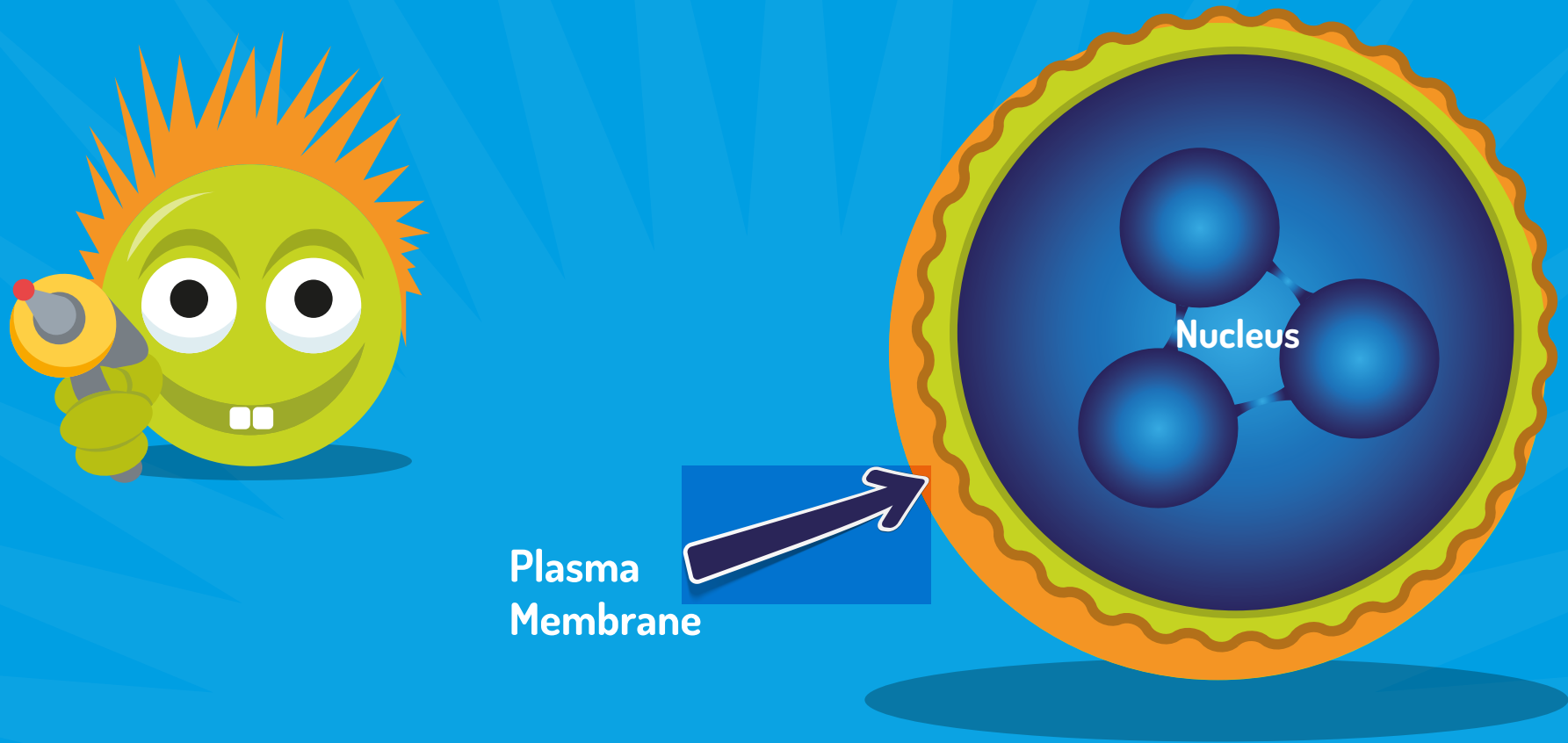


Measuring Rac Activation in Neutrophil Chemotaxis



Neutrophils are the body's **first line of defence** and are the first cell to be called upon in an immune response.



They contain a **nucleus divided** into 2–5 lobes.

