

Chapter 6

**Silver Oxide–Copper  
Oxide Nanocomposite  
Preparation and  
Antimicrobial Activity  
as a Source for  
the Treatment of  
Fish Diseases:  
Silver Oxide–Copper Oxide  
Nanocomposite Preparation  
and Antimicrobial Activity**

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## **ABSTRACT**

*Aeromonas hydrophila* is a heterotrophic, gram negative bacterium which is primary or secondary cause of ulcers, fin rot, tail rot, and hemorrhagic septicemia in fish. The treatments for this infection are only restricted to some antibiotics. So, novel materials are being searched for combating with bacterial infections and the resulting consequences. In this chapter,  $\text{Ag}_2\text{O}/\text{CuO}$  nanocomposites were synthesized chemically and characterized by X-ray diffraction (XRD), scanning electron micrograph (SEM) and transmission electron microscope (TEM). The antimicrobial activities of  $\text{Ag}_2\text{O}/\text{CuO}$  nanoparticles (NPs), was checked by both well diffusion and turbidometric (spectrophotometric) method. Synthesized nanoparticles exhibited their antimicrobial efficacy in both the standard inhibitory assays; these results thus provide a scope for further research on the application of  $\text{Ag}_2\text{O}/\text{CuO}$  nanoparticles as disinfectant and/or antibiotic in the fishery industry.

## **INTRODUCTION**

Fish disease is one of the major threats to the sustainable development of aquaculture causing loss of millions of dollars annually. *Aeromonas hydrophila* is a gram negative bacterium that can grow both in aerobic and anaerobic condition and causes a variety of diseases in both fish and human populations. There are contradicting views on whether the microbe is a primary cause of diseases or an opportunistic one causing diseases to hosts that are immune compromised and stressed (Nielsen et al., 2001). However, this pathogen has been found to cause ulcers, fin rot, tail rot, and hemorrhagic septicemia and epizootic ulcerative syndrome (EUS) in fishes (Austin et al., 1996; Roberts, 1997). The ubiquitous nature of the bacterium in aquatic environments provides significant opportunity for animals, mainly fish and amphibians to contact and ingest organisms (Seshadri et al., 2006). The treatment for the bacterial infection is limited to very few antibiotics like Tetracycline and Remet-30®. Moreover, the bacteria are developing resistance to the available antibiotics because of prolonged use and new compounds for combating bacteria-borne diseases are being searched for.

Nanotechnology is an emerging scientific field and considered to have potential to generate new and innovative materials. Nanotechnology provides the ability to engineer the properties of materials by controlling their size and this has driven research towards a multitude of potential uses for nanomaterials (Saifuddin et al., 2009). Nanoparticles exhibit distinct optical, thermal, chemical and physical properties from that of the bulk material due to their higher surface area to volume ratio.

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