

COATINGS THAT KILL BACTERIA AND VIRUSES ON CONTACT

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Over the past half dozen years, we have been designing and exploring novel, non-release strategies for rendering common materials, such as plastics, glass, and textiles, highly microbicidal (see ref. 1 for a review). Some of our approaches, involving either covalent attachment [2] or painting-like deposition [3-5] of certain long, moderately hydrophobic polycations onto materials surfaces, have proven remarkably effective against a variety of pathogenic Gram-positive and Gram-negative bacteria, both airborne and waterborne, as well as against fungi and influenza viruses [4, 5], including the latter's human and avian strains, both wild-type and drug-resistant ones [6]. The immobilized polycationic chains appear to kill microbes on contact by disrupting microbial cell membranes (with no resistance developing over at least a dozen successive generations of bacteria) and viral lipid envelopes [1].

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1. A.M. Klibanov (2007) "Permanently microbicidal materials coatings". *J. Mater. Chem.* 17: 2479-2482.
2. K. Lewis, A.M. Klibanov (2005) "Surpassing Nature: rational design of sterile-surface materials". *Trends Biotechnol.* 23: 343-348.
3. D. Park, J. Wang, A.M. Klibanov (2006) "One-step, painting-like coating procedures to make surfaces highly and permanently bactericidal". *Biotechnol. Progr.* 22: 584-589.
4. J. Haldar, D. An, L. Alvarez de Cienfuegos, J. Chen, A.M. Klibanov (2006) "Polymeric coatings that inactivate both influenza virus and pathogenic bacteria". *Proc. Natl. Acad. Sci. USA* 103: 17667-17671.
5. J. Haldar, A.K. Weight, A.M. Klibanov (2007) "Preparation, application, and testing of permanently antibacterial and antiviral coatings". *Nature Protocols* 2: 2412-2417.
6. J. Haldar, J. Chen, T.M. Tumpey, L.V. Gubareva, A.M. Klibanov (2008) "Hydrophobic polycationic coatings inactivate wild-type and zanamivir- and/or oseltamivir- resistant human and avian influenza viruses". *Biotechnol. Lett.* 30: 475-479.