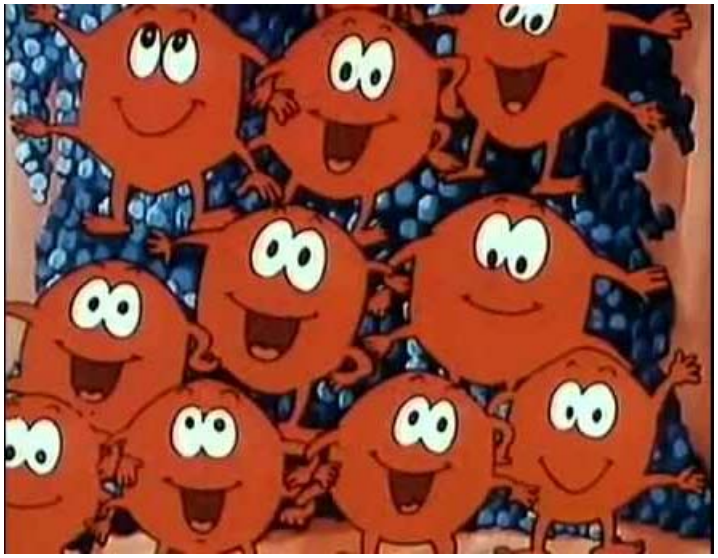
The sweet kiss of platelets

Dr Dianne E. van der Wal



Australian governments fund the Australian Red Cross Blood Service to provide blood, blood products and services to the Australian community

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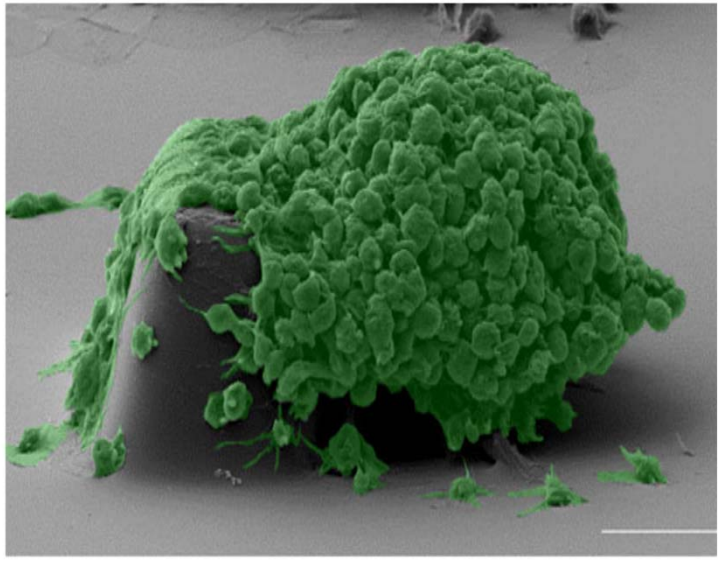
Why this research matters

- Heart disease kills 51 Australians every day
- Imbalances in your blood
- Risk factors:
    - Diet
    - Cholesterol
    - Blood Pressure

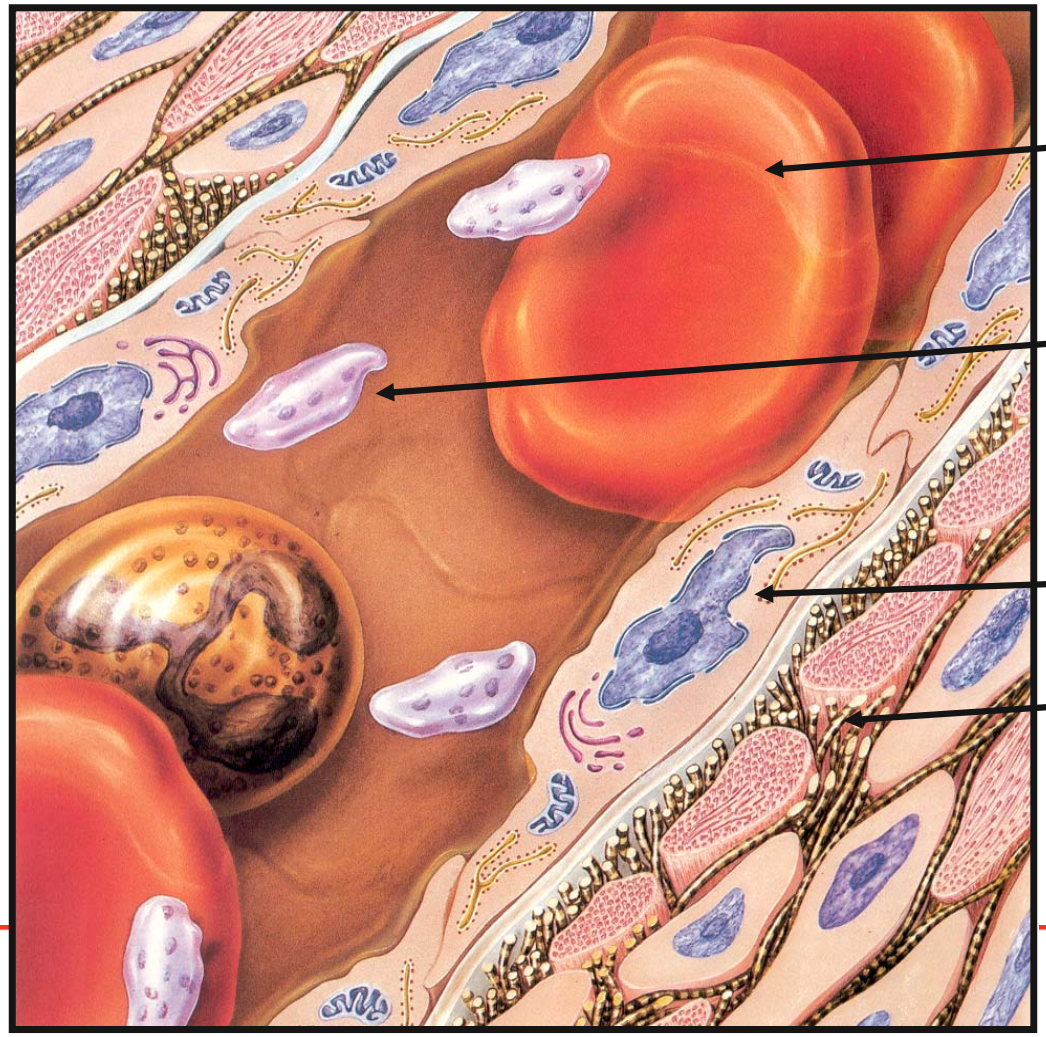
Platelets! (not all sweet)

