

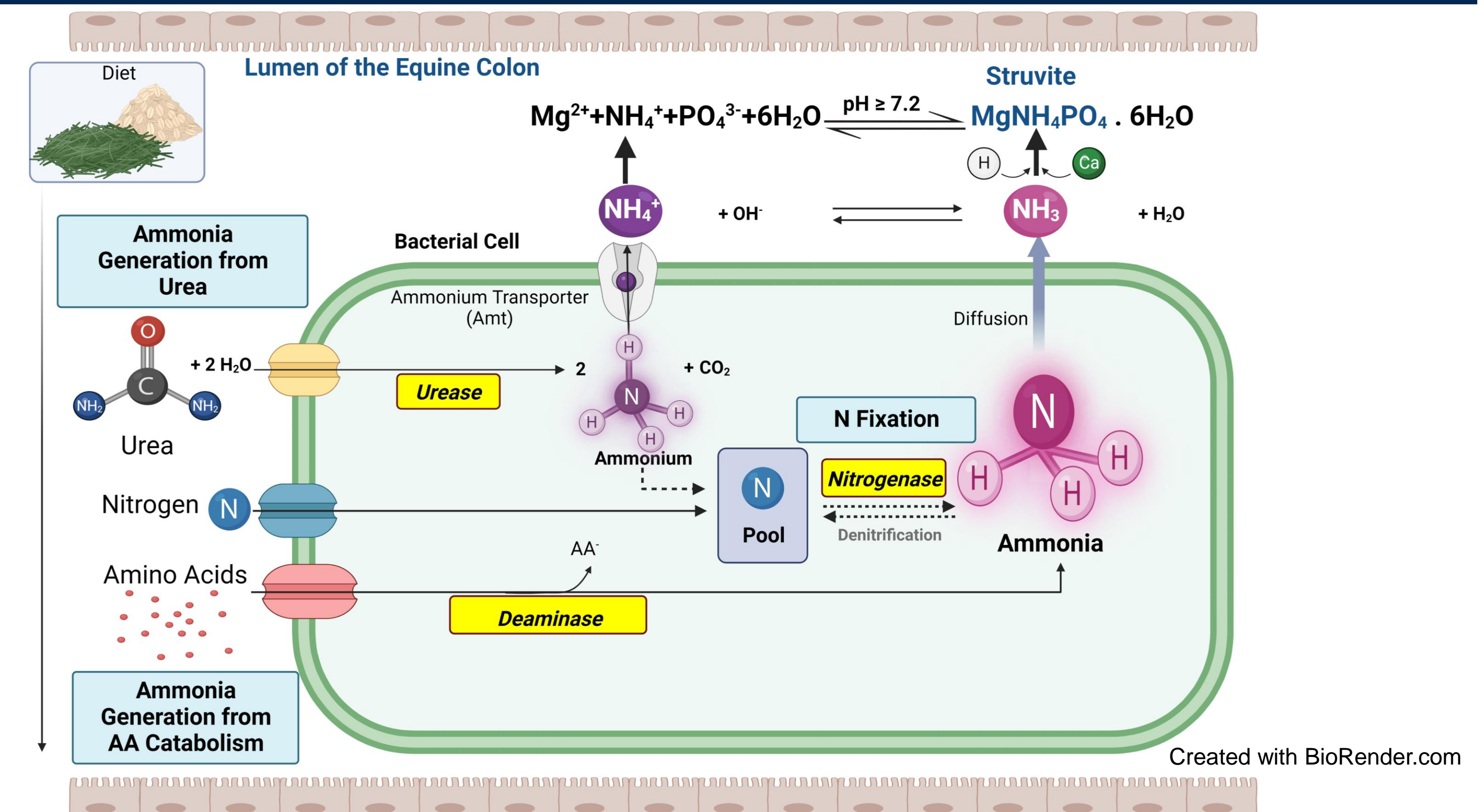
The role of bacteria in the formation of the struvite equine enterolith

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Introduction

Enteroliths: Endogenously produced mineral accumulations that form in concentric rings around a foreign object (nidus).

