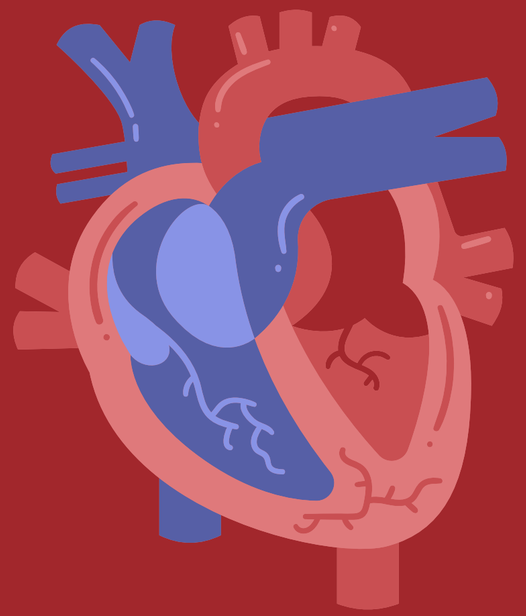
HUMAN BLOOD SUBSTITUTES



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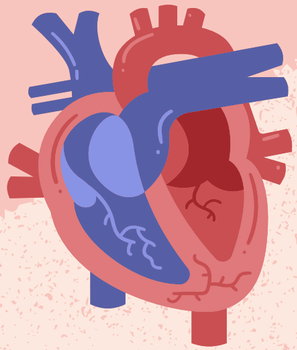
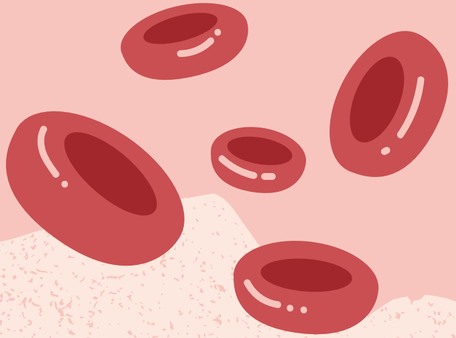
WHAT ARE HUMAN BLOOD SUBSTITUTES ?

Human blood substitutes are synthetic or artificial substances designed to temporarily replicate the oxygen-carrying function of natural blood, used when real blood is unavailable or unsafe for transfusion.

WHAT MAKES A GOOD BLOOD SUBSTITUTE?



It must efficiently carry and release oxygen throughout the body, just like hemoglobin in red blood cells. Should be stable, easy to store and transport

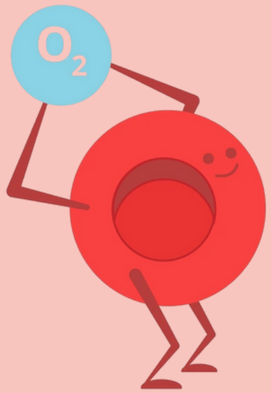


It should be safe, cause no immune or allergic reactions, and not interfere with normal processes like blood clotting or circulation. Have a long shelf life and be easy to store

TYPES OF HUMAN BLOOD SUBSTITUTES

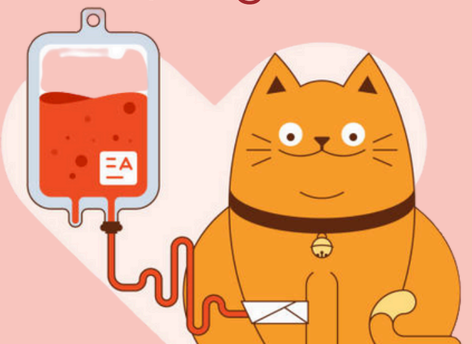
Hemoglobin-Based Oxygen Carriers - (HBOCs)

Hemoglobin-based oxygen carriers (HBOCs) are a type of human blood substitute that is designed to carry and deliver oxygen to the body's tissues.



Perfluorocarbons - (PFCs)

PFCs are extremely small particles, can reach damaged or narrow blood vessels. Helpful in organ preservation, radiology, or lung conditions.
Don’t rely on blood sources, fully synthetic.



HEMOGLOBIN-BASED OXYGEN CARRIERS - (HBOC'S)

- They are made using hemoglobin, the part of blood that normally carries oxygen.
- This hemoglobin is taken from humans or animals.
- They are made by isolating hemoglobin, and formulating it into a solution or suspension that can be infused into a patient's bloodstream.
- They work for any blood type, can be stored for a long time, and don't spread infections.

