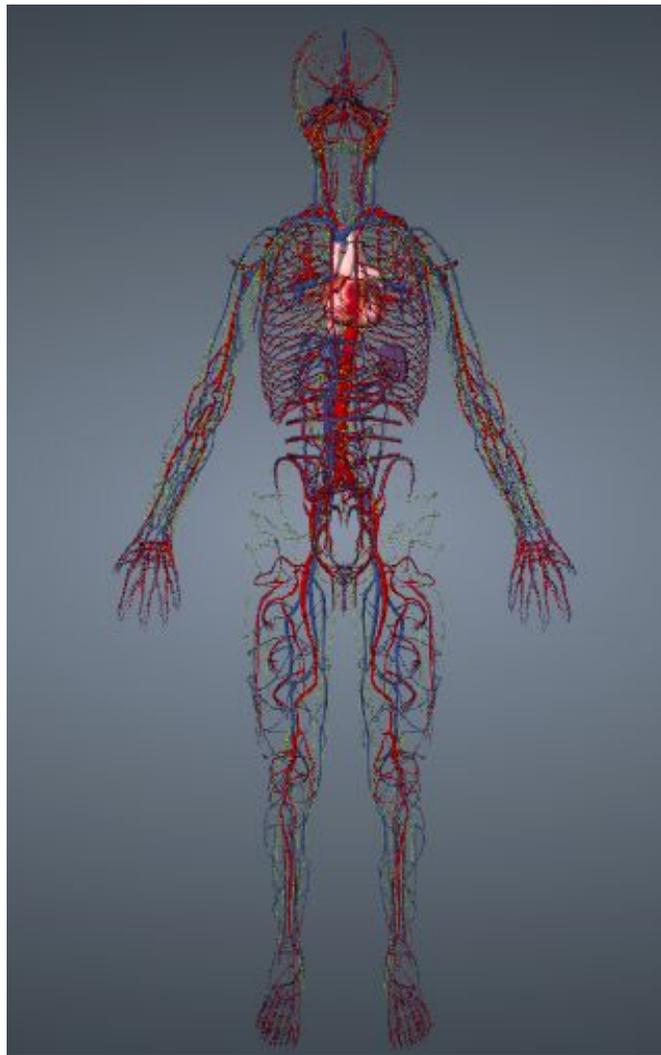


ABS

Circulatory & Lymphatic Systems



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Problem Statement

What design for the circulatory and lymphatic systems will actually function mechanically, connect to an existing ABS design, and illustrate a certain medical problem with cure or corrective?

Gathering Information

The circulatory system bring oxygen and nutrients to the body. It is the system that keeps your blood pumping, literally. The lymphatic system keeps the body healthy. They are the warriors of the human body. Here is some more information.

1. The heart pumps blood to the body.
2. Arteries are high pressure blood vessels. They take blood from the heart to the body.
3. Veins are low pressure blood vessels. They take blood back to the heart.
4. Capillaries are small, hair-like, blood vessels that allow gas exchange.
5. Platelets are blood cell fragments that form blood clots to stop bleeding.
6. Plasma is the liquid portion of blood, which is mostly water.
7. Red blood cells carry oxygen and nutrients to cells. They also carry the waste back to the heart.
8. Hemoglobin is protein that carries oxygen.
9. Blood Type- + - A, + -AB, + - B, + - O
10. The thymus trains and develops T-lymphocytes (T-cells), which are a type of white blood cell. The thymus gets smaller as you get older, until it becomes just a fatty mass.
11. Lymph nodes are small structures that act as filters, they attack germs in lymph.

12. The spleen purifies blood, by taking out the worn blood cells. It also produces white blood cells. Even though the spleen is very handy, it is possible to live without one.

13. White blood cells (sometimes called WBCs or leukocytes) fight and destroy germs.

14. Lymph is a clear or white fluid that is made of WCBs (mostly lymphocytes) and a fluid from the interstices of all body tissues called chyle (made mostly of proteins and fats).

15. Antibodies (sometimes called immunoglobulin) are Y shaped protein molecules that attach to germs (antigens) and neutralizes them.

16. Lymph ducts drain lymph into the subclavian veins.

Citations

Thymus- https://www.innerbody.com/image_endoov/lymp04-new.html

Lymph Nodes- <http://www.cancer.org/cancer/cancerbasics/lymph-nodes-and-cancer>

Spleen- <http://www.news-medical.net/health/What-Does-the-Spleen-Do.aspx>

White Blood Cells- <http://www.med-health.net/What-Do-White-Blood-Cells-Do.html%22%3Ewhat>