Platelets are like sheep: they aggregate

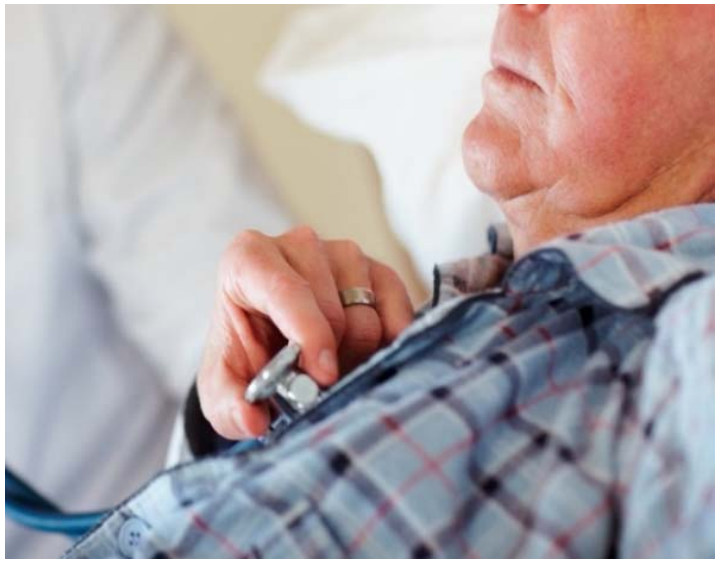


Me in my happy place

Platelets are smallest blood cells

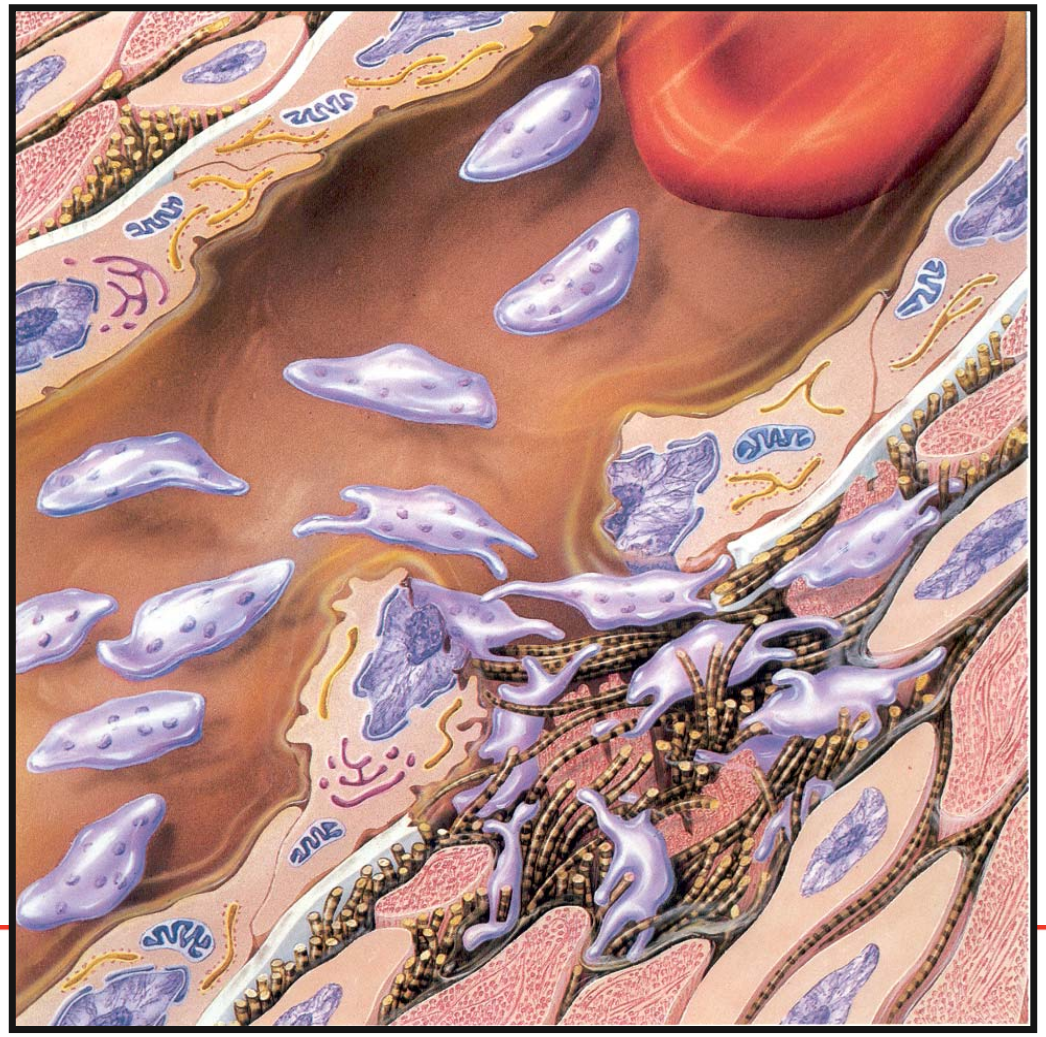


