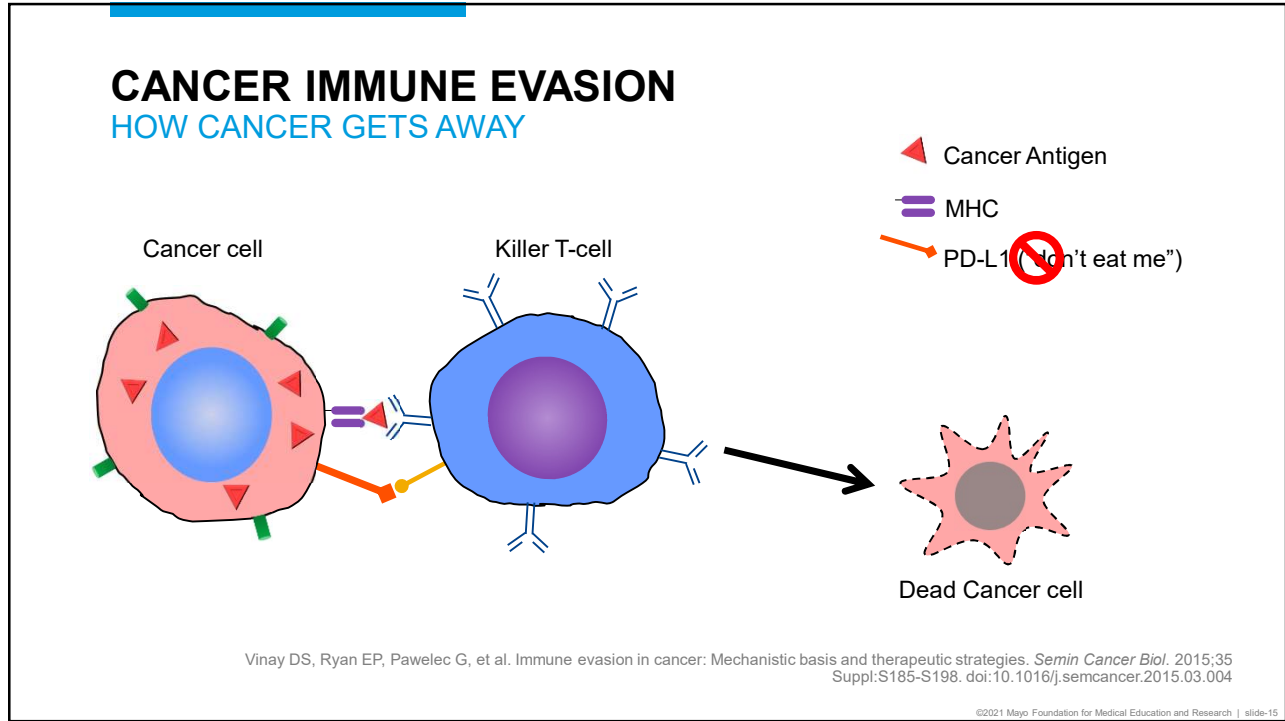
- Strategies of immune evasion
 - Immune suppression
 - Cancer-produced cytokines
 - Inhibitory molecules (“don’t eat me” signal)
 - Loss of tumor antigen
 - Loss of MHC* or antigen processing machinery

