## Preferred UVC Treatment Solutions (cont.)

### UVC WATER TREATMENT

If you're growing hydroponically, and want to combat microbial contamination in your water supply, rest assured that UVC water treatment solutions have been used effectively for this purpose for more than a century. And, if you're already filtering your water supply, the UVC chamber can be installed directly after the filtration. The cleaner and clearer the water going into the UVC vessel, the greater the decontamination results of the UVC on the water supply. UVC Water Treatment units are sized based on the maximum flow rate of water in your operation and the target microorganisms. Always consult with your equipment manufacturer to ensure proper sizing. American Ultraviolet offers UVC water treatment systems for flow rates from ½ a gallon per minute up to 11,000 gallons per minute.


# WHY AMERICAN ULTRAVIOLET UVC SOLUTIONS

## Decades of Experience

American Ultraviolet has been designing and manufacturing complete UVC solutions since 1960, so there's not much we haven't seen, or manufactured a solution for. Our breadth of product is unmatched, and our solutions are unequaled, because, unlike other UV manufacturing companies, we've had an extended amount of time to gain the knowledge and proficiency needed to deal with the unique requirements and challenges across dozens of markets, including food safety. We believe this gives our entire team the ability to provide the exact solutions all our customers need, rather than just a few solutions we could offer if we were only in a few limited markets.

## Air, Surface & Liquid Applications

Whether your application calls for UV to treat air, surfaces, or liquids, American Ultraviolet has a standard, or custom, solution, so there's no need to seek out multiple UVC suppliers if you have the need for UV in different parts of your operation. Using our science-based approach, we simply calculate for the appropriate variables in each type of application, and provide the most appropriate solution.

## Custom Solutions

On many occasions since 1960 customers have come to us with truly unique situations that require truly unique UVC solutions, which is exactly why American Ultraviolet has a full staff of experienced engineers. Our team specializes in the design, mechanical, and electrical aspects of all our projects, enabling us to consistently provide our customers with solutions based around their unique needs and situations. And, because we have in-house engineering, fabrication, assembly, and testing, projects that require custom solutions do not come with unnecessarily long lead-times, or astronomically high prices.

**American Ultraviolet stands behind all our value-oriented standard and custom products. And we're very proud that our customers frequently, and consistently, let us know how our insightful solutions have led to remarkable results.**

UVC SOLUTIONS FOR CANNABIS


**American Ultraviolet**
Insightful Solutions. Remarkable Results. SINCE 1960.

212 South Mt. Zion Road • Lebanon, IN 46052 • 800.288.9288
**www.americanultraviolet.com**



# UVC SOLUTIONS FOR CANNABIS

**High Intensity UVC Rack Inside Air Handling Unit**

## WHY UVC FOR POWDERY MILDEW AND BUD MOLD

### Science Based

UVC is a completely chemical-free way to combat ***Sphaerotheca macular*** (powdery mildew), ***Botyrtis cinerea*** (bud mold, or gray mold), and other types of DNA-based molds and bacteria that plague growing plant life, including cannabis plants. UVC is actually energy from light that is outside of the visible spectrum, and it's been used to inactivate DNA-based contaminants since the 1850's. The UVC light emitted from American Ultraviolet lamps, at 253.7 nm, attacks the very core of mold spores and bacteria, preventing them from replicating, and turning the microorganisms into harmless, microscopic dust.

### Chemical Free

Because UVC technology involves shining a particular spectrum of non-visible, and non-penetrative light on the desired target, there is no residual left behind, and no chemicals involved. The cannabis product is not altered by the exposure to UV light, and any DNA-based surface contamination, such as molds, bacteria, and viruses, are reduced, or even eliminated entirely.

**American Ultraviolet®**
Insightful Solutions. Remarkable Results.
SINCE 1960

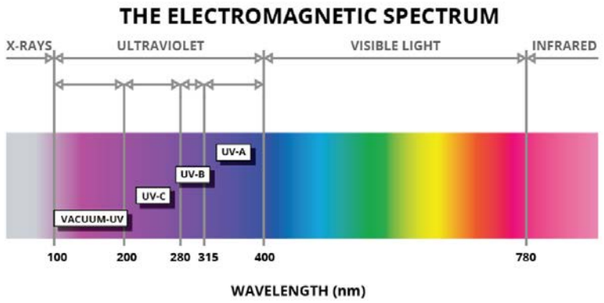
## How UVC Works

Through the use of measurement, calculation, and experimental data, the precise dosage of UVC energy has been determined to inactivate mold spores, bacteria, viruses, and other undesirable microscopic contaminants. Coupled with innovative and proven energy-emitting lamp technology, effectively using UVC to reduce Powdery Mildew and Bud Mold - as it has been used in HVAC systems, and healthcare settings – is a process of applied math and science, rather than one of smoke and mirrors.

