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## Transcriptomic Insights into the Genetic Regulations of *Leptospira interrogans* within a Mature Biofilm.

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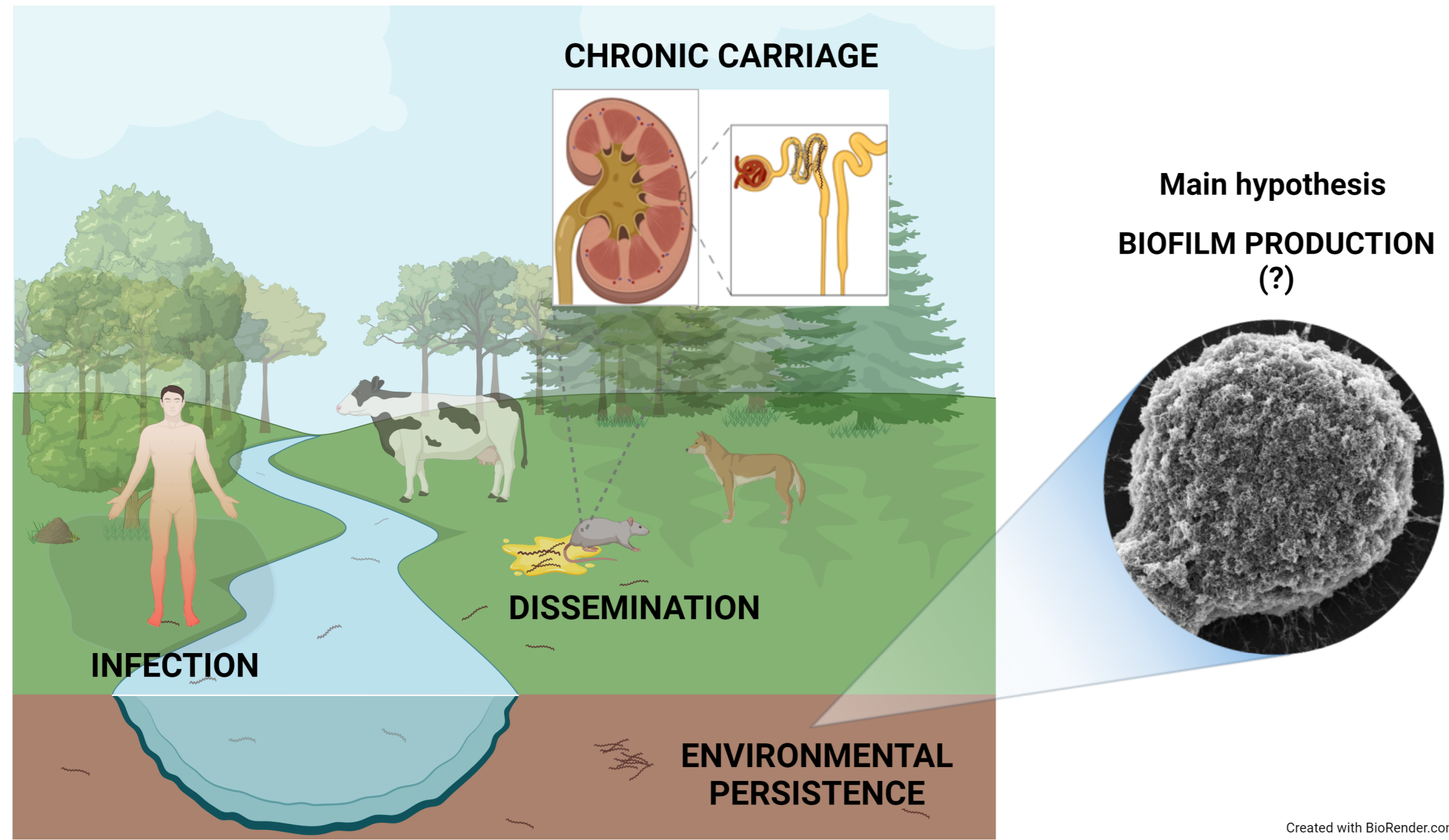
**<https://hal.science/hal-04719179v1>**

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## INTRODUCTION



Could **biofilm** be the missing link in understanding the **environmental persistence** and **chronic carriage** of leptospires?

*Leptospira interrogans*, the causative agent of leptospirosis, goes through a complex life cycle in which biofilm formation could be one critical survival strategy under adverse environmental conditions. The genetic mechanisms underlying the motile-sessile shifts in *L. interrogans* remain largely unexplored. To unravel the transcriptomic regulation in *L. interrogans* within a mature biofilm, we performed a RNA-seq analysis. We also assessed the metabolic state of biofilm-forming bacteria and their ability to initiate infection.

## OBJECTIVES

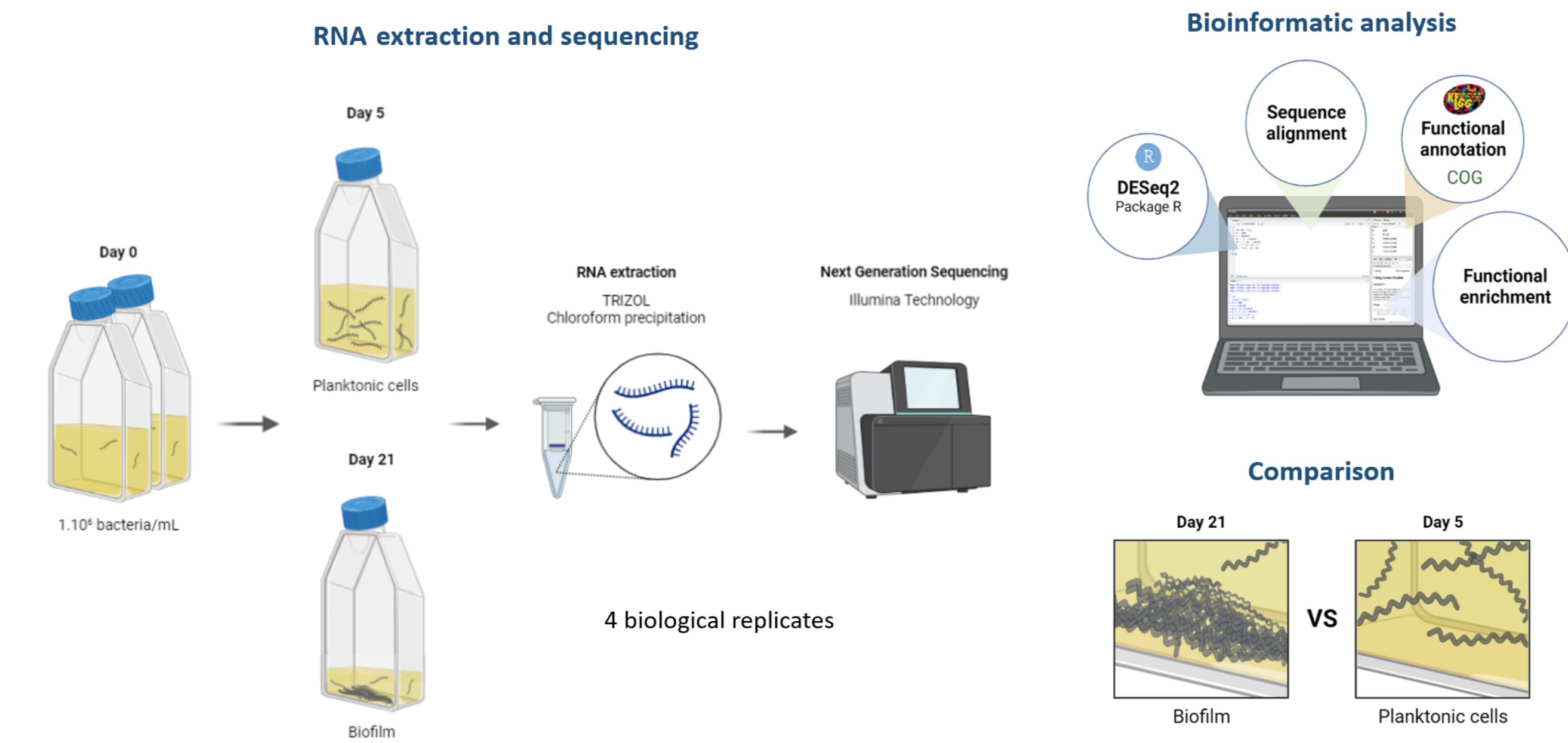
What are the **transcriptomic changes** between planktonic cells and a mature biofilm of a pathogenic strain of *Leptospira interrogans*?

