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E.R. Tripp, J.Q. Lyerly, M.-K. Liao, and G.P. Lewis. 2010. Abundance and diversity of antibiotic-resistant bacteria in streams draining urban and rural watersheds in the South Carolina Piedmont.

Streams draining urban areas typically receive higher nutrients and pollutant inputs and have lower macroinvertebrate and fish diversity compared to rural streams. However, not enough is known about the impact of urban land cover on the abundance or diversity of stream bacteria. In this study, we compared the abundance and community compositions of antibiotic-resistant bacteria (ARB) in streams draining urban and rural watersheds in the South Carolina piedmont. Between July 2008 and July 2009, we examined the abundance and diversity of ARB in three streams: Brushy Creek (BC), a stream draining a highly urbanized watershed, the South Pacolet River (SPR), a stream draining a rural (mostly forest/pasture) watershed, and the Middle Saluda River (MSR), a stream draining a forested watershed. In addition, during July 2009, we quantified abundances of ARB from streams in 5 watersheds with mostly commercial land cover, 5 watersheds with mostly residential land cover, and 5 watersheds with mostly forest cover. Water samples were filtered through 0.45 μm membranes that were placed on nutrient agar with different antibiotics and the CFUs of ARB on filters were determined. The diversity of 431 ARB isolates from BC, SPR, and MSR was analyzed by the restriction pattern (ImageJ) or the sequences of 16S rRNA genes (BLAST). Concentrations of fecal indicator bacteria and major stream solutes also were determined for all samples. Bacteria resistant to ampicillin, chloramphenicol, kanamycin, and tetracycline were most abundant in commercial watersheds. With the exception of tetracycline-resistant bacteria, ARB were least abundant in forested watersheds. Streams draining commercial watersheds also had higher electrical conductance and sulfate concentrations than did streams in residential or forested watersheds. In all samples, ampicillin-resistant bacteria were more abundant than were other ARB by up to 5 orders of magnitude. We found greater ARB diversity in MSR than in either BC or SPR. Our research suggests that urban streams often have higher abundance of ARB than do forest streams, but diversity of ARB may be higher in forest streams than urban streams.