



SafeClean Prototype for Sterilizing Personal Protective Equipment

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EXECUTIVE SUMMARY

The world is suffering from a new coronavirus-type pathogen, namely COVID-19. Health professionals are obliged to protect themselves with personal protective equipment (PPE); however, we encountered some problems: most of this equipment is not self-cleaning. How do you protect professionals from contaminated personal protective equipment? How do you dispose of used personal protective equipment? For the construction of this equipment, the authors used the methodology of define, measure, analyze, improve, and control (DMAIC). The developed prototype was applied in a primary care sector clinic, where the pre-test (swab sampling procedure) was performed to identify cross-contamination of the environment. The cost of the prototype developed was low in relation to existing market options. The tests carried out allowed the authors to observe its effectiveness in the sterilization of equipment. However, new, more complex tests are still needed to better validate the prototype and to study its economic viability as a product.

INTRODUCTION

These days unfortunately the world suffers from a new pathogen of the coronavirus type, designated as COVID-19. Health professionals must protect themselves with the highest number of Personal Protective Equipment (PPE), but we found some problems, most of this equipment is not self-cleaning. According to the regulation of the European Union Equipment 2016/425 of the European Parliament and of the Council of 9 March 2016, Individual Protection is

For the purposes of this regulation, the following definitions apply: 1) Personal protective equipment (PPE) a) Equipment designed and manufactured to be worn or handled by a person to protect him against one or more risks to his health or safety; b) Interchangeable components for the equipment referred to in paragraph a) that are essential for its protective function; c) Connection systems for equipment referred to in point (a), which are not operated or worn by a person, which are designed to connect such equipment to an external device or secure attachment point, which are not designed to be attached permanently and that do not require a fastening action before being used (Official Journal of the European Union, 2016, p.7).

How do protect professionals supposedly contaminated PPE in UPA Emergency Care Units, hospitals, schools, and even nursing homes? The UPA are emergency and emerging units offering medical care services 24 hours a day, every day of the week, and are associated with the Mobile Emergency Care Service (SAMU, from the Portuguese Serviço de Atendimento Móvel de Urgência). The sterilizer is equipment to destroy all germs that are harmful to human health. The function of the sterilizer is to eliminate any microorganisms that may interfere with the experiments or influence the results, eliminate the contamination generated by the burning of Liquefied Petroleum Gas (LPG) and also protect against the risks arising from liquid fuels that are ignited inside the laboratory. The sterilizer is used to purify objects such as handles, tubes, scissors, tweezers, and tips, preventing objects from coming into direct contact with the flame. It can also be very useful equipment to be placed in unidirectional flow cameras or biological security cameras in place of the Bunsen burner. The II Congress in 1932, established the standardization of the categories of ultraviolet light in A, B, and C, provisionally defined by the following filters:

Noviol -A- Barium - flint (long-wavelength UV UV-A giving approximately 4000 to 3150 Å spectral band). Barium Flint - Pyrex (medium wavelength UV or UV-B giving approximately 3150 to 2800 Å spectral band). Pyrex (short-wavelength UV, or UV-C giving approximately rays less than 2800 Å) (Coblentz, 1932)

Ultraviolet A radiation is invisible, is present from sunrise to sunset and when a person is exposed for a long time without sun protection, it can harm human health. Ultraviolet B radiation is present on the earth's surface from 9 am to 4 pm, these rays are responsible for burning and redness in the skin when exposed to the sun, for a long time without sun protection. And ultraviolet C radiation is blocked by the ozone layer, so we don't suffer its effects because they don't reach humans.

Ultraviolet radiation, at 253.7 nm, forms a part of artificially reproduced solar radiation and provides effective disinfection without causing adventurous disinfection by-products.

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