- Form in the right dorsal colon (RDC) of equids
- Important cause of colic in certain geographical regions
- Can cause complete or intermittent obstruction with risk of pressure necrosis and intestinal rupture
- Primarily composed of struvite ($MgNH_4PO_4 \cdot 6H_2O$)
 - Struvite
 - Relatively insoluble at neutral/alkaline conditions
 - Highly soluble in acidic conditions



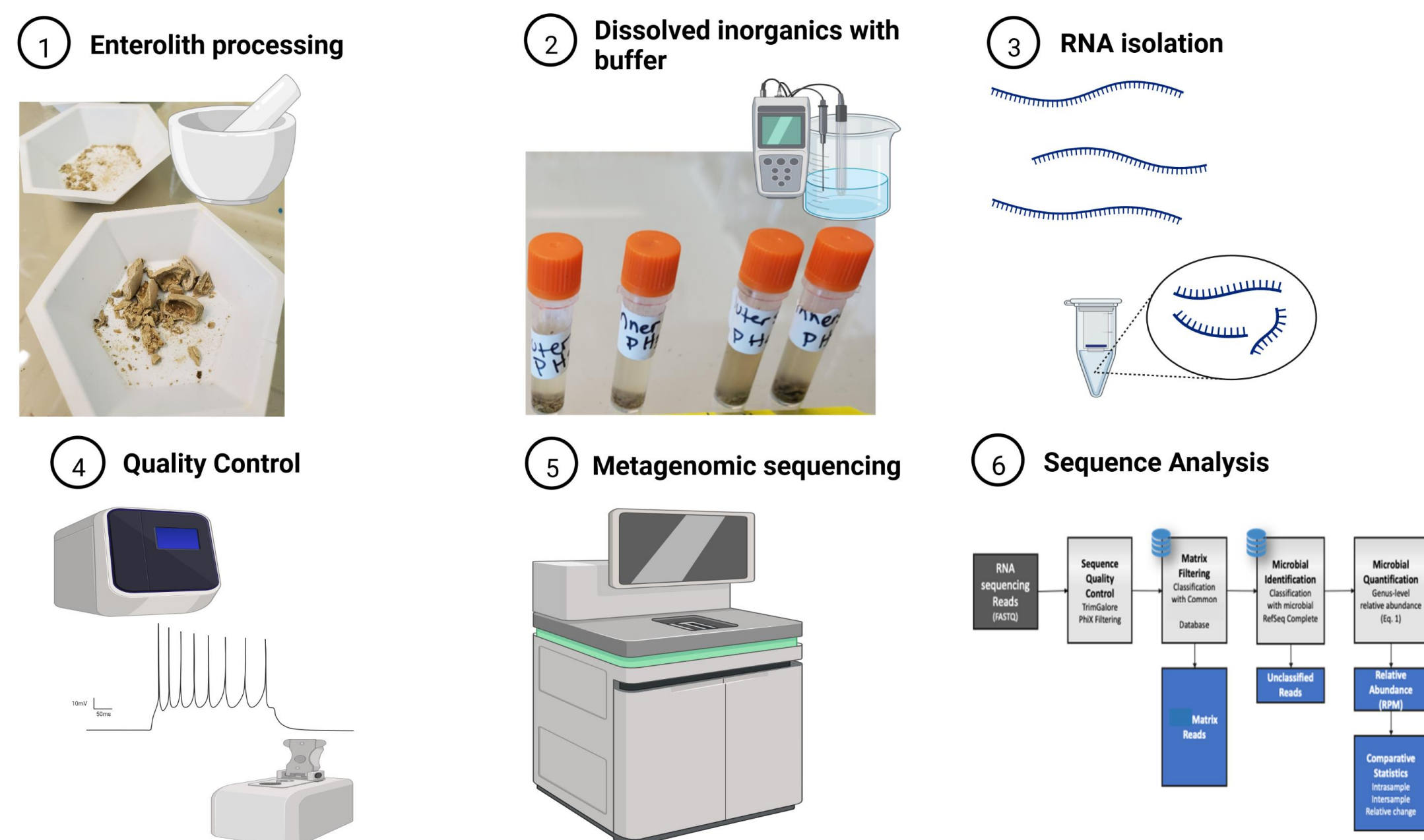
Purpose

- Enterolithiasis is an understudied disease despite having a disproportionately high rate of occurrence in CA compared to other areas worldwide
- The potential connection between the gut microbiome and the disease has yet to be investigated
- Promising translational applications to human and small animal veterinary medicine with struvite kidney/urinary stones

Objectives

- Hypothesis:** A microbial community exists (microbiome) within equine enteroliths and contribute to enterolith formation.
- **Aim 1:** Identify the microbiome of enteroliths using deep RNA metagenomic sequencing.
 - **Aim 2:** Determine whether struvite production is a result of a microbial catabolism of urea that ultimately results in excess ammonia within the colonic environment.