When platelets go rogue



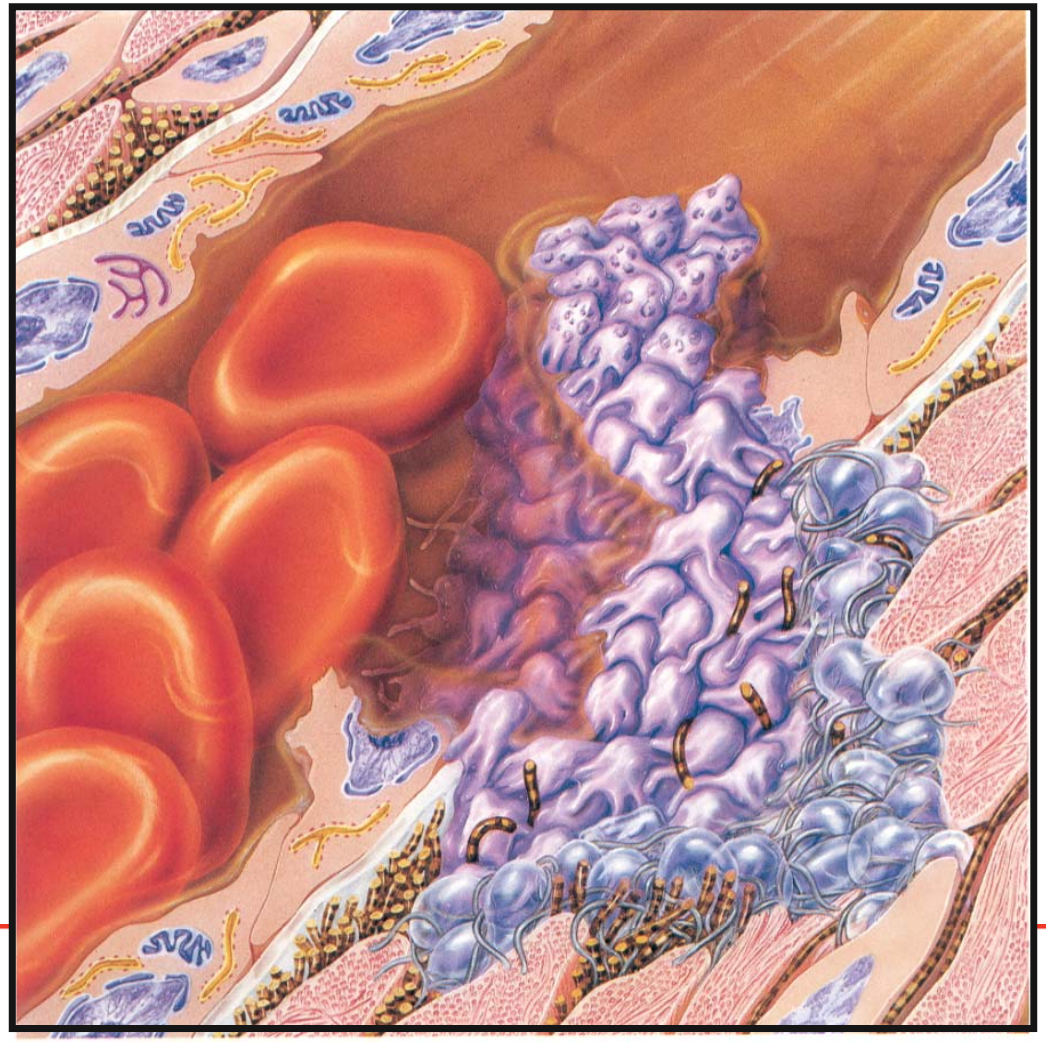
- Too active: heart diseases
- Too few platelets: bleeding
- Balance between clotting and bleeding