*MHC: Major histocompatibility complex

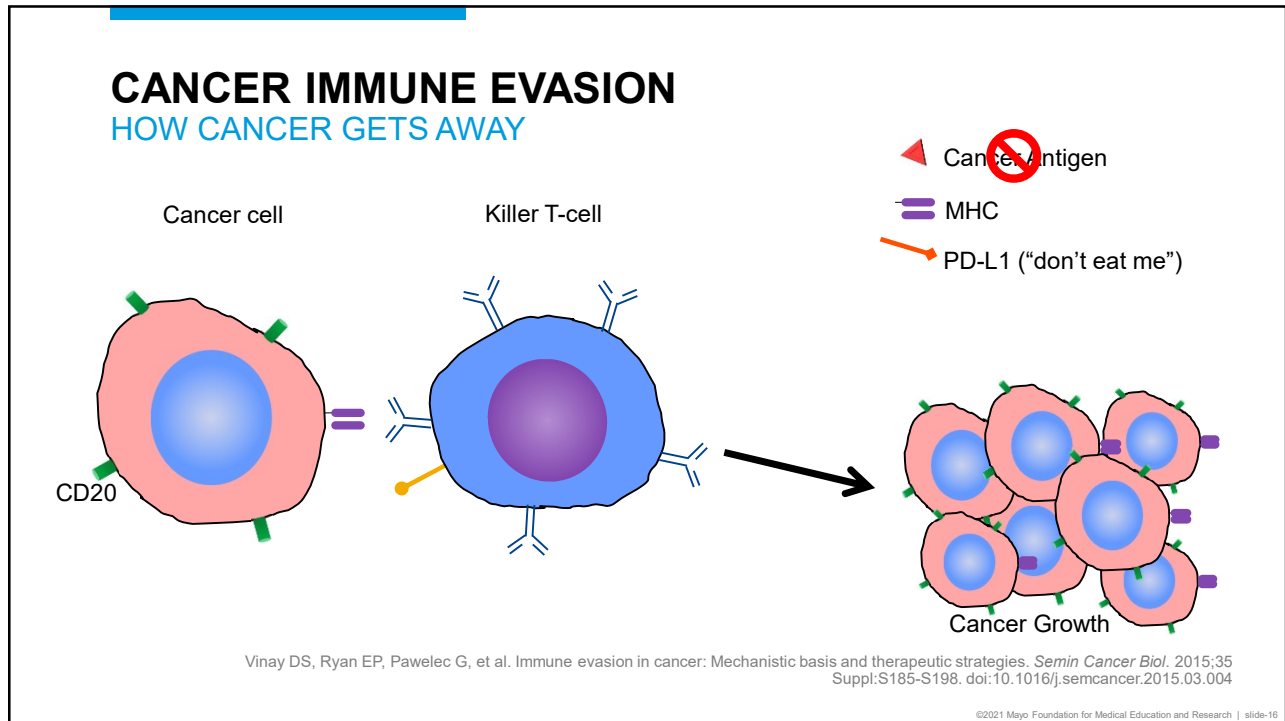
Vinay DS, Ryan EP, Pawelec G, et al. Immune evasion in cancer: Mechanistic basis and therapeutic strategies. *Semin Cancer Biol*. 2015;35 Suppl:S185-S198. doi:10.1016/j.semcancer.2015.03.004