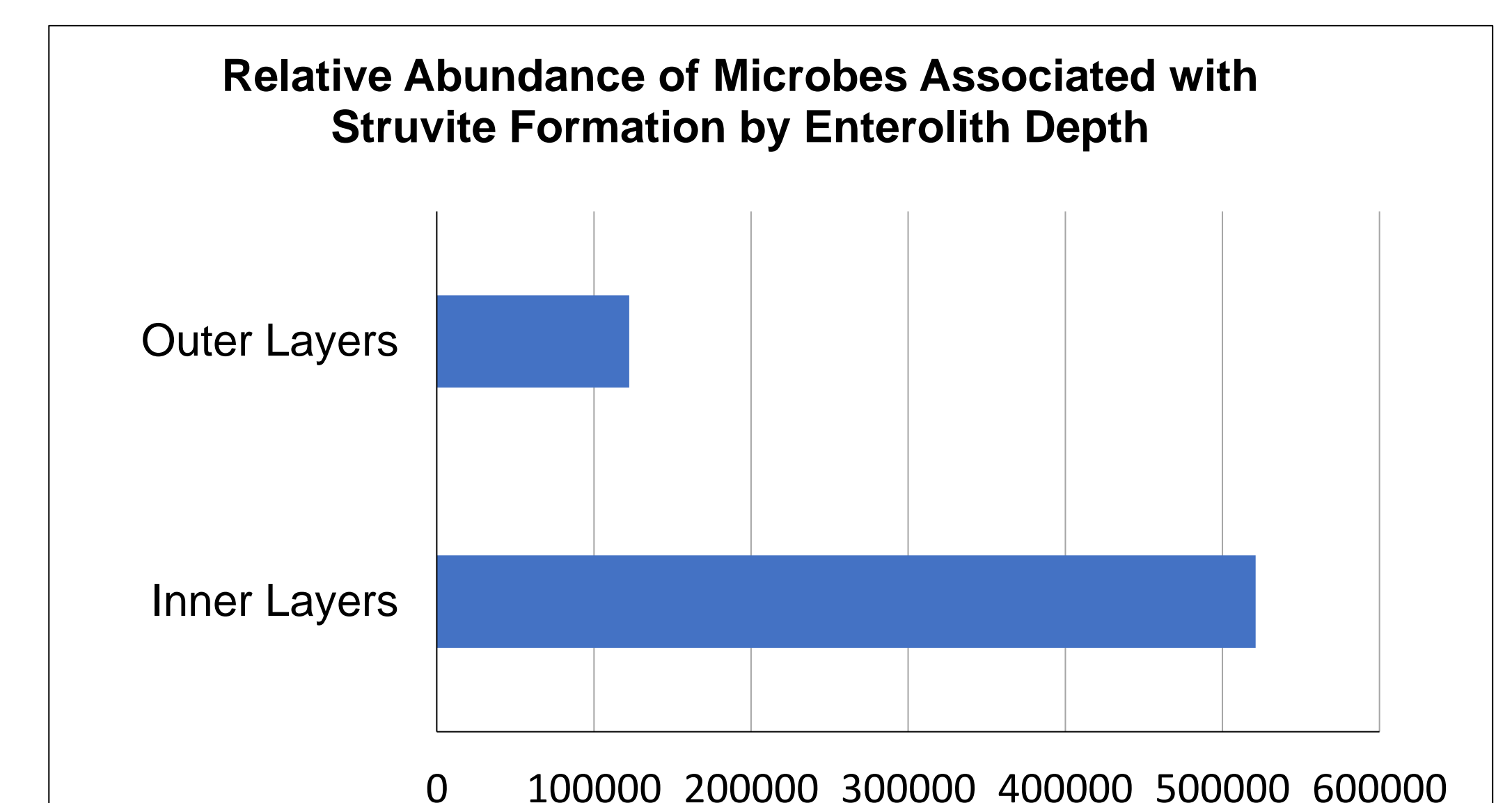
Methods



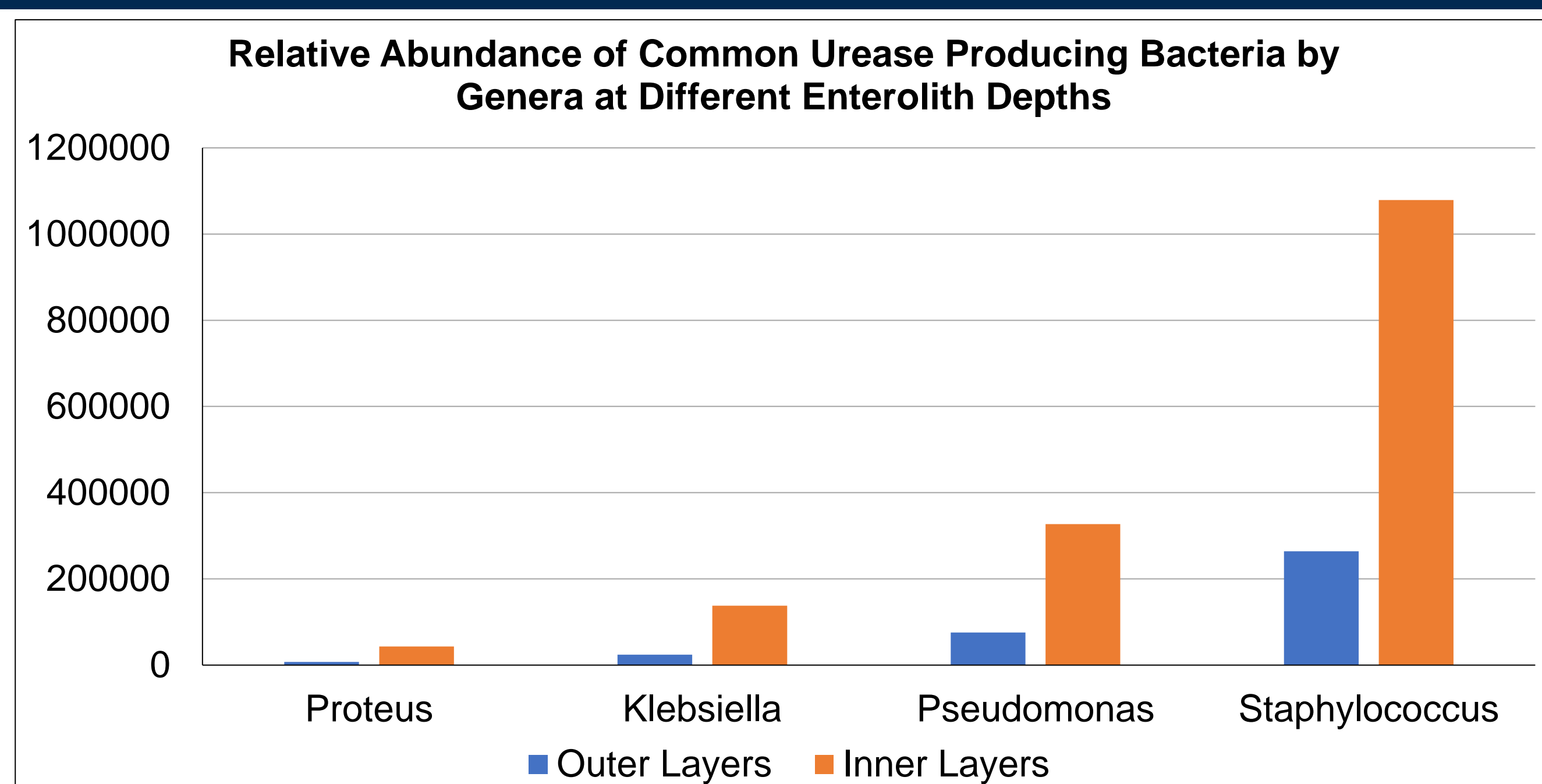