Platelets: cease bleeding and help clotting



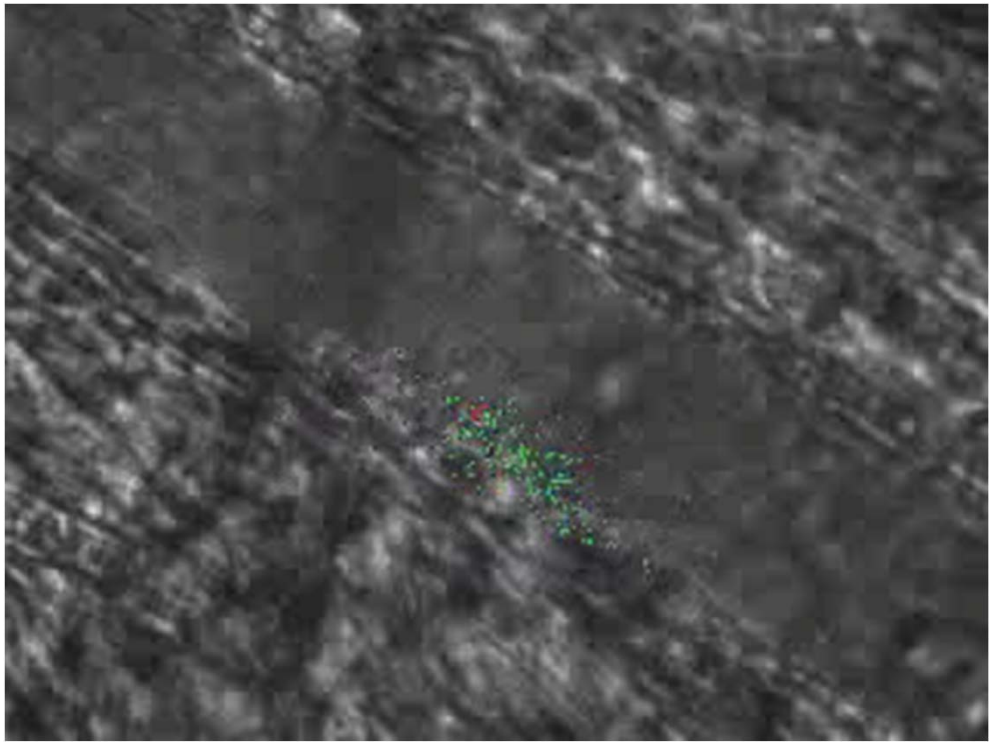
- Platelet size
  - 2-4 µm (2/millionth) meter
- Human hair
  - 50 µm
- Platelets stick to injured blood vessels

When platelets are too activated



- Vessel obstructed: thrombosis!
- Heart disease

Heart disease when platelets are too activated



- Platelets are in red
- Platelets form a thrombosis

https://youtu.be/-7iwv4y2MPc

Platelet products are life-saving

Different patients:

- Trauma (surgery)
- Heart disease patients (post-surgery)
- Cancer patients (post-chemotherapy)

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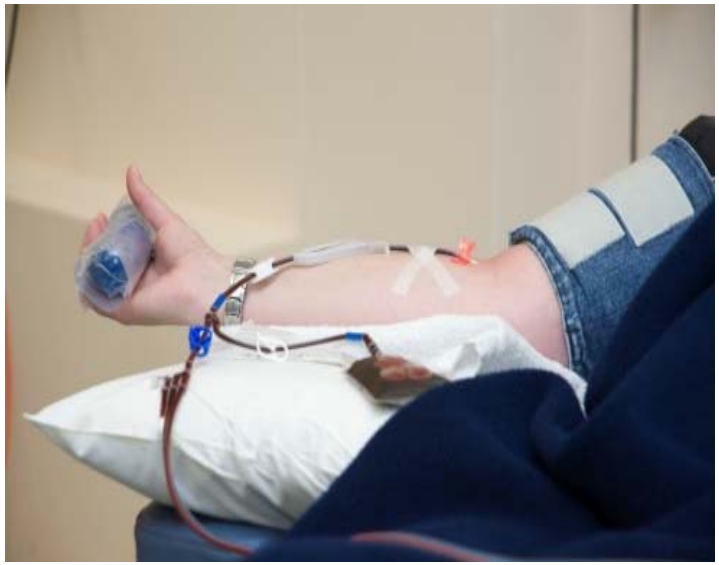
Platelet products and storage



Platelet storage in blood bank:

- Blood/platelets donation at donation centre
- 21-22°C in gas permeable bags
- Constant “gentle shaking”

Shelf life of 5 days!

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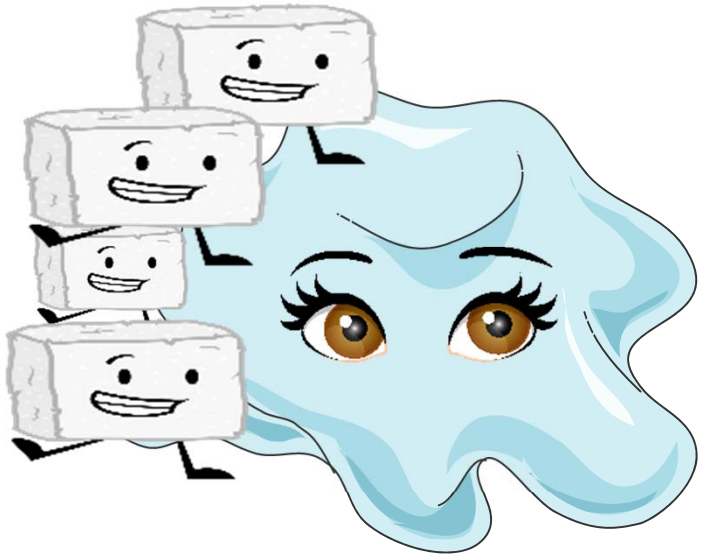
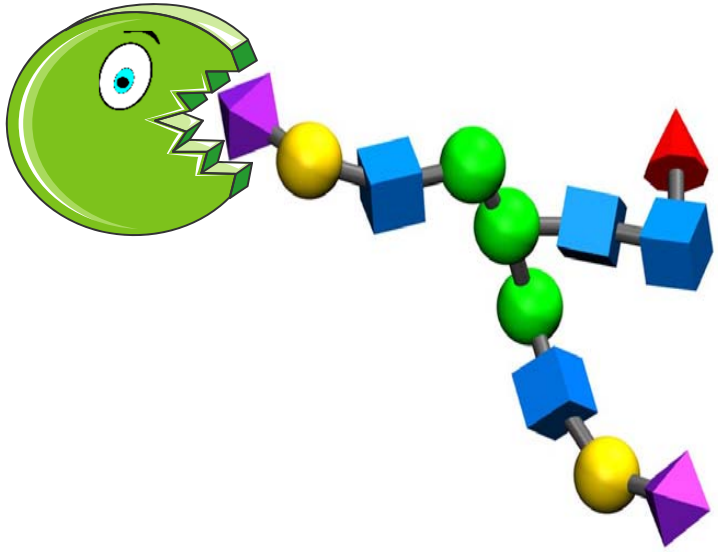
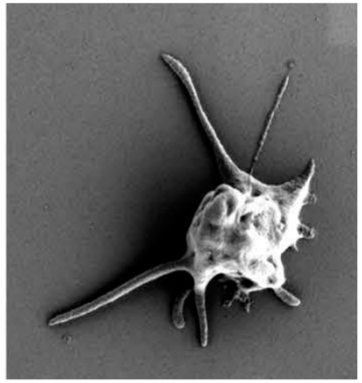
All platelets are different

