

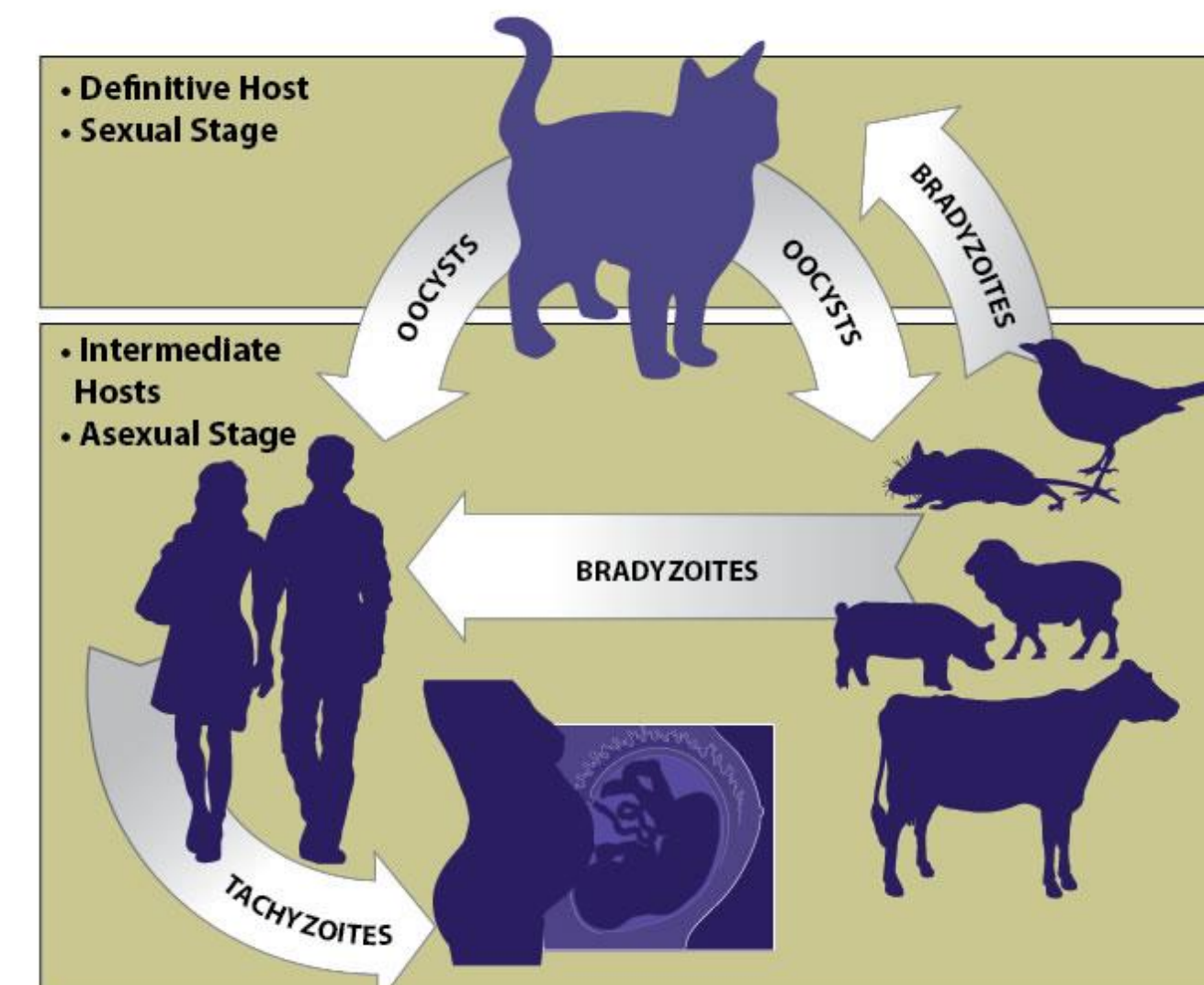
# Multi-layer Regulation of the Essential ApiAP2 Factor AP2X-7 in *Toxoplasma gondii*