Results



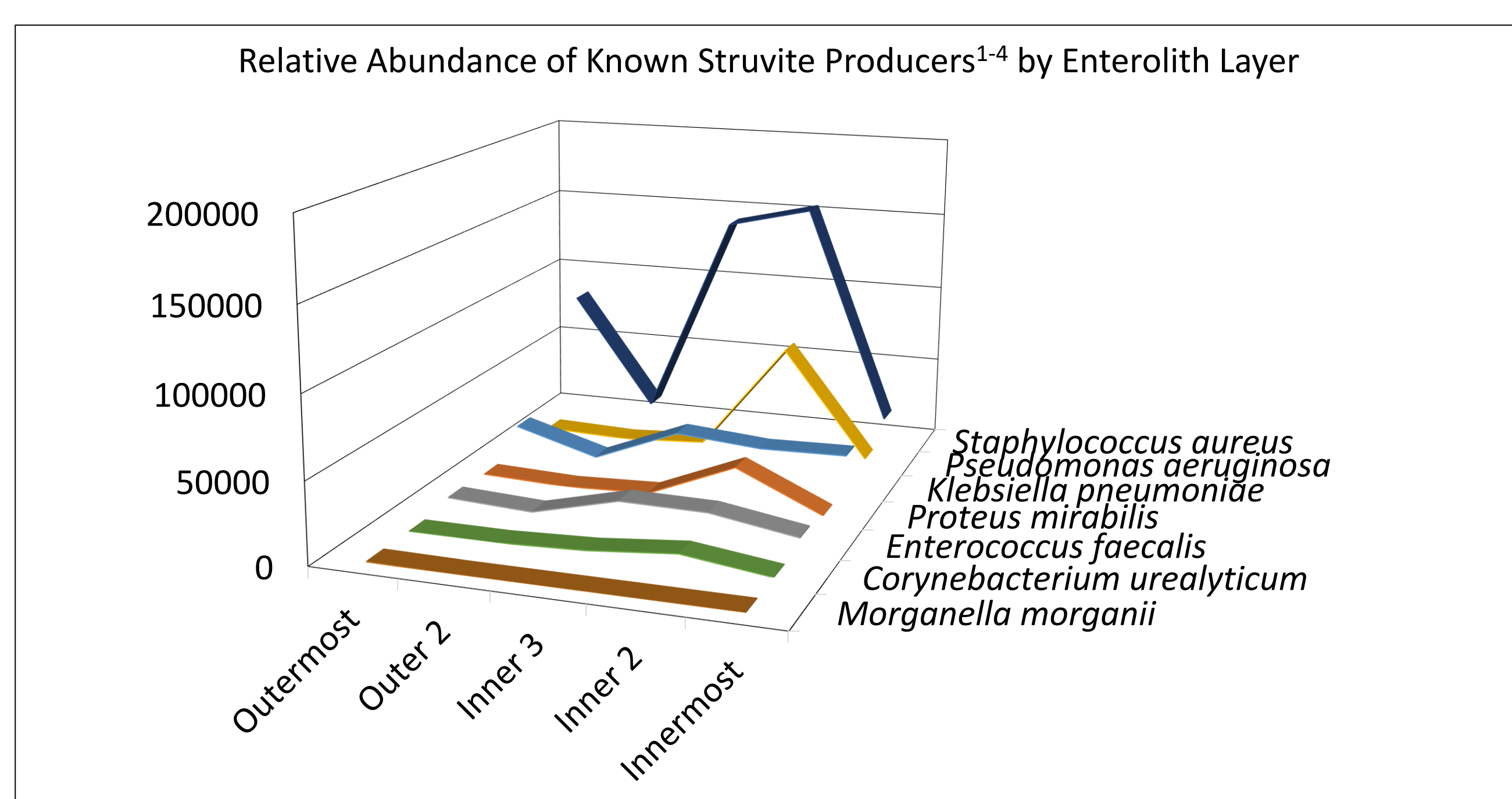
4,390 species of microbes
Of the 5 layers found within the enterolith, 4,390 distinct microbial species were identified in total.



