Impact of Biofilm in Skin and Ear Infections

EXTRACTED FROM THE ROUND TABLE ON EAR AND SKIN INFECTIONS

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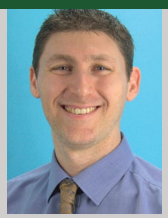

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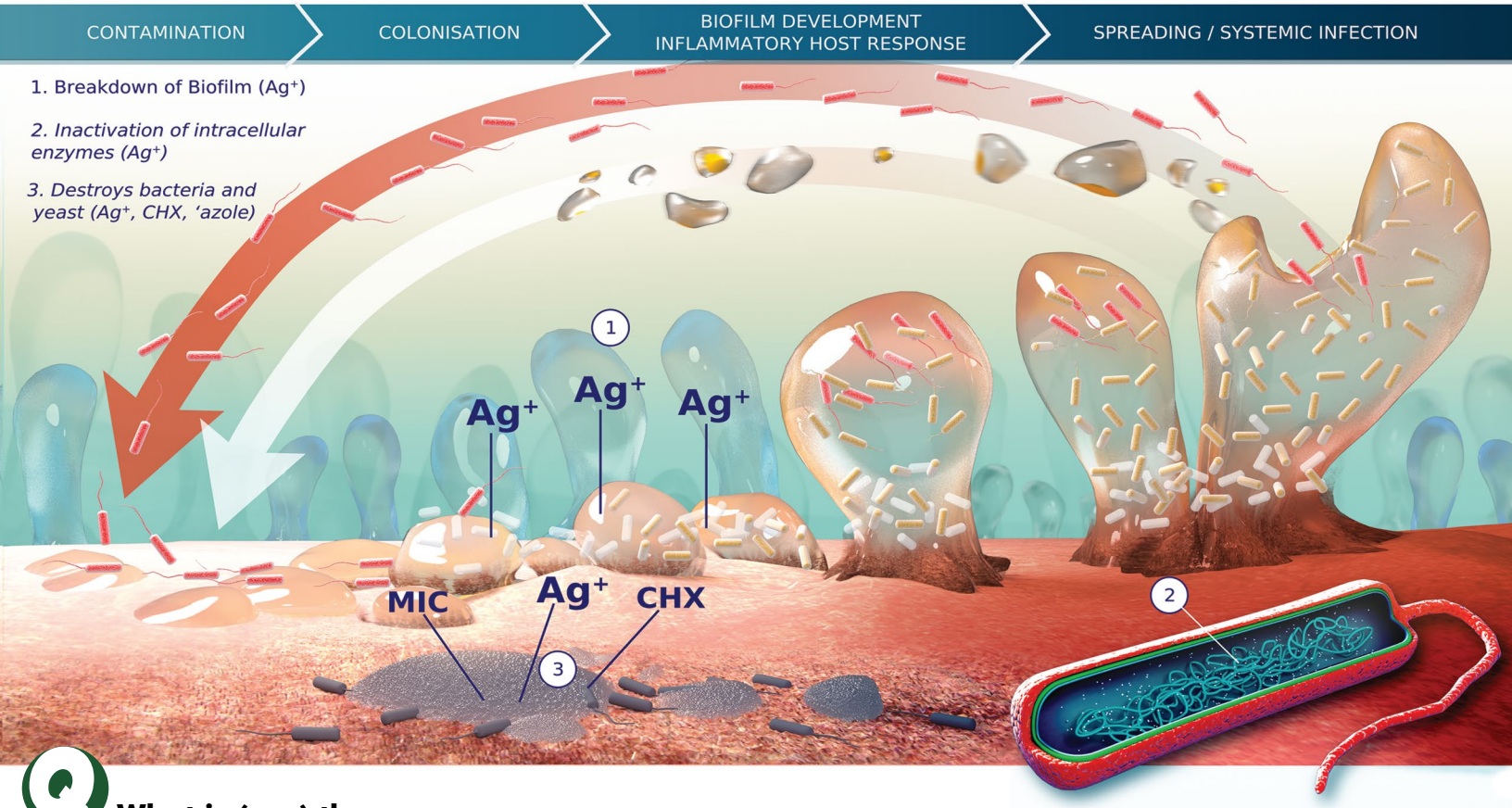

What is (are) the definition(s) of "biofilm"?

DS = Biofilm has different definitions. The most commonly accepted is an aggregation of different populations of bacteria. These bacteria live together and create a "community." I like to think of biofilm as a metropolis with different species and types of bacteria all living together and all sharing tools to fight whatever aggression is potentially outside. So they secrete material to protect themselves such as polysaccharides; the slimy material that we see. When the metropolis is getting too big, they migrate and split. Paradoxically, the inflammation (the body) helps the metropolis grow.

