with silver nanoparticles may emerge as futuristic applications for biofilm-based human ocular problems (Kalishwaralal et al. 2010). In another study, Martinez-Gutierrez and co-workers (2013) also demonstrated that silver nanoparticles effectively prevent the formation of biofilms and kill bacteria in established biofilms, which further reinforces the use of this therapy to prevent and combat infections related to pathogenic biofilms.

In a more recent study, Gillet and co-workers(2018) explored the efficacy of silver nanoparticle-based films against *E. coli* biofilms. As a result, films were able to act as a silver source sufficient to prevent unwanted initial formation of these biofilms while maintaining toxicity at low levels and therefore could be suggested as potential candidates for use in the medical industry (Gillett et al. 2018).

In the context of silver nanoparticles as active agents against pathogenic biofilms on abiotic surfaces, specifically medical devices, the literature brings several studies. For example, the study by Roe and co-workers(2008) carries tests with plastic catheters coated with silver nanoparticles, which were able to efficiently inhibit the formation of the biofilms of the bacteria *E. coli* and *S. aureus* and the fungus *C. albicans*. Moreover, in *in vivo* experiments these coated catheters provided safe use in animals, since they were not toxic (Roe et al. 2008). In another study, Secinti and co-workers(2011) with coated titanium implants with silver in *in vivo* experiments tested the toxicity and ability of these implants to inhibit the formation of *S. aureus* biofilm. As a result, the coated implants did not induce toxic effects and were able to inhibit the biofilm formation of these bacteria (Secinti et al. 2011).

In summary, despite the extensive investigation of silver nanoparticles as potential alternatives for treatment against pathogenic biofilms, either as active biofilm agents or as a coating for medical devices, there is still no in-depth knowledge about the interaction of these nanoparticles with the body human. Therefore more studies are required, since the biosafety of silver nanoparticles for humans is currently uncertain, since in the literature the studies focus on biodistribution and *in vivo* toxicity with rabbits, rats, and mice (Markowska et al. 2013).

20.4 Conclusion and Future Directions

As previously described, pathogenic biofilms are the main contributors to chronic infection. Therefore, the need for new therapies to reduce the impact of these infections becomes even more urgent. Thus, the study of biofilm and strategies to prevent and combat them consists of one of the most important fields of research today. In this sense, advances in biotechnology have allowed the opening of new therapeutic horizons and therapies with AMPs; bacteriophages and nanoparticles are currently the most promising for anti-biofilm