Could we identify genes involved in **biofilm formation** and **environmental adaptation**?

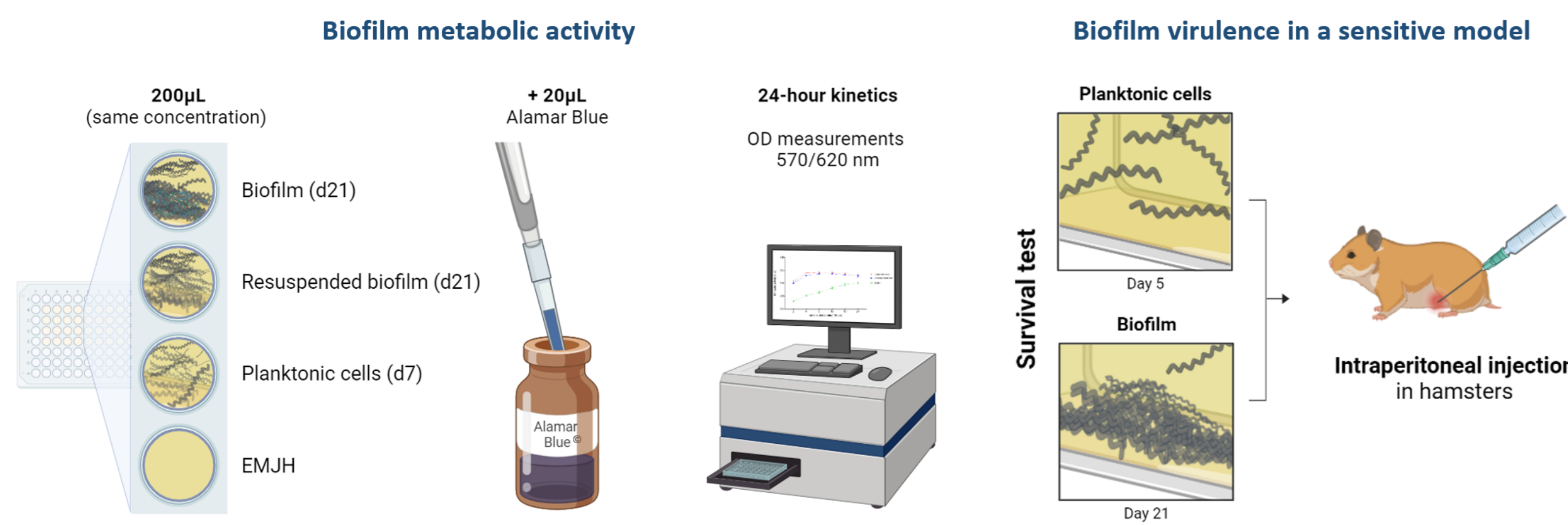
Is *Leptospira interrogans* still **virulent** when in a biofilm state?

