Efforts to understand the environmental impact of released nanoparticles have identified some simple relationships between nanoparticle binding and toxicity to bacteria. Here, we use a panel of Gram-negative bacteria that come from diverse environmental niches to assess nanoparticle toxicity and to further understand the interaction of nanoparticles with diverse bacterial cell walls. In using such a panel, we see only a loose correlation between nanoparticle binding amounts and observed toxicity. This demonstrates that more complex biological mechanisms may be involved in nanoparticle toxicity. Using a panel comprised of environmentally-diverse bacteria can help account for biological complexity and allow identification of bacteria types that are most affected by different nanoparticles, which should improve efficiency in investigating the environmental impacts of nanoparticles.