Evaluation the effectiveness of combinative treatment of atmospheric plasma jet and natural product on wound healing

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Abstract

It is well known that both atmospheric plasma jet and natural product has efficacy for wound healing, while plasma activated water (PAW) recently has huge attention in plasma medicine research. This presentation aims to evaluate the effectiveness of combinative treatment of atmospheric plasma jet and aqueous natural products on wound healing using small animal model. Atmospheric plasma jet as described previously[1, 2] was applied. Several types of natural product in liquid phase, namely Indonesian honey, Manuka honey and *Piper betle L.* leaf extract, were applied. Three main issues were presented here, namely:

1. Effect of combinative treatment of cold plasma jet and Indonesian honey supported microwell dressing on wound healing[2].
2. Effect of combinative treatment of plasma jet and *Piper betle L.* leaf extract on wound healing
3. Comparative study on Manuka and Indonesian honeys to support the application of plasma Jet during proliferative phase on wound healing [3].

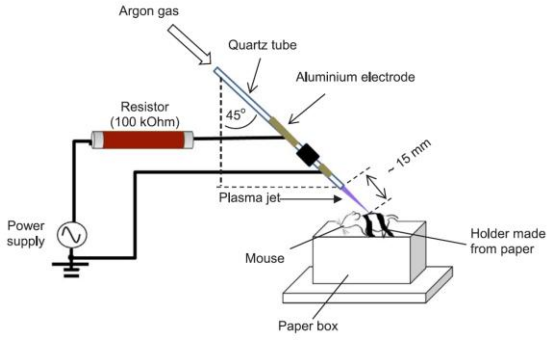

Figure 1. Experimental setup[1]

As the result, firstly, while this investigation may provide a new insight in how to combine plasma jet and natural product solutions in animal or human models for skin-oriented treatment, generally it was shown that natural products tended to decrease the effectiveness of atmospheric plasma jet for wound healing. In this context, natural products may have role as antioxidant that impede the work of reactive oxygen nitrogen species (RONS) produced by plasma jet. Secondly, regarding the comparative study on Manuka and Indonesian honeys to support the application of plasma jet during proliferative phase on wound healing, Manuka may be better to support plasma jet than Indonesian honey due to its chemical characteristic.

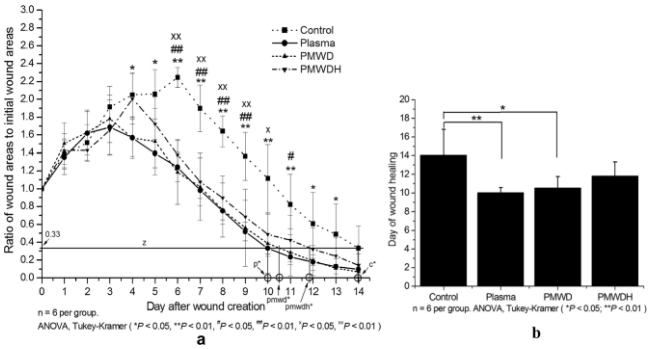

Figure 2. Day of wound healing for a group with combinative treatment of plasma and Indonesian honey (PMWDH) was tended to lower than that of plasma only [2].

Acknowledgement

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References

[1]. Nasruddin, et al. A simple technique to improve contractile effect of cold plasma jet on acute mouse wound by dropping water. *Plasma Processes and Polymers* 2015; 12: 1128-1138.

[2]. Nasruddin, et al. Evaluation the effectiveness of combinative treatment of cold plasma jet,Indonesian honey, and micro-well dressing to accelerate wound healing, *Clinical Plasma Medicine*. 2017, 5–6, pp.14–25.

[3]. Wahyuningtyas et al. Comparative study on Manuka and Indonesian honeys to support the Application of Plasma Jet during Proliferative Phase on Wound Healing. *Clinical Plasma Medicine*. 2018. *Submitted.*