- Age
- Gender
- Diet
- Lifestyle
- Medications

Platelet surface contains sugars





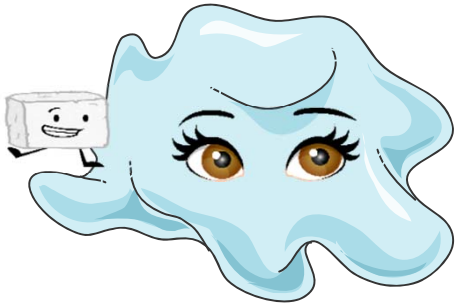


- Sugars are highly branched
- Sugars removed by proteins
- Role in platelet function not well studied

Platelet sugars protect against “eating”

- Bleeding disorder ITP:
- platelets are removed too quickly from body

-> **bleeding**



- Patients: less platelet sugars
- Protect sugar coat

  -> patient platelets survived longer

van der Wal DE/Li J et al, *Nat Comm* 2015

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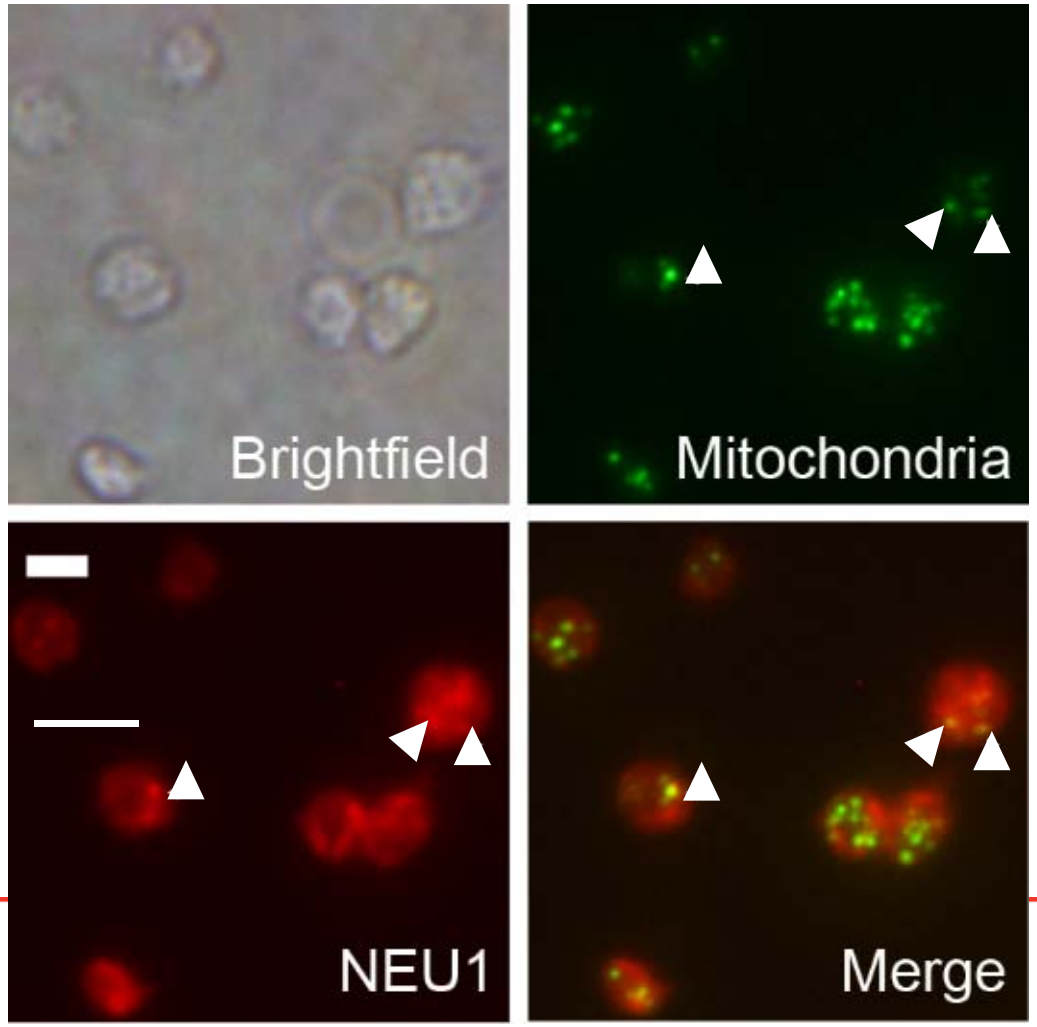
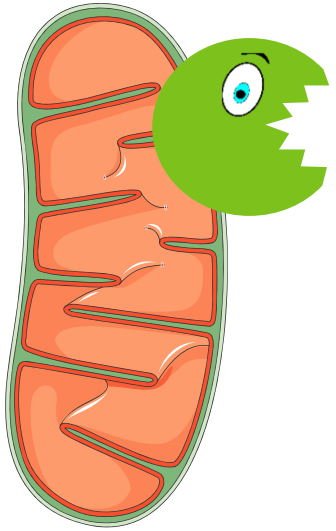
Where are sugar removing proteins?





