



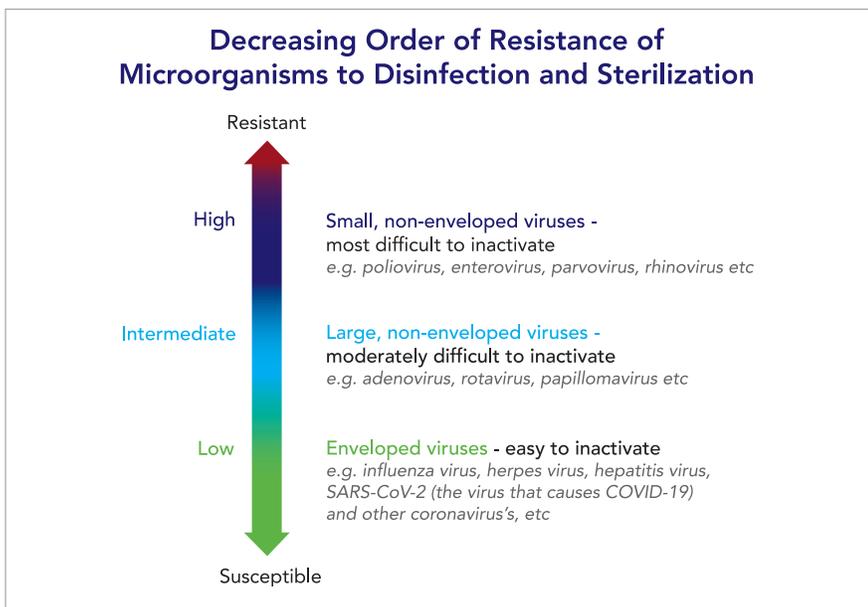
MS2 Bacteriophage (MS2) is a very difficult to kill non-enveloped virus that is harmless to humans and therefore safer to use in testing laboratories. Since human viruses can be dangerous, expensive and cumbersome to work with and MS2 has similar aerosol characteristics to human viruses<sup>1,3</sup> it is one of the bio-aerosols recommended for air filtration tests by the EPA. MS2 has been utilized as a surrogate virus for many pathogenic viruses such as Norovirus, Influenza virus and now SARS-CoV-2 (the virus that causes Covid-19).<sup>1,2</sup>

Similar to SARS-CoV-2, MS2 is also a single stranded RNA virus but MS2 is much smaller (27 nm compared to SARS-CoV-2 at 120 nm) so it is therefore harder to filter. Due to this it is often used in air purifier and air filtration tests as a surrogate for viruses of similar or larger dimensions.<sup>4</sup>

In addition, MS2 is more resistant to UV light and more chemically resistant to destruction than SARS-CoV-2 and many other viruses. Due to this MS2 has also been employed in bio-aerosol experiments to simulate airborne transmission of many diseases.<sup>1</sup>

The EPA and the Centers for Disease Control and Prevention (CDC) recognize that certain microorganisms can be ranked with respect to their tolerance to chemical disinfectants. The Spaulding Classification model, used by the CDC, tiers microorganisms in accordance with the level of resistance to being killed (inactivated) by typical disinfectant products. With this approach viruses are divided into three viral subgroups (small non-enveloped, large non-enveloped, and enveloped) based on their relative resistance to inactivation (see below). According to this hierarchy, if a disinfectant product can kill a small, non-enveloped virus it should be able to kill any large, non-enveloped virus or any enveloped virus. Similarly, a product that can kill a large, non-enveloped virus should be able to kill any enveloped virus.<sup>5</sup>

This hierarchy ranks viruses in the following order:



#### References

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MS2 has been used in the past to assess efficacy of first generation photocatalytic oxidation in decreasing the amount of MS2 in an aerosol chamber, with one study yielding a 90% or greater reduction of MS2.<sup>6</sup> Extrapolating on the information for chemical and UV disinfection, it could be assumed that MS2 is also a more difficult to kill microorganism compared to other airborne viruses, when a photocatalytic ionization device is used to decontaminate the air.

