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PATHOGENIC VERSUS HEALTHY BIOFILMS: A METAPHOR FOR ACADEMIC MOBING

Several medical devices, ranging from artificial hip joints to catheters, often can come with unwelcome individuals/communities— complex structures of microbial pathogens called biofilms that can be resistant to antimicrobials and to the human immune system, being therefore a serious threat to human health (Wolcott et al., 2012; Heller, 2011; Hall-Stoodley et al., 2012).

Microbial populations can have a planktonic mode of growth, where microbes grow as singular units, and a biofilm mode of growth, where microbes grow as a community. But what is a biofilm? Microbes are free in suspension and can adhere to a biotic or abiotic surface, and then they communicate to each other using quorum-sensing skills. Afterwards they form microcolonies that can produce exopolysaccharide (EPS) that involve the communities and produce the so-called biofilm. This sessile type of growth can involve different strains of the same microbe, or even different microbes, thus allowing the developing of very complex heterogeneous communities (Costerton & DeMeo, 2011).

In the microbial research community we started to give special importance to the concept of “prebiotics”— molecules that promote growth of selective microorganisms and “probiotics”— selected microorganisms that promote healthy biofilms (Macfarlane 2008; Macfarlane, Bahrami & Macfarlane, 2011). These prebiotic molecules can be used to promote the growth of non-pathogenic microbes in the biofilm, thus enabling the maintenance of the biofilm in a healthy status.

In this article, I draw on the nature of biofilms as a metaphor for academic mobbing. Just as microbial populations form microcolonies that produce either healthy or pathogenic biofilms, populations of academics produce either healthy or pathogenic departments. Just as prebiotics and probiotics can be used to promote healthy microcolonies and biofilms, administrative and peer-to-peer interventions can promote healthy departments.

Perhaps as a preventive measure there should be used several kinds of “prebiotics” by the administration of the University/Faculty in order to avoid “imbalance” in a Department. Another strategy could be the introduction of alternative “qualitative probiotics/leaders” or additional healthy “quantitative probiotics/professors.” This is achieved by an active monitoring and formative feedback from people that manage and by the people under that management (Tigrel, 2009; Faria, 2012).

In a biofilm there is a gradient of redox potential, which means that from the outside to the internal layer there is a decrease in oxygen availability, thus enabling the growth of anaerobes (microbes that grow in the absence of oxygen) or a very slow growth of facultative aerobes. As in a Faculty/Department individuals are subjected to different “growth conditions” in terms of scientific and pedagogic curricula. If at times the “oxygen availability” is different, discrimination occurs and the individual/communities have to live under “extreme conditions,” mainly if “central administration” does not have adequate monitoring

methods and there is a myopic or near-sighted evaluation of the contributions or merit of each individual in a Department.

As in a biofilm, individuals can aggregate within in homogenous communities that share metabolic similarities. In a healthy biofilm there are some communities that preserve “democratic values,” thus enabling equilibrium/balance and avoiding overgrowth of “pathogenic microbes/individuals.” Pathogenic communities living in healthy biofilms share resources with healthy communities, but if for some reason they are left to overgrow they tend to eliminate all other communities, thus demonstrating a very “anti-democratic behaviour.” This is similar to academic departments although “rational animals” like us have moral codes and deontological principles, besides the fact that we and microbes are the antipodes of evolution!

In biofilms, as in our case study, there are time that bacteria and fungi co-exist as different communities (there are some prosthesis infections that involve bacteria like *Pseudomonas* or *Staphylococci* and fungi like *Candida*). But sometimes, mainly if there is for some reason a decrease in bacterial growth and there are not sufficient surveillance methods, fungi can overgrow and disrupt “democratic” equilibrium, thus allowing bacteria to be eliminated. This process, as in academic mobbing, is slow because biofilm growth avoids detection of the immune defences of the host. This can be a metaphor for an administration that allows “anti-democratic” behaviours because they are myopic or want to be. The result is a “mature pathogenic biofilm” that is very complicated to treat, because the antimicrobials can eventually penetrate biofilms only in high and toxic concentrations. The therapeutic measure for this can be the use of “molecules” that promote growth of “healthy bacteria,” such as prebiotics, or directly “inoculating” into the biofilm healthy microbes such as the “probiotics.” This therapeutic approach is often the only measure to treat chronic infections caused by biofilms. Chronic infections have to be transformed or “moved” into acute infections in order to be treated.

