DEEP DIVE MOLECULES THAT MATTER

Dr.Reddy's

RITUXImAb

sounds like (ruh·tuhk·suh·mab)

monoclonal antibody mAbs are **similar to our body's antibodies** that are designed and made in a **laboratory**, meant to **modulate our immune system.**

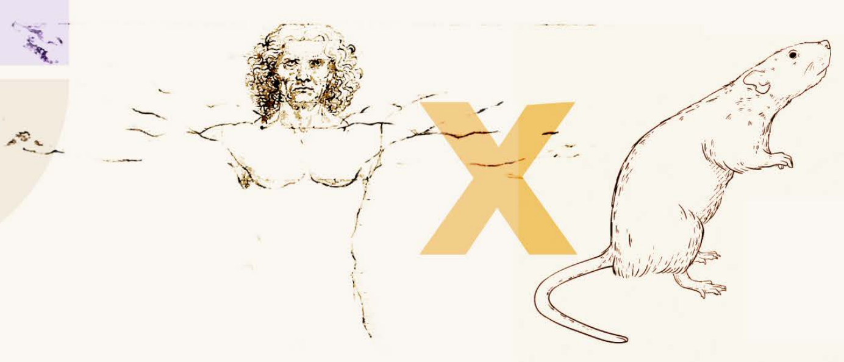
Rituximab is a **chimeric** monoclonal antibody (mAb) used to treat certain autoimmune diseases and types of cancer.

Used to treat | **Non-Hodgkin lymphoma and Rheumatoid arthritis**

1st In the year **2007**

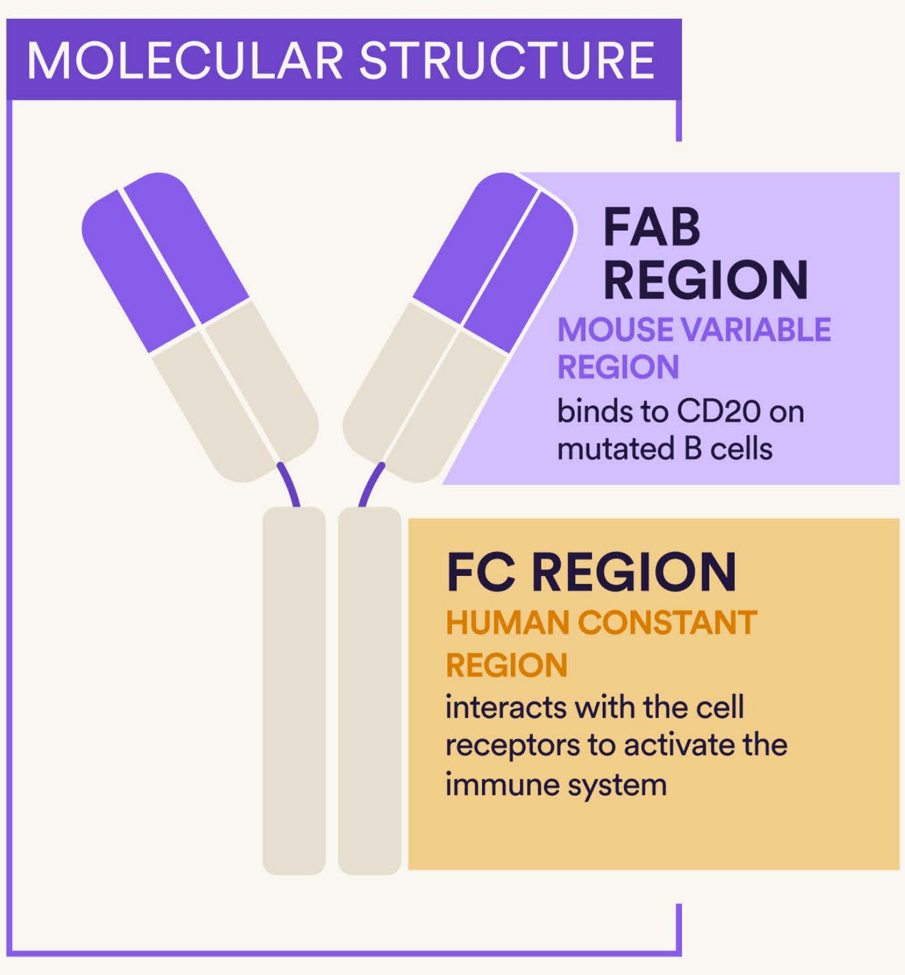
Dr. Reddy's was the first company to launch a Rituximab biosimilar in the world.

