IUVA Fact Sheet on COVID-19

国际紫外线协会（IUVA）关于新型冠状病毒（COVID-19）的信息简报

The International Ultraviolet Association (IUVA) believes that UV disinfection technologies can play a role in a multiple barrier approach to reducing the transmission of the virus causing COVID-19, SARS-CoV-2, based on current disinfection data and empirical evidence. UV is a known disinfectant for air, water and surfaces that can help to mitigate the risk of acquiring an infection in contact with the COVID-19 virus when applied correctly. "The IUVA has assembled leading experts from around the world to develop guidance on the effective use of UV technology, as a disinfection measure, to help reduce the transmission of COVID-19 virus. Established in 1999, the IUVA is a nonprofit dedicated to the advancement of ultraviolet technologies to help address public health and environmental concerns," says Dr. Ron Hofmann, Professor at the University of Toronto, and President of the IUVA.

国际紫外线协会（IUVA）认为：根据目前的消毒数据和经验，紫外线消毒技术能够在阻止新型冠状病毒传播的多级屏障消毒策略中起到重要的作用。在正确的使用下，紫外线是一种被认可的用于空气，水和表面消毒的方法。它可以降低被新型冠状病毒感染的风险。国际紫外线协会主席，多伦多大学 Ron Hofmann 教授表示：“国际紫外线协会已经专门成立专家组，汇集了世界各地紫外线领域的资深专家共同编写如何有效应用紫外线消毒技术的指南，以帮助解决新型冠状病毒传播所带来的危机。国际紫外线协会是成立于 1999 年的非盈利机构，致力于推动紫外线技术以帮助解决环境和健康问题。”

It must be noted that “UVC”, “UV disinfection” and “UV” as used here and in the scientific, medical and technical literature, specifically and importantly refers to UVC light energy (200-280nm light) in the germicidal range which is not the same as the UVA and UVB used in tanning beds or sunlight exposure.

必须引起注意的是，这里的“UVC”，“UV 消毒”和“UV”等用在科学，医学和技术文献中的名词，主要是特指在 UVC 杀菌波段（200-280nm 紫外光），与日晒床或者太阳照射中的 UVA 和 UVB 波段是不同的。

Facts on UV and COVID-19
关于紫外线和新型冠状病毒的事实

Can UVC help prevent COVID-19 transmission by reducing contamination?

Based on existing evidence, we believe so. Here's why:
紫外线是否能够通过杀菌阻止新型冠状病毒的传播？
根据目前的证据，答案是肯定的，下面是具体的原因。

UVC light has been used extensively for more than 40 years in disinfecting drinking water, waste water, air, pharmaceutical products, and surfaces against a whole suite of human pathogens (Fluence UV Dose Required review IUVA: https://www.iuvanews.com/stories/pdf/archives/180301_UVSensitivityReview_full.pdf). All bacteria and viruses tested to date (many hundreds over the years, including other coronaviruses) respond to UV disinfection. Some organisms are more susceptible to UVC disinfection than others, but all tested so far do respond at the appropriate doses.

紫外线已经被广泛地应用于饮用水和污水，空气，医药用品以及表面消毒有超过 40 年的历史，可以针对很多种人类的病原体。（紫外线的剂量响应曲线可以从这个 IUVA 文件链接中查找：https://www.iuvanews.com/stories/pdf/archives/180301_UVSensitivityReview_full.pdf）。所有到目前为止测试的细菌和病毒（多年来研究的几百种，包括两种冠状病毒）都对紫外线有响应。一些微生物相对于其他的微生物来说对紫外线更敏感，但是所有的微生物在合适的紫外线剂量范围内都有响应。

- UVC disinfection is often used with other technologies in a multibarrier approach to ensure that whatever pathogen is not "killed" by one method (say filtering or cleaning) is inactivated by another (UVC). In this way UVC could be installed now in clinical or other settings to augment existing processes or to shore up existing protocols where these are exhausted by excessive demands due to the pandemic.