## METHODS

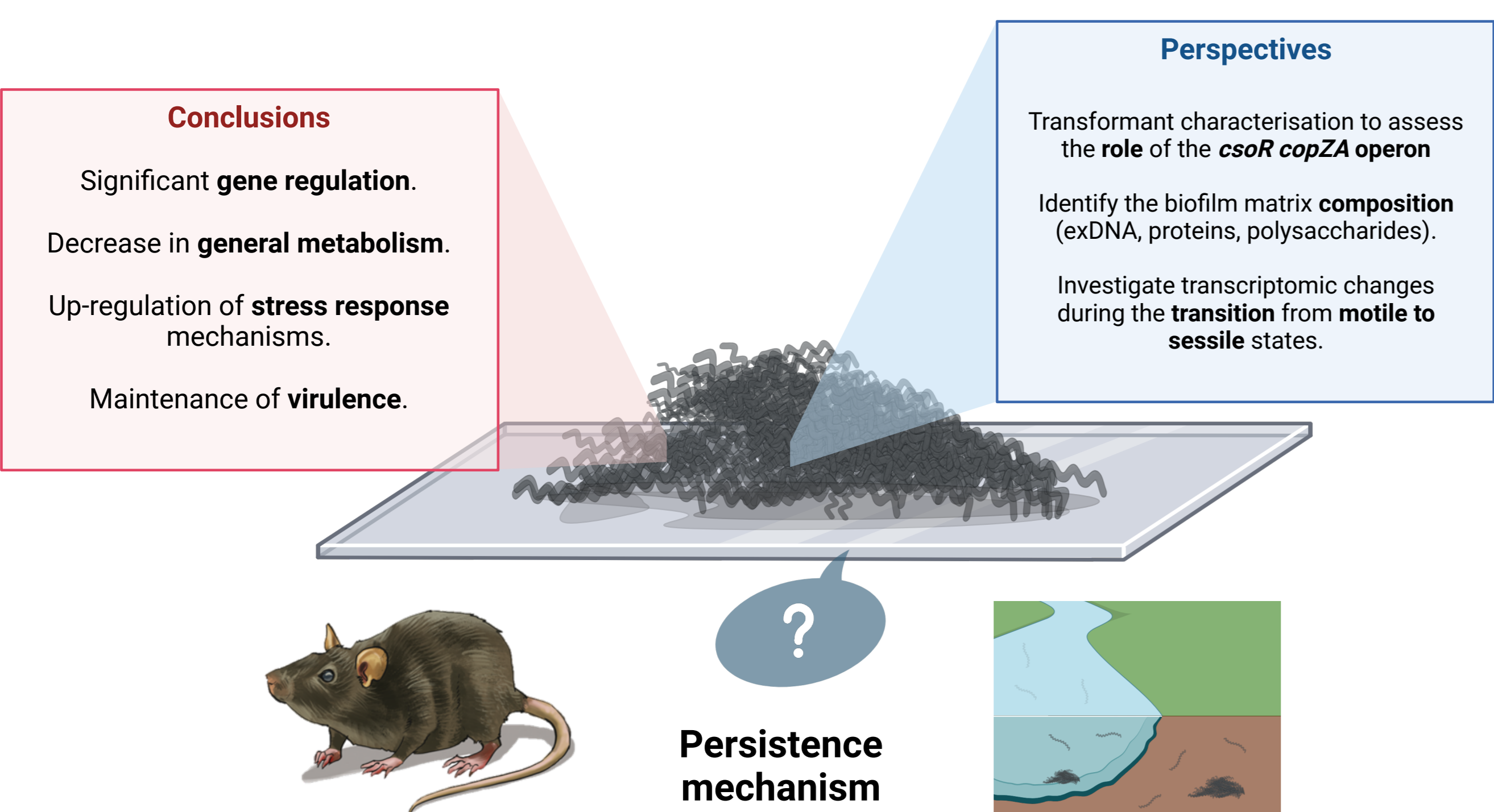
### 1. COMPARATIVE TRANSCRIPTOMICS



### 2. BIOFILM ACTIVITY AND VIRULENCE



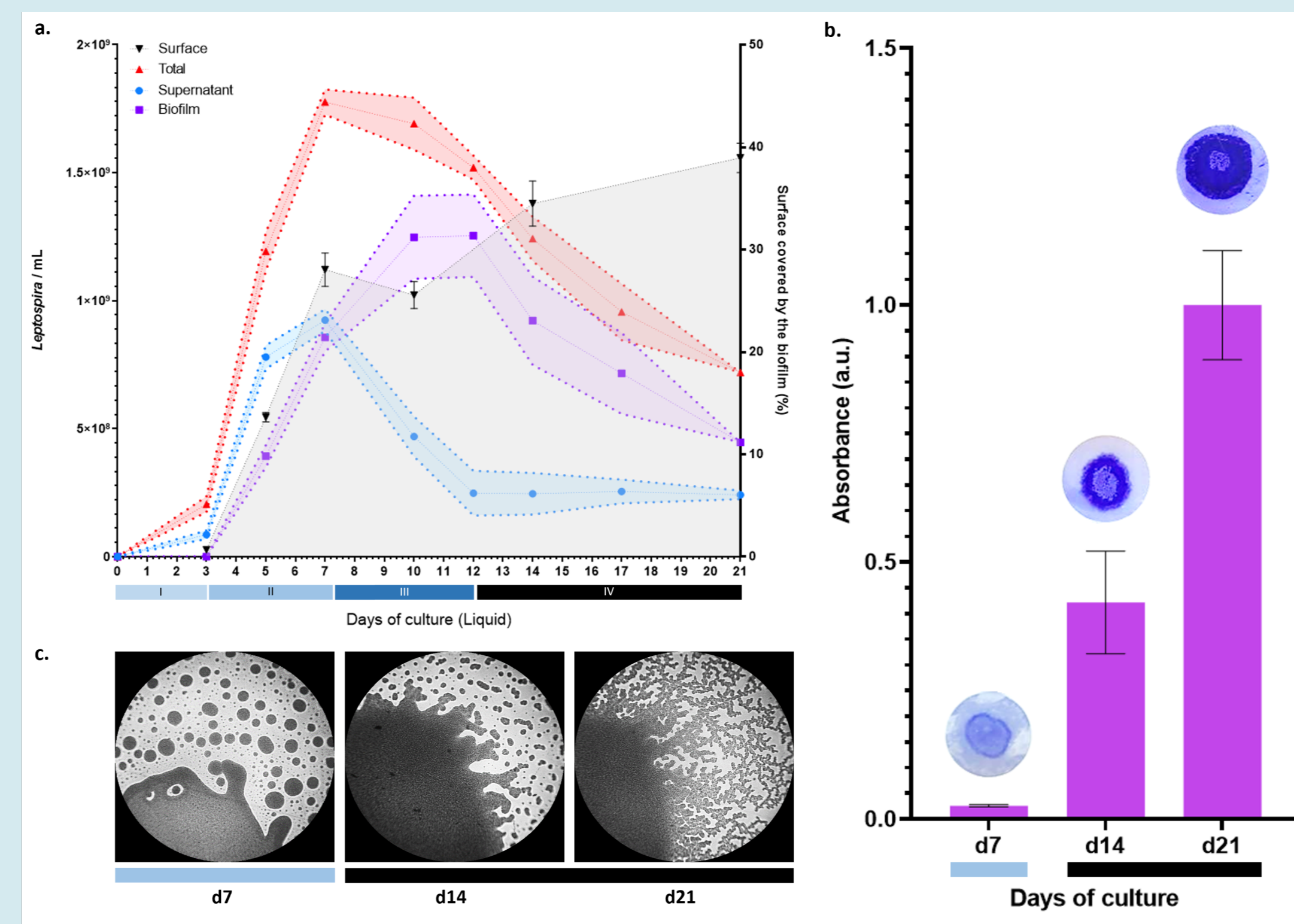
## CONCLUSION AND PERSPECTIVES



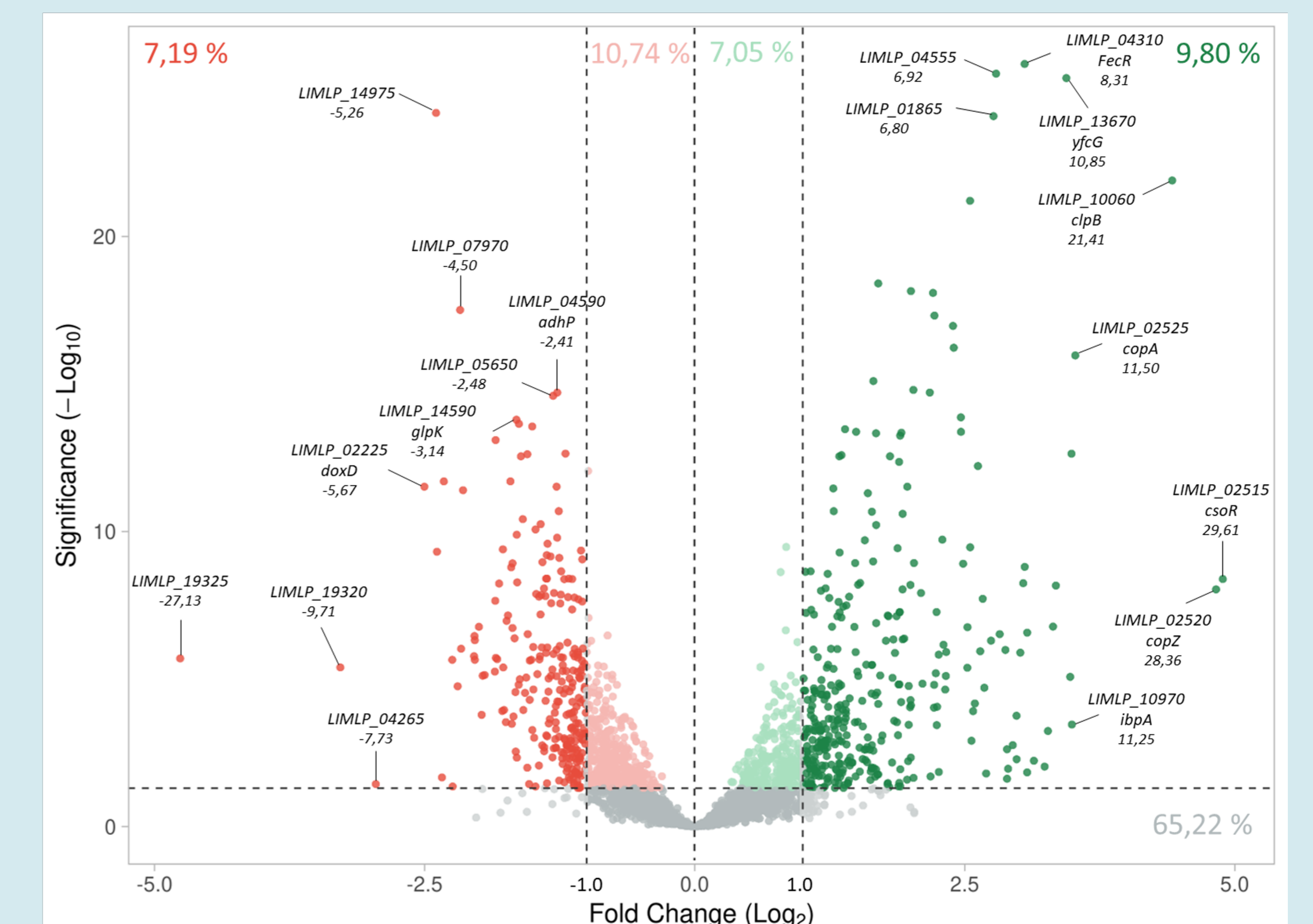
Day 21 likely shows a combination of **biofilm** and **starvation** traits.

