

Pathogenic biofilms: leading contributors to recurrent vaginitis and cystitis

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Problem Statement

Recurrent cystitis and vaginitis have an increasing relevance in gynecological practice. They are a major health issue for women and their sexual life, with a specific impact on vaginal and bladder pain associated with intercourse (Graziottin A. 2014; Graziottin A. et al., 2014 a). At the same time recidivism of cystitis and vaginitis may cause frustration to the practitioner, whose therapeutic expertise appears to be too often significantly jeopardized.

Significant data on both the dramatic increase of bacterial resistance and common escalation of microbial aggression in urology and gynecology diseases suggest a connection with the frequent, and sometimes indiscriminate, use of antibiotics.

Methods

This abstract focuses on pathogenic biofilms, as they may lead to a new understanding of the pathogenesis of recurrent urogynecological infections.

Results

In the urogynecological field, biofilms can be: extracellular, usually in the vagina, and intracellular, in urothelium.

An extracellular biofilm is composed by pathogenic microorganism-secreted polysaccharides, with a primitive circulatory system, and a complex assembly of synergistic micro-organisms. The polysaccharides network acts as a protection system that prevents drug's penetration and action and immune response effectors. Increasing evidence proves that the majority of urogynecological infections are supported by pathogenic biofilms. This evidence parallels the same pathophysiologic mechanisms operating in recurrent nose, sinus, bronchial or lung infections thus underlying a general microbiologic aggressive and survival-oriented strategy. It may explain the:

- incomplete or absent response to common drugs
- high presence of co-morbid forms of urogynecological antibiotic-resistant infections and diseases
- the increasing bacteria resistance to immune response effectors
- the infection's tendency to become chronic

Extracellular biofilm grows close to the vaginal vestibule, and all along the vaginal wall. They usually reside near the apical cell surface of the vaginal mucosa and protrude towards the cavity. They can also be found on the surface of mucous membranes or different inert supports such as all kind of medical devices (Aparna M.S. and Braz Y.S., 2008; Leonhard M. et al., 2013). Inside the biofilm, bacteria have a gradient of metabolic activity, the higher at the surface, the lower in the deeper part of the biofilm, close to the vaginal mucosa. In the deeper part of biofilms, reduced levels of oxygen and nutrients facilitates the growth of a sub-population (0.1-1%) of quiescent bacterial cells called persister cells, dormant phenotypic variants of regular cells whose slow metabolism fits perfectly into the habitat. Thanks to their minimal metabolic activity, persister cells are the most resistant to antibiotics and to immune system attacks.

Intracellular biofilm resides inside the urothelium that covers the inner bladder/wall bladder. They are characterized by a specific pathogenic strain of *Escherichia coli*, carrier of the antigen K. This strain is responsible for 75-85% of recurrent cystitis and intracellular biofilm formation, (Rosen D.A. et al., 2007).

Conclusion

Understanding the pathophysiology of pathogenic biofilms, and the most effective modulation of their role, may add a new potentially effective arrow in the physician's arms. Controlled prospective studies are needed to substantiate the impact and limits of this new approach.