For academic mobbing, there should be instruments that have the necessary impartiality that needs to be used to detect “chronicity” (often hidden) and start to identify the “microbe” communities, classify them, understand their communications, and if needed partially intervene with the input of “new communities” or integration of a “small pathogenic” in a large “healthy biofilm.” Conditions or problems are worsened when a small group is integrated with a group of professors that share the same clone (geographic/ethical) with pathogenic management behaviour (as if it was “their place...”), which affects the larger department. This therapeutic measure needs a senior administration with a “healthy and democratic” outlook that stands by and understands the need to avoid judicial fights among the faculty members and degradation of the department’s image. As in biofilms, there is a need to control the microbes that first adhere (the case of caries in dental plaque biofilms is a very interesting metaphor), but this control must take into account who is going to be selected and under what criteria. For instances, when you avoid cleaning your teeth you are selecting specific types of “pathogenic microbes” to be the pioneers in teeth and gingival adherence. After this, having established community dominance they select the microbes with which they have affinities, in an eternal “gravitational” wave that becomes a never-ending story!

In biofilms, if we permit a dominant, “winning community,” the others tend to disappear. If it is obvious that it is a “healthy biofilm” it is fine, namely if there is no story of elimination of other communities. Sometimes, as in academic mobbing, the story can be of “pseudo-healthy biofilms” where previous “frames” of “microbial growth” are deleted and administrators only declare the final achievement of the dominant community.

This kind of behaviour can, in the future, kill at the start some types of controversial ideas and microbes within the “winning pathogenic community” may start to criticize their leaders. As an example of this is the “dual behaviour” in the fungi *Candida albicans*, biofilms that come to us recently in the research work of Heller (2011) and Yi et al. (2011) where two different types of yeast with different morphophysiological characteristics have different susceptibilities to antimicrobials, thus allowing the existence of healthy biofilms. As in biofilms, in academia there is always the opportunity to promote “healthy growth” even in “pseudo-healthy biofilms” and this is possible with a very open and accurate monitoring methods. Of course there could be a “pseudo-religious” attitude, reinforcing moral codes of

conduct, but this is innocuous if there are not some functional attitudes resulting from the detection of the “pathogenic microbes” and their non-healthy attitudes (Sperry & Duffy, 2009; Duffy, 2009; Faria, 2012).

At this time the reader can understand why we used microbes for our metaphor, which are singular prokaryotic cells, the base of evolution. These singular cells, similarly to eukaryotic cells in differentiate tissues can talk with each other using their quorum sensing tools and “work” in communities. As in microbial biofilms, academic communities could avoid and treat “pathogenic behaviours” with proper development and use of diagnostic tools (Leymann, 1990; Westhues, 2005, 2012). Biofilms are often underestimated by the host, as in cases of academic mobbing, so “rational animals” like us can learn from the state-of art research work with our past ancestor, the microbes.

This metaphor highlights the case where “pathogenic fungi” start a process of elimination of the “bacterial community” and there is insufficient detection of this in the developing process. At this time, “mobbers” try to show their “biofilm” as “healthy,” even to central administration of the university.

As in the ecological metaphor (Zhao & Frank, 2003), the Zebra mussel/pathogenic microbes/mobbers rapidly invades the Great Lakes ecosystem/healthy biofilms/academia because of its characteristics as an invading species, namely a high reproductive strategy and the ecosystem’s characteristics. In academia, dominant groups can grow as their reproductive strategies mesh with the ecosystem’s characteristics (such as the subjectivity of performance measures, the organizational structure, “You scratch my back and I’ll scratch yours” behaviour, blind confidence in hierarchy, and administrators turning a “blind eye” or adopting myopic monitoring systems). If these invasive species/mobbers become dominant in the academic ecosystem there will be very low tolerance to different or new species and, as in “pseudo-healthy” biofilms, probiotic microbes/non-mobbers will be seen ironically as a threat to homeostasis and will be selected for slow and discrete elimination. The main idea and goal of this new pseudo-healthy biofilm/pseudo-homeostatic academic ecosystem is to desperately maintain a “good” image to the academic world, namely by giving extreme importance to the outcomes without taking into account how they are achieved.

What should we think about academic management that does not give merit to aerobic bacteria like “*Pseudomonas*/non-mobbers” that grow anaerobically/without oxygen (having other “molecules/alternative curricula” than the “oxygen/original faculty/department,” as in a final acceptor to electrons in the respiratory chain) in order to survive? Is this a metaphor for the major effort of upgrading curricula with other competences and skills (without financial support) in order to effect a complete integration in another “biofilm,” a “healthy biofilm”? What type of “rational animals” are we if at the end, the equilibrium of the communities depends on mechanisms that are similar to microbial biofilms that are our antipodes in terms of evolution? Where are the basic human codes? At a time that the research community recognizes consciousness in non-human animals, recognizing that they should be respected, is there a “theatre of the absurd” where “rational animals” are not respected in their dignity and rights? Should we understand and “speak” microbial biofilms language in order to survive as “rational animals” in academic communities?

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AFFILIATIONS

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