## RESULTS

### *L. interrogans* biofilm development and expansion



### One-third of the genome is regulated within a mature biofilm

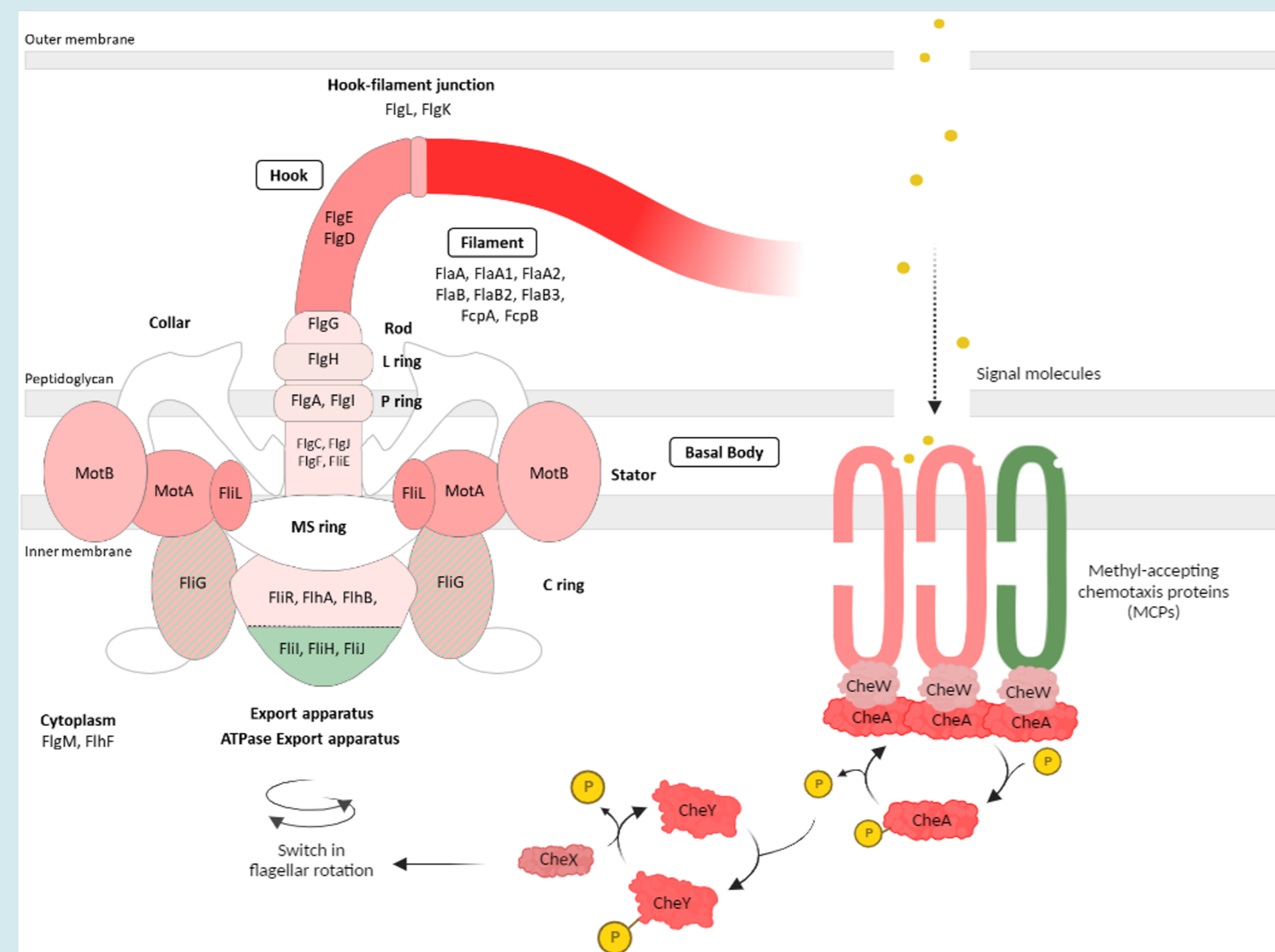


Although the **biofilm surface expands for up to 21 days**, the **number of bacterial cells decreases over time**, probably giving way to a larger portion of matrix or dead cells.