Chimeric mAbs are a type of antibody that are made in a lab by **combining a human antibody with a mouse or rat's antibody.**



The **mouse** or rat part of the antibody (murine variable) **binds to the target antigen**, while the **human** part makes it **less likely to be destroyed** by the body's immune system.

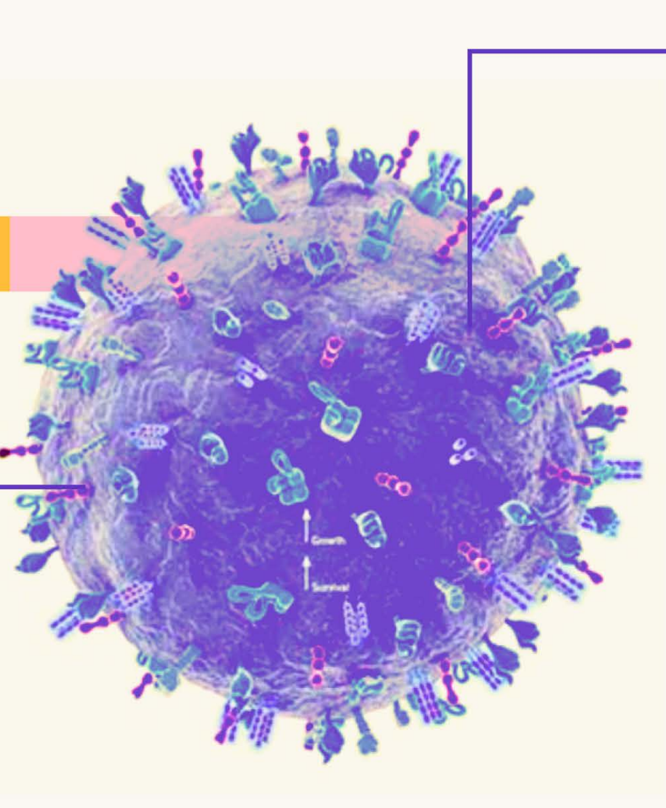
MOLECULAR STRUCTURE



FAB REGION
MOUSE VARIABLE REGION
binds to CD20 on mutated B cells

FC REGION
HUMAN CONSTANT REGION
interacts with the cell receptors to activate the immune system