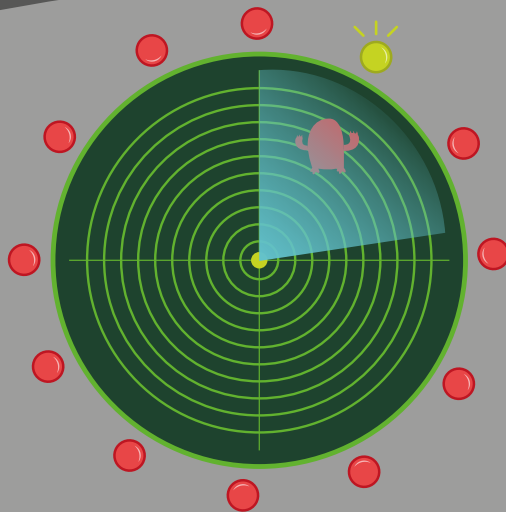
Neutrophils have **no sense of direction** or defined 'front' and 'back' in their normal state.



However, neutrophils sense the **debris trail** left behind by a bacterium or **distress signals** from other cells and move towards the trouble.



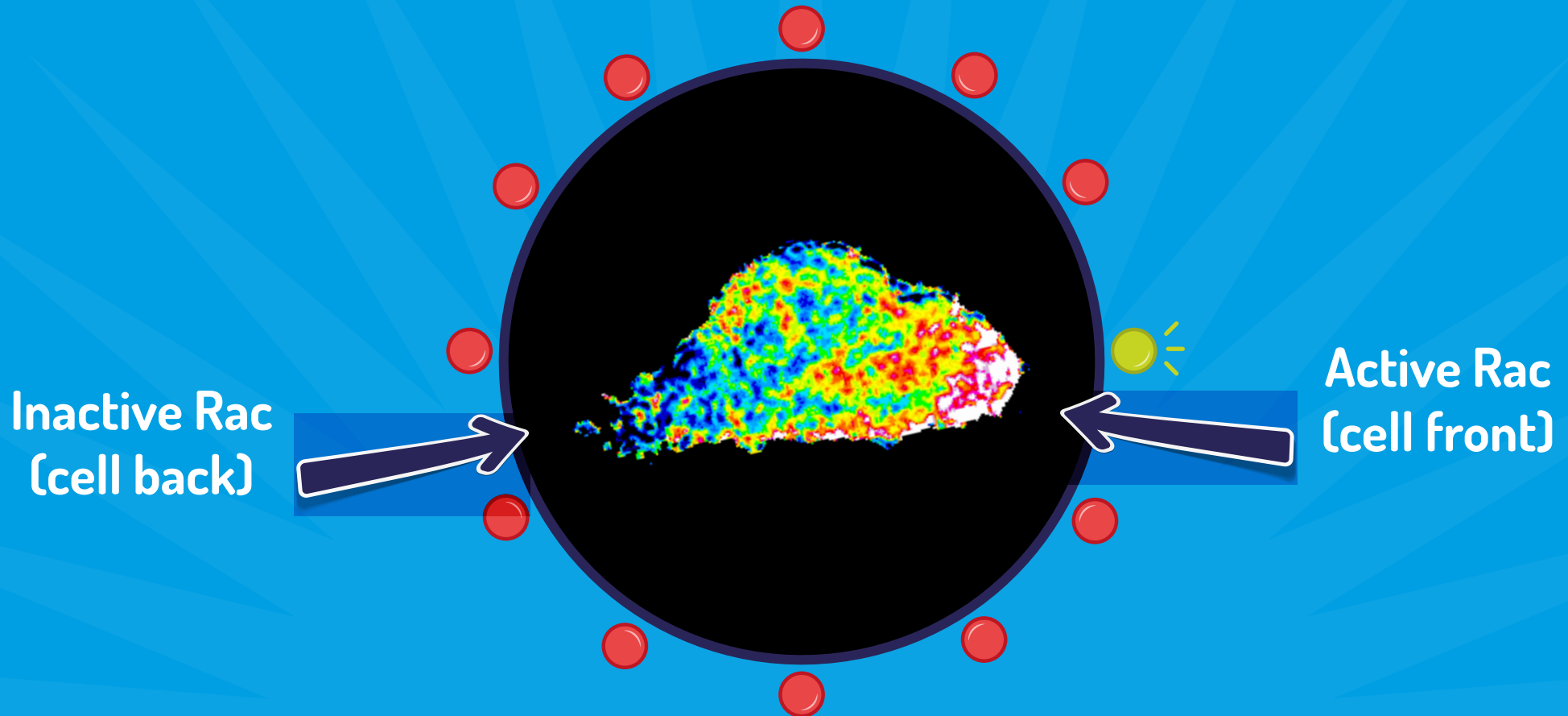
This detection triggers the **formation of a front and back** of the neutrophil. Followed by chemotaxis (movement) towards the bacterium.