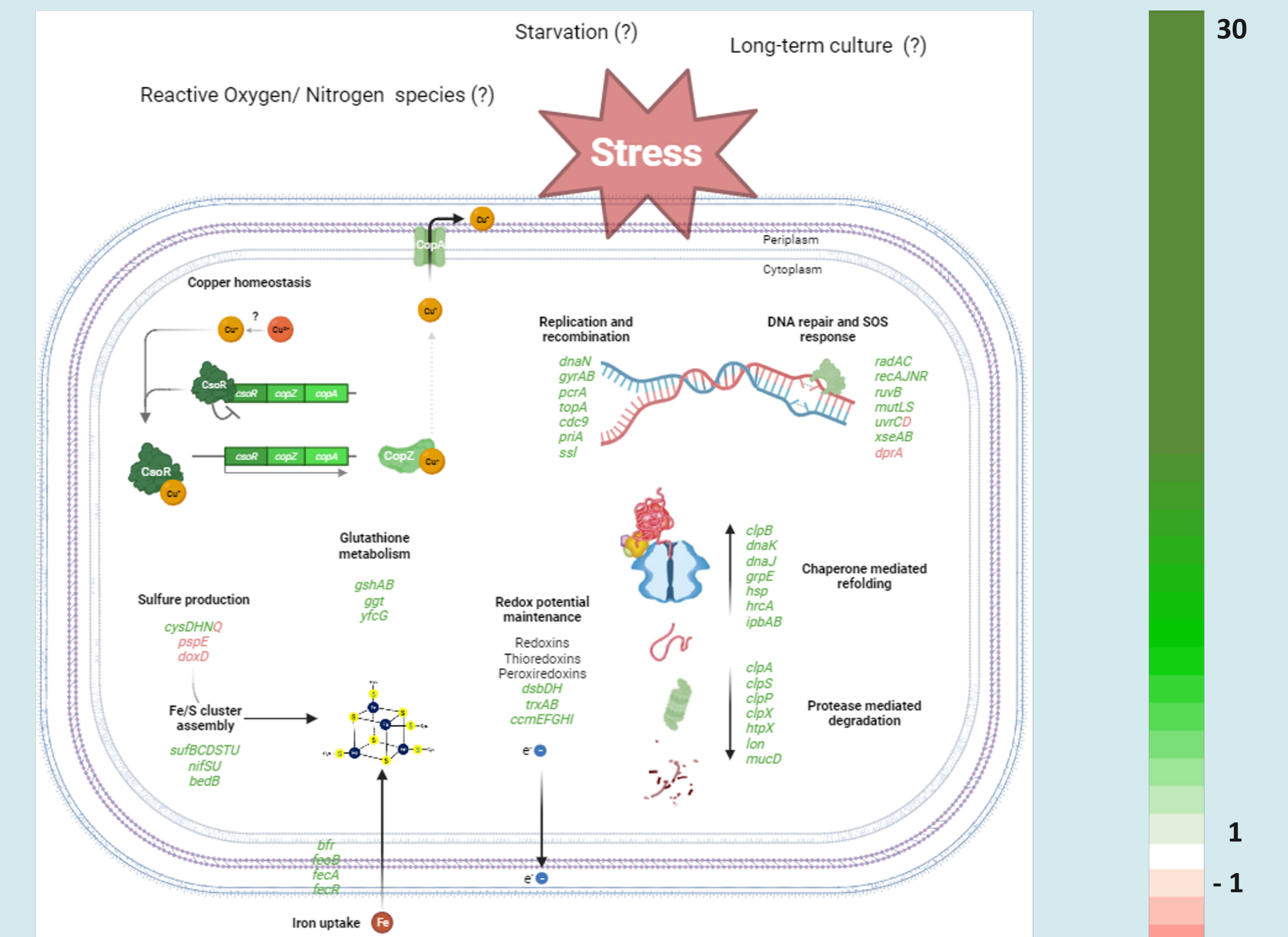
**1263** modulated genes out of 3651  
**612** up-regulated genes and **651** down-regulated genes  
**Evenly distributed** on the chromosomes and the plasmid

While the general metabolism is down-regulated, the stress response is up-regulated in the biofilm state