MECHANISM OF ACTION



B cells

Part of the immune system, involved in producing antibodies

CD20

A protein found on the surface of most B cells

1 Targeting CD20 on B cells

Rituximab is designed to bind specifically to the CD20 antigen

2 Depleting B cells

After binding to CD20, Rituximab initiates the process for B cell depletion

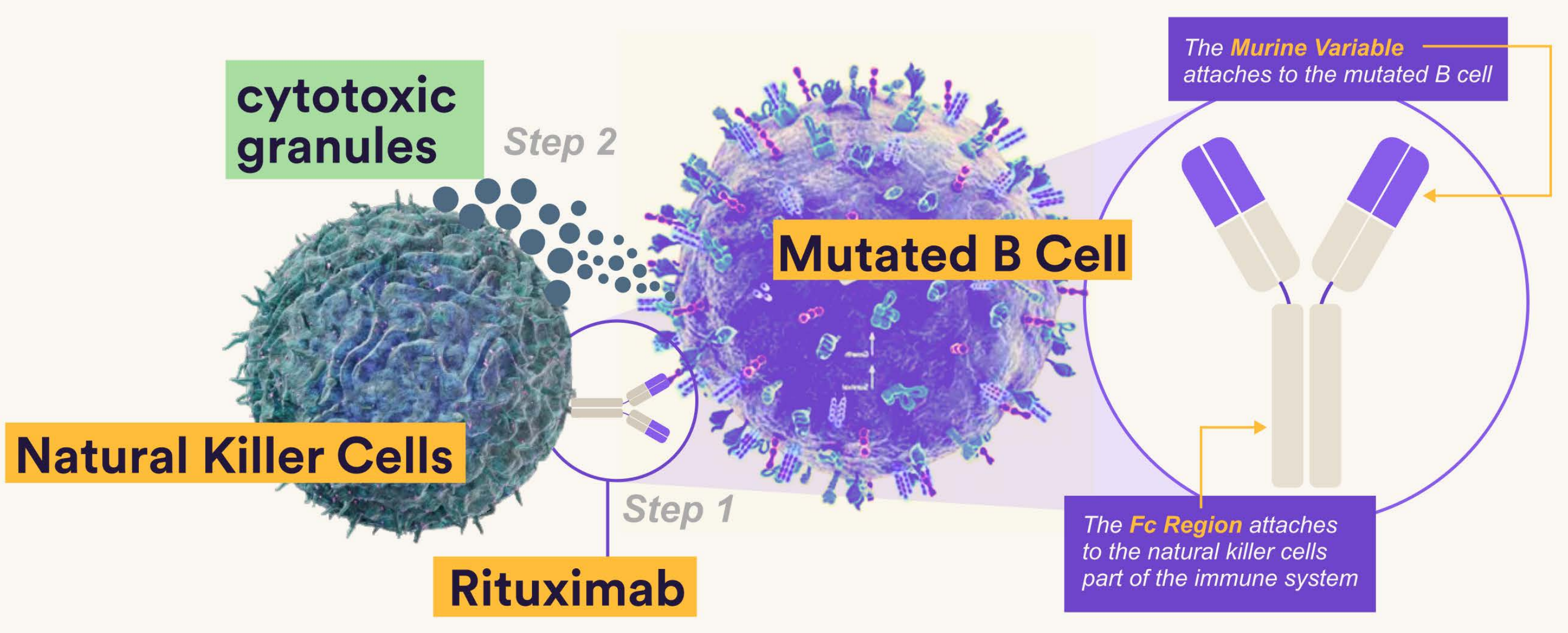
B CELL DEPLETION PROCESSES

Fun Fact! Rituximab has **multiple mechanisms of action** because the binding to the CD20 antigen can trigger **various immune responses depending on the cellular environment** resulting in different types of cell destruction.

A Antibody-Dependent Cellular Cytotoxicity (ADCC):

In ADCC[1], the immune cells **recognize the mutated cells** by their attachment to Rituximab and bind to the Fc region of Rituximab.

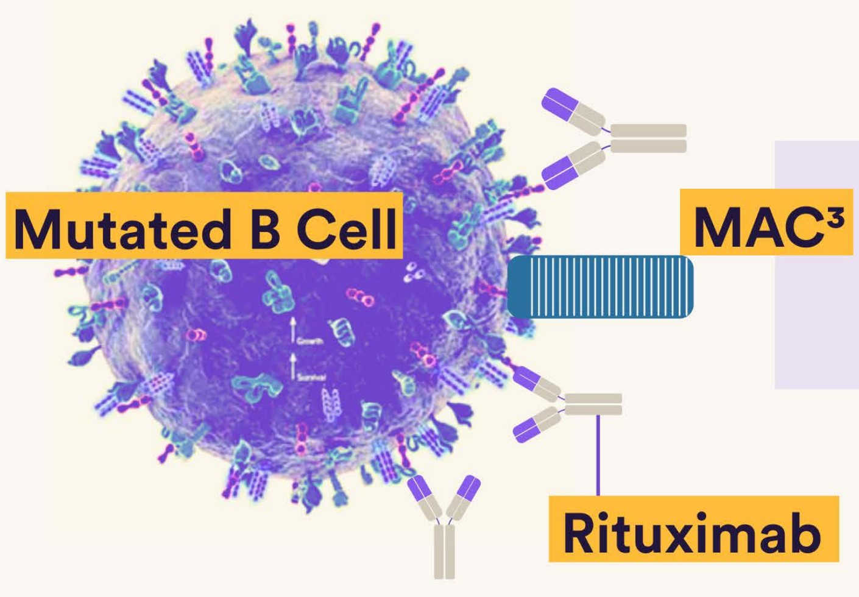
This interaction triggers the natural killer cells to **release cytotoxic granules that induce cell death in the mutated B cell.**



*The **Murine Variable** attaches to the mutated B cell*

*The **Fc Region** attaches to the natural killer cells part of the immune system*

B Complement-Dependent Cytotoxicity (CDC):



