



Latest Advances in Medical Oncology

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Discussion Topics

- Immunotherapy (preceded by principals of immunity)
- Genetically engineered treatment: CAR T cellular Therapy
- BITE (Bi specific antibodies)-infusion
- Oral targeted Drugs aka Oral Chemotherapy
- Cancer Vaccines
- Concept of Precision Medicine

Immune System

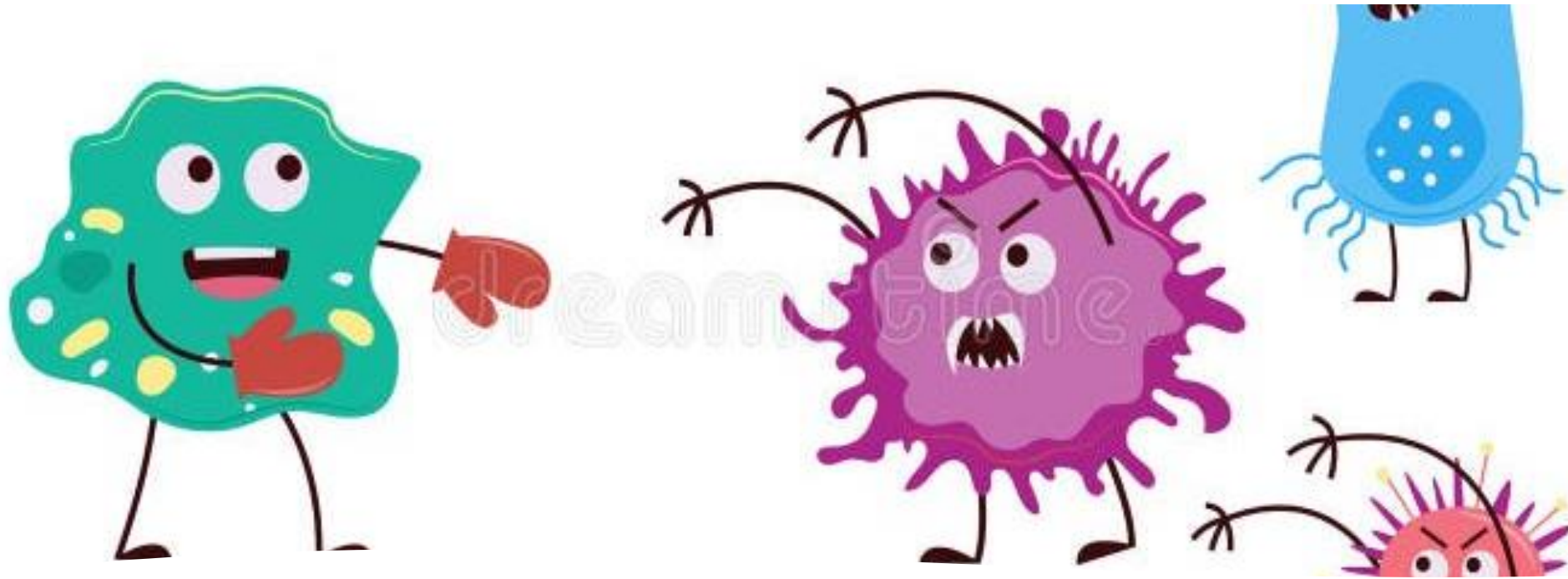


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- **We all have an Immune system**
- **It is our body's defense system**
- **Our body is attacked by many germs and environmental insults daily**
- **We are all born with some immunity from birth**

Immune system

- **What does the immune system do?**
- Your immune system works hard to keep you healthy. It does this by:
- Keeping invaders (like [germs](#)) out of your body.
- Destroying invaders.
- Limiting how much harm the invaders can do if they're inside your body.
- Healing damage to your body.
- Adapting to new challenges and threats.



How does the immune system work ?