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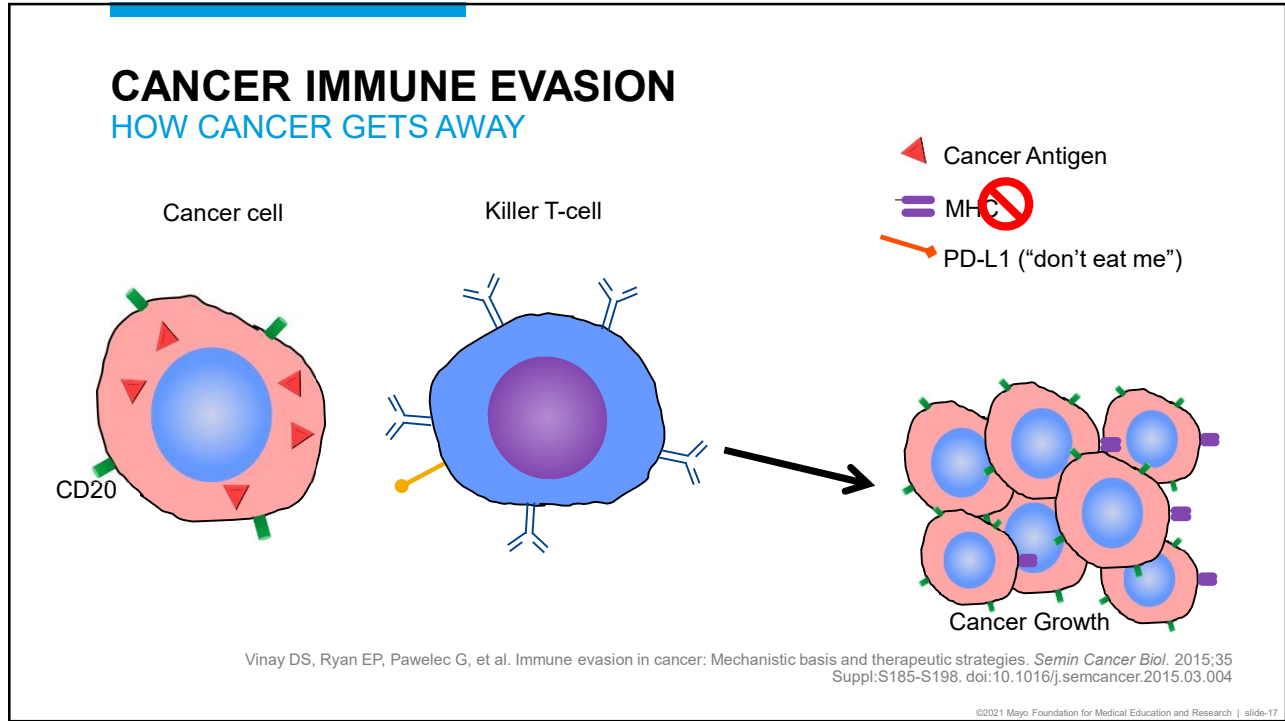
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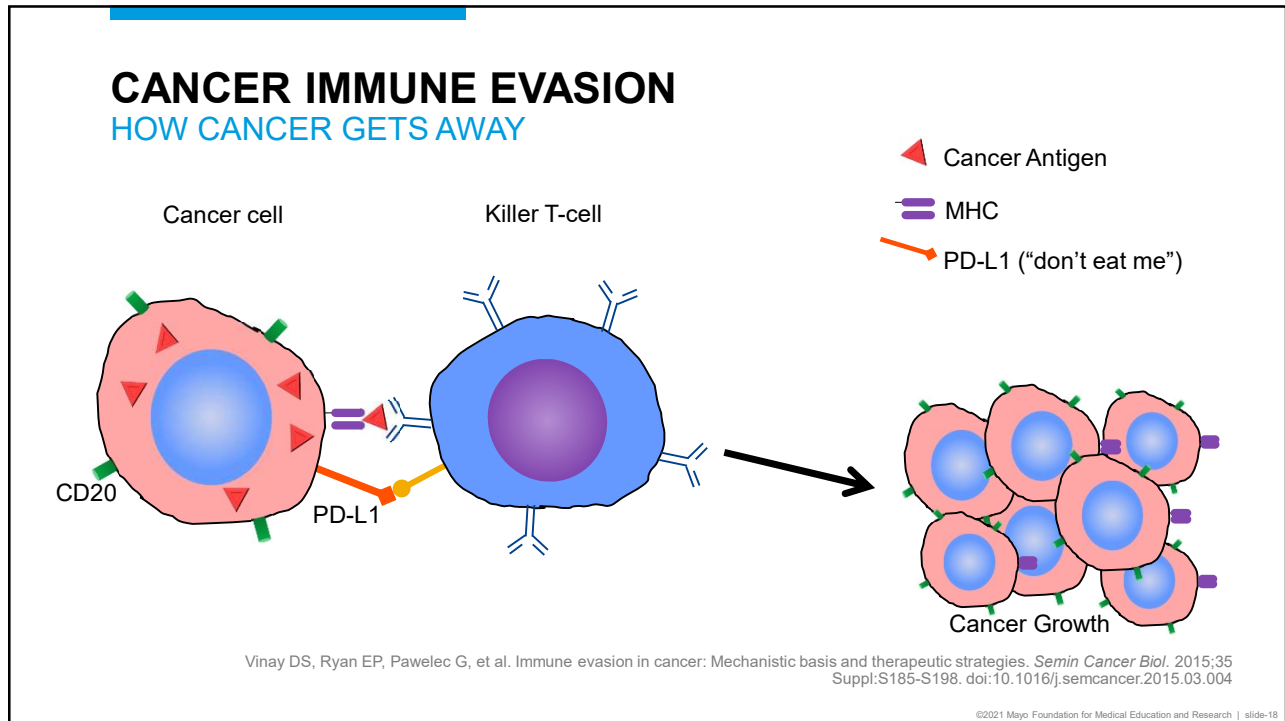
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IMMUNOTHERAPY: ENHANCING YOUR IMMUNE SYSTEM TO FIGHT CANCER