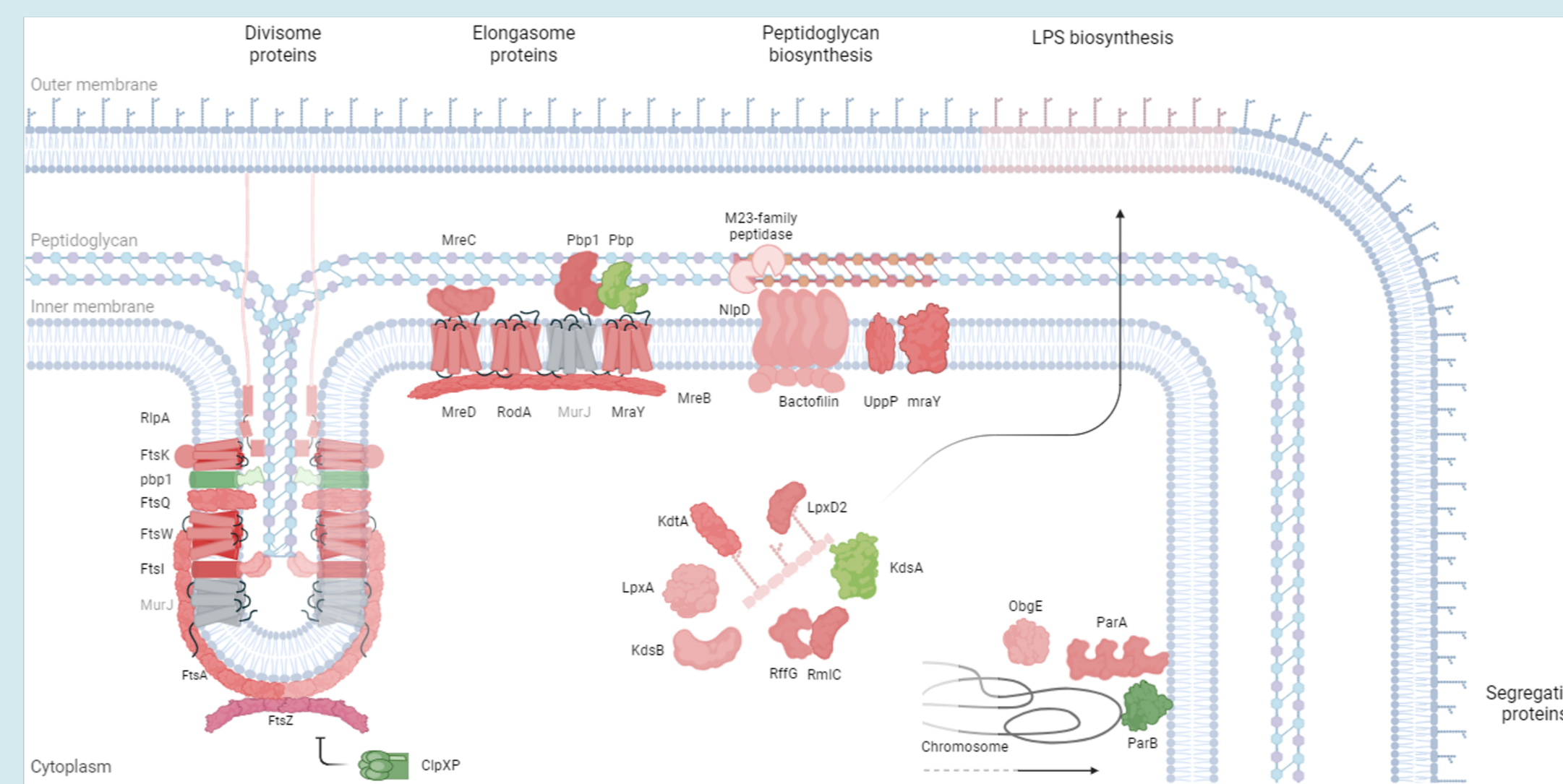
### Loss of motility and chemotaxis



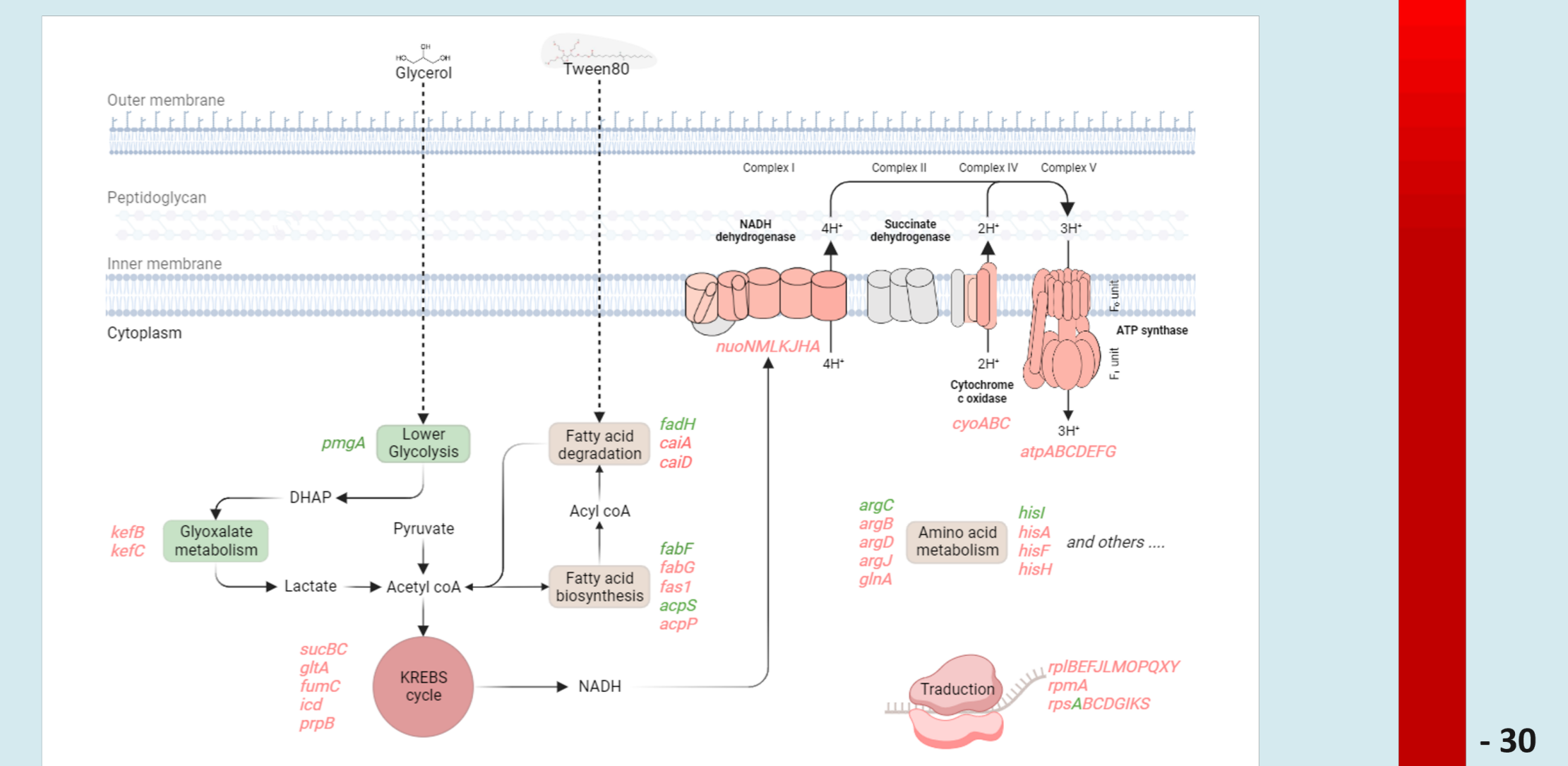
### Up-regulation of repair mechanisms and management of intracellular stress