- Learns about germs after you've had contact with them and develops [antibodies](#) against them.
- Sends out antibodies to destroy germs that try to enter your body in the future.

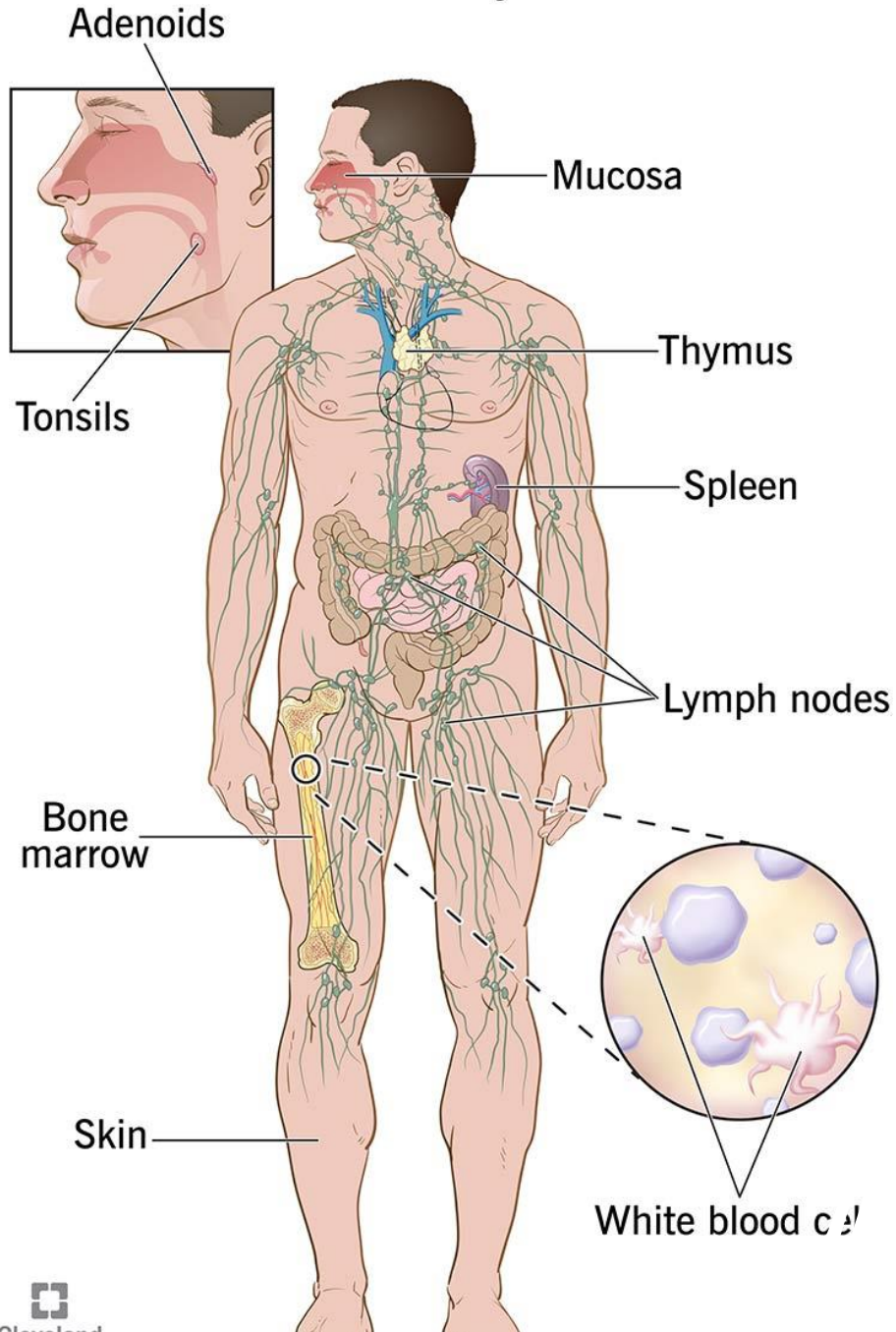
Examples of Invaders

- Invaders your immune system protects you against include:
- Bacteria.
- Viruses.
- Fungi that can cause infections.
- Parasites.
- Cancer cells
- Environmental toxins/fumes/gases/warfare related exposures

How does the immune system work?

