The Combination of Nanoparticles with Antibiotics and Biofilm for Cystitis
To avoid Antibiotic Resistance

uic barcelona

PATHOLOGY

Urine infection

Can affect different parts of your urinary tract:

- Bladder (*Cystitis*)
- Urethra (*Urethritis*)
- Kidneys (*Pyelonephritis*)

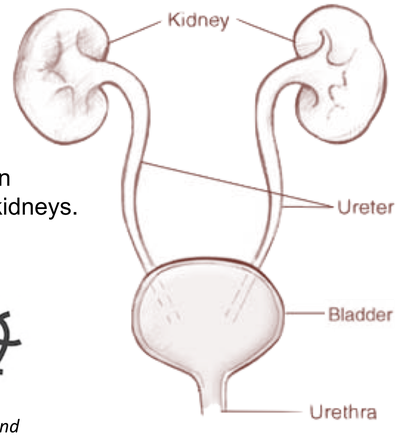

Figure 1. *Urinary System.*

Cystitis

Serious health problem happen if the infection spreads to the kidneys.

→ Bacterial infection

Figure 2. *Type of E. coli and different pathogens that causes Cystitis.*

SYMPTOMS

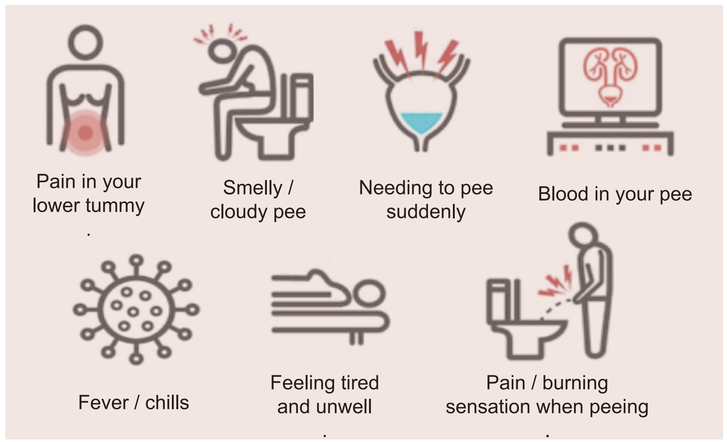

Figure 3. *Symptoms of Cystitis.*

Between 50 and 60 % of women suffer an episode of cystitis throughout their lives

CURRENT TREATMENT

→ **Antibiotics**

- Trimethoprim / sulfamethoxazole (*Bactrim, Septra*)
- Fosfomycin (*Monurol*)
- Nitrofurantoin (*Macrodantin, Macrobid*)
- Cefalexin (*Keflex*)
- Ceftriaxona

TRIGGERING MECHANISM

Inhibitors of:

- Bacterial wall formation
- Protein synthesis
- DNA duplication
- Cytoplasmic membrane
- Metabolic pathways

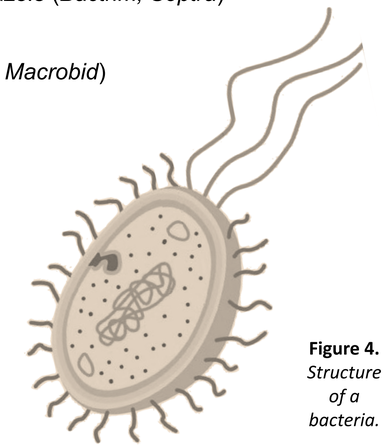

Figure 4. *Structure of a bacteria.*

PROBLEM with current treatment

→ **Antibiotic resistance**

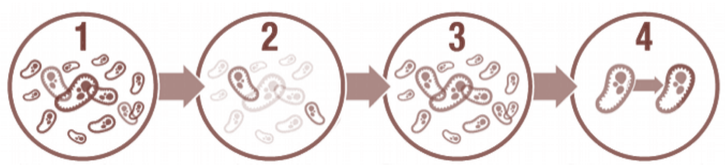

Figure 4. *How occurs the antibiotic resistance.*

ALTERNATIVE DRUG DELIVERY SYSTEM

Biofilm containing antibiotic and nanoparticles

- Highly adhesive properties
- Sustained release of the active ingredient
- Low moisture content
- Minimizes the incorporation preservatives
- Greater stability and longer life
- Non-friable

via vaginal

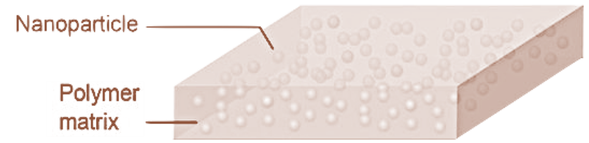

Figure 4. *Nanoparticles and composite films.*

Remains at the administration site after hydration

- Low-dose drugs (controlling the size, shape and size distribution of particles)
- Facilitate the binding of antibiotics to bacteria

Bacteria that have become resistant to antibiotics can be destroyed

CONCLUSION

This method represents an **effective solution to overcome bacterial resistance**.

It is important to know that with a **lower dose of antibiotics** we achieve the **same effect**, providing **protection levels for longer periods of time**.

Can be used for the development of new delivery systems for other drugs

Contact

Zoe Allué Mengual
3rd of Bioengineering
zoeallue@uic.es

References

[1] Messing, E. M., & Stamey, T. A. (1978). *Interstitial cystitis early diagnosis, pathology, and treatment. Urology, 12(4), 381–392.* doi:10.1016/0090-4295(78)90286-8

[2] Allahverdiyev, A. M., Kon, K. V., Abamor, E. S., Bagirova, M., & Rafailovich, M. (2011). *Coping with antibiotic resistance: combining nanoparticles with antibiotics and other antimicrobial agents. Expert Review of Anti-Infective Therapy, 9(11), 1035–1052.* doi:10.1586/eri.11.121

[3] Diez-Pascual, A. M. (2019). *Antibacterial Nanocomposites Based on Thermosetting Polymers Derived from Vegetable Oils and Metal Oxide Nanoparticles. Polymers, 11(11), 1790.* doi:10.3390/polym11111790

Drug Delivery & Discovery