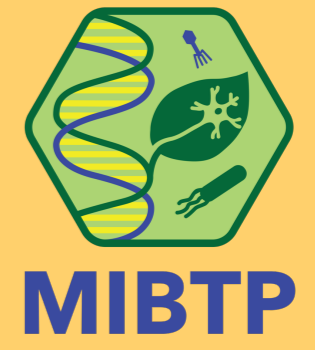


Rewriting Genomes: Programmed DNA Elimination in *Auanema rhodense*

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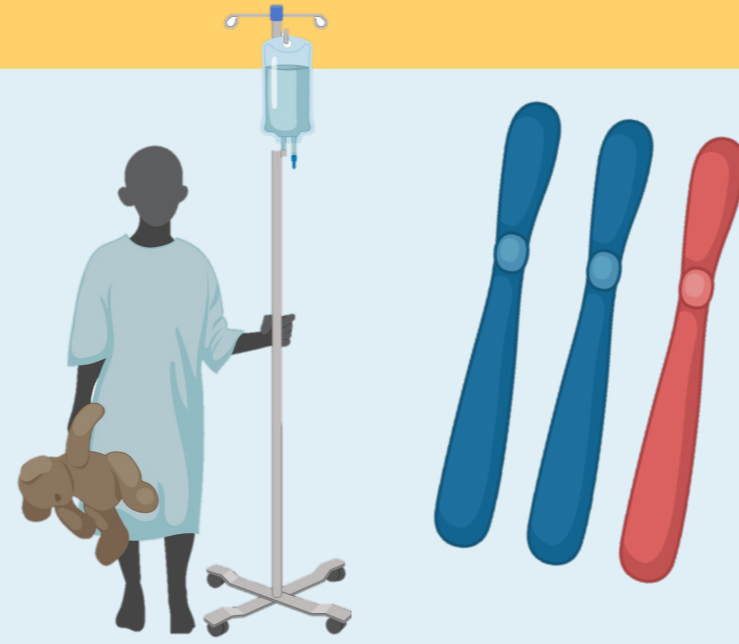
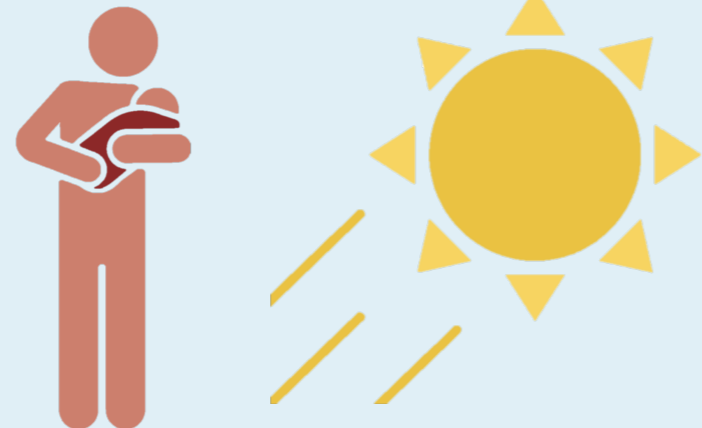


Motivation & Problem



Changes in our DNA/ genome (mutation) can lead to diseases.

Mutations can be inherited from our parents or caused by external factors (e.g.: UV exposure).



Genetic diseases include Down's syndrome & Cancer.

There's currently no cure for these genetic diseases.



There is an urgent need for genome editing as treatment for genetic diseases.

The Solution: Programmed DNA Elimination (PDE)

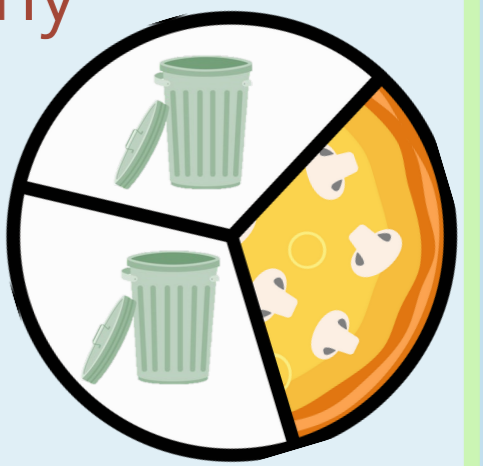


PDE is where some animals remove a large part of their DNA deliberately¹.