- When your immune system is working properly, it:
- Tells the difference between cells that are yours and those that don't belong in your body. SELF vs FOREIGN
- Activates and mobilizes to kill germs that may harm you.
- Ends an attack once the threat is gone.

Immune System



What part of your body makes up the Immune System?

Thymus is a small organ in your chest that produces T cells.

Innate Immunity

- **INNATE** immunity is protection that you're born with.
- Your **innate** immune system is part of your body's first-line defense.
- It responds to invaders right away by attacking any organism that shouldn't be in your body.
- It does not need prior training to tell the difference between cells that belong in your body and those that don't.

Innate Immunity has shortcomings

- The white blood cells involved in **innate immunity** don't learn to recognize certain invaders
- They have no memory
- That's where **acquired immunity** comes into play

Acquired Immunity

- **Acquired immunity**, also called adaptive immunity, is protection your body gains (acquires) over time from exposure to germs.
- Certain white blood cells called **lymphocytes** remember specific invaders and can tell when they don't belong in your body.
- So, if those invaders try to get in again, the lymphocytes can quickly spring into action and work with other cells to eliminate the threat.



**Immunotherapy
in Cancer**

IMMUNOTHERAPY

- We all have the ability to activate our immune cells -mainly T cells lymphocytes to kill cancer.
- Cancer cells escape T cells is by sending false signals to immune cell “checkpoints” to make themselves look harmless.
- A class of drugs known as **immune checkpoint inhibitors** block these false signals, so the immune system isn't tricked into ignoring tumors.

Several drugs have been approved for Immunotherapy

KEYTRUDA[®]
(pembrolizumab) Injection 100 mg



**AN IMMUNOTHERAPY THAT
MAY HELP FIGHT YOUR CANCER.
IT'S TRU. **KEYTRUDA.****



Opdivo[®]
(nivolumab)
injection

40 mg/4 mL
(10 mg/mL)

For Intravenous Infusion Only
Single-dose vial; Discard unused portion.
Please provide enclosed Medication
Guide to the patient.


 Bristol-Myers Squibb



YERVOY[®]
(ipilimumab)
Injection

50 mg/10 mL
(5 mg/mL)

For Intravenous Infusion Only
Single-use vial; Discard unused portion

 Bristol-Myers Squibb



How is immunotherapy given?

