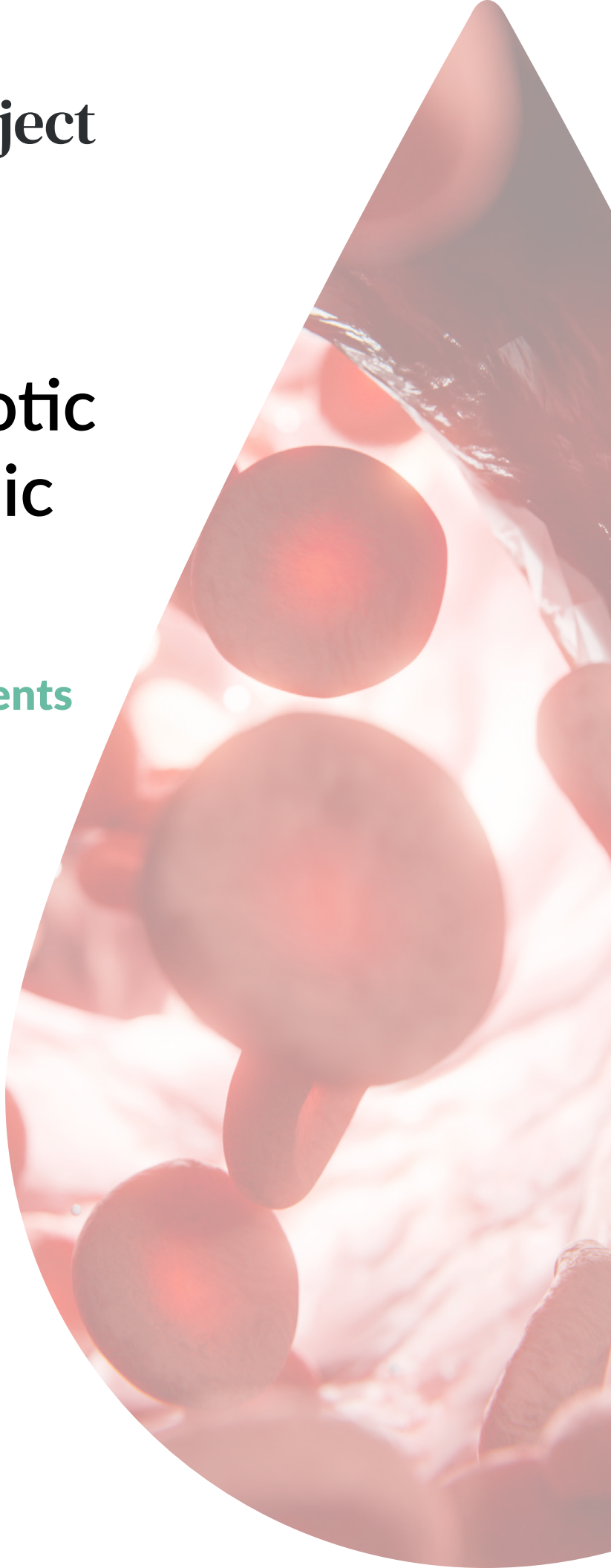
The Blood Project

Pocket Resource

Immune Thrombotic Thrombocytopenic Purpura (TTP)