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IMMUNOTHERAPY CLASSES

1. Antibody-based therapies
2. Immunomodulators
3. Cell-based therapies
4. Vaccines
5. Oncolytic viruses

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IMMUNOTHERAPY CLASSES

1. Antibody-based therapies
 - a. "Naked" antibodies
 - b. Antibody-drug conjugates
 - c. Bispecific antibodies
2. Immunomodulators
 - a. Check point inhibitors
 - b. Cytokines
3. Cell-based therapies
 - a. CAR-T cell therapy
 - b. Tumor-infiltrating lymphocytes
 - c. Natural Killer cell therapy

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IMMUNOTHERAPY CLASSES

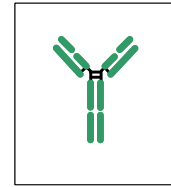
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ANTIBODY-BASED THERAPIES

"NAKED" ANTIBODIES



- Targeted monoclonal antibodies
- Binds to a specific target on cells signaling to immune system to destroy it.
 - Immune-mediated killing

Drug	Target
Rituximab, obinutuzumab, ofatumumab	CD20
Tafasitamab	CD19
Alemtuzumab	CD52

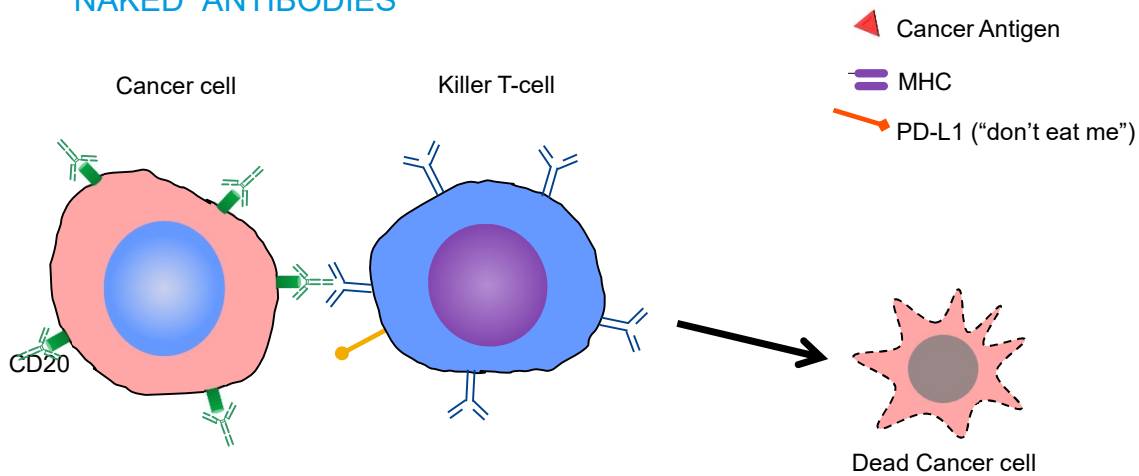
Novo, Mattia et al. "Antibody Therapies for Large B-Cell Lymphoma." *Biologics : targets & therapy* vol. 15 153-174. 18 May. 2021. doi:10.2147/BTT.S281618