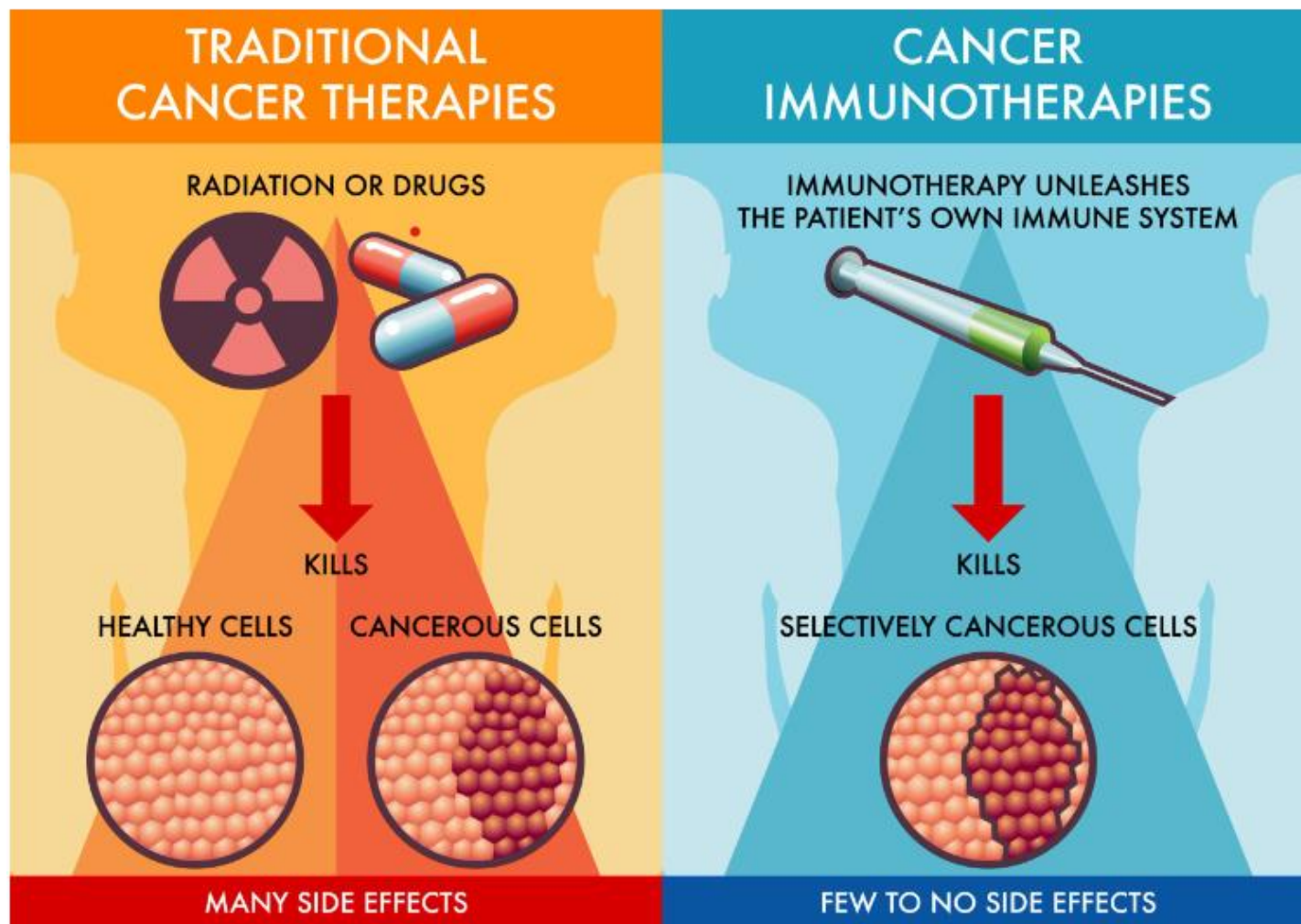
- In your medical oncologist's office – it is given intravenously

Immunotherapy Trivia

- This discovery was so important that, in 2018, American immunologist James P. Allison and Japanese immunologist Tasuku Honjo were jointly awarded the Nobel Prize for their work that led to the development of checkpoint inhibitors.

Advantages of Immunotherapy

- Breakthrough!!
- Phenomenal results
- Better handled/less side effects
- Quick infusion
- Given every few weeks

