The Role of CEP164B in *Trypanosoma brucei*: Implications for Flagellum Biogenesis and Cell Cycle Regulation.

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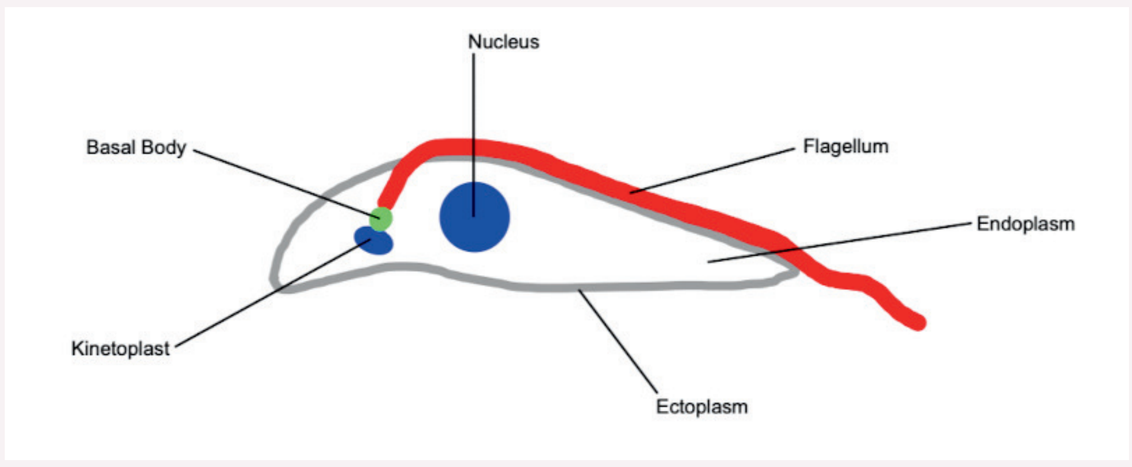
INTRODUCTION

African Sleeping Sickness is a neglected tropical disease caused by the parasite ***Trypanosoma brucei.***
The disease is transmitted by tsetse flies and progresses from flu-like symptoms to severe neurological disorders and ultimately leading to death if untreated. [1]

What is *Trypanosoma brucei*?
A single celled parasite responsible for African Sleeping Sickness. [2]
Its survival depends on a unique whip like tail called a **flagellum**. This is used to move around the body and for division of the cell.[1]

What is CEP164B?
A key protein situated in the basal body that helps the parasite build and control its flagellum. When **CEP164B** is missing, the parasite **cannot divide properly** and **becomes shorter** and defective.

Figure 1 - Annotated diagram of a trypansome cell.



OBJECTIVE

The **aim of this research** was to investigate whether CEP164B had an affect on the flagellum length and cell cycle of Trypanosomes.
Current treatments are limited for African Sleeping Sickness and have side effects.
Understanding the parasite's movement and division could **reveal new drug targets.**

METHODOLOGY

Using **RNA interference** (**RNAi**), a technique used to turn off genes.[3] This was so that CEP164B was removed from the parasite.
I used **immunofluorescence microscopy**[3] which is a method that uses dyes that glow to highlight specific parts of the cell - to track changes in cell shape and movement.
After images like the ones below were taken, I analysed over 2000 cells measuring the length and categorising them into groups.