BACTERIA DETECTED

**RAC
ACTIVATED**

In order for chemotaxis to take place
Rac must be active in the cell.



Rac gives the cell a front and back,
as shown in the above heat map of active Rac.

Rac is a molecular switch existing in an 'OFF' (GDP bound) or 'ON' (GTP bound) state.



RAC SWITCH

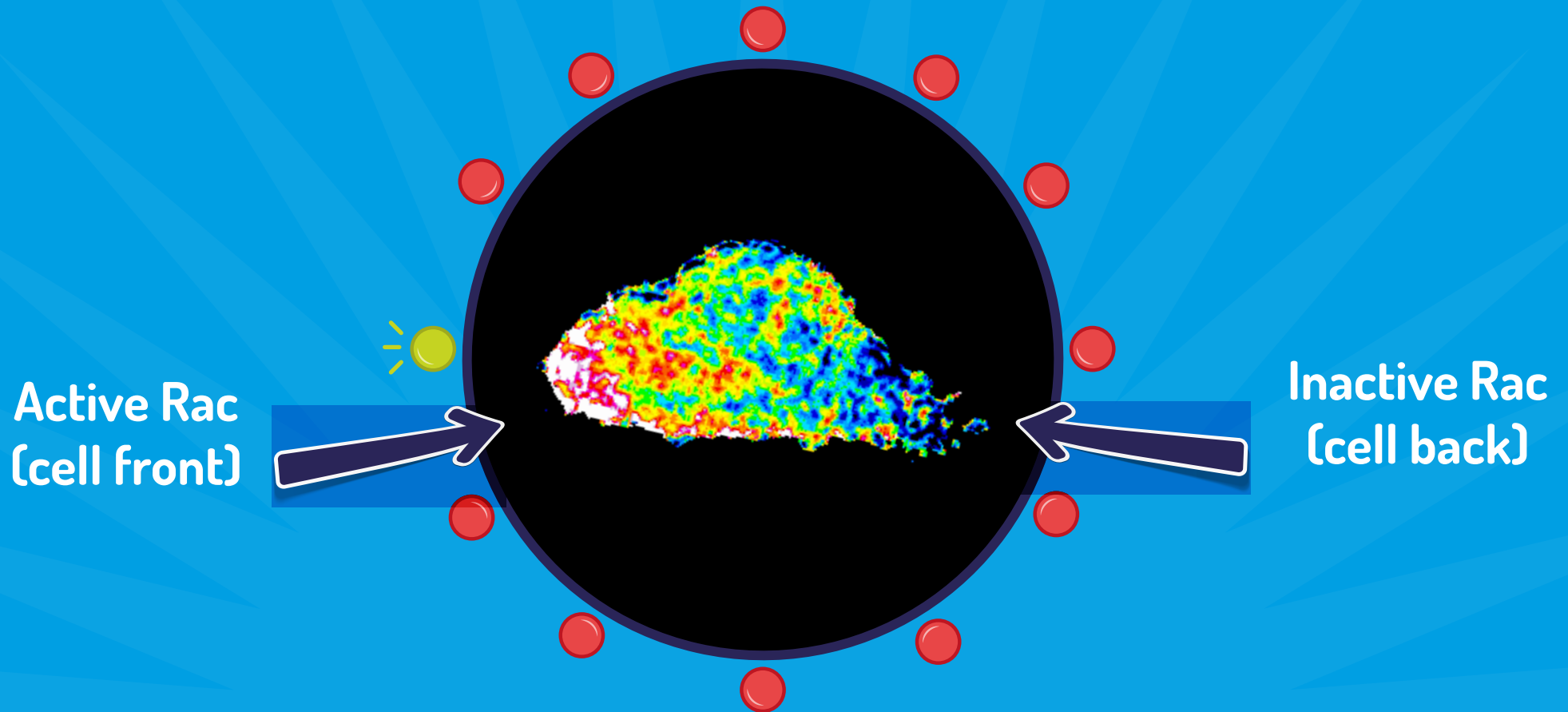
GDP
BOUND

OFF

ON

GTP
BOUND

Rac is stimulated by the debris trail left behind by a bacterium and **migrates towards it**.



