210138984
a.hiorns2@ncl.ac.uk
Biomedical Sciences

‘GAG..Ging’ Bacteria as a novel treatment for Recurrent Urinary Tract Infections?

Alice Hiorns*

Supervisors: Dr Judith Hall & Dr Phillip Aldridge

Introduction I

- Urinary tract infections (UTIs) are a common bacterial infection affecting up to 50% of women during their life-time[1].
- Majority of infections are caused by *Escherichia coli* (UPEC) which originate in the bowel and contaminate the urinary tract (Figure 1)
- 1: 4 women will suffer from recurrent infections (rUTIs: up to 3 per year) that require repeated antibiotic treatments
- These treatments have resulted in antimicrobial resistant microbes that clinically are driving ‘antibiotic stewardship’ directives
- These directives encourage the reduced use of antibiotics and development of new non-antibiotic therapeutics[2]
- **Project Aim: Can we exploit natural bladder protection agents i.e. Glycosaminoglycans (GAGs) as treatments to block bacteria infecting the bladder?**

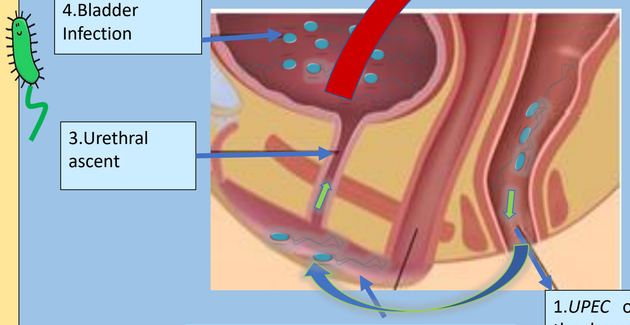
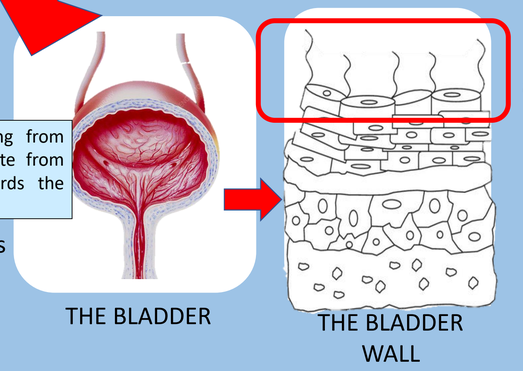


Figure 1: Potential infection mechanism in females

Introduction II

- The bladder wall contains GAGs such as hyaluronic acid and chondroitin sulphate that act as a protective barrier and stop bacterial infections (Figure 2)
- An alternative therapy for rUTIs focuses on self-administered bladder installations containing GAGs to thicken the bladder wall



Hyaluronic Acid and Chondroitin Sulphate

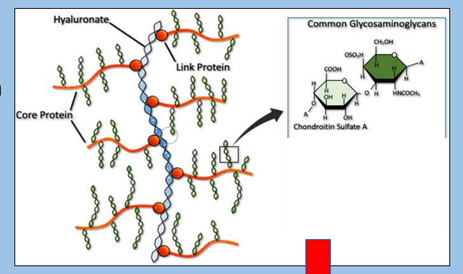
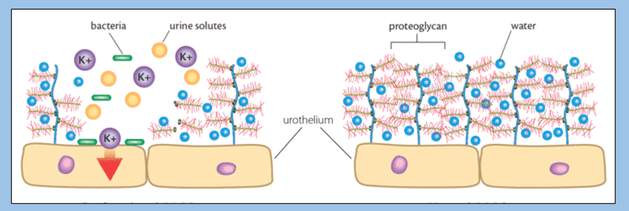
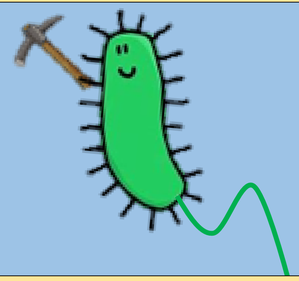


Figure 2: Bladder wall and GAGs.



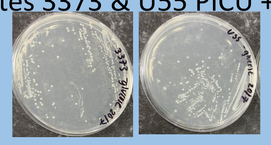
- BUT we know that some *E.coli* contain the ‘*PicU*’ gene, which encodes proteins that act as a ‘pickaxe’ to break-down GAGs
- **To explore this further we analysed the genomes of *E.coli* isolates (UPECs) recovered from patients suffering rUTIs for carriage of the *PicU* gene and production of the PICU protein .**



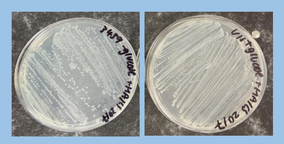
RESULTS:

- **Two *E.coli* isolates producing PICU were 3373 and U55**
- **Two *E.coli* isolates not producing PICU were 3439 and U15**

Isolates 3373 & U55 PICU +ve

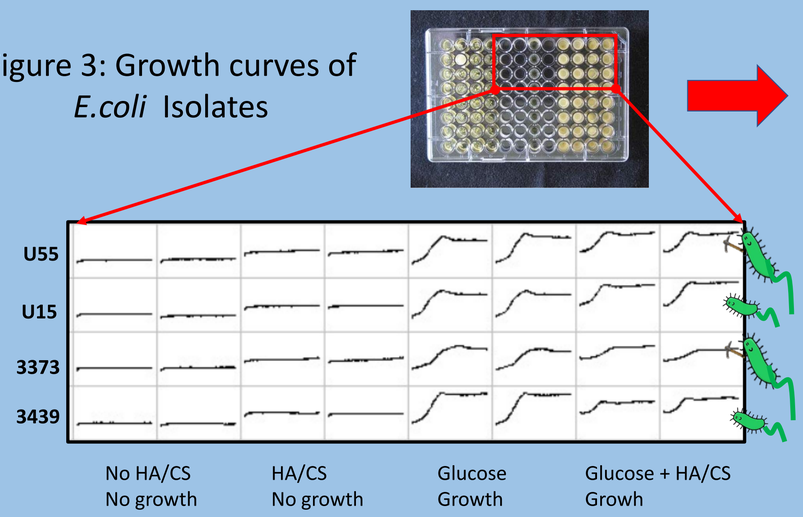


Isolates 3439 & U15 PICU –ve



- Using microtitre plates we compared the growth of these four isolates plus or minus the GAGs hyaluronic acid and chondroitin sulphate (Figure 3)
- No bacterial (E.coli) growth
- Bacterial growth

Figure 3: Growth curves of *E.coli* Isolates



Conclusions

- No *E.coli* isolates grew in media containing GAGs hyaluronic acid and chondroitin sulphate
- Bacterial (*E.coli*) growth was detected only in presence of glucose.

Summary

- Data support further studies into use of GAGs hyaluronic acid
- and chondroitin sulphate as a potential novel antimicrobial treatment in preventing and treating rUTIs

References: [1.] Foxman (2010) Nat Rev Urol 7 653-60: The epidemiology of urinary tract infection:
[2]BMJ Open (2016); 6:e009669: HA & CS for the treatment of female rUTIs: A European multicentre nested case-control study