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Mini Review

An Improvement in Our Comprehension of the Species of *Francisella*

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Abstract

We might interpret the destructiveness and pathogenesis of *Francisella spp*. has made significant progress in recent years, including the discovery of this organism's ability to form biofilms. What is currently known about *Francisella species* biofilms is summed up here and future exploration questions are recommended. The atomic premise of biofilm creation has started to be contemplated, particularly the job of extracellular carbs and container, majority detecting and two part flagging frameworks. Further work has investigated the commitment of amoebae, pili, external layer vesicles, chitinases, and little atoms, for example, c-di-GMp to *Francisella spp*. biofilm development. A job for *Francisella spp*. It has been suggested that feeding mosquito larvae create biofilm. As no solid job in harmfulness has been found at this point, *Francisella spp*. Most likely, biofilm formation is a crucial mechanism for environmental persistence and survival. *Francisella Spp*.'S significance and importance's biofilm aggregate as a basic part of its microbial physiology is being created. The potential role of *Francisella spp*. is one area that could use some more research. Biofilms in the control of virulence and the infection of mammals as hosts.

Keywords: Pathogenesis, Biofilms, Mosquito larvae, Environmental persistence, Microbial physiology

INTRODUCTION

Tularemia, or "hare fever", is brought about by the gram-negative bacterium *Francisella tularensis*. Tularemia is known as a "zoonotic" illness; that is, it regularly influences creature populaces, in any case, can taint people with directs contact. Worldwide, tularemia of humans and domestic animals occurs infrequently but frequently. In the early 1900s, tularemia was a common public health problem, with approximately 2000 cases per year in the United States. Only about 200 cases per year are reported in the United States today, and the majority of these cases are transmitted by ticks. Hunters contracted the disease by cutting themselves while skinning animals like rabbits or squirrels. Ticks utilize a "transstadial component" of transmission, in which the tick procures the bacterium as a hatchling or sprite and holds it into adulthood, when it can taint people. CDC arranges the harmful type of *F. tularensis* as a Level 1 danger specialist because of its high infectivity when breathed in by the human lung. The verifiable improvement of *Francisella spp.* as a biological weapon, a thorough comprehension of its microbial physiology is necessary. The taxonomy has evolved over the past few decades as a result of the ever-increasing diversity of *Francisella species*, particularly as environmental samples are subjected to genomic analysis 2. The family Francisella generally contains two species (*F. tularensis* and *F. philomiragia*), with four subspecies of *F. tularensis*, *F. tularensis* (Type A), *F. tularensis holarctica* (Type B), *F. tularensis mediasiatica*, and *F. tularensis novicida*. The genus Francisella's nomenclature has undergone significant revisions recently, with *F. novicida* being reduced to a subspecies (2-4) and the proposed promotion of a *F. philomiragia* subspecies to a new species (F. noatunensis) are pathogens of mammals that live on land and in water, particularly rodents and lagamorphs. The European (Holarctic, Type B) form of tularemia is less virulent overall for humans than the American (Type A) form, but it is more prevalent in humans. Despite this lower virulence, there are thousands of human cases each year in active years in northern Europe, particularly Sweden.

Normal zoonotic plagues of tularemia happen throughout the late spring a very long time in creature populaces all through Europe, the US, and Russia. These pandemics are ordinarily spread by arthropod vectors like mosquitoes, gnawing flies, and ticks. The Swedish human tularemia cases are thought to be mosquito-borne, and are firmly connected with the distressed patients having been close to water and having mosquito bites. Between pandemics, F. tularensis strains (Type An in the US and Type B in Europe) can likewise be regularly tracked down in the climate by sub-atomic sequencing of ecological examples (Verhoeven AB, 2010).