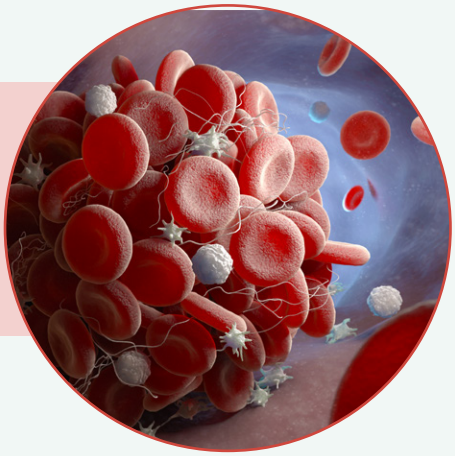
A Pocket Resource for Patients



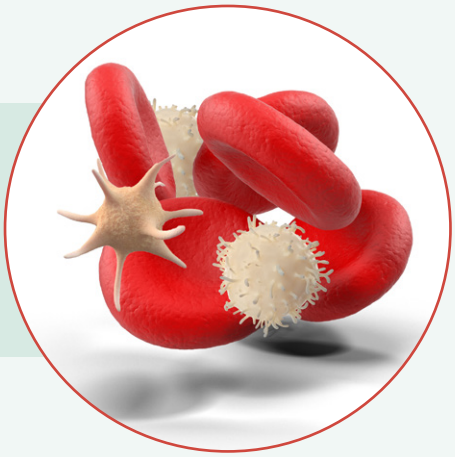
William C. Aird, MD
Brian J. Carney

What does TTP Stand For?

T **Thrombotic**
Thrombosis (blood clot)



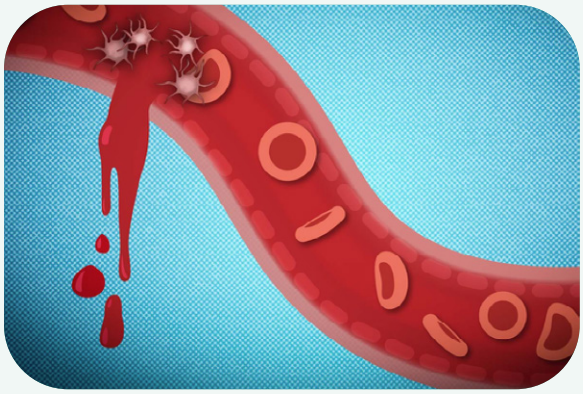
T **Thrombocytopenic**
(low platelet count)



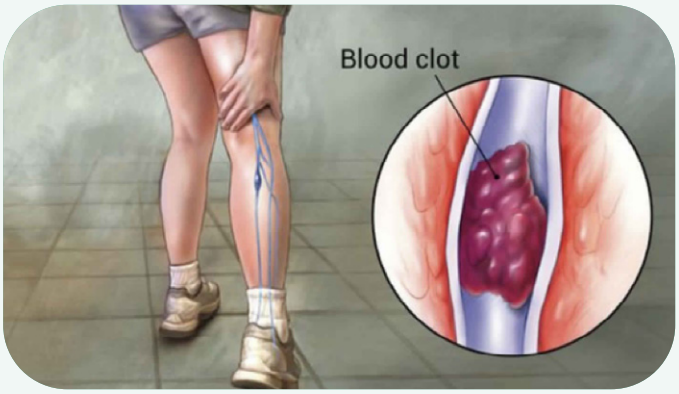
P **Purpura**
(bleeding into skin)

What is **Thrombosis**?

Formation of a blood clot (thrombus) inside a blood vessel, obstructing normal blood flow



Normal clotting
(plugs the hole in vessel wall)