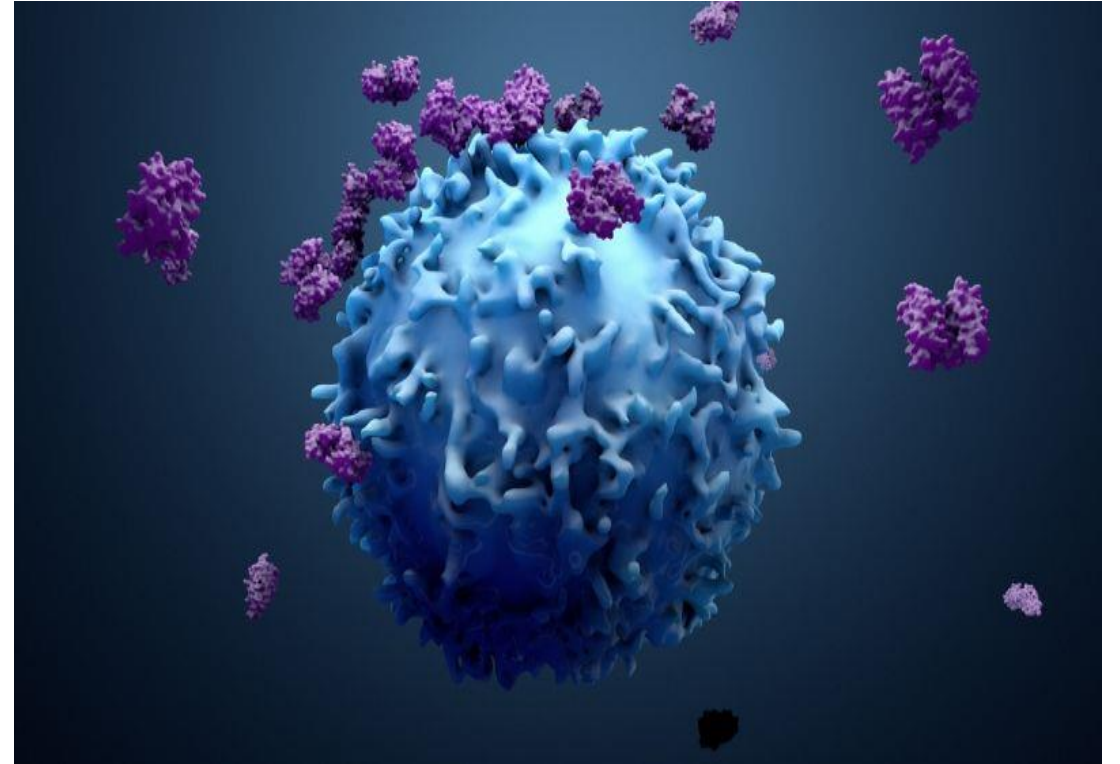


Downside of Immunotherapy

- Expensive (\$\$\$)
- Rare but life threatening side effects
- Necessity for trained providers

Immunotherapy is used for many cancers

- Lung
- Breast
- Throat
- Melanoma
- Colon and Stomach cancers
- Other skin cancers
- Kidney cancer
- Brain cancer



Immunotherapy

- Can Immunotherapy be used for any diseases apart from cancer?
- Research ongoing re use in metabolic diseases like diabetes, genetic disorders-like inherited blood disorders, heart diseases and regenerative medicine

Cellular Immunotherapy

- Another type of immunotherapy known as **cellular immunotherapy** uses the “Trojan horse” concept to overcome cancer.
- Immune cells are taken from a patient’s body- > modified in a lab and- > replaced back into their body. This helps the immune system to fight cancer.