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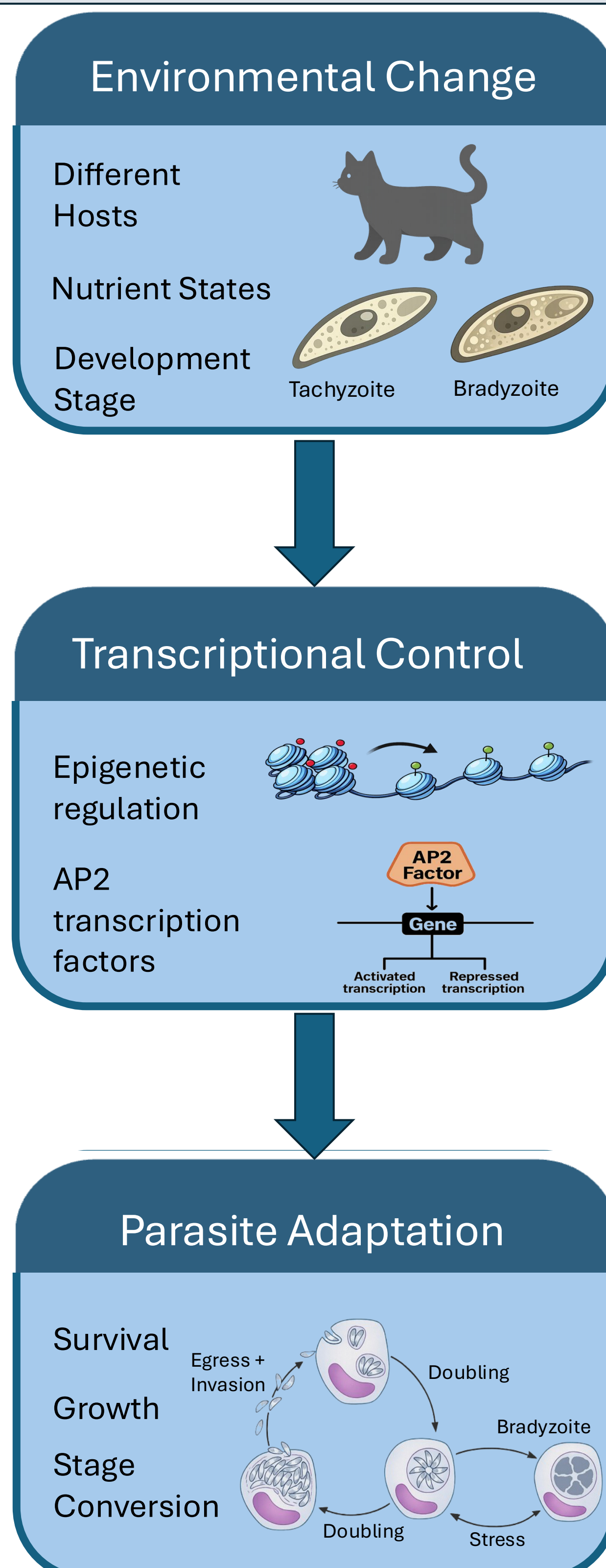
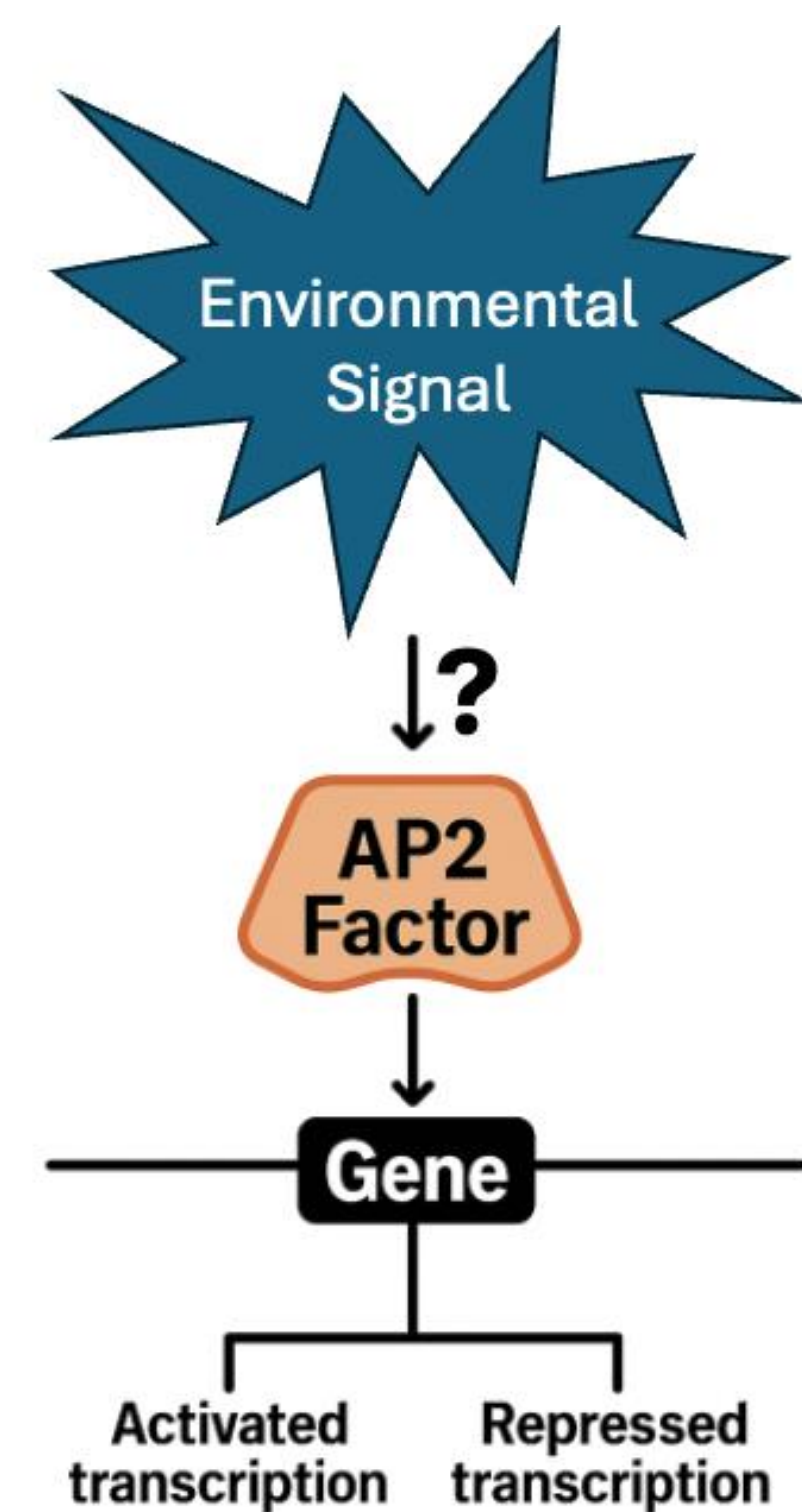
## *Toxoplasma gondii*: A Zoonotic Parasite of Global Concern

*Toxoplasma* is a parasite that infects many warm-blooded animals, including humans, causing the disease toxoplasmosis. It switches between fast-growing (tachyzoite) and dormant (bradyzoite) stages to survive and spread. Because successful infection depends on adapting to changing conditions, understanding how *Toxoplasma* rewires gene expression may reveal new vulnerabilities in the parasite.