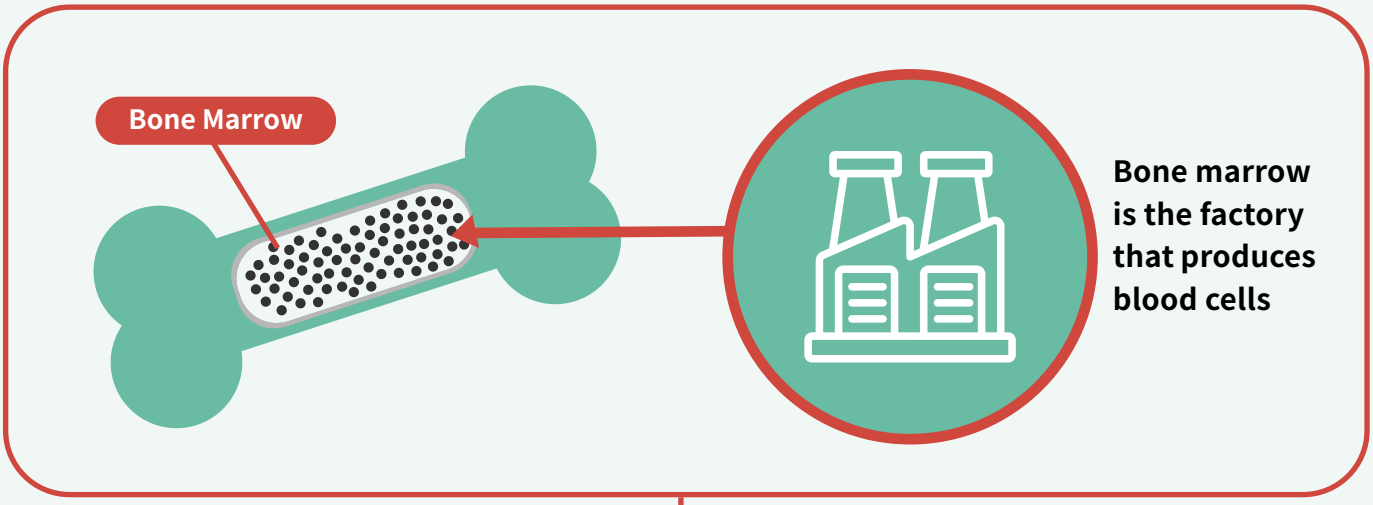
Thrombosis
(plugs the lumen of the blood vessel)

- Our HEART pumps blood around the body
- This pumping function generates BLOOD PRESSURE
- Blood is normally contained within BLOOD VESSELS
- Blood vessels can leak from normal wear and tear
- The CLOTTING SYSTEM evolved to patch defects in the blood vessel wall
- It consists of PLATELETS which rush to the site of injury, and the formation of a glue called fibrin (think of the platelets as the bricks and FIBRIN as the mortar)
- In some diseases, the clotting system is overactive and leads to spontaneous brick-and-mortar formation inside otherwise healthy blood vessels
- Instead of patching holes, these “clots” or “THROMBI” can obstruct the blood vessel and impede blood flow to body parts

What is Thrombocytopenia?

Thrombocyte = platelet **Penia = low**

Low platelet count (low numbers in blood)



There are 3 types of cells that circulate in our blood

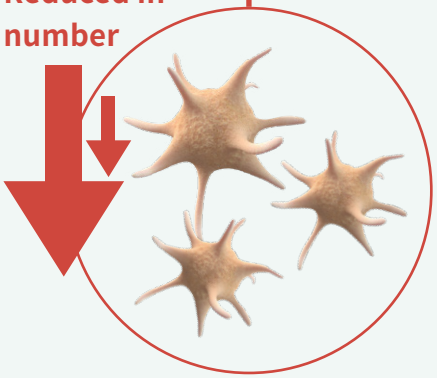
1

Red blood cells

Deliver oxygen to body parts

2

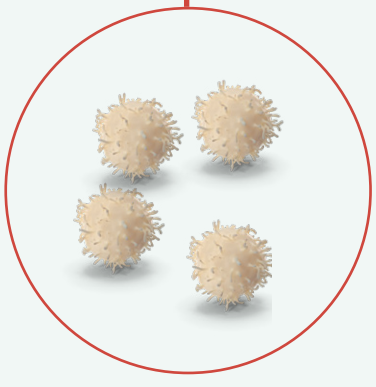
Reduced in number



Platelets

Prevent bleeding

3



White blood cells

Fight infection

What is **Purpura**?

Bleeding in the skin

Purpura causes red, purple or brown blood spots on your skin.
It happens when small blood vessels leak blood under the skin' s surface.