### Down-regulation of cell division and biogenesis

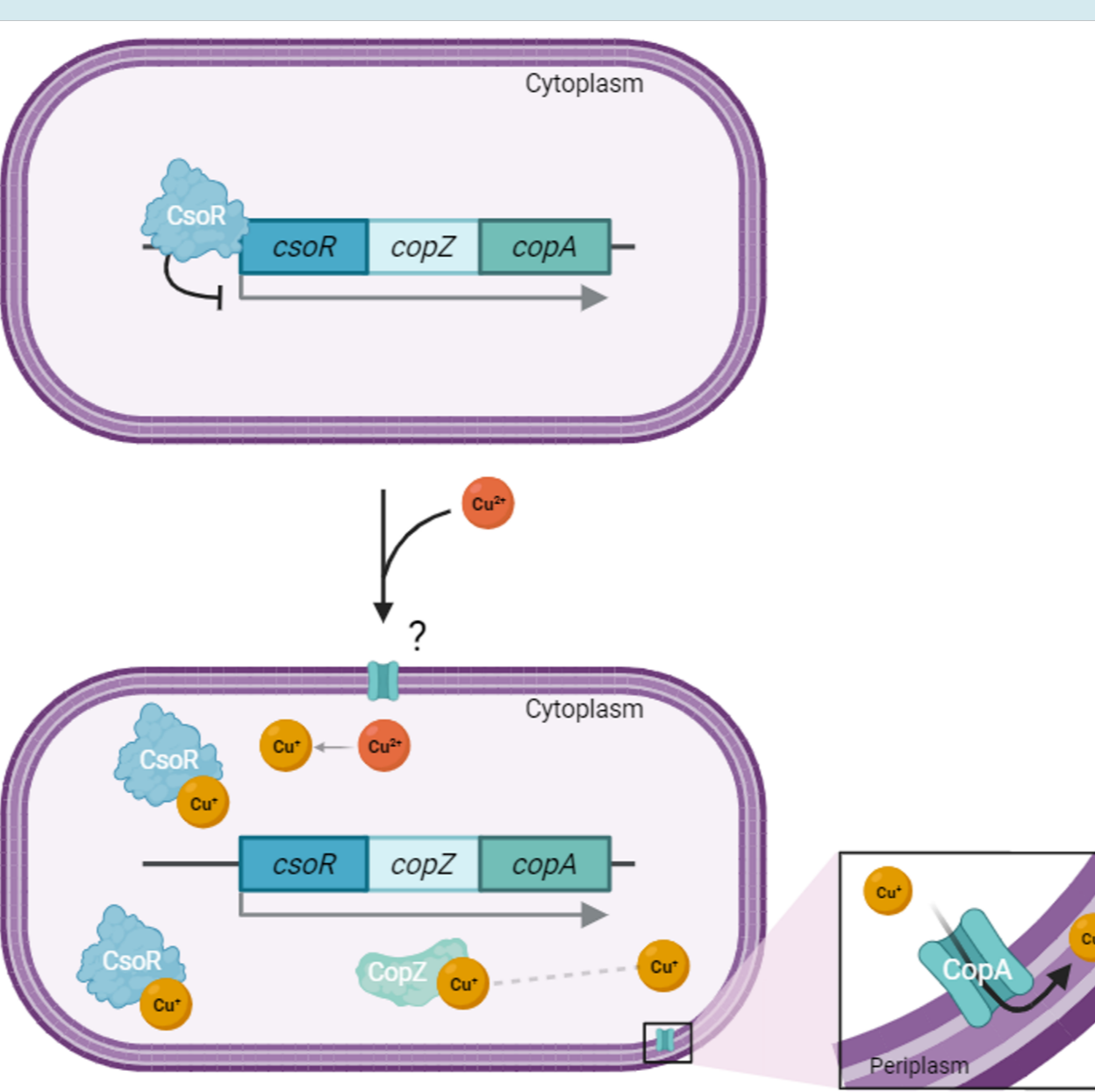


### Significant changes in intracellular metabolism

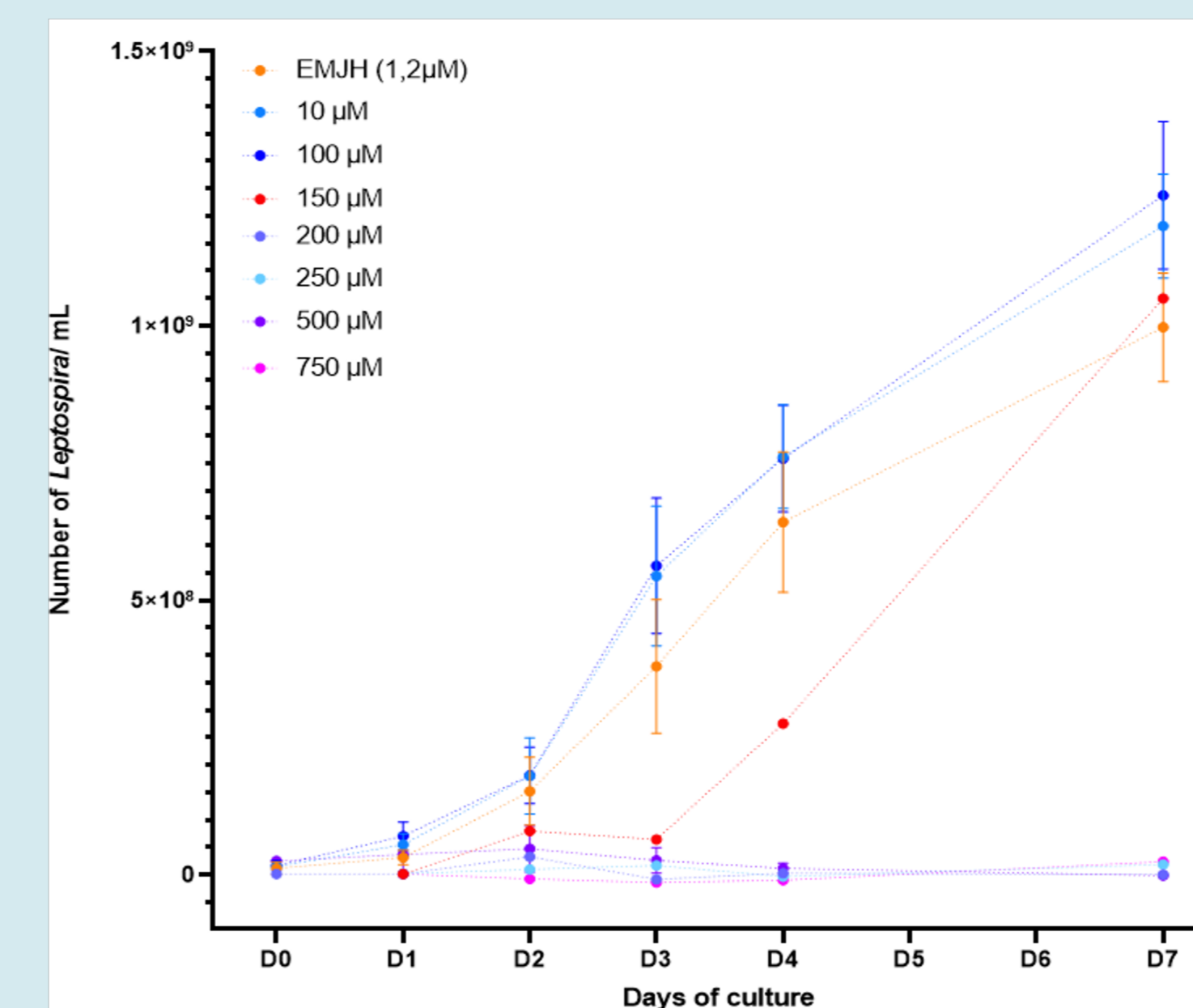


### Focus on the *csoR-copZA* operon

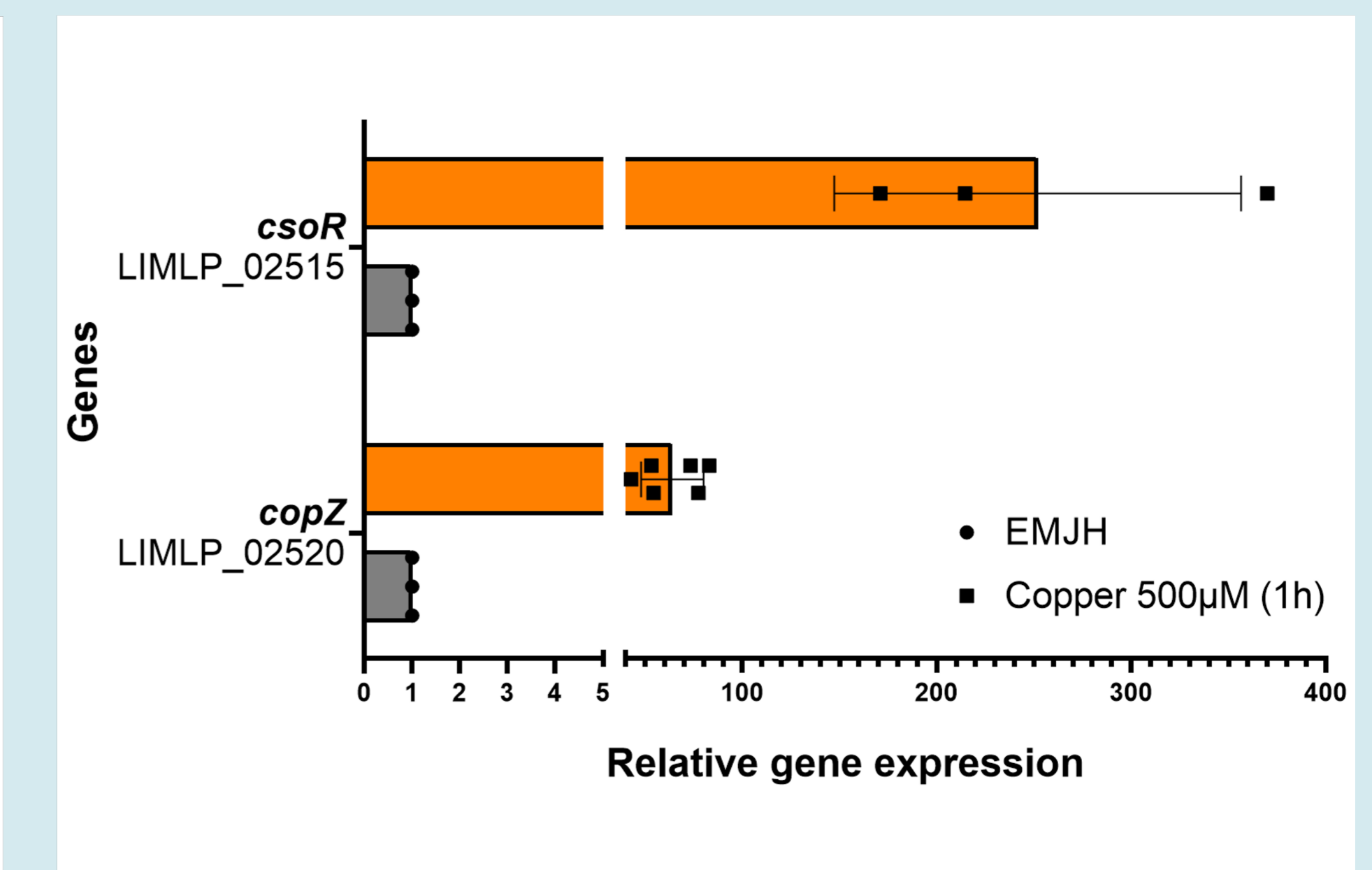
#### *csoR-copZA* is required for copper detoxification in other bacteria



#### Copper becomes