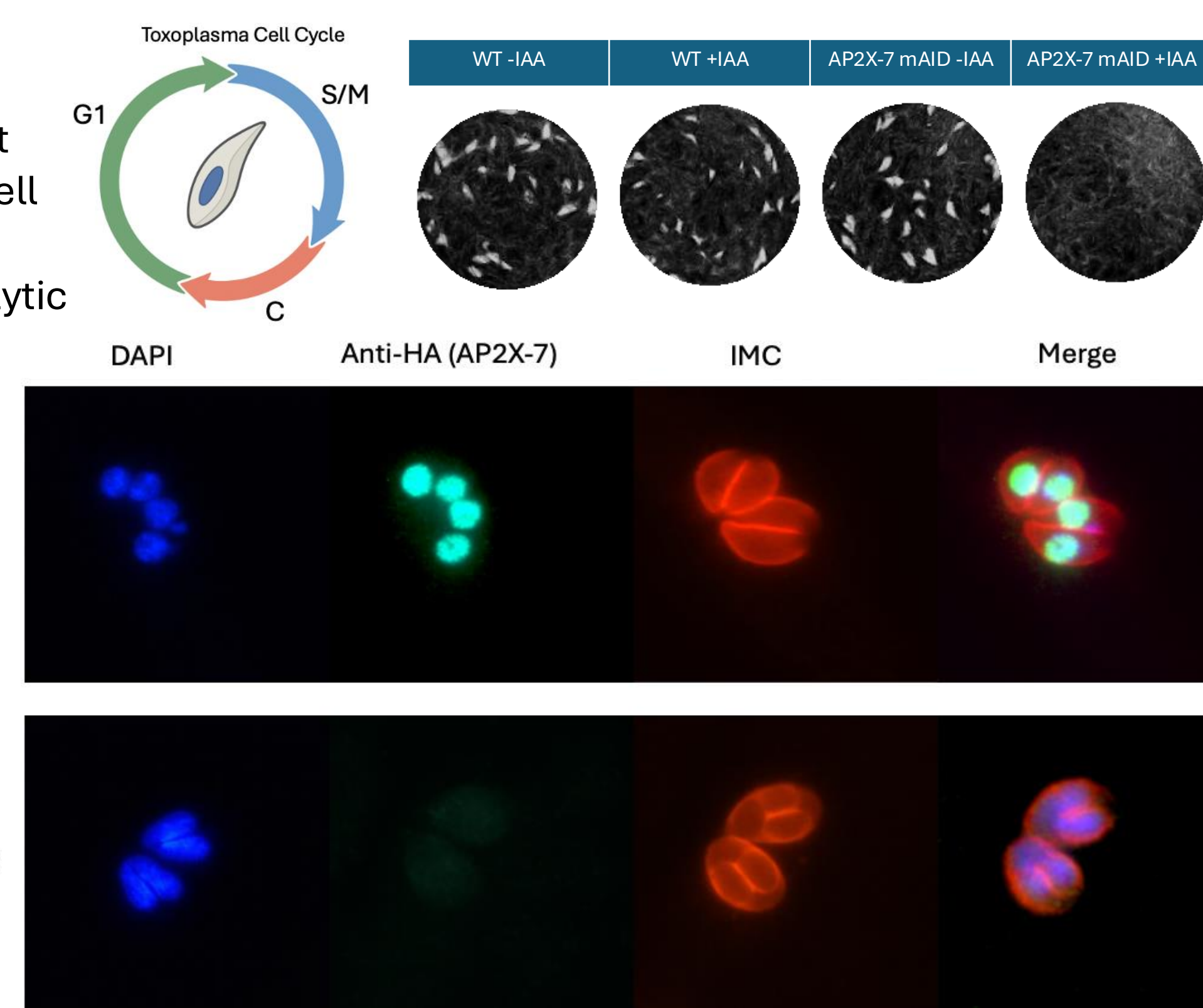
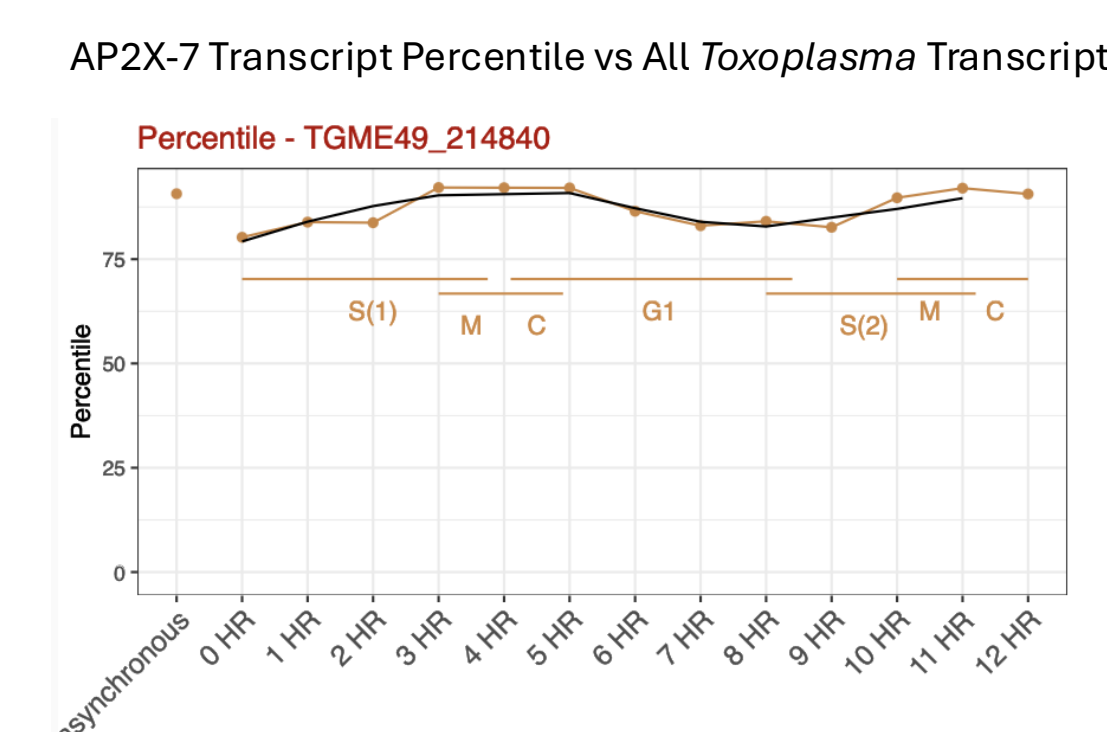
## Environmental Signals Regulate Transcription in *Toxoplasma*