ADVANTAGES AND DISADVANTAGES OF HBOC'S

ADVANTAGES

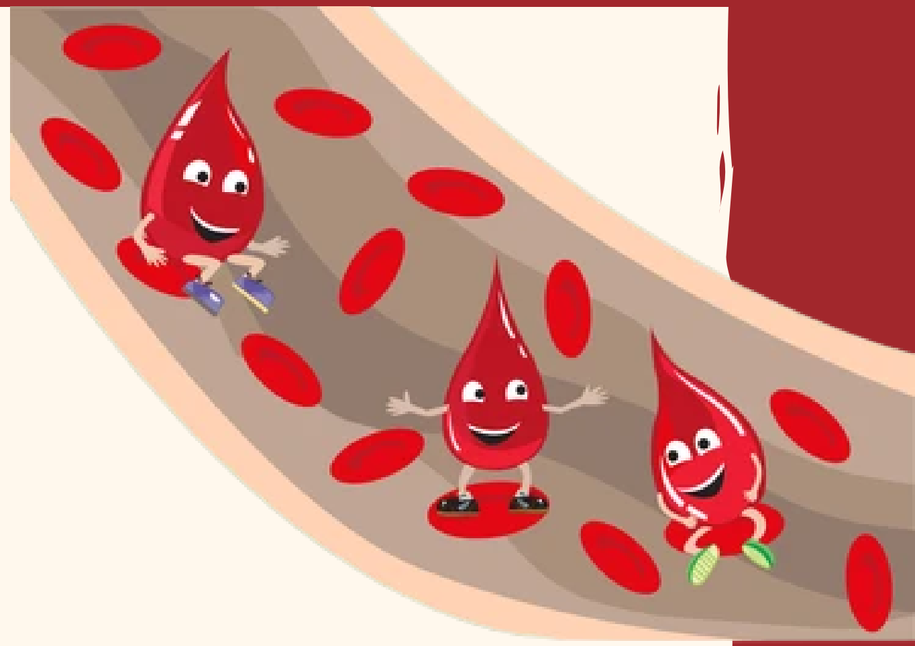
1. **Increased oxygen-carrying capacity:** HBOCs can potentially carry more oxygen per unit volume than whole blood.
2. **Universal compatibility:** Unlike blood transfusions, HBOCs can potentially be universally compatible with any blood type.
3. **Longer shelf life:** HBOCs have the potential for longer storage and shelf life compared to donated blood, which has a limited lifespan.
4. **Reduced risk of infections:** Since HBOCs are synthetic and do not rely on human donors, the risk of infections associated with transfusion can be significantly reduced.

DISADVANTAGES

1. **Renal toxicity:** Some HBOCs have shown a potential for renal toxicity, causing damage to the kidneys.
2. **Short half-life:** HBOCs tend to have a shorter half-life in the body compared to natural red blood cells.
3. **Nitric oxide scavenging**: Excessive nitric oxide scavenging by HBOCs can lead to vasoconstriction, impairing blood flow to vital organs and potentially causing adverse cardiovascular effects.
4. **Immunogenicity and Allergic Reactions:** Because HBOCs are foreign substances, the immune system may attack them, causing allergic reactions or other immune responses in some patients.

PERFLUOROCARBONS – (PFC'S)

- Perfluorocarbons (PFCs) are synthetic chemicals made up of carbon and fluorine atoms.
- Unlike natural blood, PFCs don't use any biological materials but can dissolve large amounts of oxygen. When a person breathes in oxygen, PFCs in the blood can absorb and transport that oxygen to the body's tissues.
- This makes them a useful option for short-term oxygen delivery, especially in situations like lung surgeries, organ preservation, or medical imaging.
- However, PFCs require high levels of oxygen to work properly and are quickly removed from the body, limiting their use to short-term applications.
- They're smaller than red blood cells, so they can reach areas where red blood cells might have trouble, but they don't last as long in the bloodstream.