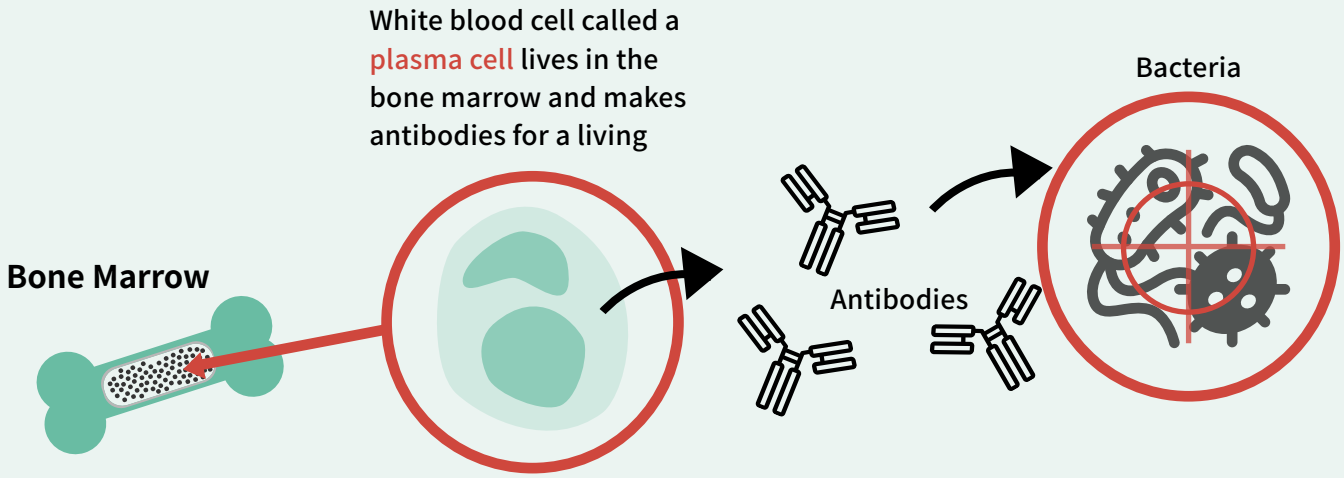
Purpura and other types of bleeding occur in TTP because the platelet count is often very low and platelets normally function to prevent bleeding

What Causes **TTP**?

TTP is an autoimmune disease

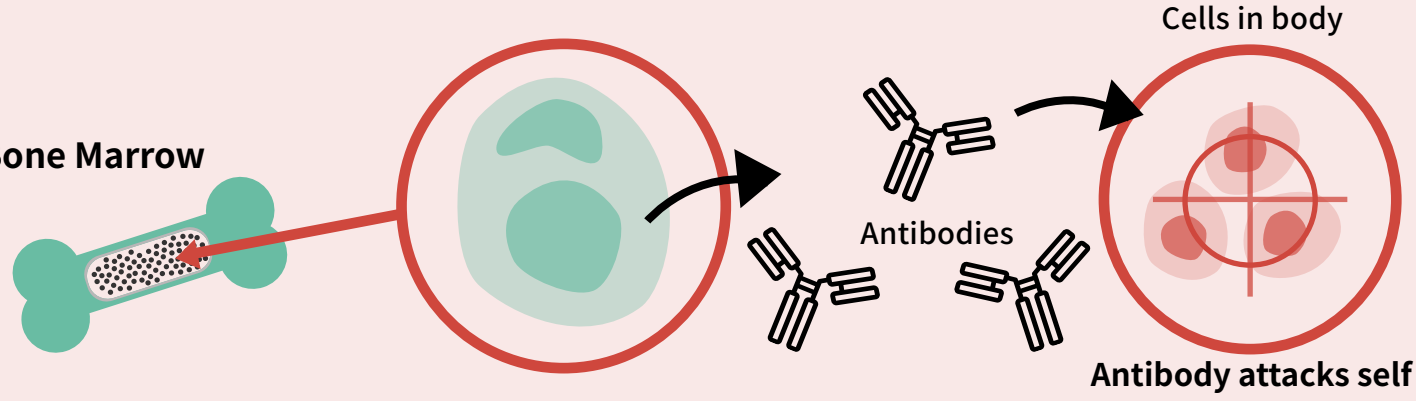
Normal function of antibodies

- The bone marrow contains white blood cells that make and release **antibodies** into the blood stream
- Normally, antibodies **target infectious organisms** like bacteria and viruses, leading to their clearance