Mechanism of biofilm formation

Water-associated biofilms are made by pathogenic and non-pathogenic bacteria to help them survive challenging environments like low nutrient availability, protozoan predation, and other stressors. *L. pneumophila*, *Helicobacter pylori*, *Pseudomonas aeruginosa*, and *Vibrio cholera* are a few well-studied examples. Definite investigations of the guideline of biofilm arrangement in these life forms have shown that they utilize different atomic components to coordinate fluctuated ecological signs (like supplement limit) and signals from different microorganisms, (for example, majority detecting atoms) to direct their physiological status between biofilm versus planktonic aggregate. Investigations of Francisella biofilm development at the atomic level have basically been finished in *F. novicida* to date, also, are more restricted in scope because of the originality of this area of research (Forsberg A, 2007) (Ark NM, 2011).

Francisella biofilm production involves type IV pili:

Type IV pili are made out of pilin proteins, like those encoded by the *F. novicida* Heap qualities. The job of Type IV pili in *Francisella spp*. has been studied recently and the current findings suggest that they may be involved in adhesion to hosts or surfaces. *Francisella spp*. encodes multiple genes for pilin. The transposon mutants in *F. novicida* pilE4 were not defective for *F. novicida* biofilm production, so it was concluded that pilE4 is not essential to biofilm production in *F. novicida*. The pilE4 gene is important for fiber formation in *F. tularensis*, *F. novicida*, and LVS. This result was unexpected due to the association of Type IV pili with biofilms in other organisms. Type IV pili are necessary for the full formation of a biofilm in Pseudomonas due to their role in the initial attachment and colonization of surfaces33. Bacterial physiology, as well as the function of Type IV pili in *Francisella species*, is still poorly understood (Costerton JW, 1999) (Apicella MA et al., 2010).

Carbohydrates outside of the cell in Francisella species production of biofilms:

The exact sythesis and indeed, even the presence of this container has been an issue of examination for a long time. spp. of Francisella a capsule-like complex (CLC) in *F. tularensis* has recently been reported. This may be the same as the HMW carbohydrate that was recently identified as separate from the F. tularensis O-antigen capsule. Extracellular carbohydrate, perhaps in capsule, may also represent a potential vaccine target for tularemia (Bandara AB et al., 2011). Recent studies have suggested that there is an O-antigen capsule for *F. tularensis* and *F. holarc*. It is unknown whether *F. novicida* has yet demonstrated CLC, HMW carbohydrate, or capsule. Responses of antibodies to *Francisella species* sugars are regularly announced. More recently, renewed vaccine efforts that focus the immune response to the carbohydrate and polysaccharides suggest that this may be an effective strategy. Vaccination has been attempted using "capsule" material (González Barrios AF et al., 2006) (Hager AJ et al., 2006).

Francisella interactions with Eukaryotes with one cell

The second piece of our speculation is that Francisella may be held onto inside amphibian eukaryotes, for example, amoebae inside the water section. It has recently been demonstrated that Francisella species, including live vaccine strain [LVS], SchuS4, and *F. novicida*, can infect the water-dwelling amoeba A. castellanii. Our group has recently demonstrated that the environmental organism *F. philomiragia* can also infect A. castellanii amoeba. In an effort to comprehend how Francisella can survive in the environment, several groups have proposed In addition, it has been demonstrated that Francisella LVS grown in the presence of A. castellanii-conditioned medium has an increased overall growth rate, indicating that the bacteria benefited from a close association with the amoebae. For other pathogens such as Legionella, the interaction of bacteria with amoebae has been demonstrated to promote persistence in aquatic systems and increase virulence, i.e., the ability of Legionella to invade mammalian host cells (Forslund AL et al., 2006) (Salomonsson EN, 2011).

CONCLUSION

Francisella may be in a physiological state that was previously unknown, which could be represented by biofilms. The testing of brand-new hypotheses and the creation of novel biofilm-prevention strategies may be made possible by comprehending Francisella's microbial physiology in relation to biofilm formation. Overall, the current data suggest that this meticulous and delicate organism likely uses biofilms as a key mechanism for environmental persistence in the natural environment. Future research ought to concentrate on whether Francisella biofilm contributes to the pathogenesis and infection of the mammalian host.

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