- Visible light falls between 400-800 nanometers (nm) in wavelength
- Ultraviolet light from 100-400nm, can be divided into 3 bands:
  - UVA = 315-400nm
  - UVB = 280-315nm
  - UVC = 100-280nm
- UVA, and some UVB from the Sun, reach the surface of the earth, and UVB contributes to plant growth and development
- UVC is entirely blocked by the ozone layer and oxygen in the atmosphere, is non-penetrative, and can only act on what it can "see"
- Although UVC can cause a painful (but temporary) reaction on exposed skin and eyes, simple precautions will serve as adequate protection for any personnel who may need to access an area where UVC lighting cannot be turned off during their access

*UVC dosage is the product of the Intensity of the UVC light and Exposure Time*

*Intensity is determined by the UVC output of the light source and its proximity to the target.*




In other words, the closer of two equal UVC power sources will provide the greater intensity. When locating the UVC light close to the target area is difficult, higher output lamps can be used to overcome the proximity issue. UVC lamp intensity is determined by the UVC output of the lamp, which is typically expressed as microwatts per square centimeter ($\mu W/cm^2$) at a distance of 1 meter. Straightforward math and physics are used to calculate the change in intensity at distances other than 1 meter.

## How UVC Combats Powdery Mildew in Cannabis Grows

An adequate dosage of UVC light will act on Powdery Mildew, and Bud Mold, just as it does on other DNA-based microorganisms – it will damage its DNA such that it can no longer replicate, and therefore will no longer be viable. If a less than adequate dosage of UVC light is applied, you'll instead get what you get with every other UVC application not resulting in a zero survival rate – a reduction. Too little UVC won't reduce Powdery Mildew enough. Too much UVC can burn the cannabis plants. The proper amount depends on the intensity of the light source, the amount of time it's exposed to the light, and how close to the plant the light is located. In many applications, a 3-log or 4-log (99.9% and 99.99%, respectively) reduction of bacteria is the goal, and anything beyond that is a bonus. So, even if you don't completely eliminate Powdery Mildew and Bud Mold, UVC treatment will still reduce it in some capacity.

Most cannabis growers who have already used UVC to protect against Powdery Mildew, and Bud Mold, and have been disappointed with the outcome, have done so with a form of a handheld unit. These units vary widely in their intensity, and quality. And, because a human being must use their own judgment as to how far away to hold the fixture, and how quickly to move it, rather than using applied math and science, it is more likely that a less than adequate dosage was applied.

In addition, if a grower was trying to treat already visible Powdery Mildew, it was likely too late, as the visible signs show up well after contamination. Finally, current research indicates that the surface treatment of cannabis plants with UVC doesn't systemically solve the outbreak – the Powdery Mold will return, unless the grower continues to treat the plants throughout the grow cycle. And, even then, there's still a chance that the product of the grow will still be contaminated, and will not pass testing.

## Preferred UVC Treatment Solutions

Instead of using UVC handheld units, attempting to treat the surface of cannabis plants with UVC, or waiting until after Powdery Mildew or Bud Mold is already present, American Ultraviolet offers several other more successful solutions designed to stop the problem before it starts. Along with the environment basics of controlling temperature, humidity, and airflow, adding UVC, properly, will absolutely help tip the scales in your favor in the battle against microbial contamination.


### UVC AIR TREATMENT

There are several ways to treat the air in your grow space and the right answer for you depends on your grow space.

If you have an air handling unit (AHU) providing conditioned air to your grow space, a bank of UVC lamps (either in one or multiple fixtures) can be installed at the cooling coil – the purpose of UVC in an AHU for a grow operation is to provide an adequate dosage of UVC to both the coil/drain pan surfaces and the air as it passes by. Mold – like Botrytis cinerea – is significantly more resistant to UVC than bacteria like E. Coli and, as such, requires a higher dosage of UVC light for treatment in moving air. A proper UVC install for Powdery Mildew control in a cannabis grow requires the UVC equipment manufacturer to provide a solution engineered for the specifics of your air handler and your grow space. American Ultraviolet's ICR series is a made-to-order UVC solution that has been used throughout the world for air treatment in critical areas.

If you don't want to place lights in your AHU, or you believe the contamination isn't coming from outside the room, you can use an Air Mover that incorporates filtration and UVC, providing the unit is adequate for the size of the grow space, and desired air changes per hour. These units typically consist of a steel enclosure with a blower that moves the air, HEPA filters, and UVC lamps sized to treat the air flow through the air mover. The CleanBox from American Ultraviolet offers a stainless-steel enclosure, rugged wheels on the larger units, 0.3-micron HEPA filters, and high output UVC lamps engineered to deliver the amount of UVC required to combat PM.

### DIRECT UVC SURFACE TREATMENT

These UVC fixtures are not to be used to treat the surface of the plants, but rather the surfaces of the grow space, between grows. Direct UVC surface treatment is widely used in healthcare and food manufacturing applications to eliminate unwanted molds, viruses and bacteria. By using direct UVC fixtures on the floors, walls and tables of your grow space, you provide a clean slate for your next grow. This can be achieved with mobile UVC units, or hard-mounted fixtures in the room. Since UVC is harmful to exposed skin and eyes, this is best done when no personnel will be in the room. If personnel must enter the room while the UVC lights are on, they will need to cover exposed skin (any regular clothing will suffice, but ideally, anyone entering the grow room would be wearing coveralls whether the UVC lights are on or not), and eye protection (inexpensive goggles are widely available). American Ultraviolet's Mobile UVC solutions incorporate motion sensors that shut the lights off when motion is detected, and these units operate on timers to deliver specific exposure times. All mobile, and hard-mounted, solutions should be accompanied by a consultation with the UVC equipment manufacturer to ensure the UVC equipment you're installing is correct for your space.