Figure 2 - Annotated diagram of the cell cycle in Trypanosomes

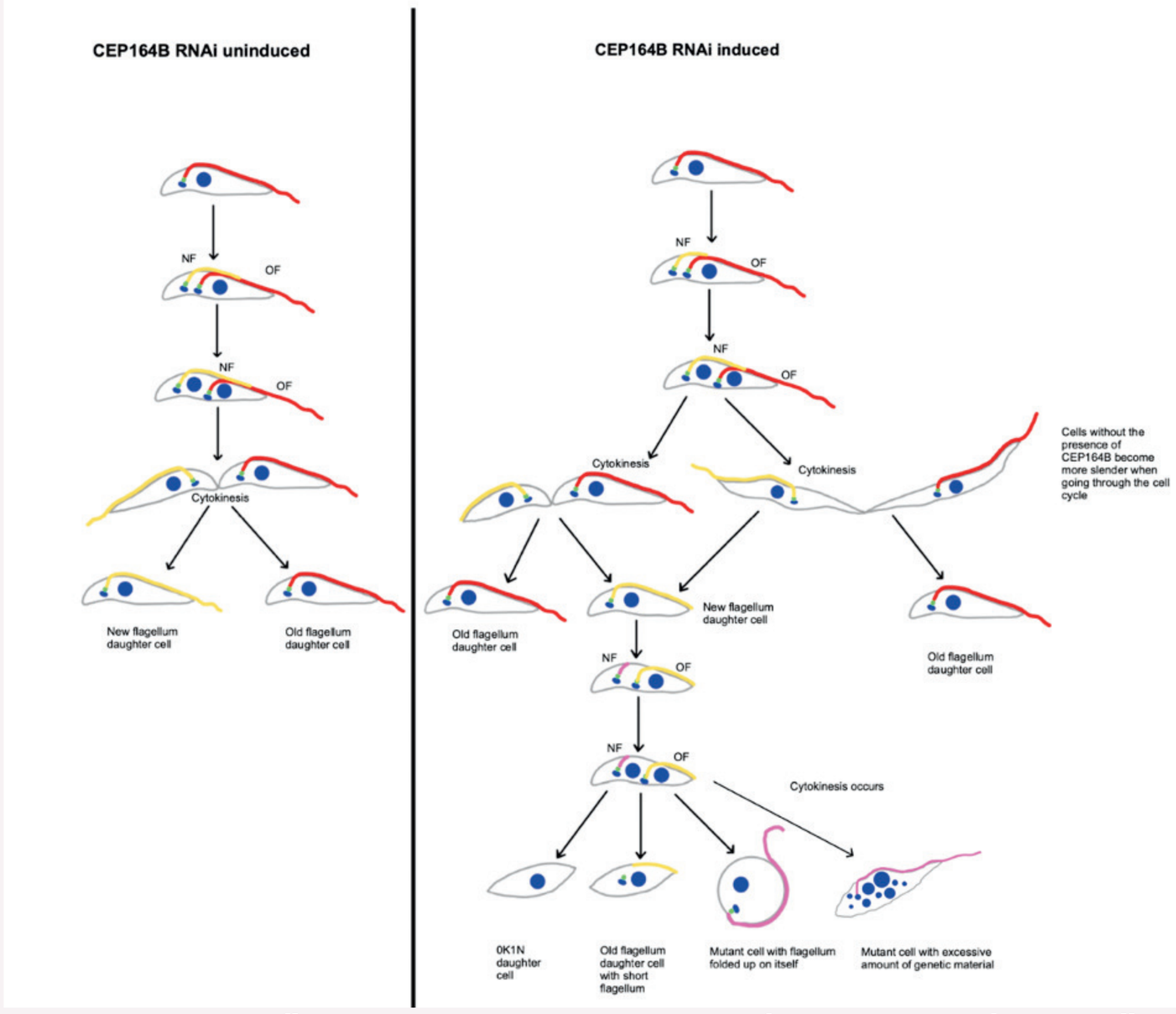
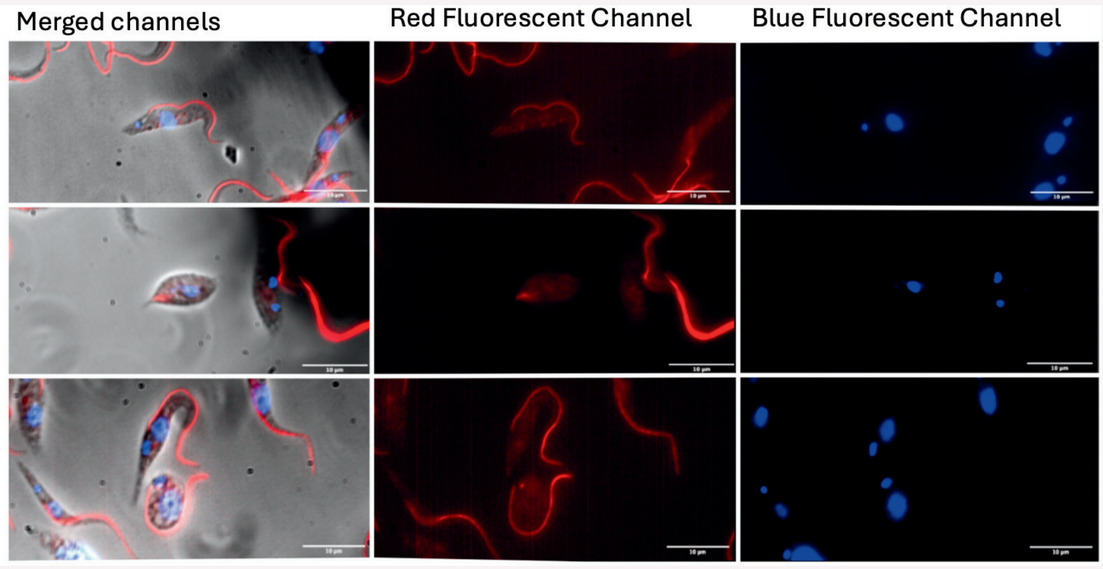