WR = When I think of biofilm, I think of it in a localized site in or on the body, as opposed to it spreading all over the body. It may also be a very important component that can contribute to the bacterial "resistance." A perfect localized example is a biofilm that may occur in ears and contribute to resistant cases of otitis externa or media.

CG = Some bacteria have the ability to produce a biofilm and some don't. It was shown 40% of canine otic *Pseudomonas* isolates and 30% of the canine otitis Staph strains are able to produce biofilm.[1,2] A study on canine *Malassezia* showed that 95% can produce biofilm.[3]

How would you approach a patient with complications by biofilm formation in ear infections?

SW = For the ears I envision the biofilm as the thick and sticky stuff you find at the bottom of the pot after cooking pasta! If you just use water, it does not wash out as rapidly as if you use soap or some other detergent. …I think this is even more so for the body…and for local lesions such as intertriginous areas, washing with something that has a degree of surfactant or something that would be able to strip away the exudate as well as something that could kill off the organisms…that would be ideal. …In terms of ingredients, on the skin, I would use a product that contains chlorhexidine and miconazole at least to kill bacteria and yeast and just the mechanics of it would also help to get rid of the biofilm. … In the ears, I would use a combination of a cleanser and a treatment. The cleanser would ideally be a product that would strip off or break off the biofilm. The treatment would be a product that kills the organisms, recognizing that these days several cleansers also have antimicrobial activities…

"I think there is sort of an intuitive feeling that the more I can wash things out, the better it will be."

Stephen White, DVM, DACVD

WR = I agree entirely with Stephen. Again thinking of these biofilms as a well protected environment for bacteria with polysaccharide coatings and envelopes—is there a way to disrupt biofilm formation?

In the ear, physically cleaning, flushing, and removal of purulent debris, but then also following with the addition of various disinfectants that would penetrate and break down the biofilm.

CG = This is where some new molecules and a mix of new technologies such as MicroSilver could play a role.

There are some recent products currently available that contain MicroSilver that seem to act specifically on biofilm prevention, and potential elimination of existing biofilms. What is the mechanism of action of micronized silver?

WR = The proposed mechanism of action of the MicroSilver (Ag+) ions against bacteria is related to its ability to inhibit the transmembrane transport of protein. This results in lysis of the bacterial cell wall.

We know that the MicroSilver (Ag+) will prevent bacterial adhesion and, if you recall, adhesion is an important component of the biofilm formation.

There is also some indication that Ag+ will destabilize the binding sites of bacteria to proteins.

MicroSilver has two highly desirable proven properties: Antibacterial and Antibiofilm.

Thanks to its special biologically active surface structure, MicroSilver is highly effective and safe. Products formulated with MicroSilver have an Antibacterial, regulating and stabilizing effect. Harmful microorganisms are neutralized while the damaged skin is gently repaired with the long lasting residual effect of MicroSilver.

Most recently VetBiotek sponsored a research project documenting that topical products containing various concentrations of MicroSilver (Ag+) were effective at eradicating biofilm formation in an established in vitro model for Staphylococcus intermedius and Pseudomonas aeruginosa.

This research was conducted by an independent laboratory that utilized an established model for biofilm studies. This study will be presented at the World Dermatology Veterinary Congress as it was accepted in the supporting original studies session. We are excited about using Ag+ products as we have several clinical cases showing significant improvement with MicroSilver. These are cases that were not responding to multiple treatment regimens.

What are the potential future developments associated with the management of biofilms?

"What I would like to see in terms of ideal product when dealing with biofilms is one that:
- **Dissolves polysaccharides**
- **Kills bacteria."**

Domenico Santoro, DVM, PhD, DACVD

DS = So molecules like acetylcysteine, EDTA, or MicroSilver are able to disrupt the "shield" and open the door to antimicrobial products.

Some of these molecules such as MicroSilver also have an antimicrobial effect.

CG = That is one of the keys. It is not only how you kill the organisms BUT how you prevent resistance from developing. Multimodal approaches are needed. An organism must have a genetic mutation that works to become resistant. If an organism needs not one but 2 or 3 genetic mutations, it becomes more difficult for that organism to become resistant.

So having, for example, miconazole, chlorhexidine, and MicroSilver should be more effective at preventing resistance.

JA = Most of our patients are atopic dogs and these are predisposed to overgrowth by Staphylococcus intermedius. A study in Japan on atopic dermatitis in people showed the correlation between secondary infections and the reduction of natural ceramides in the skin.

So it is not only the combination of the ingredients to kill bacteria that matters, but also the addition of ceramide[3]. This will contribute to a positive reaction in patients with pyoderma, as we know they have altered skin barrier function.

References

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