PDE- undergoing animals ranges from finches to microscopic roundworms called *Auanema rhodense*.

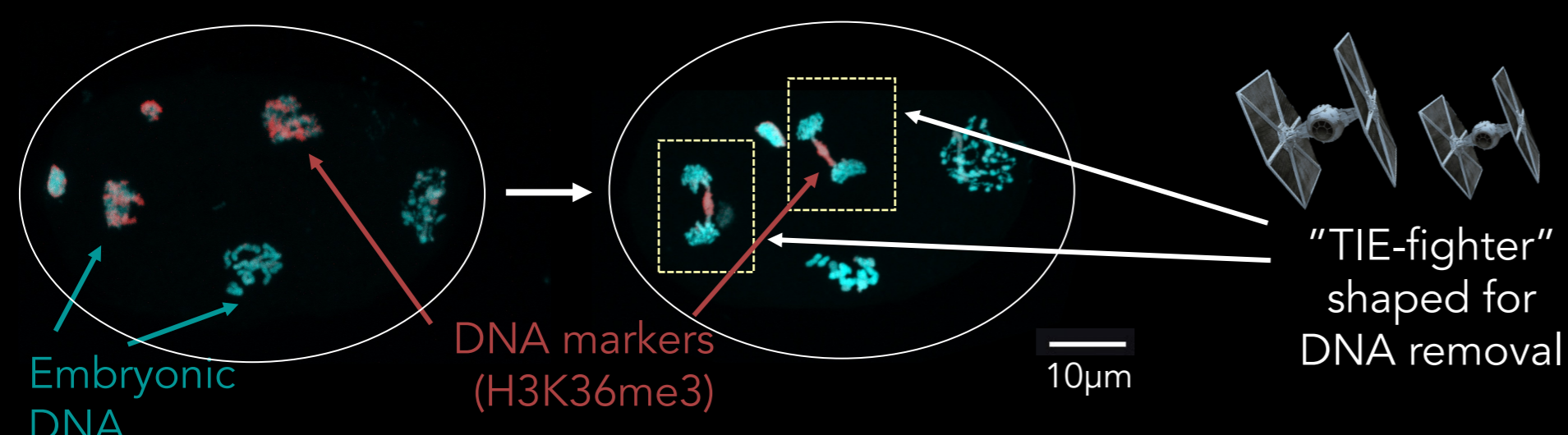
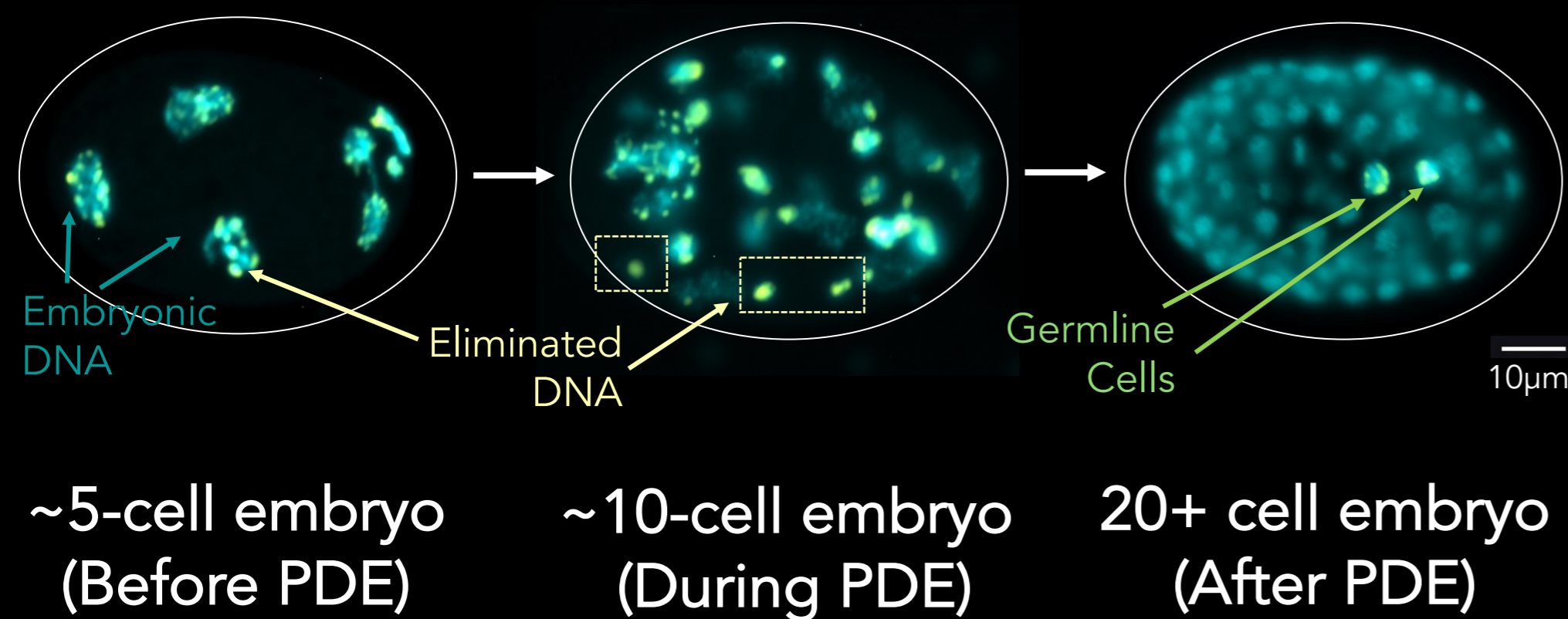
A. rhodense removes nearly 2/3 of its DNA in body (somatic) cells, while the sperm & eggs (germline) stay intact².



