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How graphene family materials affect *Listeria monocytogenes* and *Salmonella enterica* strains?

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High thermal stability, high mechanical strength, relatively good bio-compatibility for humans resulted from carbon composite graphene-like structures capable of being an antibacterial agent. The study compared the toxicity of different forms of graphene family materials (GFM); pristine graphene (pG), graphene oxide (GO) and reduced graphene oxide (rGO) towards bacteria strains. The effect of three different GFMs on chosen food-borne bacteria strains: Gram-positive (G+) – *Listeria monocytogenes*, and Gram-negative (G-) – *Salmonella enterica* were examined. Results are a decreased number of bacterial colonies were observed in probes 250 μg/mL for all examined GFMs. Moreover, as low concentration of GO as 25 μg/mL caused a drop in the level of bacterial colonies as well and reduced growth by almost 100%. The shape and size of GFMs and their interactions towards bacteria strains were inspected by transmission electron microscope. Bacteria were aggregated and attached to GFMs. A strong affinity occurred between bacteria and edges of pG and rGO, while bacteria strains attached to GO nanoparticle surfaces. The present results indicate that GFM antibacterial activity causes mechanical damage of bacterial cell membranes by a direct contact of the bacteria with the extremely sharp edges of GFM with sp3-hybridized bonds. Based on the present results, we propose a three-step antimicrobial mechanism of GFM. It includes initial cell deposition on GFM (step 1), membrane stress and disruption caused by direct contact with sharp edges and bonds (step 2), and finally stimulated oxidation stress (step 3). The key difference between the chosen graphene materials is the bacterial cell deposition place.

Biography

Natalia Kurantowicz is absolvent of Microbiology and Business Management at Warsaw University of Life Science. She is interested in nanotechnology, microbiology and new conception of crisis management in social media. She is a PhD student at Warsaw University of Life Science and investigating nanoparticles impact on living organisms like bacteria, rats etc.

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