lethal above 150µM

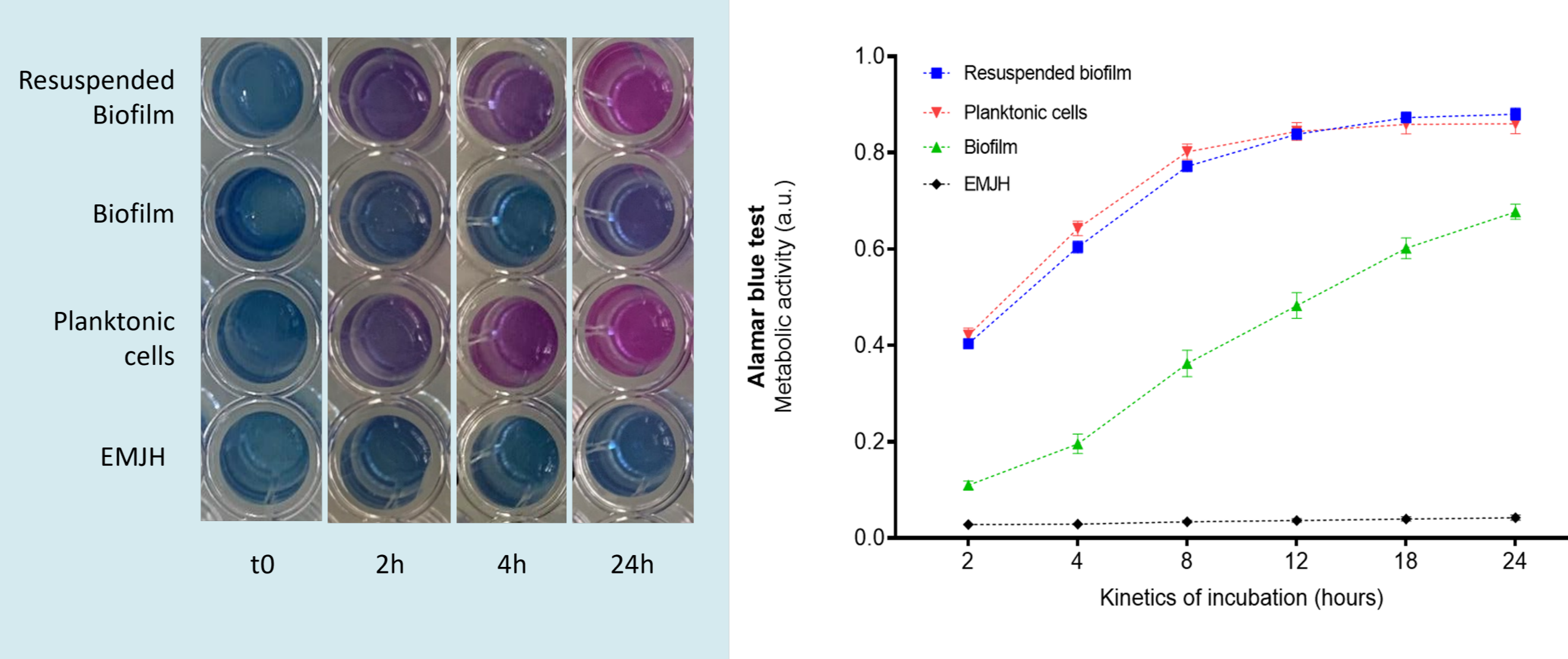


#### A copper stress similarly leads to over-expression of the operon



### *Leptospira interrogans* metabolic activity and virulence in a biofilm state

#### Resuspension of the biofilm reactivates the metabolic activity



#### *Leptospira interrogans* remains virulent when in a biofilm state

