Advanced Air Column Disinfection Through Aerosol Physics

About Genesis360 Misting System

Ultra-Fine, Micro Droplet Technology

Traditional disinfection methods are designed mainly for surfaces. Genesis360 is built to address the air column, where dust, aerosols, spores, and microorganisms continuously circulate. It does this by producing ultra-fine droplets smaller than 10 microns that remain suspended in the air far longer than conventional spray droplets, allowing antimicrobial compounds to move through the full space before settling. The system is automated, thereby reducing human error and chemical waste in application.

Droplet Size Comparison

Technology	Typical Droplet Size	Air Behavior
Pump Sprayers	80–300 µm	Falls immediately
ULV Foggers	20–50 µm	Falls within seconds
Electrostatic Sprayers	40–80 µm	Rapid surface deposition
Genesis360	**Sub-10 µm**	**Suspended aerosol behavior**

This size range is the core difference. Conventional systems are designed to coat surfaces. Genesis360 is designed to stay airborne longer and interact with the environment more broadly.

Why Droplet Size Matters

Droplet size determines how liquid behaves in air. Once droplets fall below about 10 microns, airflow begins to matter more than gravity. At that scale, droplets move with air turbulence, thermal currents, Brownian motion, and electrostatic forces rather than simply dropping to the floor. This is what allows Genesis360 to function in the aerosol suspension regime instead of behaving like a conventional fogger or sprayer.

Why Suspension Improves Coverage

Because sub-10 micron droplets stay suspended longer, they can circulate throughout the air column instead of depositing only near the source. This extended suspension increases microbial interaction, particle collisions, and environmental coverage. In practical terms, that means the technology supports volumetric treatment of the space rather than surface-only application. These droplets suspend in the air for up to 8 hours in field studies.

The Physics Behind It

Stokes' Law explains that very small particles settle much more slowly because air resistance becomes dominant as diameter decreases. When droplets reach the sub-10 micron range, air drag can outweigh gravity enough to keep them suspended for extended periods and moving with airflow patterns.

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The Science Behind Air Column Treatment

Dry to Human Touch, Wet to Pathogens

One of the most important ideas in the document is that Genesis360 droplets behave differently from conventional sprays. Because the droplets are smaller than 10 microns, they contain very small liquid mass and do not accumulate enough moisture to feel wet to the human touch when settling on skin, equipment, or surfaces. At the same time, they remain fully liquid at the microscopic level. Microorganisms, such as bacteria and viruses, are typically 0.5–5 microns in size, which means sub-10 micron droplets are still large relative to microbes. In practical terms, droplets that feel dry to people are still capable of wetting and interacting with microbial surfaces. This supports antimicrobial interaction without soaking surfaces or damaging sensitive equipment.

Air Column Coverage

Compare conventional fogging with Genesis360 micro-droplet behavior (see the table on the front). Conventional fogging droplets fall rapidly to surfaces and have limited air interaction. Genesis360 droplets, by contrast, circulate with airflow and turbulence, filling the air column rather than simply coating surfaces. This makes the technology an airspace-treatment approach, not just a surface-treatment approach.

Static Electricity Suppression and Dust Capture

Indoor air contains significant electrostatic charge generated by airflow, HVAC systems, and particle friction. Charged particles tend to remain suspended longer and contribute to contaminant circulation. Ultra-fine micro-droplets act as charge dissipators in the air column. When droplets collide with charged particles, electrostatic charge is neutralized, particles lose suspension energy, and dust and aerosols can aggregate with droplets. This contributes to dust suppression, airborne particle capture, and improved environmental sanitation.

Why Surface Area Matters

Breaking liquid into billions of micro-droplets dramatically increases total surface area. This increases microbial contact probability, antimicrobial interaction, and environmental dispersion. This is one of the core scientific reasons that ultra-fine droplets behave differently from larger droplets produced by conventional foggers. Instead of acting like isolated drops that fall quickly, they create a much larger reactive interface within the air column.

Scientific Foundations

In the 1940s, propylene glycol vapor studies by Dr. Theodore Puck at the University of Chicago demonstrated that antimicrobial compounds suspended in the air column could rapidly reduce airborne bacteria. Botanical vapors and aerosols can inhibit bacterial growth, reduce fungal spores, and lower airborne microbial loads. In the context of Genesis360, these foundations support the idea that suspended antimicrobial compounds can interact with airborne contaminants before settling.

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