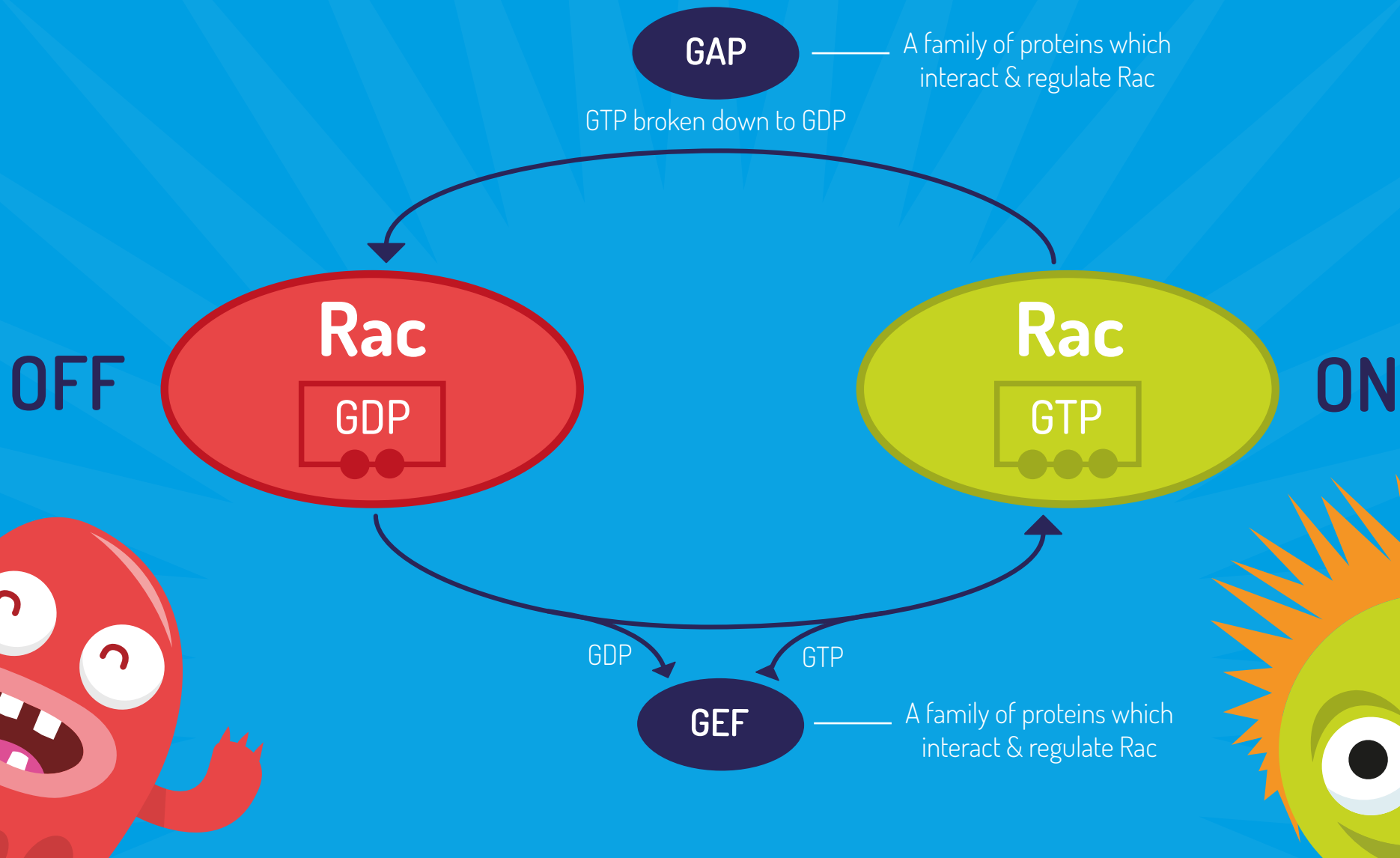
The cell won't turn to follow the trail,
it will simply create a new front

If Rac is **dysfunctional** then neutrophils **can't migrate**.