- T. gondii* must rapidly adapt to changing host and environmental conditions
- Adaptation requires large-scale remodeling of parasite gene expression
- This regulation occurs through chromatin accessibility and ApiAP2 transcription factors
- ApiAP2 proteins bind DNA to activate or repress gene expression programs
- How environmental signals influence AP2-mediated transcription remains unclear



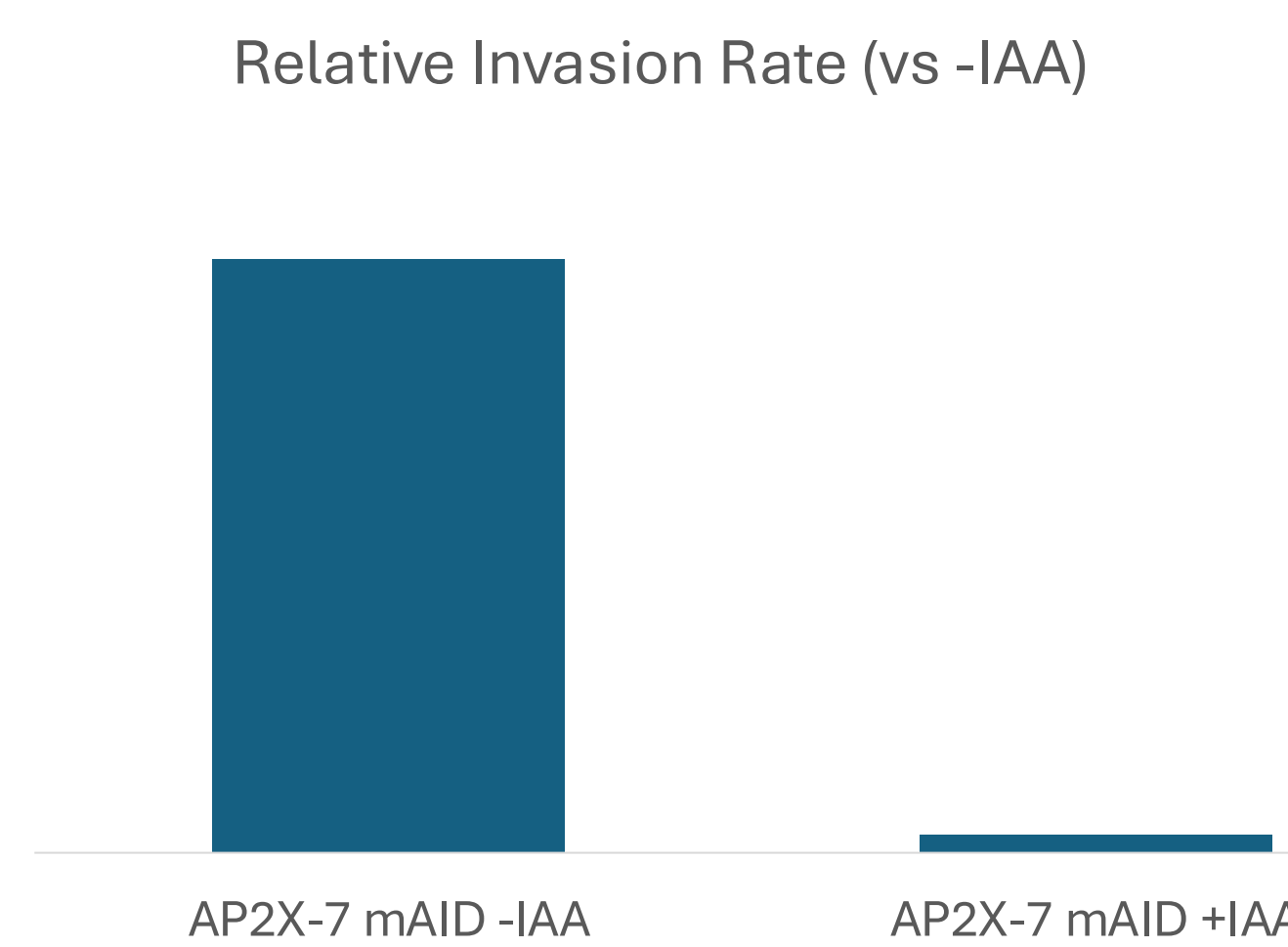
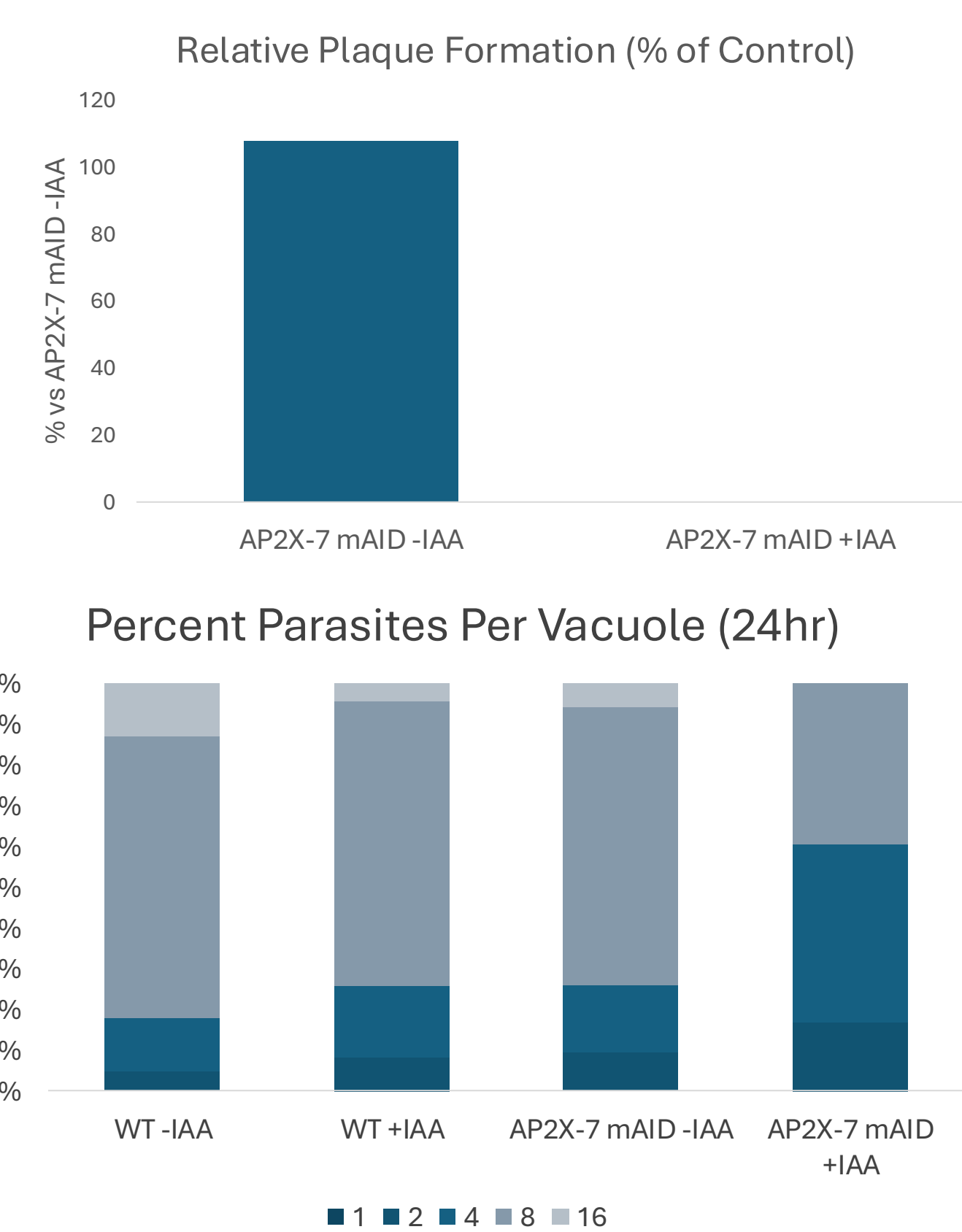
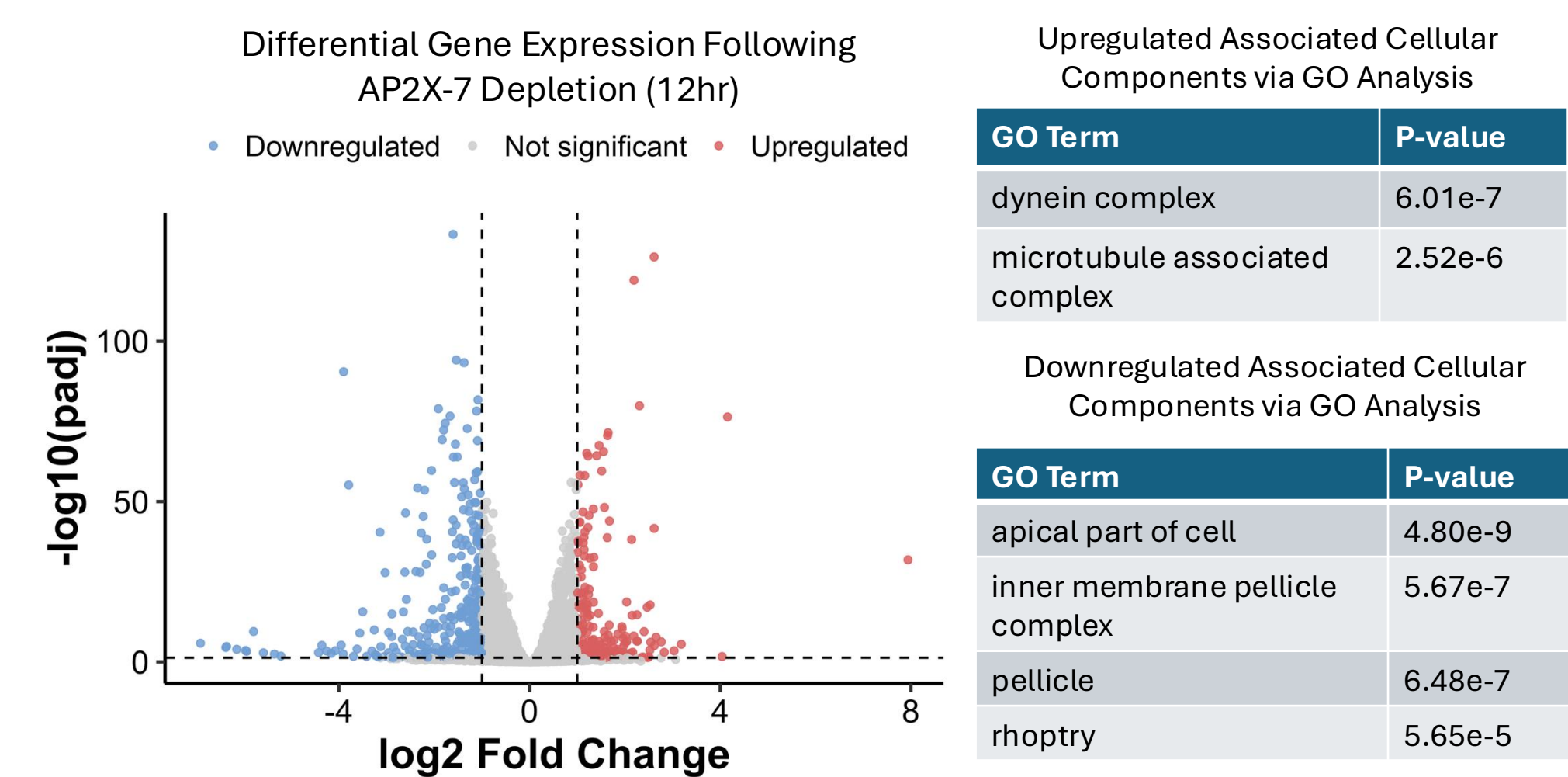
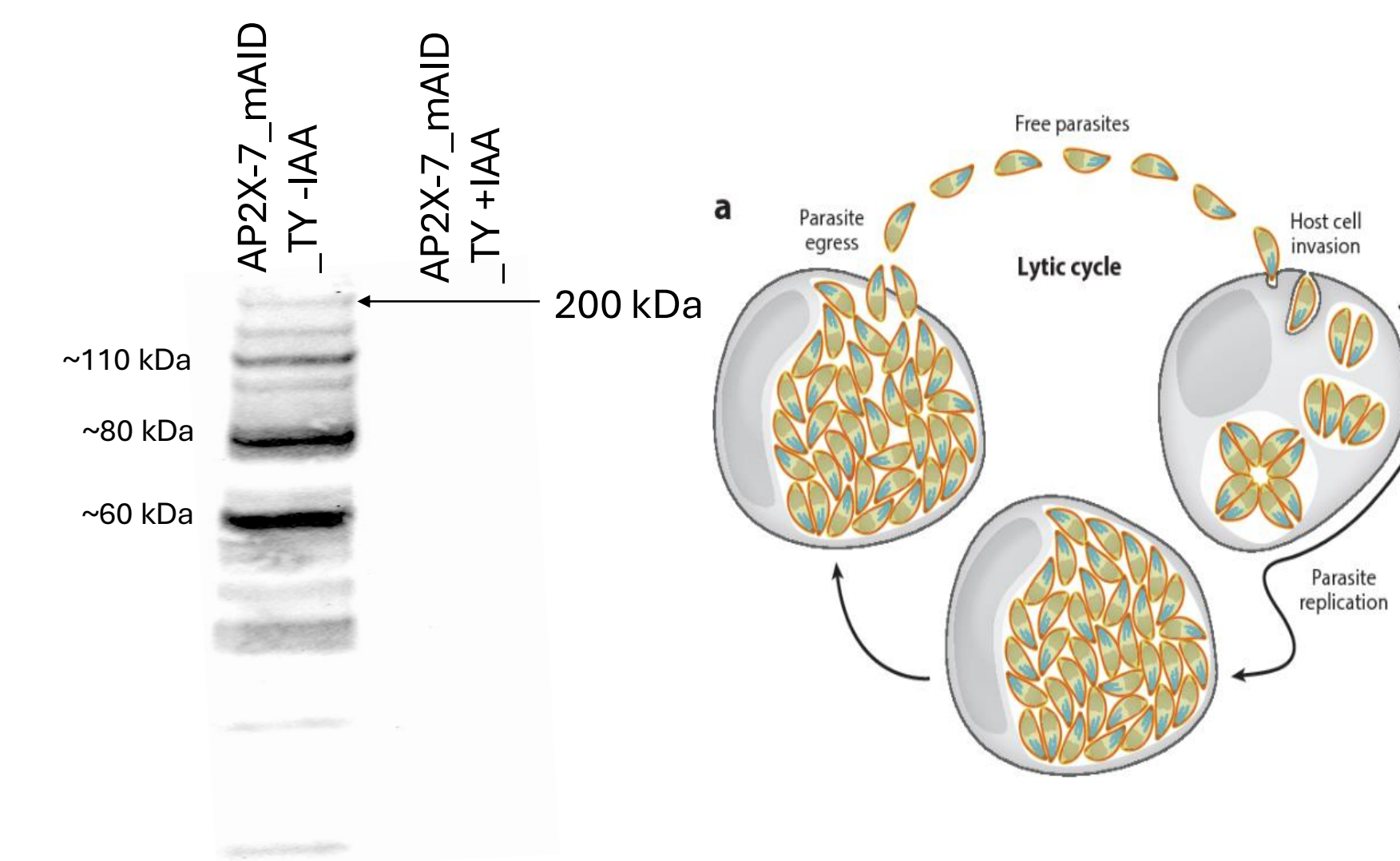
## AP2X-7 is an Essential Regulator of Gene Expression