- Fluorescence microscope
- **Green: Mitochondria**
- **Red: NEU1**

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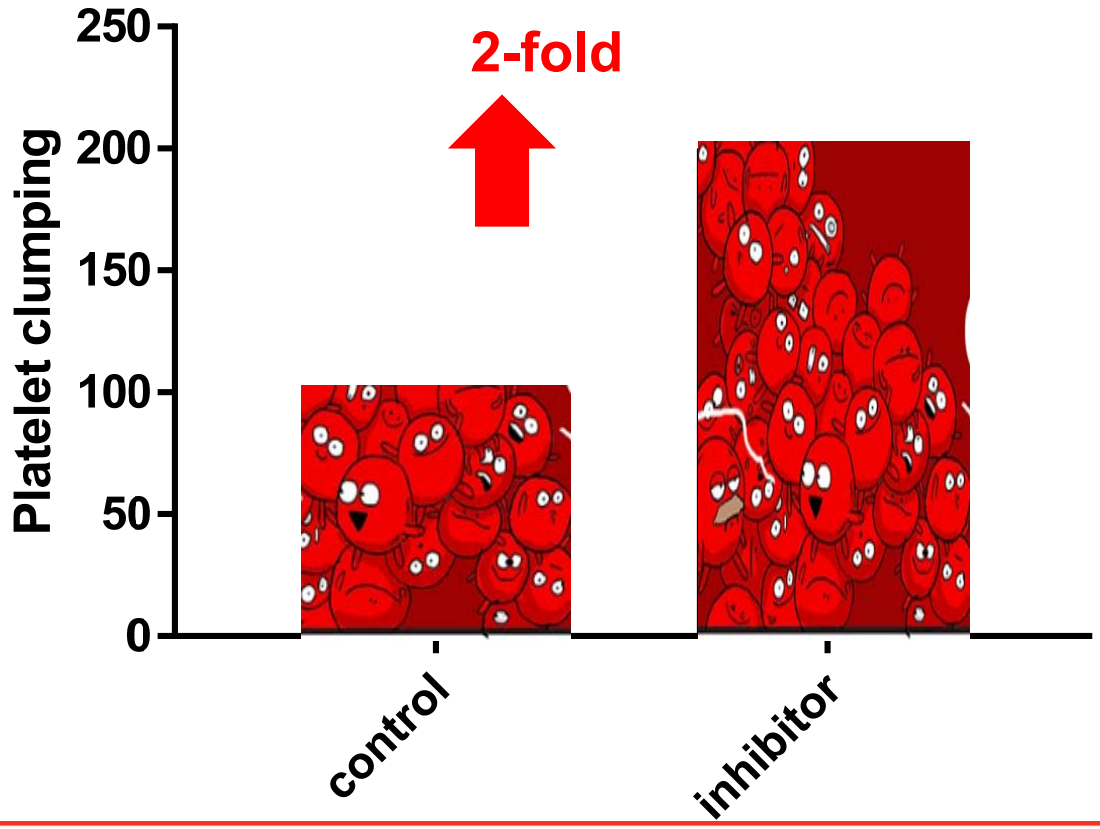
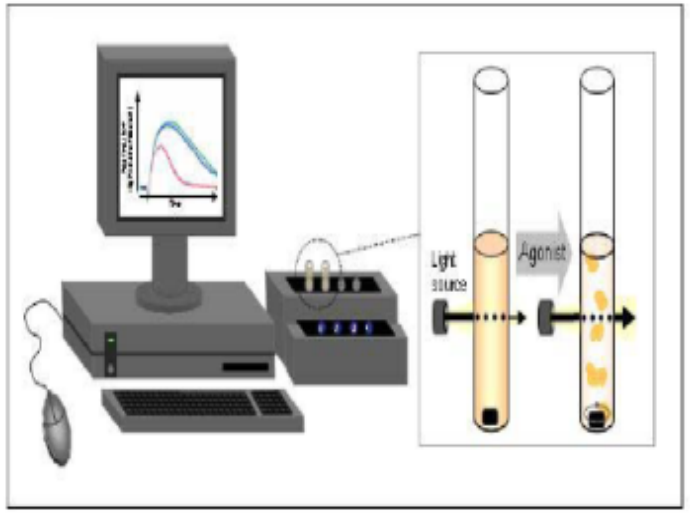
Sugars important for platelet clumping