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ANTIBODY-BASED THERAPIES

"NAKED" ANTIBODIES

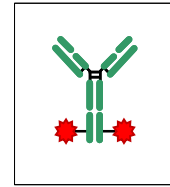


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ANTIBODY-BASED THERAPIES

ANTIBODY-DRUG CONJUGATES



- Targeted antibody carrying an anti-cancer drug
- Monoclonal antibody = delivery system, specific to a cancer cell type
- Chemotherapy drug = payload, kills the cancer cell

Drug	Target / Anti-cancer drug
Brentuximab vedotin	CD30 / MMAE
Polatuzumab vedotin	CD79b / MMAE
Loncastuximab tesirine	CD19 / PBD dimer

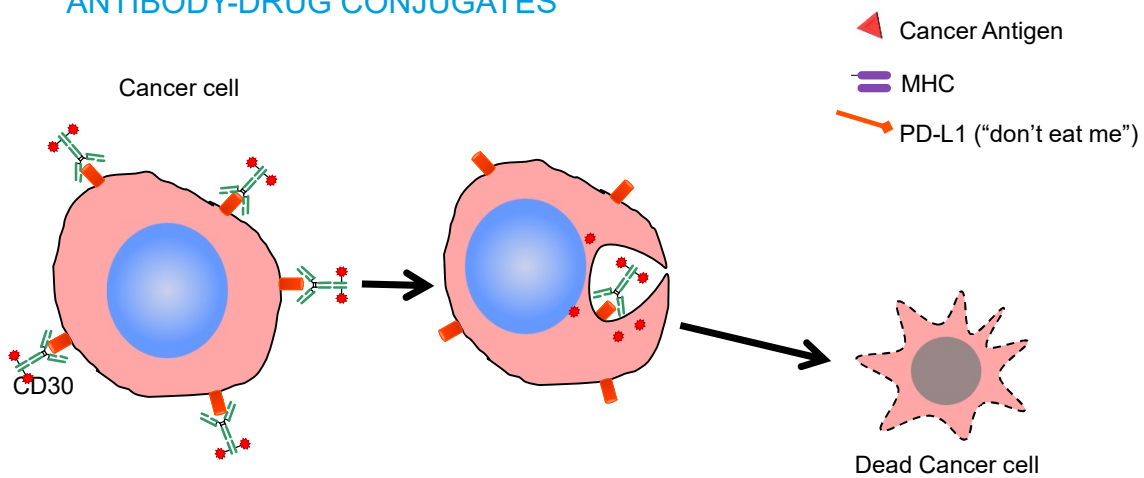
Chu, Yurou et al. "Antibody-drug conjugates for the treatment of lymphoma: clinical advances and latest progress." *Journal of hematology & oncology* vol. 14,1 88. 5 Jun. 2021, doi:10.1186/s13045-021-01097-z

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ANTIBODY-BASED THERAPIES

ANTIBODY-DRUG CONJUGATES

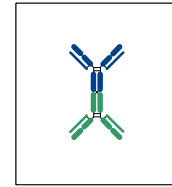


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ANTIBODY-BASED THERAPIES

BISPECIFIC ANTIBODIES



- 2 targeted antibodies combined
- Attached to 2 different targets at the same time.
 - Connect an immune cell to a cancer cell, leading the immune cell to destroy the cancer cell