Figure 3 - Immunofluorescent microscope images of *Trypanosoma brucei* cells



RESULTS

Key Findings:
Changes in Cell Shape and Division:

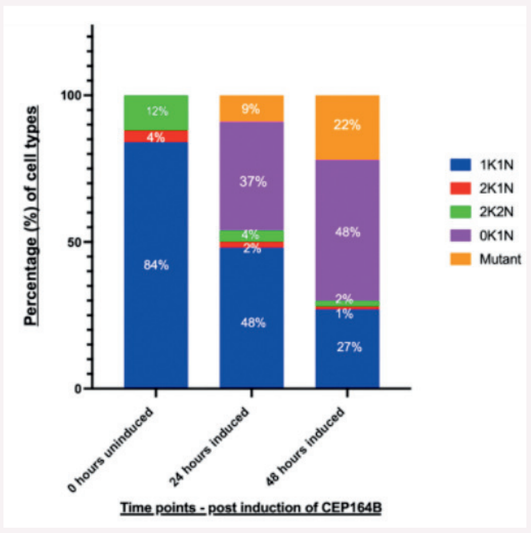
- Normal cells had one nucleus and one kinetoplast.
- The cells without CEP164B, lost their kinetoplast, became deformed, or failed to divide properly.

Flagellum Defects:

- In normal cells, the flagellum helps in movement and cell division.
- The cells without CEP164B. the flagellum were shorter and defective, affecting the parasites survival.

CONCLUSION

This study highlights the essential role of CEP164B in the cell division and flagellum formation of *T.brucei*. When CEP164B was removed, the parasite showed severe defects in cell shape, flagellum growth and organelle division, leading to abnormal cells to emerge. This suggests that CEP164B is crucial for maintaining cell cycle progression and structural stability. Unlike human cells, T.brucei lacks strict cell cycle checkpoints, allowing defective cells to persist.



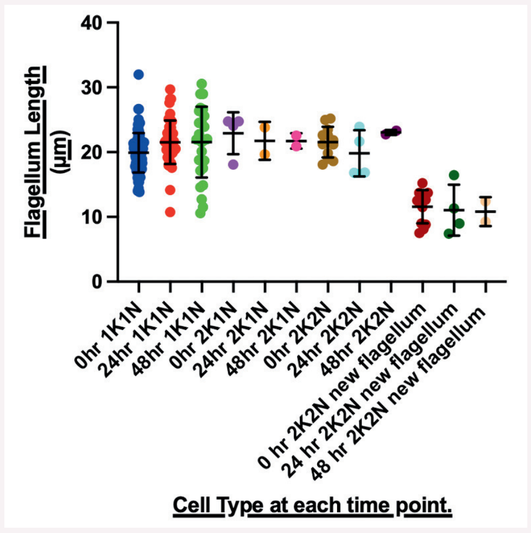


Figure 4 - A stacked bar graph showing the distribution of cell types across the different time points.
Figure 5 - A scatter plot of each cell types flagellum length (µm) at each time point.

These findings support the idea that CEP164B is a key regulator of flagellum biogenesis and cytokinesis, making it a potential target for future treatments against African Sleeping Sickness.

REFERENCES

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3 - Andre, J., Kerry, L., Qi, X., Hawkins, E., Drižytė, K., Ginger, M.L. and McKean, P.G. (2014). An Alternative Model for the Role of RP2 Protein in Flagellum Assembly in the African Trypanosome. Journal of Biological Chemistry, 289(1), pp.464–475. doi:https://doi.org/10.1074/jbc.m113.509521.