紫外线消毒经常和其他的技术联和使用形成多级屏障，以确保在某种致病微生物不能被一种技术杀灭（比如过滤或清洗）的时候，会被另一种技术杀灭（比如 UVC）。在这种情况下，UVC 可以安装在诊所或其他场景来加强已有的处理系统或补充目前的处理方法来应对疫情带来的超负荷的需求。

- UV light, specifically between 200-280nm[i] (UVC or the germicidal range), inactivates (aka, 'kills') at least two other coronaviruses that are near-relatives of the COVID-19 virus: 1) SARS-CoV-1[ii] and 2) MERS-CoV[iii] [iv] [v]. An important caveat is this inactivation has been demonstrated under controlled conditions in the laboratory.

The effectiveness of UV light in practice depends on factors such the exposure time and the ability of the UV light to reach the viruses in water, air, and in the folds and crevices of materials and surfaces.

紫外光，特别是 200-280 纳米[i]（UVC 或者杀菌波段）波段，能够有效的灭活另外两种冠状病毒，这两种冠状病毒与新型冠状病毒非常相似：1）SARS-CoV-1[ii] 和 2)MERS-CoV[iii] [iv] [v]。值得注意的是，这些研究是在实验室可控条件下的结果。紫外光的实际有效性取决于像照射时间、以及紫外线能够照射到水中，空气中，以及材料和表面的褶皱和裂缝中病毒的能力。

- COVID-19 infections can be caused by contact with contaminated surfaces and then touching facial areas (less common than person-to-person, but still an issue)[vi]. Minimizing this risk is key because COVID-19 virus can live on plastic and steel surfaces for up to 3 days[vii]. Normal cleaning and disinfection may leave behind some residual contamination, which UVC can treat suggesting that a multiple disinfectant approach is prudent. UVC has been shown to achieve a high level of inactivation of a near-relative of COVID-19's virus (i.e., SARS-CoV-1, tested with adequate dose of 254nm UV while suspended in liquid)[viii]. IUVA believes similar results can be expected when treating COVID-19's virus, SARS-CoV-2. However, the key is applying UVC in such a way that it can effectively reach any remaining viruses on those surfaces.

新型冠状病毒可以通过人接触受污染的表面然后再接触自己的面部区域来传播（虽然这种传播的机率低于人传人，但是仍然是一个问题）[vi]。减少这种风险很关键，因为新型冠状病毒可以在塑料或者金属表面存活 3 天[vii]。正常的清洁和消毒不一定能够彻底消杀病毒，使用紫外线作为多级屏障消毒策略的一个环节是非常明智的。UVC 已经被证明能够有效灭活与新型冠状病毒非常接近的病毒（例如 SARS-CoV-1，测试条件是使用 254nm 的紫外线照射溶在水中的病毒）[viii]。IUVA 认为用紫外线灭活新型冠状病毒可以得到类似的结果。然而，在这种情况下使用 UVC 的关键是能够有效的照射到那些残留在表面的病毒。

- IUVA also concurs with CDC guidance to hospitals that the germicidal effectiveness of UVC is influenced by the UVC absorbing properties of the suspension, the surface or aerosol that the organism is in; by the type or action spectra of the microorganism; and by a variety of design and operating factors that impact the delivered UV dose to the microorganism (https://www.cdc.gov/infectioncontrol/guidelines/disinfection/).

IUVA 也赞同美国疾控中心（USA CDC）对于医院的指导：即紫外线的杀菌效果受悬浮液，生物体表面或气溶胶的紫外吸收特性、微生物的类型或作用响应谱线（action spectra）的影响；各种设计和操作因素都会影响紫外线对微生物的照射剂量 (https://www.cdc.gov/infectioncontrol/guidelines/disinfection/)。

- IUVA recognizes that in the cases where the UVC light cannot reach a particular pathogen, that pathogen will not be disinfected. However in general, reducing the total number of pathogens reduces the risk of transmission. The total pathogenic load can be reduced substantially by applying UV to the many surfaces that are readily exposed, as a secondary barrier to cleaning, especially in hurried conditions. This would be a relatively straight-forward matter of illuminating the relevant surfaces with UVC light, for example the air and surfaces around/in rooms and personal protective equipment.