Autoimmune Disease

- In certain diseases, antibodies target proteins and/or cells in the body. These are called **autoimmune diseases** (auto because the antibodies target "self"). Type 1 diabetes is an example of an autoimmune disease where antibodies target and destroy insulin-producing cells in the pancreas
- TTP is another example of an autoimmune disorder

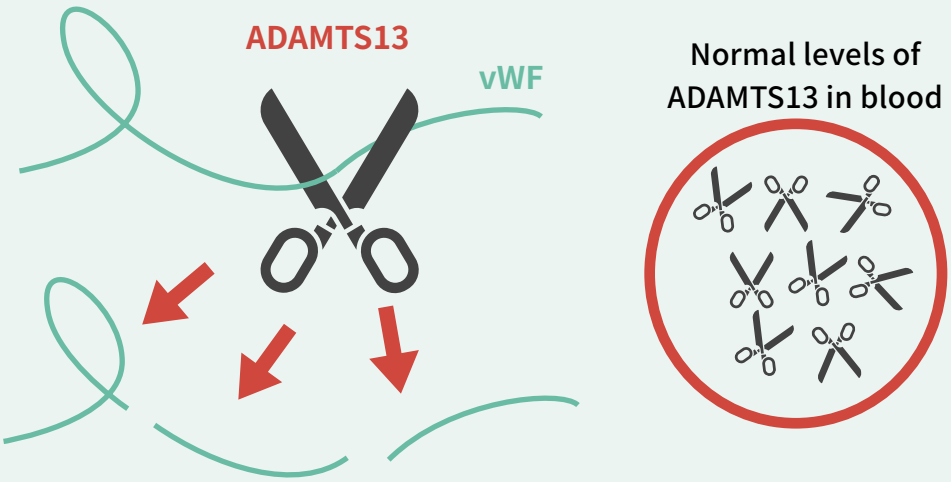


What Causes **TTP**?

Antibody against a scissor-like protein

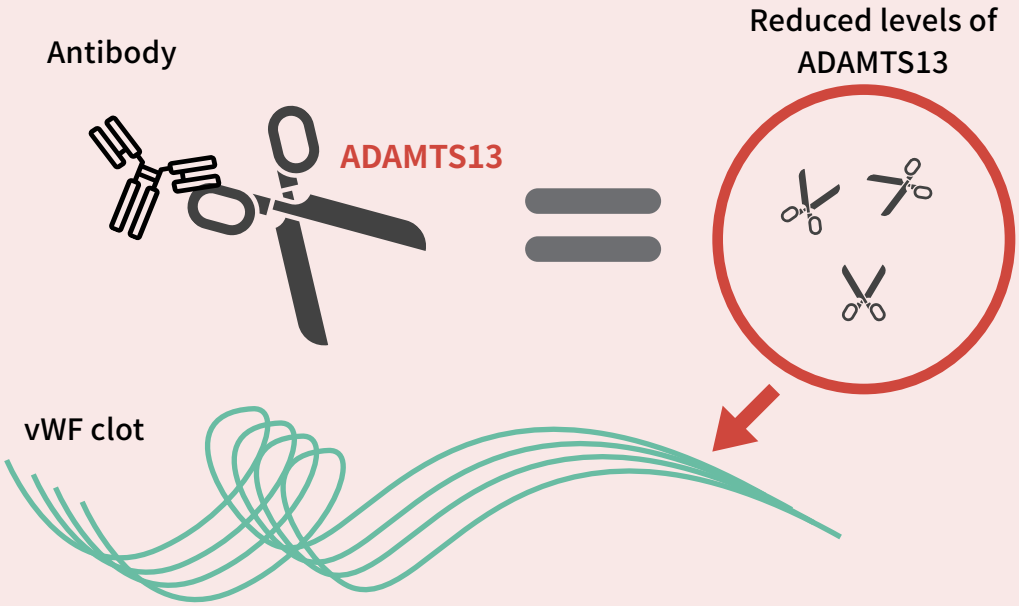
Healthy condition

Normally, a scissor-like protein called **ADAMTS13** cleaves another protein in the blood called **von Willebrand factor (vWF)**. vWF promotes clumping of platelets (the bricks in the brick-and-mortar analogy) in blood vessels. So, ADAMTS13 is a protective mechanism to prevent excessive platelet clots/plugs