Drug	Target / Target
Blinatumomab	CD19 / CD3

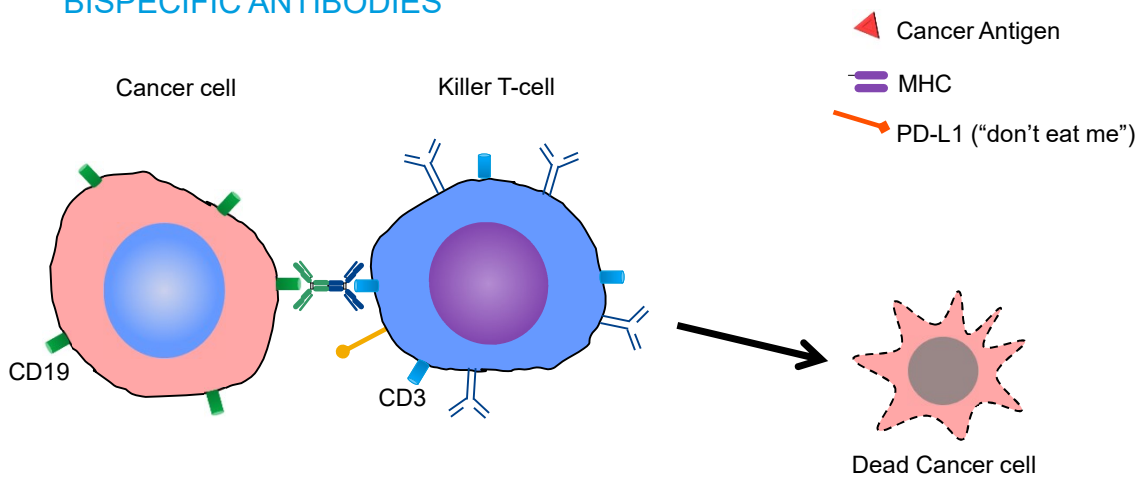
Khattak, Z.E., Hashmi, H., Khan, S.I. *et al.* Dawn of a new era of antibody-drug conjugates and bispecific T-cell engagers for treatment of multiple myeloma: a systematic review of literature. *Ann Hematol* (2021). <https://doi.org/10.1007/s00277-021-04599-5>

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ANTIBODY-BASED THERAPIES

BISPECIFIC ANTIBODIES

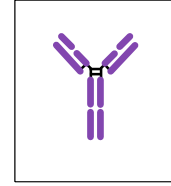


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IMMUNOMODULATORS

CHECK POINT INHIBITORS



- Antibody that blocks the “don’t eat me” signal (or the “breaks” of the immune system)
- Cancer cells can shut down the immune cells by expressing “don’t eat me” signals
 - CTLA-4, PD-L1/PD-1

Drug	Target
Nivolumab	PD-L1/PD-1
Pembrolizumab	PD-L1/PD-1
Ipilimumab	CTLA4

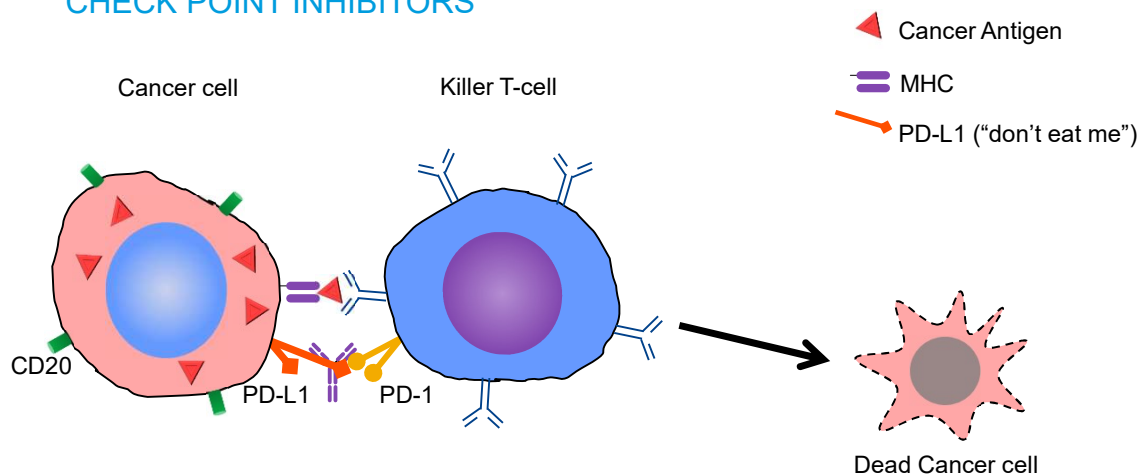
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IMMUNOMODULATORS