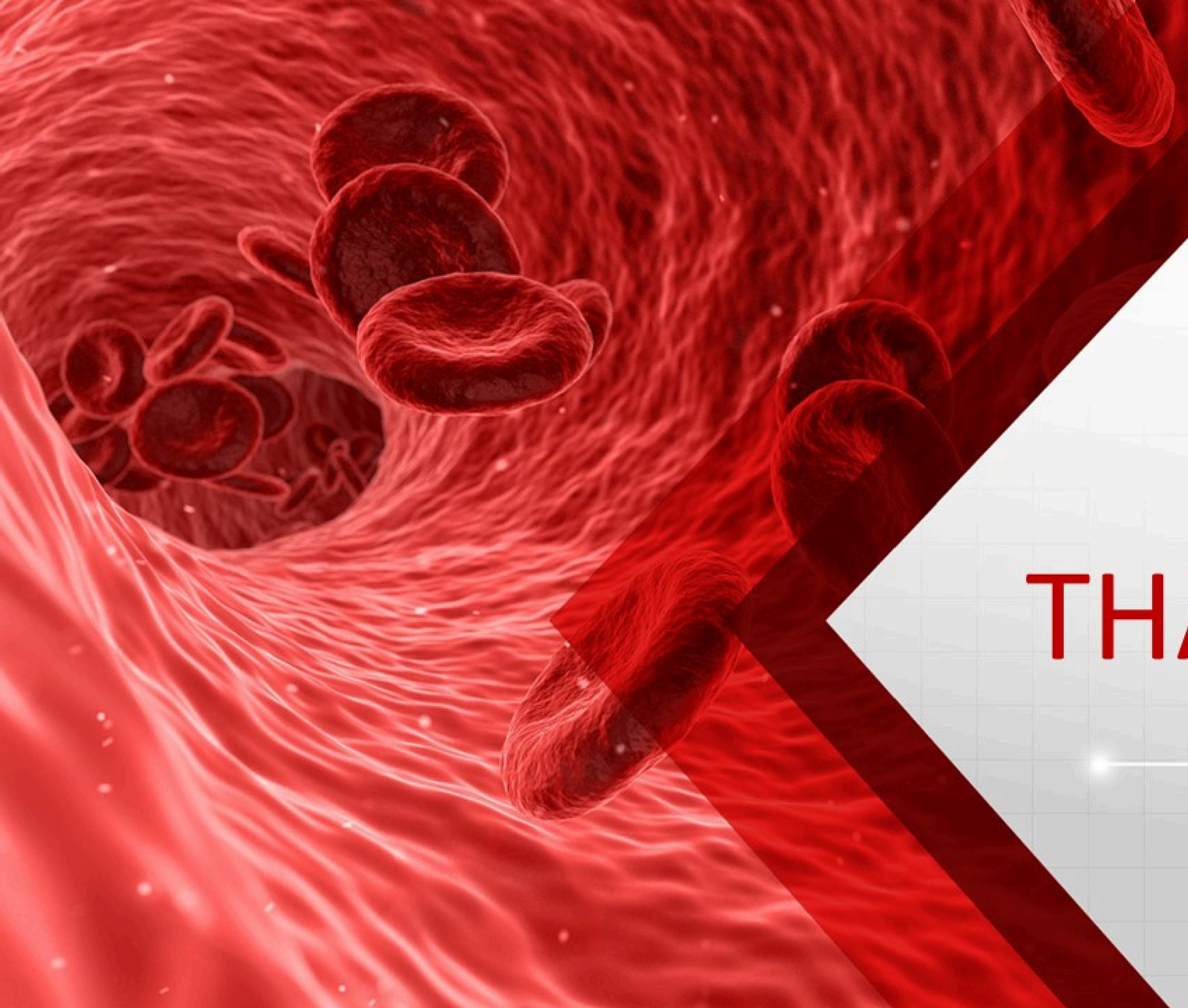
ADVANTAGES AND DISADVANTAGES OF PFC'S

ADVANTAGES

1. **High Oxygen Solubility:** PFCs can dissolve large amounts of oxygen, making them effective at carrying oxygen to tissues
2. **No Need for Blood Matching:** PFCs are synthetic and don't require blood type matching, which is beneficial in emergency situations where blood compatibility is a concern.
3. **Small Size:** Being smaller than red blood cells, PFCs can reach tight spaces in the body, improving oxygen delivery to areas that might be difficult for regular blood cells to reach.
4. **Versatility in Use:** PFCs are used in diverse applications, such as organ preservation, medical imaging, and assisting in surgeries where traditional blood substitutes may not be suitable.

DISADVANTAGES

1. **Requires High Oxygen Environments:** PFCs need an environment with high oxygen levels to work effectively, this limits their use to specific conditions like surgeries
2. **Excretion Challenges:** Since they are excreted quickly, the body needs to process and eliminate them in a short time
3. **Potential Side Effects:** PFCs can cause side effects, including lung irritation or other respiratory issues due to the high levels of oxygen they carry.
4. **Short Duration in the Body:** PFCs are rapidly eliminated from the body, meaning their effects are short-lived, making them unsuitable for long-term oxygen delivery.



THANK YOU