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Guest Editorial

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Similar Is Not Equal: It Is Time to Create the Perfect Photobiomodulation Storm

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The evidence for the use of photobiomodulation (PBM) in different clinical conditions has been growing faster year after year. Moreover, beyond the many reports of positive effects, the clear dose–response pattern of this therapy has been evident. In fact, several systematic reviews and meta-analysis of randomized controlled trials (RCTs) have clearly demonstrated the dose–response pattern of PBM to establish the optimal therapeutic window in many different indications and areas, such as oral mucositis,[1] rehabilitation of musculoskeletal disorders,[2–4] exercise performance and postexercise recovery,[5,6] and others. Finally, these systematic reviews paved the way to the establishment of recommendations and guidelines, which is of paramount importance to the wide use of PBM by clinicians.[6–8]

In the recent past, the PBM device emitters were built based mostly on single diodes with single wavelengths, which made establishing recommendations and guidelines relatively easy. However, with the fast growth of the industry in these fields, and due to the need to irradiate large areas at once, currently there are a plethora of features for PBM devices, which include many different wavelengths, power outputs, number of diodes, light sources, distribution of the diodes in the emitters, and even the combination with other electrophysical agents such as transcutaneous electric stimulation and static magnetic fields.

The large variety of devices and features available on the market, used by researchers in RCTs, despite the growth in this area, has been one of the main reasons why currently a new wave of increased conflicting results in the literature can be observed.

A good example of it can be illustrated by two recent clinical studies. In the first one, an RCT was carried out to compare the effects of three different commercially available PBM devices on exercise performance and postexercise recovery of male healthy volunteers. The same 180 J energy was delivered from the three devices; however, the differences of the devices' features lead to very different outcomes and treatment effect sizes.[9] In the second study, a comparison was made between two infrared PBM devices on energy transmission/penetration in humans. In this study, the same 150 sec irradiation length/exposure was used, and again, due to the differences in the features of these two devices, the discrepancies on the light transmission among them was huge.[10]

These are two great studies that illustrate and stress the point that every single aspect/feature of the different devices available on the market plays a key role on clinical effects and, therefore, similar is not equal. This also explains why, even when the recommended doses or dosages are used employing different devices, very different outcomes are observed, and it shows the urgency for the optimization of every single device for every single indication of use. Guidelines provide ranges of doses or dosages (and/or other parameters); however, even with narrow dose ranges there are thousands of possibilities to achieve the desired optimal effect (depending upon the wavelength, power output, mode, frequency, irradiation technique, etc.) or to fail in achieving it.

This aspect represents a big challenge that needs to be faced and overcome in the next few years. Further, this raises the eminent need for the advance of the knowledge about every particular device that reaches the market, the clinicians, and the patients. This herculean task will only be possible through something that has not been common in the past: narrowing the gap where collaboration is missing between the manufacturers and the key researchers of the PBM field.

Only with the manufacturers and the key researchers working shoulder by shoulder will it be possible to achieve the optimization of each device for each indication of use. This will certainly have a huge positive impact not only in getting PBM in the main spot, but also in regulatory aspects, in reimbursements, and further in the acceptance of PBM in the health system of different countries worldwide.

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This challenge, which is in front of us right now, offers a unique and never seen opportunity and can create the perfect storm for the PBM field. This important step must be accomplished through high-quality science and by relying on the top levels of the scientific evidence. Basic science studies using cell culture and animal models will be extremely important to providing proof of concept and mechanisms of action, but not for overextrapolations to the clinical use. Further, for optimizing indications of use for the devices, only high-quality RCTs can be used to support claims. Low-quality evidence, such as case studies or case series, can never be used. Otherwise, the reputation of PBM will be in jeopardy and many steps back will be taken.

The moment the growth of the availability of the devices on the market starts to be proportional to the growth of high-quality scientific knowledge about each device, is the moment when PBM will become mainstream medicine.

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