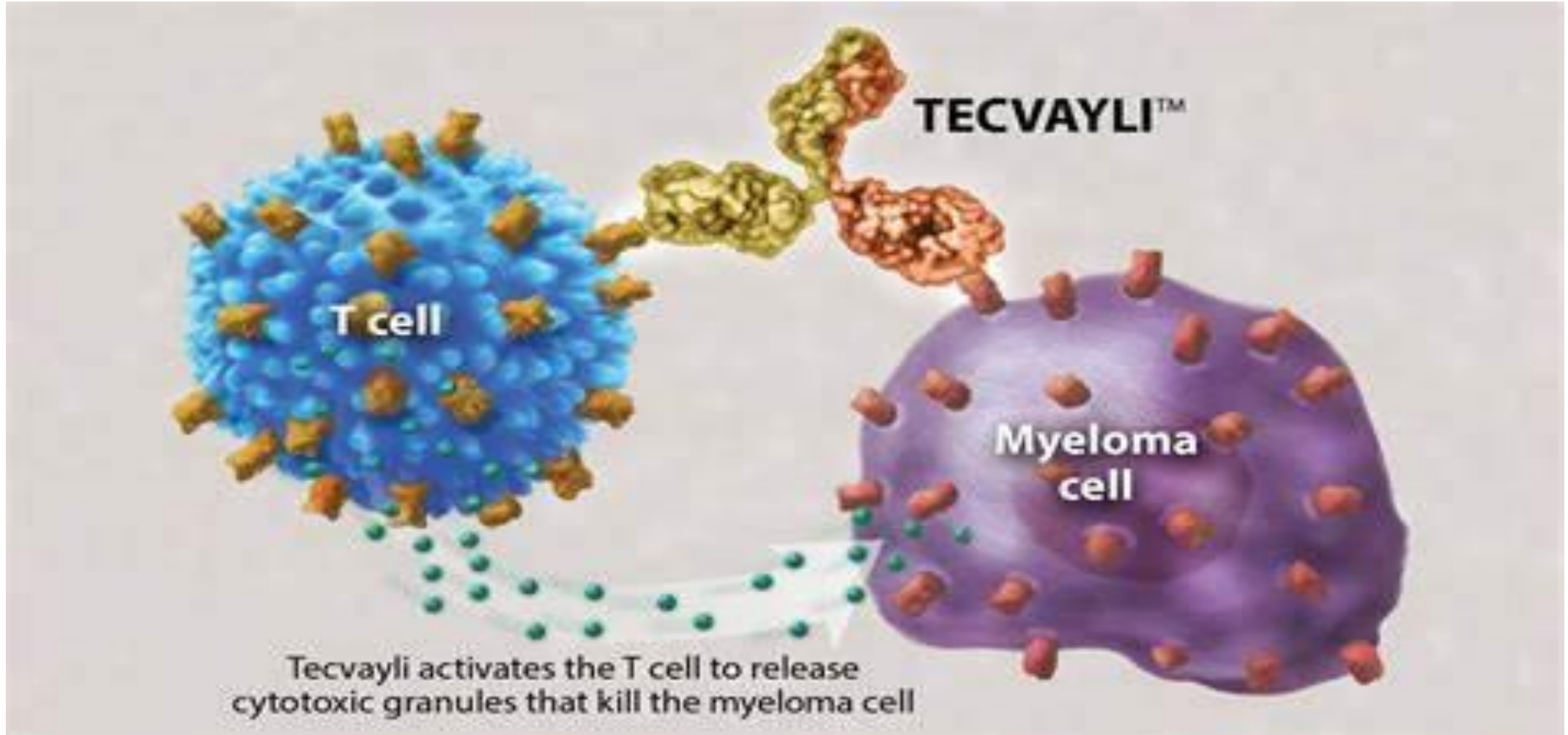
CAR T Cell Therapy

- Studied and approved for leukemia patients.
- It involves removing and genetically altering immune cells, called T cells, from cancer patients.
- The altered cells then produce proteins called chimeric antigen receptors (CARs), which can recognize and destroy cancer cells.
- In the journal *Nature*, scientists at the University of Pennsylvania announced that [two of the first people treated with CAR-T-cell therapy](#) were still in remission 12 years on!

BiTE therapy aka Bi-specific Antibodies

- Antibodies (immune cells) made artificially in the lab
- Infusion/ IV treatment in your oncologist's office
- This cancer drug binds to the receptors on surface of T cells and Cancer cells (at the same time) - > unleashes the T cell power and stimulates cancer cell destruction.

Bi-Specific Antibodies aka BiTE



BiTE Therapy

- Has some downsides:
- Given at bigger centers like Hershey or Johns Hopkins
- Has unique side effects
- Needs close monitoring in hospital- based setting with providers that are well trained.
- Expensive (\$\$\$)

BiTE Therapy

- Used for treatment of some blood cancers
- Multiple Myeloma & Lymphoma being the most common cancers
- Very successful
- Mostly used in cancers that relapse i.e that come back despite treatment.