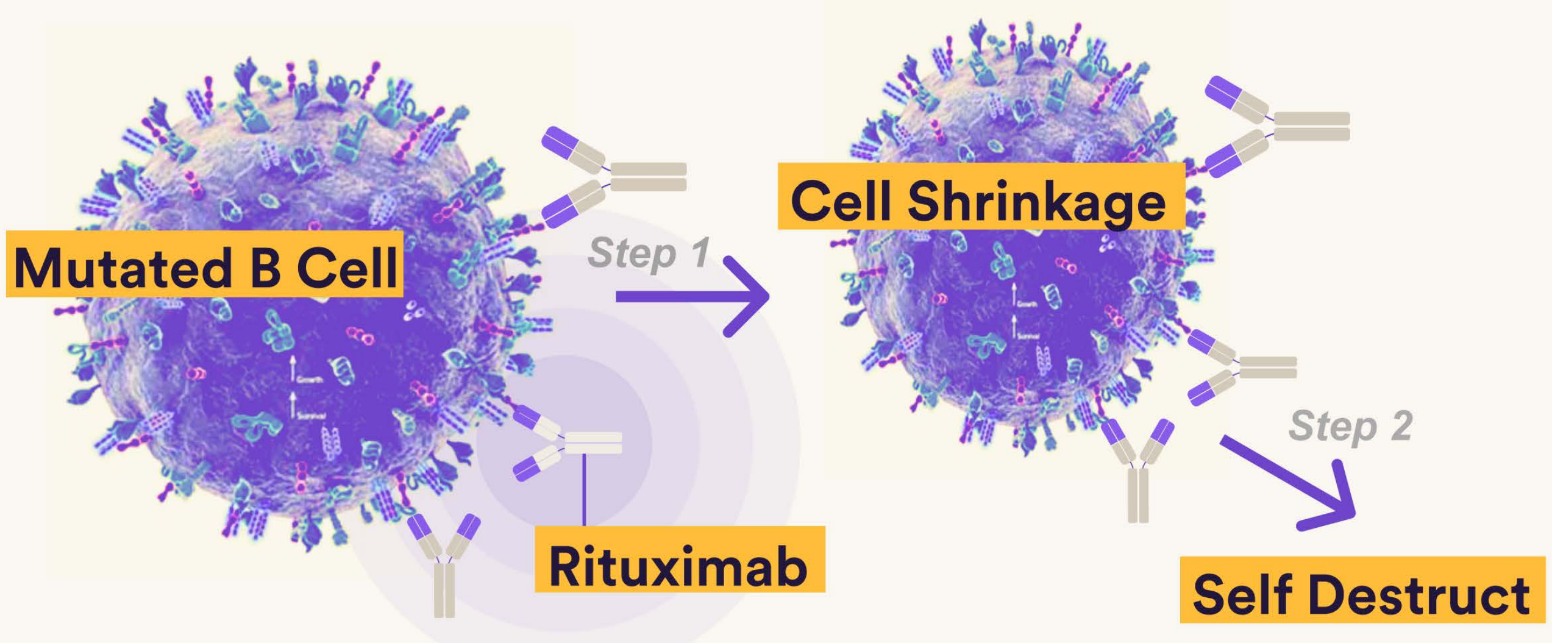
It is a cylindrical structure made up of proteins that form a pore in the cell membrane.

In CDC[2], the binding of Rituximab to the mutated B cell, activates the **complement system** (a group of proteins in the blood). This structure is known as the **membrane attack complex (MAC).**

These complement proteins attach to the mutated B cell and **form pores, leading to the destruction of the cell.**

C Direct Apoptosis

In Direct Apoptosis, the binding of Rituximab to the mutated B cell can **send a signal directly** to it, causing it to **shrink and eventually self-destruct** through the process known as apoptosis.



CD20 is present on most B cells (both healthy and cancerous) so...

Does Rituximab kill the healthy cells as well?

Yes, Rituximab does target and destroy healthy B cells along with the cancerous ones.

While this can lead to a **temporary reduction** in the number of healthy B cells, the **body is capable of regenerating** these cells after the treatment is completed.

1997 Rituximab was the first mAb to be approved for the treatment of cancer.

World Health Organization Rituximab is on the WHO's **List of Essential Medicines**

Citations & Glossary

[1] ADCC - Antibody Dependent Cellular Cytotoxicity
[2] CDC - Compliment Dependent Cytotoxicity
[3] MAC - Membrane Attack Complex

Citations & Glossary:

1. Hanif, N., & Anwer, F. (2024). Rituximab. In StatPearls. StatPearls Publishing.

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Good Health Can't Wait.