Agnieszka Jackowska-Tracz et al., J Food Microbiol Saf Hyg 2017, 2:4(Suppl)
DOI: 10.4172/2476-2059-C1-005

Antimicrobial activity of nanosized graphene and titanium oxides - Its role in food processing hygiene improvement

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The bactericidal activity of nanomaterials was evaluated using two selected pathogens which are recognized as important hazards causing non-compliances with the process hygiene criteria. As Gram (-) and Gram (+) bacterial model, *C. jejuni* and *S. aureus* were used. Strains were treated with graphene oxide (GO) and reduced graphene oxide (rGO) in two concentrations (200 and 400 µl/ml). The same bacterial model was used to determine the antimicrobial activity of ceramic tiles coated with photocatalyst (TiO_2) layer. For this purpose, UV radiation of wavelength 253.7 nm was used. Conventionally produced tiles and tiles coated with TiO_2 by means of three different methods were exposed to UV for 60, 90 and 120 sec. Quantitative bacteriological analysis was carried out to determine the surviving bacterial cells number. Results show that GO sheets, in both concentrations, present the greatest antibacterial activity among the two graphene-based materials. Reduction was observed during the first 2 hours of nanoparticles-bacteria contact. There was no evidence of increasing the loss of bacteria viability in a concentration-dependent manner. The bactericidal action of UV was much stronger on the surfaces coated with TiO_2. The strongest effect was found for film prepared by APCVD method (7-log). Since the maximum bacterial reduction level was not higher than 90% (1-log), the practical use of graphene-based materials seems to be limited. Nevertheless, GO with other control measures may contribute to improve hygiene level. The use of wall tiles coated with TiO_2 in plants where UV is applied should greatly improve the disinfection efficiency.

Biography

Agnieszka Jackowska-Tracz PhD, DVM, is an Assistant Professor in Department of Food Hygiene and Public Health Protection, Faculty of Veterinary Medicine, Warsaw University of Life Sciences – SGGW (WULS-SGGW), Warsaw, Poland. She conducts research on the impact of various factors on the ability to reduce pathogens in food of animal origin, and studies on the potential use of nanotechnologies to improve the hygiene of the production environment. Her field of specialization is hazard analysis and improvement of HACCP systems. She conducts classes and lectures for veterinary students and postgraduate students in the field of safety of animal origin products.

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