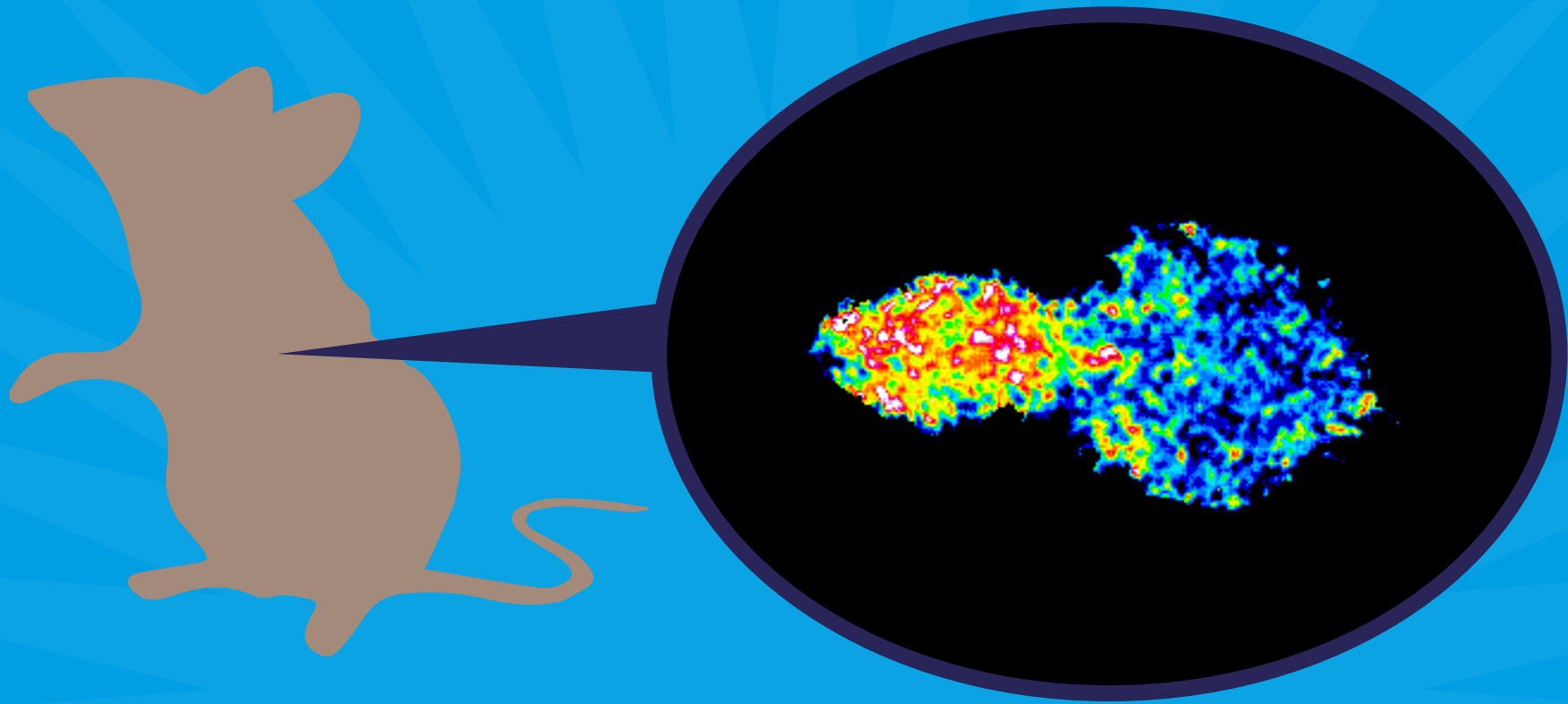


They also **can't produce oxygen radicals** which are used to break down pathogens

We study the **regulation of the Rac switch**, specifically how it is **turned on**, so that we can better understand how neutrophils function.



To advance our understanding of the function of Rac, we have developed mice with a **sensor inside their neutrophils**, which allows us to see when Rac is switched on or off.





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Research in the Welch lab focusses on the molecular mechanisms that regulate Rac, in particular the proteins which activate Rac, so called Rac-GEFs:

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