Understanding how cells delete DNA could help remove harmful mutations in genetic diseases.

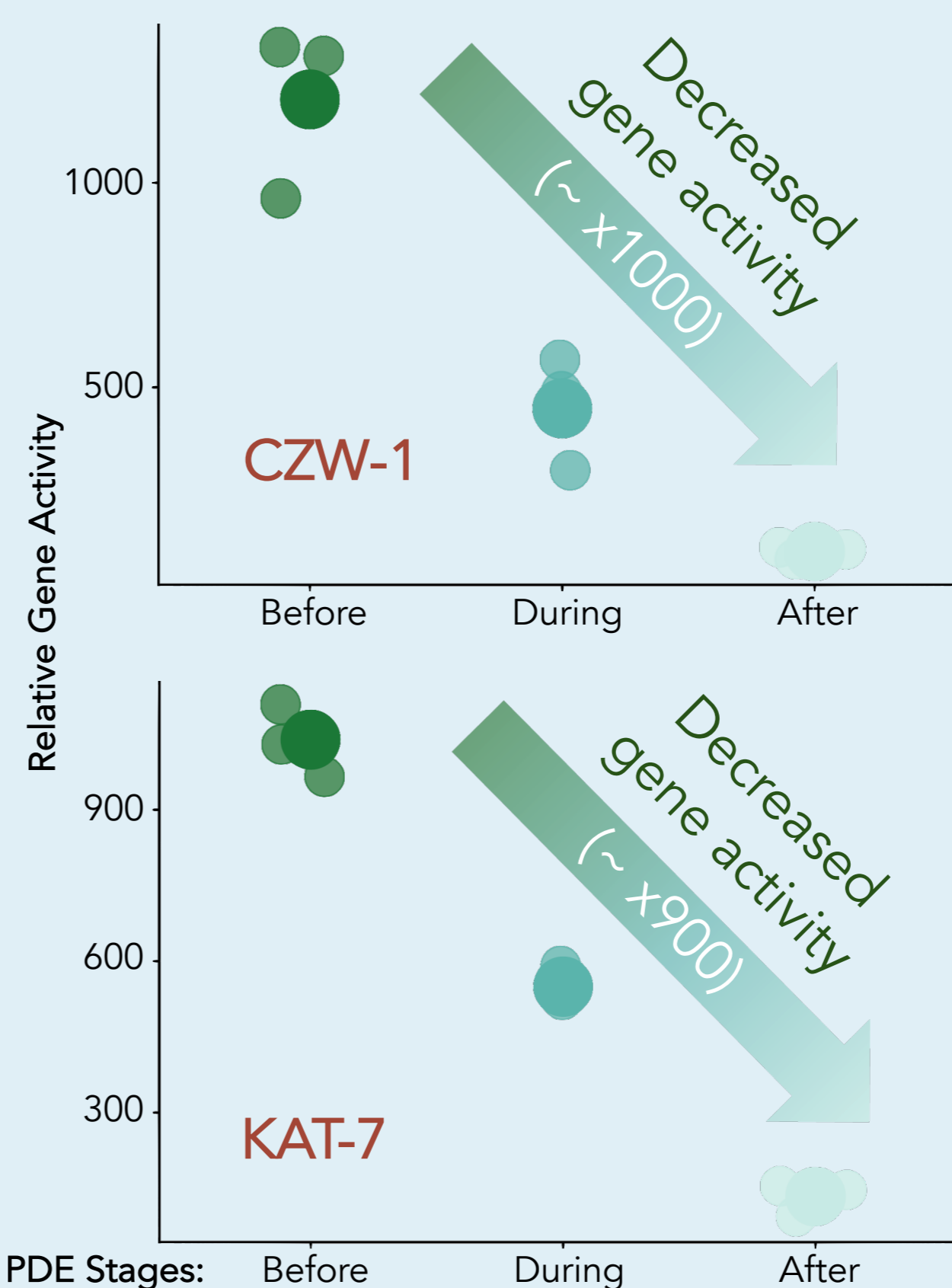
Key Findings: When & How DNA is Deleted

1. PDE occurs during early embryonic development. (100% within the 1st hour of the egg being laid!)

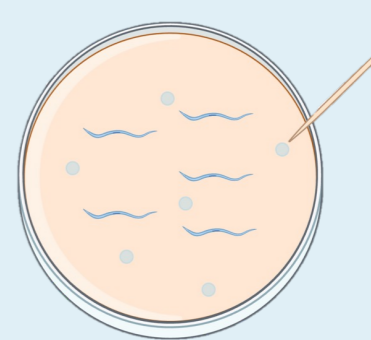


2. DNA undergoes structural change with the help of DNA markers to carry out PDE.

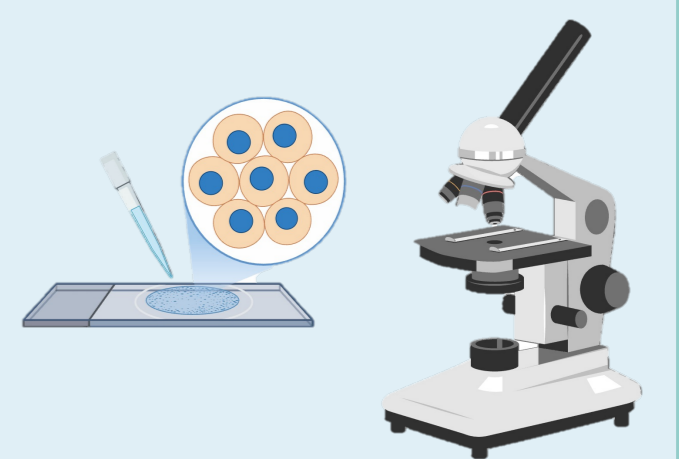
3. Candidate genes that are active before PDE are identified to have a possible role in PDE.



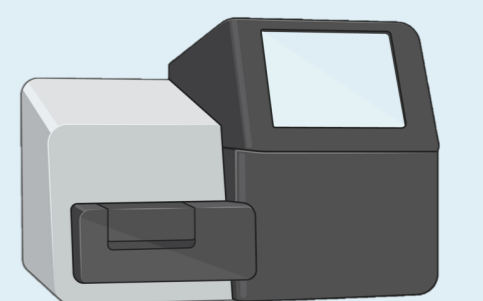
Approaches



Worm Culture & Egg Collection around the PDE timeframe



Immunofluorescence Staining & Microscopy



RNA- Sequencing (Gene expression)

Why this matters for human health?

PDE Candidate genes & proteins have the potential to be manipulated to eliminate DNA on demand.

PDE- processing genes provides a natural toolkit to remove harmful DNA to prevent and treat genetic diseases in humans.



Did you know? *A. rhodense* are trioecious, where there's female, male and self-fertilising hermaphrodites!

References

1. Wang, J. and Davis, R.E. (2014) 'Programmed DNA elimination in multicellular organisms', *Current Opinion in Genetics & Development*, 27, pp. 26-34. Available at: <https://doi.org/10.1016/j.gde.2014.03.012>.
2. Gonzalez De La Rosa, P. M. (2023) Chromosome evolution in Rhabditina (Nematoda) with a focus on programmed DNA elimination. PhD Thesis. University of Cambridge.