ORAL ANTI-CANCER DRUGS-

- Inhibit important steps in cell cycle division
- TARGETED THERAPY- because it targets a precise step
- Tyrosine Kinase inhibitors- Used for CML (Chronic Myelogenous Leukemia- a common form for blood cancer)-example GLEEVEC, TASIGNA, SEMBLIX.
- CDK4/6 inhibitors: Used in BREAST cancer-Ibrance, Verzenio
- PARP inhibitors: Olaparib used in BREAST and OVARIAN CANCERS

ORAL DRUGS

- Tyrosine Kinase inhibitors: eg Sutent (used for KIDNEY cancer)
- Androgen receptor blocking drugs: Useful in PROSTATE cancer eg Darolutamide, Apalutamide, Xtandi, Zytiga etc
- Oral MEK inhibitors: Dabrafenib/Trametinib –used for MELANOMA, THYROID cancer

Cancer Vaccines

- Therapeutic - for treatment.
- Preventative: for prevention (eg HPV vaccines have role in preventing Cervical cancer).

Cancer Vaccines

PROVENGE

Used for metastatic/stage IV
Prostate Cancer

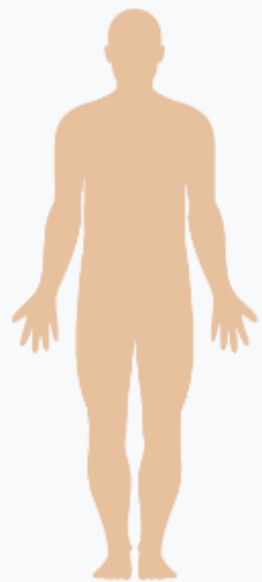
- Approved since 2010
- First cancer vaccine to be approved
- In clinical studies the men who received Provenge lived longer

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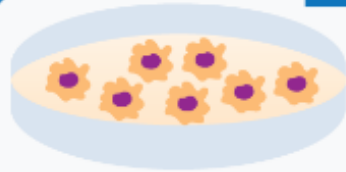
PROVENGE

- Needs specialized equipment and labs
- Given via infusion (not a shot)
- Expensive
- Not suitable for everyone