- AP2X-7 is an essential ApiAP2 transcription factor in *T. gondii*
- Its transcript is constitutively expressed, but protein is restricted to the G1 phase of the cell cycle
- Loss of AP2X-7 results in total failure of the lytic cycle
- AP2X-7 globally influences transcriptional programs required for parasite survival



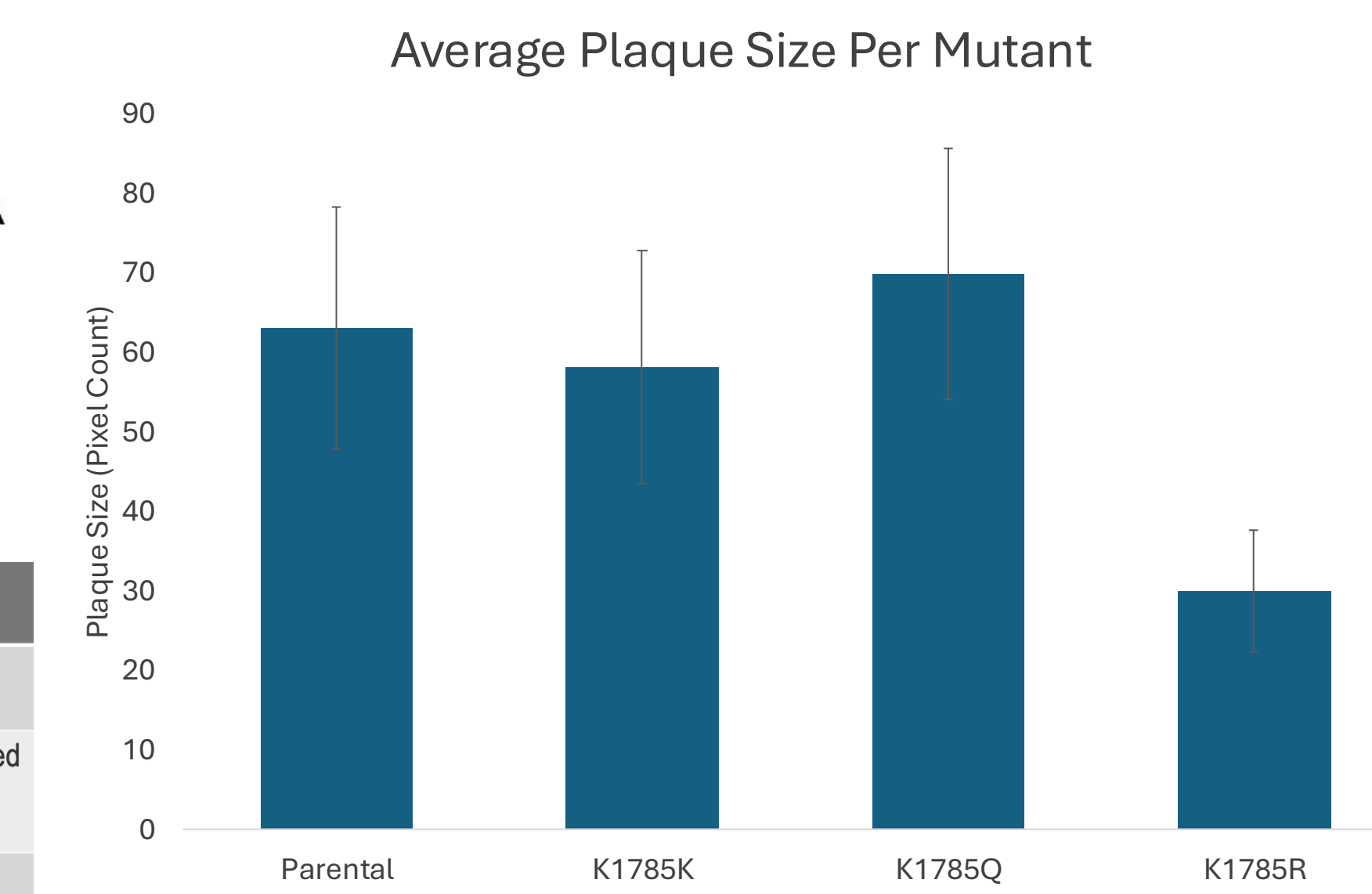
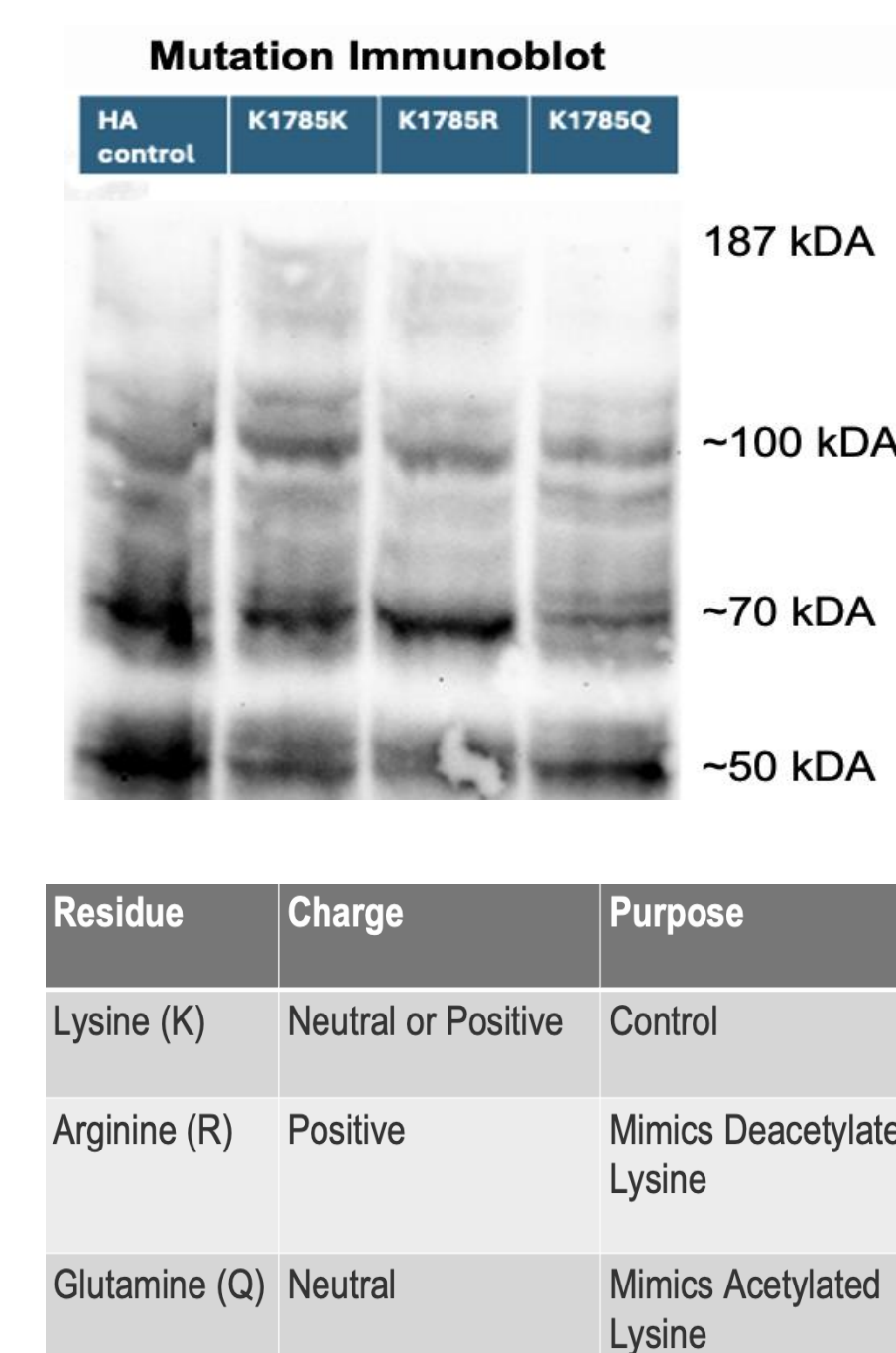
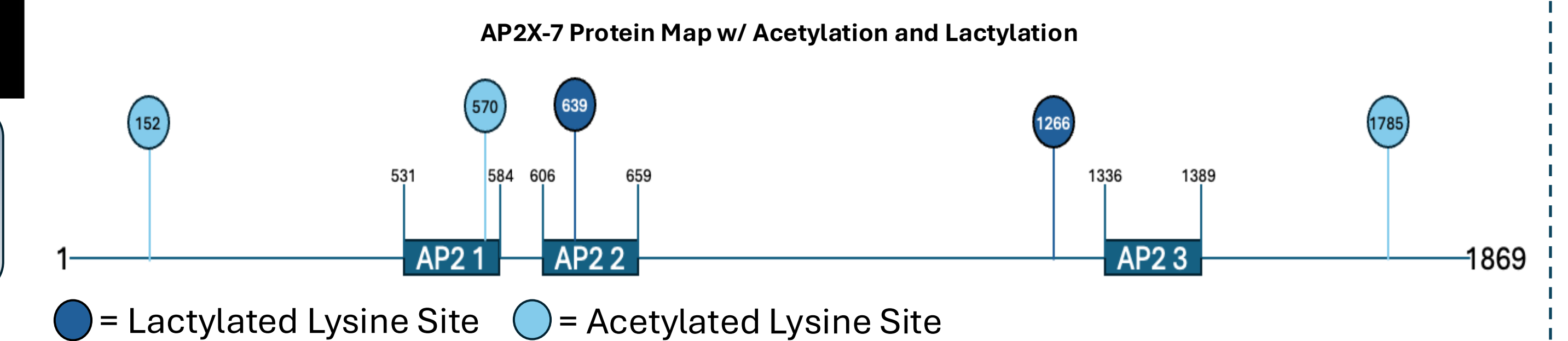
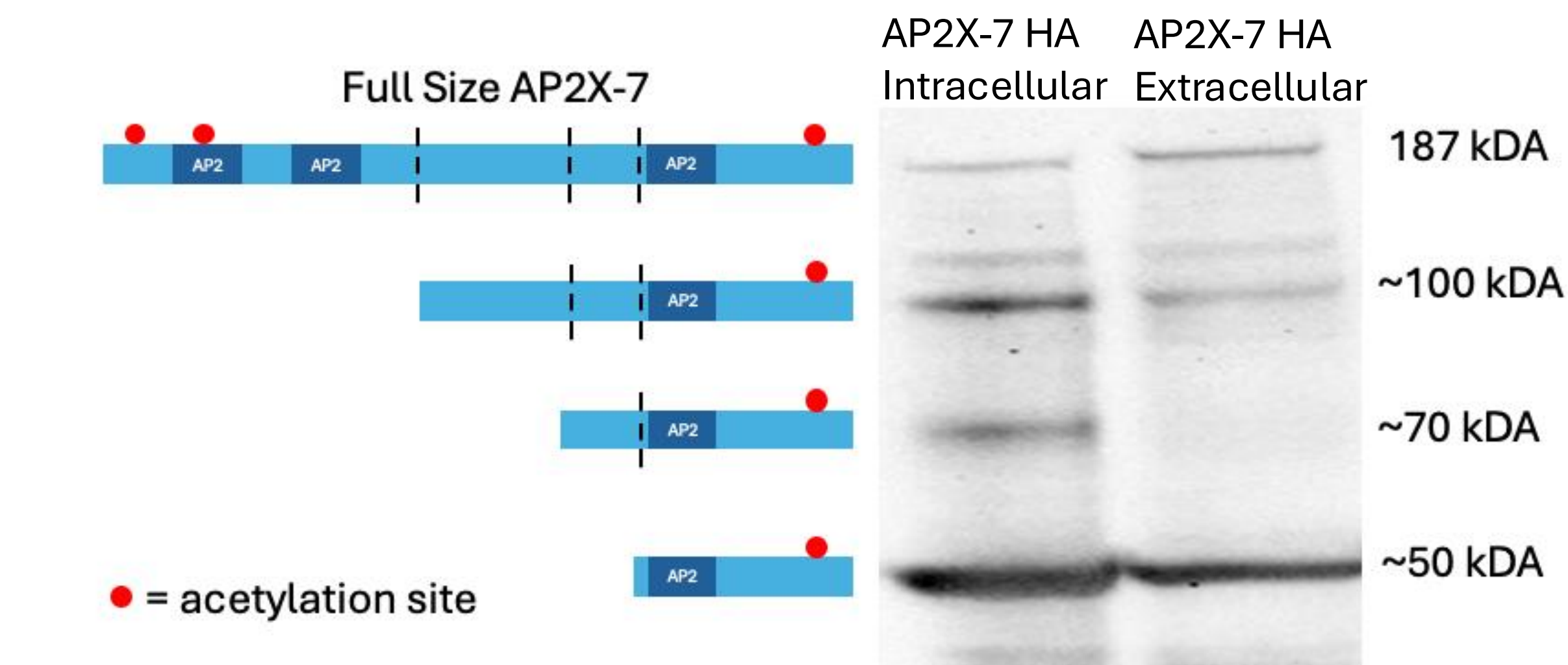
## AP2X-7 Regulates Parasite Lytic Cycle and Transcription

- AP2X-7 depletion disrupts parasite progression through the lytic cycle
- Severe invasion defect and reduced growth are observed upon depletion
- Global transcriptional dysregulation occurs upon AP2X-7 loss



## AP2X-7 Responds to Environmental State

- AP2X-7 exhibits proteolytic cleavage patterns across testing conditions
- AP2X-7 Acetylation decreases under low acetyl-CoA conditions
- Mutation of K1785 (an acetylation site) alters parasite growth, indicating functional importance.



These results suggest AP2X-7 function is modulated by environmental signals

## Future Directions

- Test additional parasite environments that may alter AP2X-7 regulation, including intracellular vs. extracellular and tachyzoite vs. bradyzoite conditions
- Define the functional roles of AP2X-7 cleavage fragments
- Generate N-terminally tagged AP2X-7 parasites to compare N- and C-terminal regulation
- Determine how acetylation and proteolytic cleavage interact to control AP2X-7 function



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