

veriDART® uses a known concentration of DNA-tagged liquid aerosols to calculate the aerosol removal rate.

Verifying Ventilation and Filtration

Concept:

The veriDART Dilution and UL Verification Tests use an eSprayer (ES-1) atomizer, which sprays well characterized liquid aerosols in the space tested. The liquid aerosols released are carriers of unique DNA tag sequences, which allows quantification of the volume of aerosols released and avoids measurement of background aerosols.



The Liquid Aerosols Removal is mainly affected by:

- Ventilation of the room, provided by HVAC supply air including outside air %.
- Filtration that occurs in the HVAC system plus any in-room HEPA filters.
- Deposition on surfaces.

Calculations:

Initial Concentration: the number of DNA copies released in liquid aerosols are divided by the volume of the tested room assuming complete homogeneous mixing. For example, this value could result in 1,000,000 DNA copies per L of Air.

Target Concentration: the pass criteria is 99% removal of aerosols in 1 hour, which is equivalent to 2 Log₁₀ removal. A target concentration is calculated at different intervals as follows and the actual concentration, determined by qPCR testing the samples, is compared with this value.

Sampling Interval	Target Reduction Fraction	*Target Concentration DNA copies/L
0 to 5 min	0.181	819,000
45 to 50 min	0.978	22,000
50 to 55 min	0.985	15,000
55 to 60 min	0.990	10,000

*Assuming 1,000,000 DNA copies per L as initial concentration, and a reduction rate of 99.2% (includes a safety factor for variability).

Results Interpretation:

Interval 1: the first sampling interval is used as a positive control of the DNA-Tag used.

Intervals 2, 3, and 4: these sampling intervals are used to verify that the concentration is lower than the expected target to achieve 99% reduction of aerosols.

Verification Pass Criteria: when two or more of intervals 2, 3 and 4 are determined to have a concentration lower than the target then the 99% reduction of aerosols is verified.

Reported Reduction: the concentration of the last interval is evaluated for its reduction. For example, if 55 to 60 minute results in 1,000 DNA copies per L of Air, then 99.9% reduction equivalent is reported*.

Link to Effective (aerosol) Air Changes per Hour: the eACH is equivalent to a Natural Log decay rate. A Log₁₀ decay rate value can be transformed to Natural Log as follows:

Log₁₀ * 2.30 = Ln**, Therefore:

- Red 99.0%/H = 2.0 Log₁₀/H = 4.61 Ln/H = 4.61 eACH
- Red 99.9%/H = 3.0 Log₁₀/H = 6.90 Ln/H = 6.90 eACH

**Assuming a Log-linear relationship with continuous and homogeneous mixing.