TTP

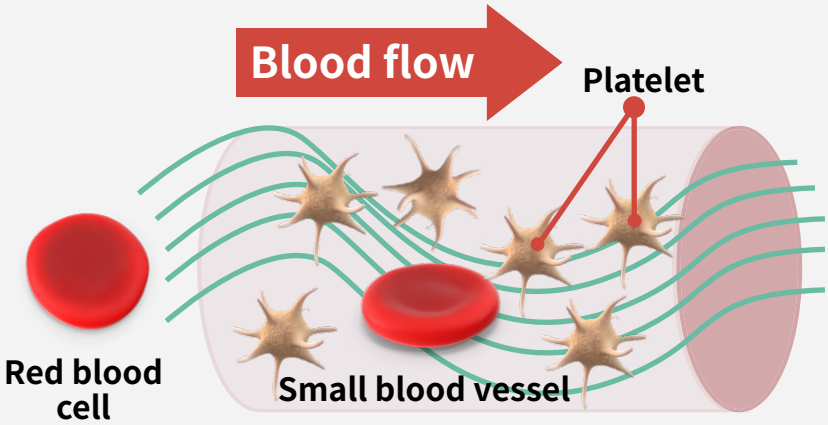
In TTP, **antibodies attack and destroy ADAMTS13**, resulting in low levels of ADAMTS13 in the bloodstream. As a result, **vWF cutting is reduced** with the result that platelets form clots in small blood vessels throughout the body



What Causes **TTP**?

Consequence of low ADAMTS13 levels

Thrombocytopenia, anemia, organ changes



Platelet clot in small blood vessel

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Consumption of platelets

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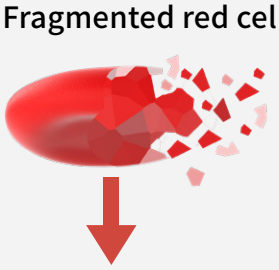
Thrombocytopenia (low platelet count)



Destruction and fragmentationof red blood cells as they navigate through the plugged blood vessel

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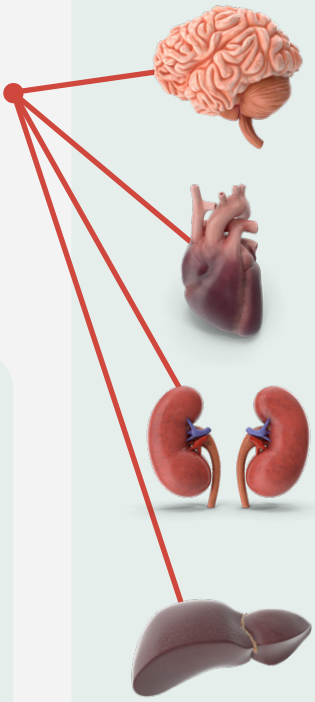
Anemia (low red cell count)



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Organ dysfunction

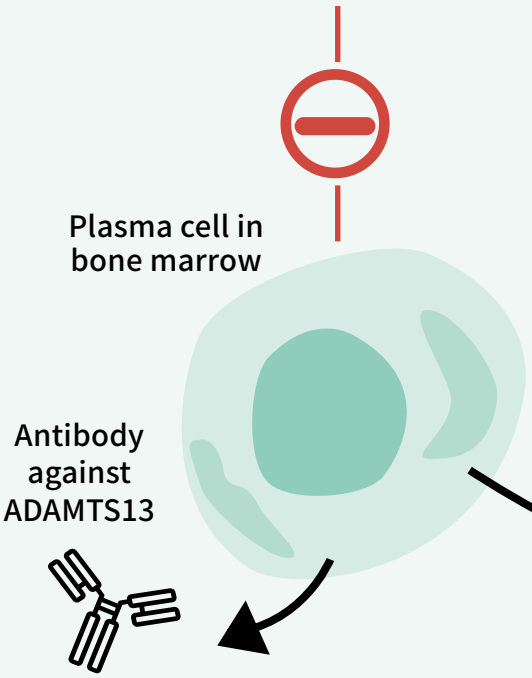
Doctors will order frequent blood draws to follow the platelet count, the hemoglobin (a marker of red cell count) and markers of red cell destruction. They will also test for signs of organ dysfunction

