A comparison between the heat shock responses of *T. brucei* and *T. congolense*

Abbey Taylor, Marianne Aelmans, Dr Caroline Dewar, Dr Mick Urbaniak.

Periods of host fever can be used as a strategy to prevent infections, by killing temperature sensitive bacteria and viruses. *Trypanosoma brucei* and *Trypanosoma congolense* are vector borne parasites causing Animal African Trypanosomiasis (AAT), a disease currently lacking effective drug-treatments. AAT affects cattle and causes extensive economic hardship in sub-Saharan Africa. Symptoms of AAT include periods of fever as high as 41°C, eliciting a heat shock response in the parasites to allow survival in the host. Eukaryotic cells respond to heat shock by triggering a global translational arrest and upregulating heat shock proteins. This response appears to be conserved by trypanosomes however the mechanisms used differ.

At 41°C, bloodstream form *T. brucei* display a heat shock response, with a decrease in polysomes and global translation and an increase in the number of P-bodies (containing DHH1, SCD6, XRNA1, PABP2) and HS stress granules (containing PABP1, eIF3E1 to E4) (Kramer et al., 2008, Kramer et al.,2013). It has also recently been shown that heat shock in *T. brucei* results in altered phosphorylation of the post-transcriptional heat shock regulatory complex MKT1-ZC3H11-DHH1 (Ooi et al., 2020). Whilst *T. brucei* is a well-studied model organism, little work has been done on the close relative *T. congolense*. As *T. congolense* is a close relative of *T. brucei* and they co-infect the same hosts, it is expected they will show similarities in host interactions.

We will interrogate and compare survival mechanisms of *T. brucei* and *T. congolense* by characterising its heat shock response, in hopes of paving the way for the discovery of novel drug targets. Data will be shown that demonstrates the similarities and differences found so far between the *T. brucei* and *T. congolense* heat shock response, including re-localisation and abundance of heat shock proteins, growth recovery and cell cycle analysis. This data represents some of the first investigations into specific pathways involved in the *T. congolense* heat shock response.

References

Kramer, S., Queiroz, R., Ellis, L., Webb, H., Hoheisel, J. D., Clayton, C. and Carrington, M. (2008) 'Heat shock causes a decrease in polysomes and the appearance of stress granules in trypanosomes independently of eIF2α phosphorylation at Thr169', Journal of Cell Science. Europe PMC Funders, 121(18), pp. 3002–3014. doi: 10.1242/jcs.031823.

Kramer S, Bannerman-Chukualim B, Ellis L, Boulden EA, Kelly S, Field MC, Carrington M. Differential localization of the two T. brucei poly(A) binding proteins to the nucleus and RNP granules suggests binding to distinct mRNA pools. PLoS One. 2013;8(1):e54004. doi: 10.1371/journal.pone.0054004.

Ooi, C. P., Benz, C. and Urbaniak, M. D. (2020) 'Phosphoproteomic analysis of mammalian infective Trypanosoma brucei subjected to heat shock suggests atypical mechanisms for thermotolerance', Journal of Proteomics. Elsevier B.V., 219, p. 103735. doi: 10.1016/j.jprot.2020.103735.