- Sugar removal stopped: more sugars -> more clumping





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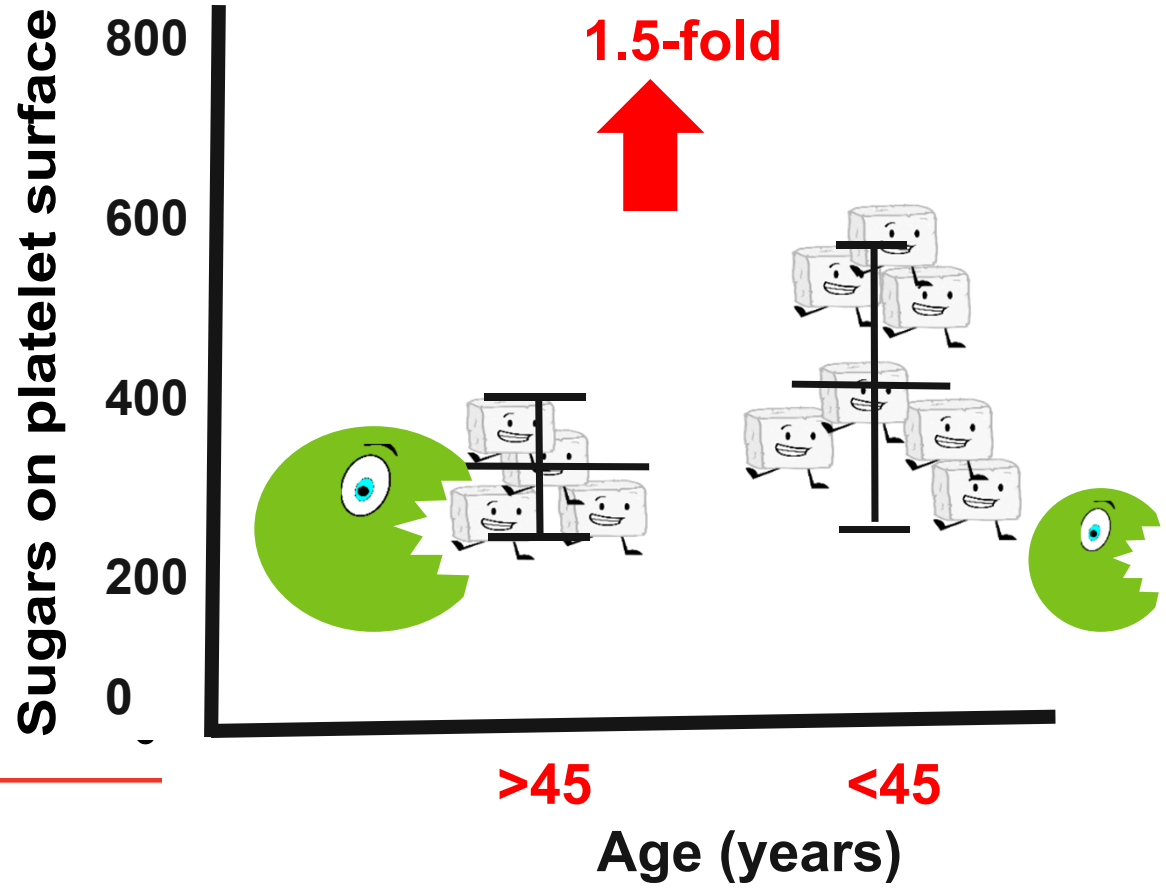
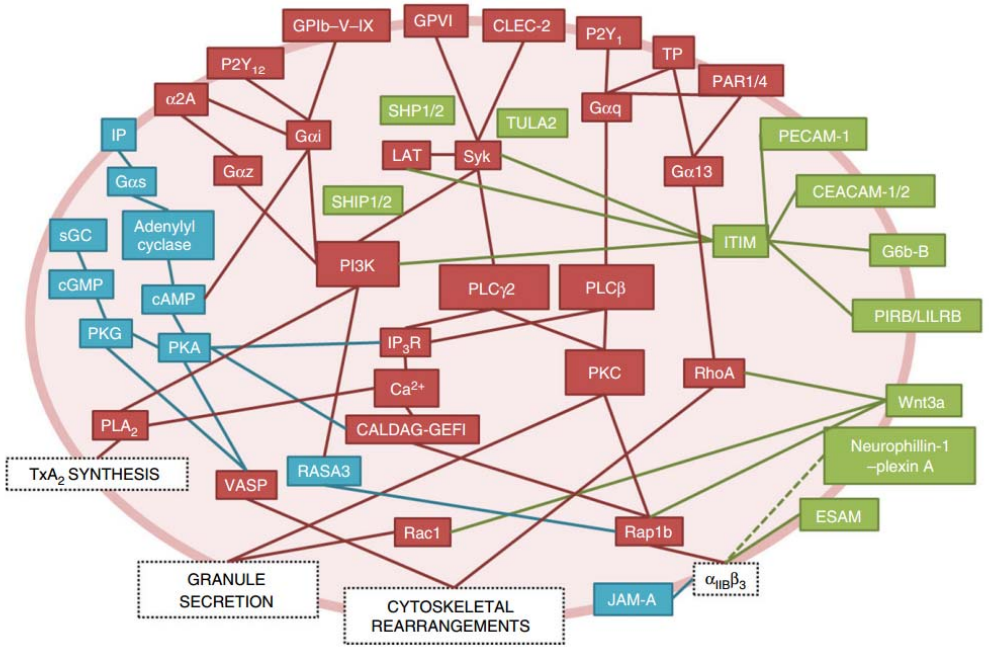
Platelet sugars are removed upon aging

