The U.S. Centers for Disease Control have predicted more deaths from antibiotic-resistant bacteria than all cancers combined in the decades that lie ahead. The synthetic materials used in tissue engineering applications today are typically composed of millimeter or micron sized particles and/or fiber dimensions and have no inherent ability to reduce bacteria functions. Although human cells are on the micron scale, their individual components, e.g. proteins, are composed of nanometer features. By modifying only the nanofeatures on material surfaces without changing surface chemistry, it is possible to control endogenous protein adsorption. In addition, our group has shown that these same nanofeatures and nano-modifications can reduce bacterial growth without using antibiotics in order to halt the growth of antibiotic resistant microbes. Inflammation can also be decreased through the use of nanomaterials. This strategy also accelerates US FDA approval and commercialization efforts since new chemistries are not proposed, rather chemistries already approved by the FDA with altered nanoscale features. This invited talk will highlight some of these advancements and emphasize current nanomaterials approved by the FDA for human implantation focusing on reducing the growing problem of medical device infection.