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Differences in Antibiotic Resistance in Fresh-water Bacteria from Furman Lake and Feeder Streams

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SUMMARY

The presence of antibiotic resistant bacteria in lakes and streams is becoming a growing public health concern, particularly in watersheds that receive wastewater or runoff from areas that have come in contact with humans or livestock animals. Human and animal-contacted run-off water that drains into tributaries and lakes has been enriched with antibiotics and antibiotic resistant bacteria. The presence of resistant bacteria that we find in these areas is due in part to the indiscriminate and overuse of antibiotics prescribed to treat human infections and fed to livestock animals to promote the growth of muscle tissue (Cabello 2004). This exposure to human and animal contact may accelerate the development of resistant bacteria that could pose a threat to humans who depend on these lakes and streams for drinking water. (Zhang et al. 2008). Although Furman Lake would only be used for recreational purposes, what we learn from our study can be used as a small comparison and analogy to more pressing issues of lake sanitation-like those seen in underdeveloped nations where people contract fatal illnesses from drinking water from lakes and rivers contaminated with harmful bacteria and parasites. Additionally, some researchers have found antibiotic resistant bacteria in tap and finished water collected from sites in Michigan and Ohio (Goni-Urriza et al.2000). Further study is needed to determine whether or not the presence of these bacteria in our water may pose a health threat.

In our experiment, we collected water samples from the North Village tributary, the amphitheater tributary, and the Furman Lake dam. We filtered the water samples for bacteria and then transferred the bacteria to agar plates containing ampicillin, tetracycline, kanamycin, or chloramphenicol. We found varying differences between antibiotic resistances to the different antibiotics and also differences between the sample collection sites. All of the bacteria grown on the plates containing ampicillin and bacteria from North Village tributary resulted in lawn coverage of bacteria. This result indicates that antibiotic resistance to Ampicillin is very high and possibly common among fresh water bacteria in the surrounding areas. The antibiotic resistance of tetracycline is greater in bacteria collected from the amphitheater tributary than from the dam, perhaps due to human settlement drainage that flows into the amphitheater tributary upstream from the collection site. We would expect to see increased resistance to this drug since it is one of the more common ones used to treat human and animal diseases (Chopra and Roberts 2001). Bacteria from the dam water had a higher level of resistance to kanamycin than did the bacteria from the amphitheater tributary. This difference may be caused by the presence of bacteria from the North Village tributary, as there were high levels of kanamycin resistance. Through bacteria transformation, more bacteria can gain resistance once the tributaries mix in Furman Lake. There is no significant difference ($t=2.104117$; $p=0.1250$; $df=3$) in resistance between the two sites, inferring that the relative levels of chloramphenicol resistance in bacteria from the amphitheater do not change significantly by the time the water reaches the dam water.

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