- After activation: more sugars on younger platelets



Solving a little piece of the platelet puzzle



- Many platelet signalling proteins known

  -> Target for heart disease medications

- **Much still unknown, sugars a new mechanism**

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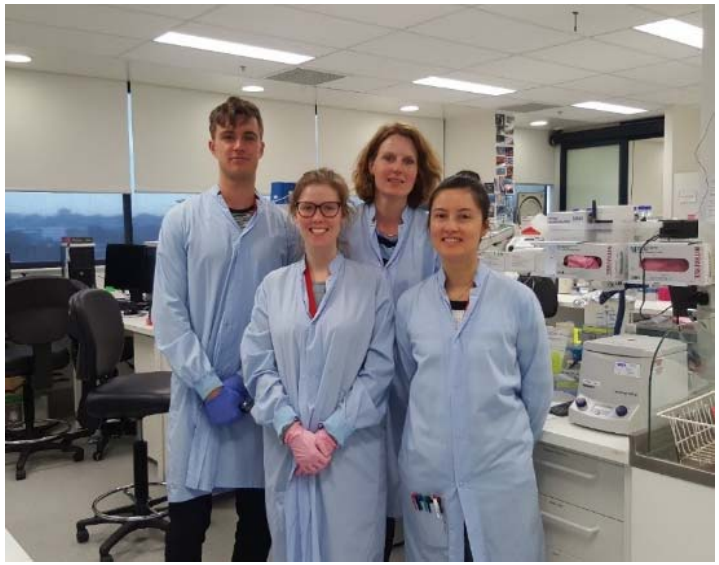
Why platelet sugars are important

Platelet products high demand and short supply

- Improve:
  - Platelet quality during storage
  - Improve effectiveness product in patients

- Know more about how platelets work:
  - Target sugars, new medicine for heart disease in future?

Acknowledgements



- As/Prof Denese Marks
- Dr April Davis
- Dr Alison Gould
- ANZSBT
- THANZ

ANZSBT
Australian & New Zealand Society of Blood Transfusion Ltd

THANZ
Thrombosis & Haemostasis society of Australia and New Zealand

Questions?

- About blood/platelet donation?
- Platelets?
- **https://www.donateblood.com.au/**

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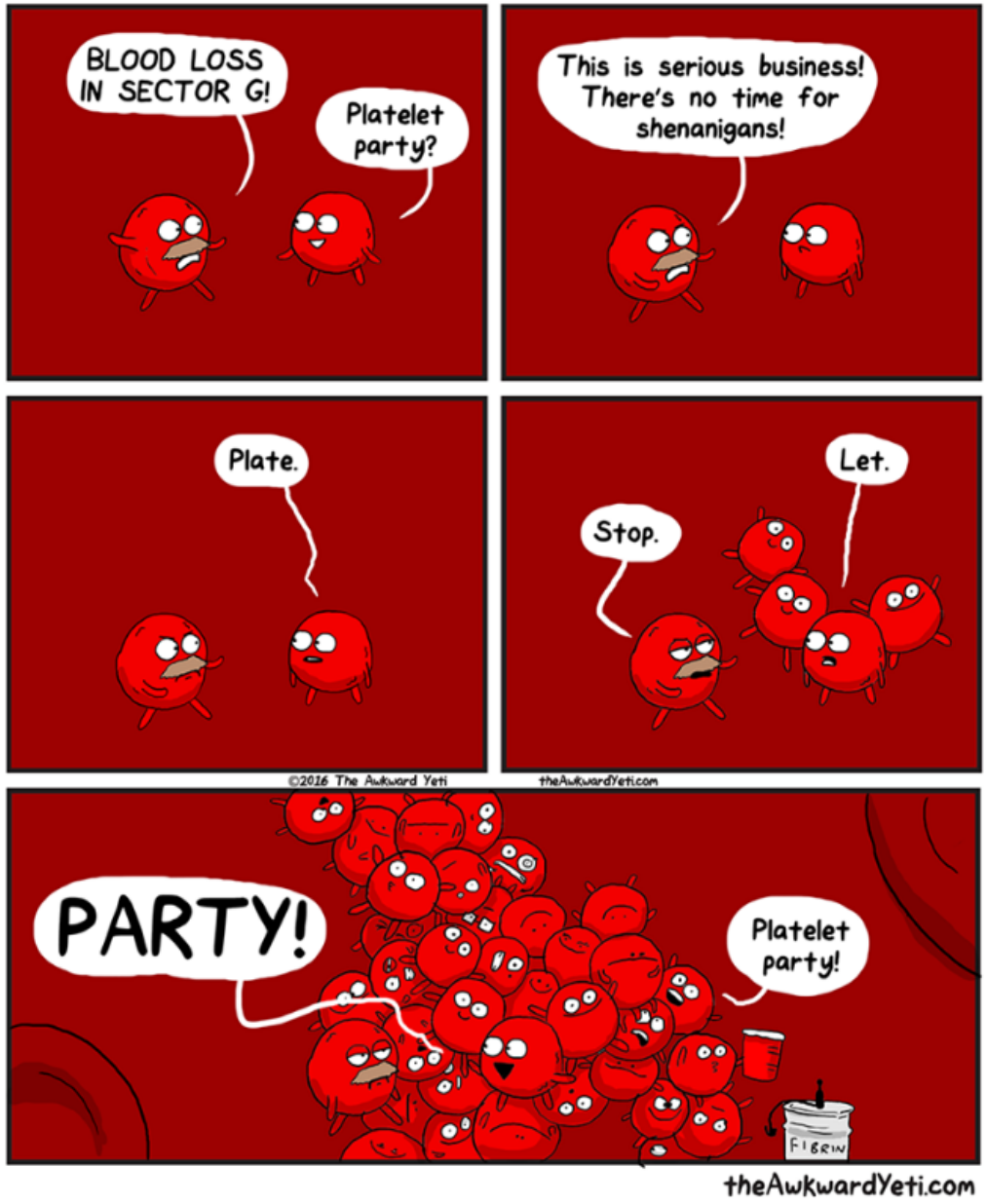

Post-donation: blood separated into products