Blood sample
collected from
patient



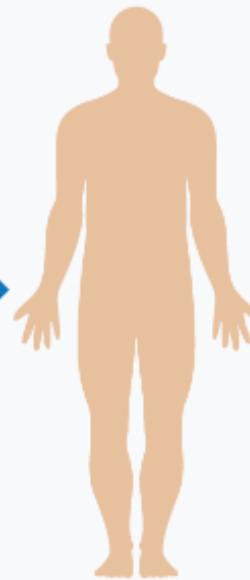
Immune cells
grown in the
laboratory



Antigen taken up by
the immune cells



Immune cells
infused



Immune system
attacks and
destroys the
tumour



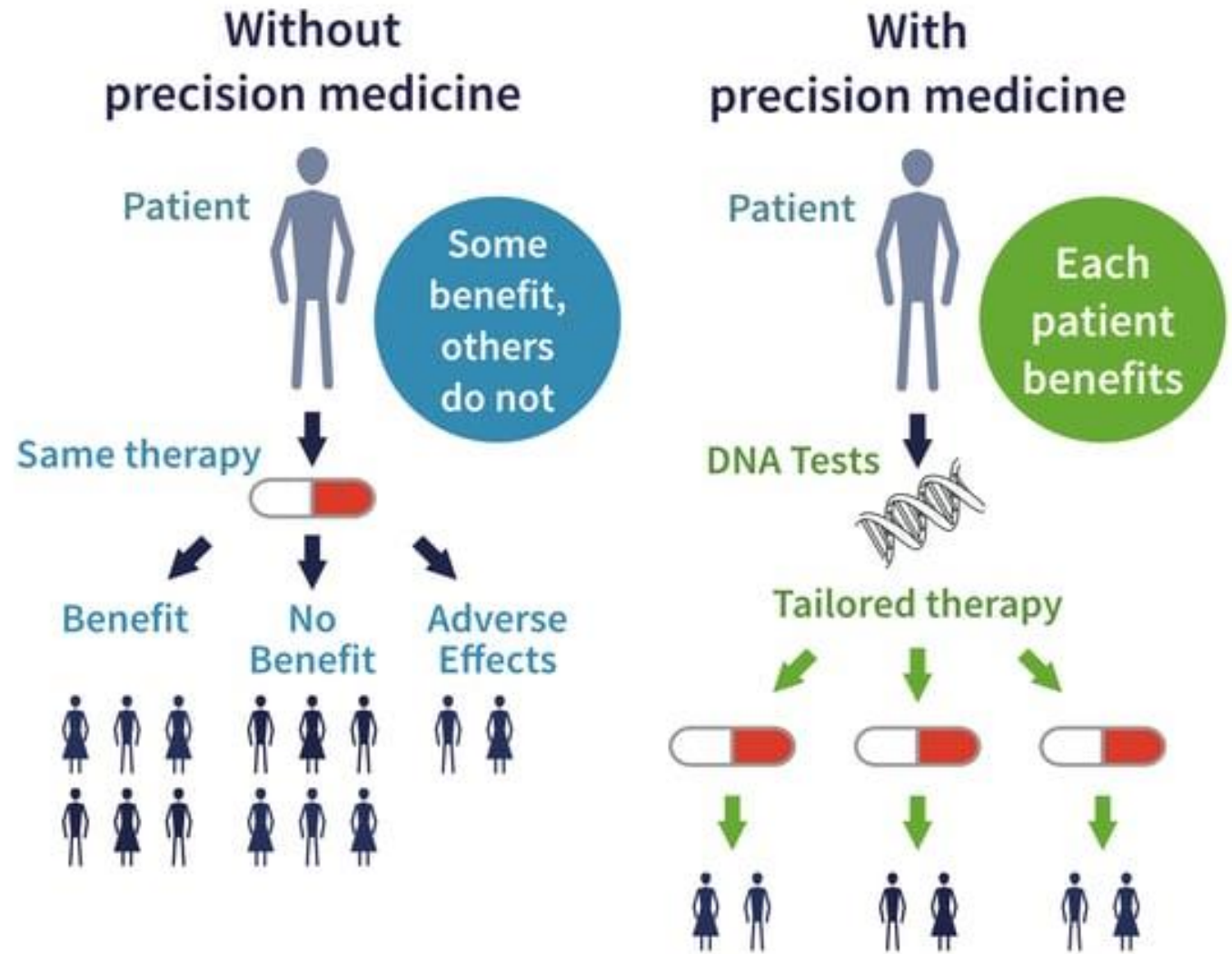
CANCER VACCINES under development

- Moderna and Merck are making vaccines against melanoma
- BioNTech is making Pancreatic Cancer Vaccine
- French Biotech company is making an ovarian cancer vaccine
- Vaccine against Lung Cancer- called TEDOPI- s being used/marketed in France/Italy and Spain

PRECISION MEDICINE

- [Precision medicine for cancer](#) treatment involves tailoring treatments to an individual patient's genetics and lifestyle, as well as the cellular and molecular features of their cancer.
- Useful for diagnosis, and treatment of many different types of cancers
- Providers order special tests called 'sequencing' of tumor genes. Think of this as a Thumb Print of the Cancer
- Cancer therapy choice dictated by the Information found in that test.
- Allows doctors to tailor treatment so that cancer cells can be effectively and selectively killed.

PRECISION MEDICINE or PERSONALIZED MEDICINE



THANK-YOU!