Lymph- <https://www.nlm.nih.gov/medlineplus/ency/article/002247.htm>

Antibodies- <http://www.novimmune.com/science/antibodies.html>

Lymph Ducts + other stuff-

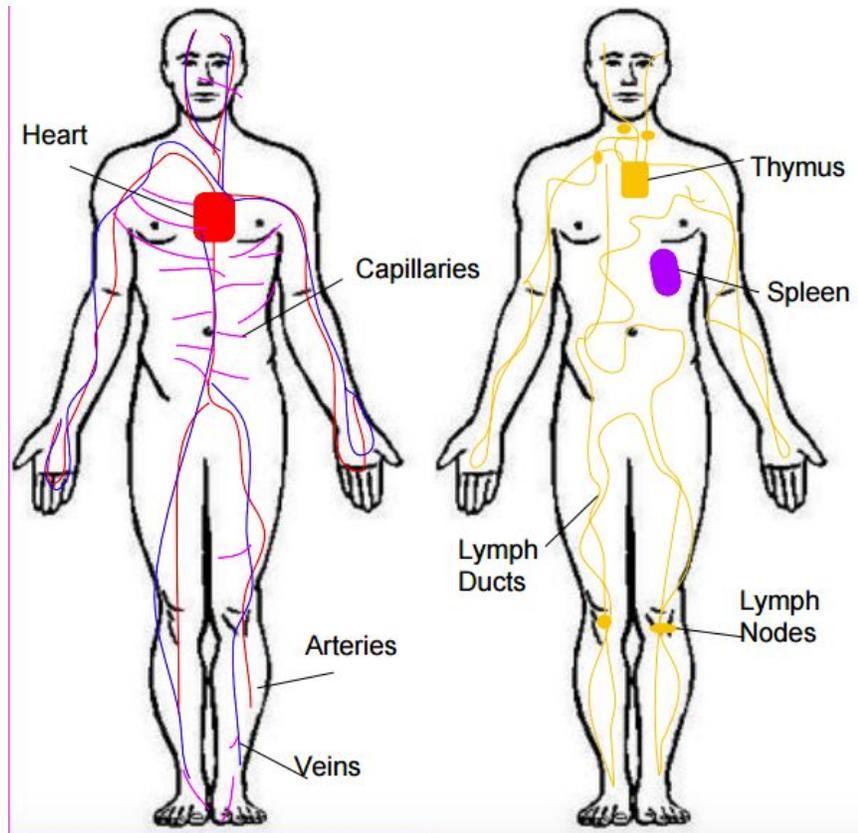
<https://www.boundless.com/physiology/textbooks/boundless-anatomy-and-physiology-textbook/the-lymphatic-system-20/lymphatic-vessels-192/lymph-trunks-and-ducts-960-5983/>
<https://www.boundless.com/physiology/textbooks/boundless-anatomy-and-physiology-textbook/the-lymphatic-system-20/lymphatic-vessels-192/lymph-trunks-and-ducts-960-5983/>

Platelets- <https://www.nlm.nih.gov/medlineplus/plateletdisorders.html>

Diagrams

Circulatory System

Lymphatic System



Hypothesis

By using the **Bubba the Science Project™** design, my artificial lymphatic and circulatory systems will operate like a human's, connect to another ABS system, and correct cardiac tamponade.

What is Cardiac Tamponade?

Cardiac tamponade is when fluid fills the space where the heart is (the pericardial sac). This causes pressure to the heart so the heart doesn't have enough room to expand.

Symptoms may include: A sharp chest pain that increases with deep breathing or coughing, paling of the skin, rapid breathing or problems with breathing, palpitations, fainting, swelling or discomfort, dizziness, drowsiness, anxiety, weak pulse (may even be absent), or restlessness.

Treatment includes: Pericardiocentesis (a needle that helps drain the fluid) and/or pericardiectomy (a surgery that removes part of the pericardial sac).

