SUMMARY

**[0006]** The present disclosure provides hard surface treatment compositions comprising: an antimicrobial component comprising at least one quaternary ammonium compound; a cationic polysaccharide derived from a natural source; an organic acid; and a surfactant selected from cationic surfactants, amphoteric surfactants, nonionic surfactants, and combinations thereof. Also presented are methods of providing a surface with residual antimicrobial action that include the step of applying a composition of the present disclosure to the surface. The present disclosure also provides a substrate with residual antimicrobial action comprising a substrate wherein at least a portion of the substrate is coated with a composition of the present disclosure.

**[0006a]** In one aspect, the present disclosure provides hard surface treatment concentrate composition comprising an antimicrobial component comprising at least one quaternary ammonium compound in an amount ranging from 800 ppm to about 40,000 ppm; a cationic polysaccharide derived from a natural source in an amount ranging from about 800 ppm to about 30,000 ppm; an organic acid in an amount ranging from about 1,000 ppm to about 35,000 ppm; and a surfactant selected from the group consisting of cationic surfactants, amphoteric surfactants, nonionic surfactants, and combinations thereof in an amount ranging from about 2,000 ppm to about 90,000 ppm.

**[0006b]** In another aspect, there is provided a method of providing a surface with residual antimicrobial action that comprises the step of applying the composition as described herein to the surface.

**[0006c]** In yet another aspect, there is provided a substrate with residual antimicrobial action comprising a substrate wherein at least a portion of the substrate is coated with the composition as described herein.

**[0006d]** In a further aspect, there is provided a use of a composition as described herein to substantially reduce or control the formation of microbial colonies on or at a surface.

DETAILED DESCRIPTION

**[0007]** The present disclosure relates to compositions that provide a longer lasting disinfection to treated surfaces and include cationic polysaccharides derived from a

natural source. The present compositions achieve microorganism (e.g. bacterial, viral, or fungal) kill of at least 95% or greater, (e.g. 99.9% kill), for 12 to 24 hours obviating the need for repeated treatment. Suitable techniques for assessing the effectiveness of compositions of the present disclosure include U.S. and European standard methods.

**[0008]** In order to substantiate 24 hour long-term sanitization claims with the United States Environmental Protection Agency (EPA), compositions are evaluated with the residual self-sanitization (RSS) method, EPA Protocol # 01-1A (https://www.epa.gov/sites/production/files/2015-09/documents/cloroxpcol_final.pdf). For validating longer term disinfection, all extant test protocols emulate the maximum amount of recontamination and abrasion by touching and wiping anticipated before reapplication, typically a 24 hour period. An intermediate protocol with approximately half the level abrasion and re-soiling challenge to a surface is presented here as the "RSS-12h" test protocol.

**[0009]** To address the need for a Standard European Test Method by which residual antimicrobial activity can be measured and assessed, the British Standard Institute has recently published BSI-PAS-2424 titled: "Quantitative surface test for the evaluation of residual antimicrobial (bactericidal and/or yeasticidal) efficacy of liquid chemical disinfectants on hard non-porous surfaces – Test method". Most methods