Titanium-based implantable devices such as joint prostheses, fracture fixation devices and dental implants, are important to human lives and improvement of the life quality of patients. The implant for hard tissue replacement should possess various attributes, including appropriate mechanical properties, good biocompatibility, high corrosion and wear resistance, well osseointegration and antibacterial property. Biomedical titanium is lack of osseointegration and antibacterium ability, therefore, many works were conducted to improve the osseointegration and antibacterium ability, respectively. However, it is more attractive if the titanium-based implant possesses osseointegration together with antibacterial property. In recent years, we have prepared several kinds of coatings and films on biomedical titanium which can prompt bone formation and kill bacteria. Porous and nanostructured Zn-incorporated TiO2 coatings were prepared using a single step plasma electrolytic oxidation on titanium in our group. The Zn-incorporated TiO2 coatings can inhibit the growth of both S. aureus and E. coli. The adhesion, proliferation and differentiation of rat bone marrow stem cells (bMSCs) on Zn-incorporated coatings are significantly enhanced compared with the Zn-free coating. In addition, silver ions was implanted into the bioactive nanostructural titania coatings using plasma immersion ion implantation technology. The surface of Ag-implanted titania coating not only showed a strong antimicrobial effect against oral microorganisms including S. mutans (UA 159), Pg (ATCC 33277) and C. albicans (ATCC 76615) by the way of direct contact, but also had a great osteoconductivity with increased cell attachment, viability and osteogenic gene expression (ALP, Runx2 and OCN).