Results



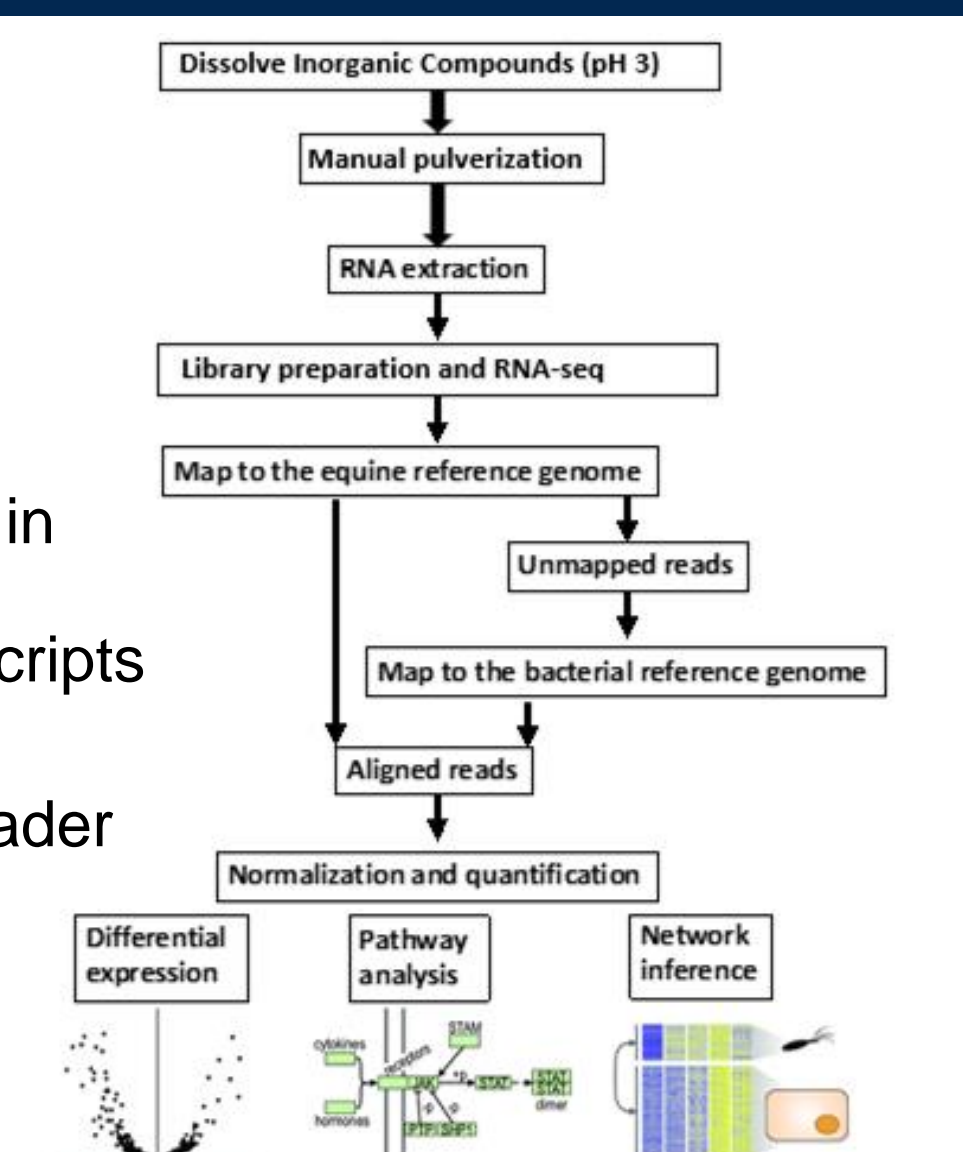
These organisms have been identified as contributors to struvite stone formation in vivo. The graph shows how these notable struvite producers change within the layers of the enterolith microbiome layer within the enterolith microbiome.



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Conclusion and Future Directions

- An active microbiome is in fact present within equine enteroliths
- Microbial species differentially occur between the layers
- Urease producing bacteria are present in multiple layers/depths
- Together, these data suggest that struvite formation is a microbiome activity in enteroliths
- Based on these findings we can now work to determine function using transcripts from the metagenome
- The transcripts allow identification of genes associated urease, but also broader ammonia and carbon dioxide metabolism associated with struvite formation



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