CHECK POINT INHIBITORS

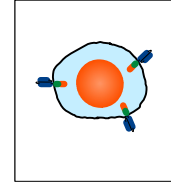


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CELL-BASED THERAPIES

CAR-T CELL THERAPY



- T-cell (immune cell) modified to target a specific cancer marker
- CAR-T cells bypass several evasion mechanisms from cancer cells
 - It's an “army division” in a bottle

Drug	Target
Axicabtagene Ciloleucel	CD19
Brexucabtagene Autoleucel	CD19
Lisocabtagene Maraleucel	CD19
Tisagenlecleucel	CD19
Idecabtagene vicleucel	BCMA

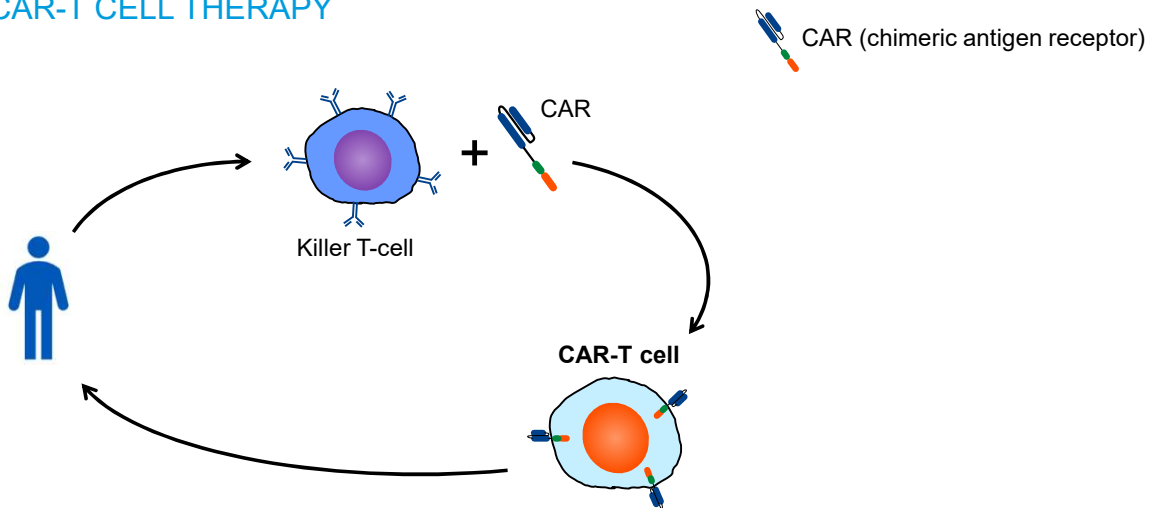
Guedan, Sonia et al. "Emerging Cellular Therapies for Cancer." *Annual review of immunology* vol. 37 (2019): 145-171. doi:10.1146/annurev-immunol-042718-041407