! A common symptom of organ dysfunction is confusion and headache

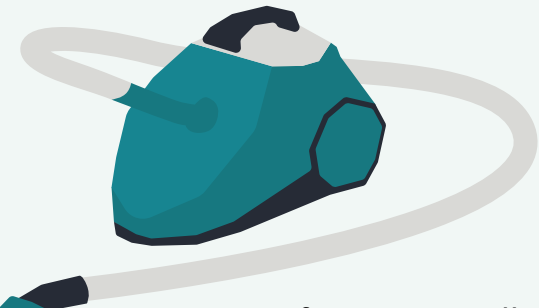
How is **TTP** Treated?

Three-Pronged Attack

1 Suppress antibody production
(Steroids)

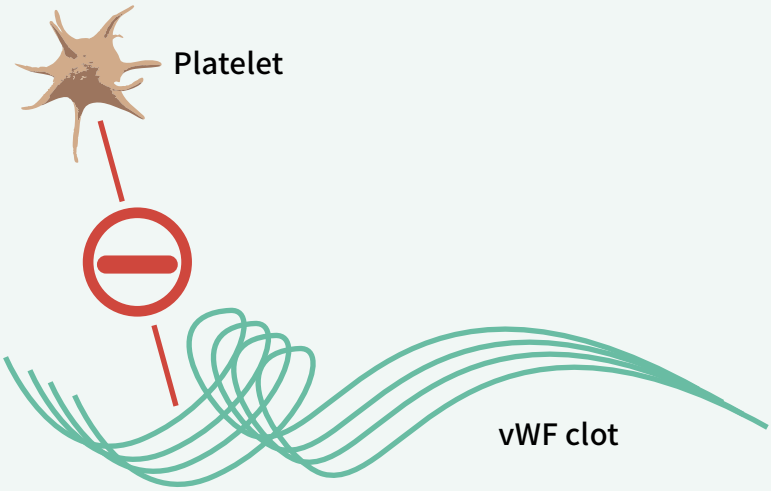


2 Remove antibodies from the body
(Plasmapheresis)



Mainstay of treatment. All patients with a high suspicion of TTP should receive timely, daily plasmapheresis whereby plasma (the liquid part of blood) is removed and replaced with normal donor plasma; this not only removes antibodies against ADAMTS13 but it also provides ADAMTS13 from the donor plasma

3 Inhibit binding of platelets to vWF
(Caplacizumab)



All patients with a new episode of TTP should receive high doses of daily corticosteroids (for example prednisone)

... many patients will also receive another immunosuppressant called **rituximab**, which is given as 4 weekly injections

What to Expect

- You will likely present to an emergency department not feeling well, perhaps with some neurological or bleeding symptoms
- You will have lots of blood tests, an EKG and X rays in the emergency room
- Once TTP is suspected, you will be admitted to the hospital, possibly to an intensive care unit so that you can be carefully monitored
- If your hospital does not have ability to perform plasmapheresis, you will be transferred to a hospital that does
- You will have a special intravenous line placed in preparation for the plasmapheresis, which will typically be initiated within hours of admission and then performed once daily until the platelet count normalizes. This can take 1-2 weeks to achieve
- You will be started on corticosteroids on the day of admission, either oral or by IV. These will be administered once daily
- You may be started on caplacizumab, which is given as a subcutaneous injection under the skin once daily
- You may also receive rituximab, which is given as a weekly injection for a total of 4 weeks