IUVA 认为，在紫外光无法照射到特定病原体的情况下，该病原体不会被灭活。然而，总的来说，减少病原体总数可以降低传播的风险。通过对许多容易暴露的表面增加紫外线照射，作为清洁的第二道屏障，特别是在应急的条件下，可以大大减少总的致病菌负荷。这将是一个比较直接了当的事情，即用紫外线照射相关表面和空间，例如房间周围/室内的空气和表面以及个人防护设备。

Are UVC disinfection devices safe?

Like any disinfection system, UVC devices must be used properly to be safe.) They all produce varying amounts of UVC light in wavelengths of 200nm-280nm. This UVC light is much "stronger" than normal sunlight, and can cause a severe sunburn-like reaction to your skin, and similarly, could damage the retina of your eye, if exposed. Some devices also produce ozone as part of their cycle, others produce light and heat like an arc welder, others move during their cycles. Hence, general machine-human safety needs to be considered with all disinfection devices, and these considerations should be addressed in the operations manual, in the user training, and appropriate safety compliance.

紫外线消毒设备安全吗？
与任何消毒系统一样，紫外线设备必须正确使用才能确保安全。各种紫外线设备都会产生波长为 200nm-280nm 的不同能量的紫外线。这种紫外线比正常的阳光强得多，会对你的皮肤造成严重太阳晒伤样反应。同样，如果暴露在紫外光下，也会严重损害你的视力。有些设备在操作周期中也会产生臭氧，有些装置则会像电焊机一样产生光和热，另外一些在操作周期中会运动。因此，所有消毒设备都需要考虑基本的操作机器安全，这些考虑应在操作手册、用户培训和适当的安全合规性中加以说明。

Are there performance standards and UVC validation protocols for UV disinfection devices?

Given the wide array of UVC devices marketed for disinfection of air, water and solid surfaces, the lack of uniform performance standards and the highly variable degree of research, development and validation testing that is performed on different devices, the IUVA urges consumers to exercise caution when selecting equipment and look for evidence of third party

testing as well as certification of device materials and electrical components by well-known organizations such as NSF, UL, CSA, DVGW-OVGW or other international requirements as applicable.

For UVC devices designed to inactivate air and solid surfaces in the healthcare industry, members of IUVA are working diligently with other national standards organizations in the lighting and healthcare industry to develop disinfection testing standards[x]. The goal is to develop guidance that will help healthcare providers world-wide choose the best possible technologies for their institutions to use in the fight against multiple drug resistant organisms and other pathogens[xi], like the COVID-19 virus.

IUVA will soon post a website dedicated to UV and COVID-19, please email us at info@iuva.org, if you would like for us to send you alerts on website postings and other IUVA activities.

紫外线消毒设备有性能标准和紫外线验证方案吗？

鉴于市场上用于空气、水和固体表面消毒的 UVC 设备种类繁多，缺乏统一的性能标准，以及不同设备在研究、开发和验证测试的高度不一致性，IUVA 建议用户在选择设备和寻找证据时要谨慎检查第三方测试报告以及由相关知名组织（如 NSF、UL、CSA、DVGW-OVGW 或其他适用的国际要求）对设备材料和电气部件的认证。

对于设计用于灭活医疗行业空气和固体表面的 UVC 设备，IUVA 的成员正与照明和医疗行业的其他国家标准组织一起努力制定消毒测试标准[x]。其目标是编制相关的指南，以帮助全球医疗保健提供者选择最佳的技术，使这项技术能够在对抗多种耐药生物和其他病原体[xi]上使用，如新型冠状病毒。

IUVA 将很快发布一个专门针对紫外线和新型冠状病毒的网站，如果您希望我们向您发送有关网站发布和其他 IUVA 活动的通知，请发送电子邮件至 info@IUVA.org。

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