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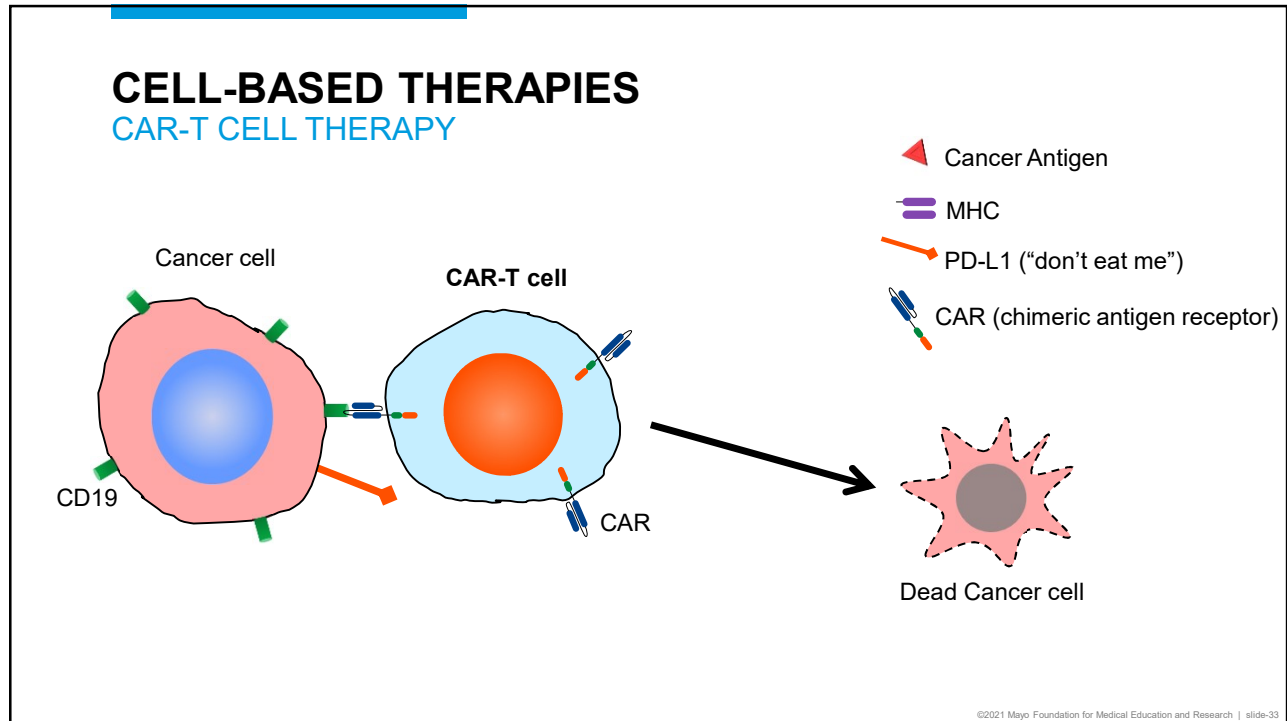
CELL-BASED THERAPIES

CAR-T CELL THERAPY



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SUMMARY

1. Timeline of Cancer Treatment Development
2. Immune System & Cancer evasion
3. Immunotherapy
 1. Antibody-based therapy
 2. Check point inhibitors
 3. CAR-T cell therapy

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THANK YOU



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QUESTIONS & ANSWERS
With Dr. Paludo

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LEUKEMIA & LYMPHOMA SOCIETY®

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LLS EDUCATION & SUPPORT RESOURCES

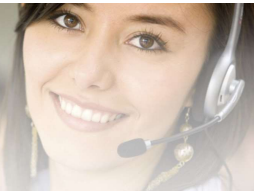
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Chat live online: www.LLS.org/InformationSpecialists
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BEATING CANCER IS IN OUR BLOOD.

Sexuality and Intimacy Facts
No. 14 • A cancer diagnosis can cause embarrassment for patients, caregivers and their loved ones.

Cancer and Sexuality
Sexuality-related concerns are often less than physical aspects of your disease or treatment, such as weight changes and hair loss. However, these concerns can affect your quality of life. Some physical or emotional effects include: • sex drive or libido, sometimes only. Other effects may be long-lasting. And some may not appear until you're no longer under treatment.

How to Get Help
• You may feel depressed, anxious or have trouble in your relationship.
• You may feel embarrassed or afraid that others will judge you.
• You may have trouble in the bedroom or in the privacy of your home.
• You may have trouble in the bedroom or in the privacy of your home.
• You may have trouble in the bedroom or in the privacy of your home.

BOOKLETS
Find Fact Sheets on Sexuality, along with other important subjects for Patients and Caregivers.
www.LLS.org/Booklets.



THANK YOU

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We have one goal: A world without blood cancers