<https://www.nlm.nih.gov/medlineplus/ency/article/000194.htm>

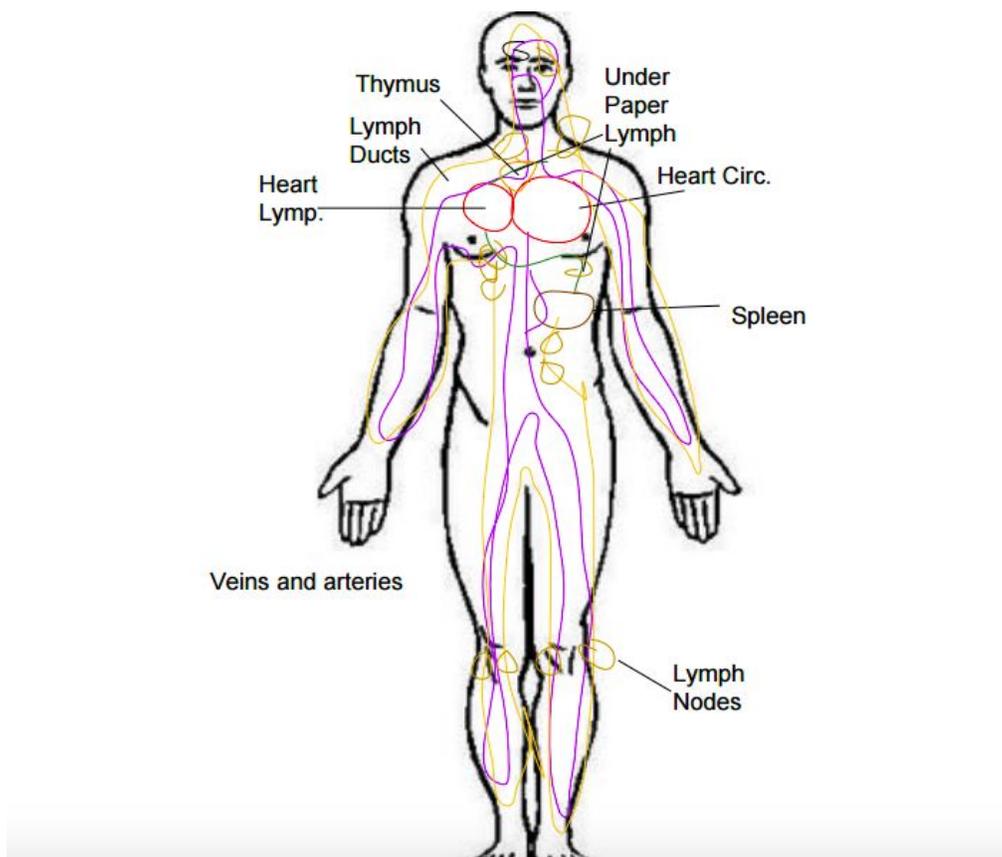
Procedure

A. Materials List

1	Large piece of paper (Big enough for someone to lay on and have extra room)
1	Large piece of wood (Big enough for someone to lay on and have extra room)
1-2	Packet(s) of red food coloring
1	Packet of lemonade flavoring
Lots of	Clear hose or fuel line
Lots of	string
2	Pumps that hook up to the hose or fuel line
2	Wires
1	Switch
1	Battery
1	Tube of deep purple paint
Lots of	Masking tape
Lots of	Duct tape
Lots of	Zip-ties
2	Water bottles (with water)
Lots of	Electrical connectors
	BLOOD!!!!!!!!!!

Lots of	Candy red hots
Some	Corn syrup
Lots of	White jelly beans or marshmallows
Lots of	Candy Sprinkles
1	Bowl

B. Design Diagram



C. Building Instruction

- 1.) Traced someone's outline on large piece of paper
- 2.) Cut out the outline
- 3.) Traced the outline on large piece of wood
- 4.) Cut out the outline
- 5.) Cut holes for pumps and screws
- 6.) Installed pumps

- 7.) Attached one end of a pump to one end of a fuel line
- 8.) Attached the fuel line to edge of the wood person w/ zip-ties
- 9.) Drilled holes in neck and spleen
- 10.) Repeated step 8
- 11.) Pushed one end of fuel line through spleen hole and other end through the neck hole
- 12.) Attached one end to the other pump
- 13.) Drilled holes for nose and eyes
- 14.) Installed switch in nose hole
- 15.) Installed screws and bolts in eye holes
- 16.) Solder and wired all of the parts together
- 17.) Put the lemonade mix in a water bottle
- 18.) Put the red dye in another water bottle
- 19.) Turned Bubba on
- 20.) Put the lemonade bottle in open end of the lymph ducts
- 21.) Let it fill up
- 22.) Put that end in the pump
- 23.) Put the red water in the open end of the veins
- 24.) Let it fill up
- 25.) Put that end in the pump
- 26.) Made the spleen out of masking tape
- 27.) Painted the spleen
- 28.) Attached the spleen
- 29.) Made the thymus out of masking tape
- 30.) Attached the thymus
- 31.) Made some lymph nodes out of masking tape
- 32.) Attached the lymph nodes
- 33.) Label everything

D. Operation Instruction

- 1.) Plug in wires and battery
- 2.) Flip the nose up to turn on
- 3.) Flip the nose down to turn off
- 4.) Unplug wires and battery

E. Medical Problem and Corrective Instructions

My patient had cardiac tamponade. To cure this, I did a surgery called pericardiocentesis. I have a video on this procedure.

I stuck a needle in his pericardial sac then a tube to drain the fluid.

Record and Analyze

A. Summary

I think it went pretty well. I wish I hadn't forgotten about my disease though. People asked questions and were making comments, it was really good. I learned that I do not like watching myself on video. Bubba cooperated well. I did not have to fix him at all!

B. Pictures of Bubba the Science Project



C. Summary of Correcting Cardiac Tamponade

The surgery went well. The patient is doing great. I do wish that I could do the surgery ON Bubba though. Also, the “tube” would not stand up straight. Other than that, it went pretty well. (I made two videos originally, then chose the best one. Both times went pretty smoothly.)

Conclusion

A.Hypothesis

My hypothesis was correct. It did act like a human’s circulatory and lymphatic system (by circulating the lymph and blood through the blood). It connected to another ABS system . Bubba connected to two other systems: the circulatory system to the lymphatic system (and vice versa) and Bessie Jo (Emma, Shelby, and Nikki’s project).

B. Improving the Original

I could make it better by, making the spleen, lymph nodes, and thymus look better. Right now they look kind of ugly. I could also make a better video. This one looks not well thought out. I have a lot to improve on, but I at least I know what to focus on!