

In vivo evaluation of antibacterial activity and wound healing power of a gel based on phenolic compounds extracted from by-products of the wine industry

Vanessa Silva^{1-4*}, Cecília Peirone⁵⁻⁷, Rupesh Kumar Singh⁸, Virgílio Falco⁸, Isabel Pires^{5,9}, Carla Miranda^{1,4,5}, Luís Maltez^{5,9}, José Eduardo Pereira^{5,9}, Gilberto Igrejas²⁻⁴, Patrícia Poeta^{1,4}

¹Microbiology and Antibiotic Resistance Team (MicroART), Department of Veterinary Sciences, University of Trás-os-Montes and Alto Douro (UTAD), 5000-801 Vila Real, Portugal;

²Department of Genetics and Biotechnology, University of Trás-os-Montes and Alto Douro, 5000-801 Vila Real, Portugal;

³Functional Genomics and Proteomics Unit, University of Trás-os-Montes and Alto Douro (UTAD), 5000-801 Vila Real, Portugal;

⁴Associated Laboratory for Green Chemistry (LAQV-REQUIMTE), University NOVA of Lisboa, Lisboa, 2829-516 Caparica, Portugal;

⁵Department of Veterinary Sciences, University of Trás-os-Montes and Alto Douro (UTAD), 5000-801 Vila Real, Portugal;

⁶Hospital Center of Trás-os-Montes and Alto Douro E.P.E., 5000-185 Vila Real, Portugal;

⁷Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB), UTAD, 5000-801 Vila Real, Portugal;

⁸Chemistry Research Centre (CQ-VR), University of Trás-os-Montes and Alto Douro (UTAD), 5000-801 Vila Real, Portugal;

⁹Veterinary and Animal Research Centre, University of Trás-os-Montes and Alto Douro (UTAD), 5000-801 Vila Real, Portugal.

*vanessasilva@utad.pt

Introduction

Agro-industrial by-products have been described as potential sources of phenolic compounds, which exhibit several properties, such as, antimicrobial, antioxidant, anti-inflammatory and wound healing. Therefore, we aimed to evaluate the effect of topical application of a phenolic compounds-base gel on the treatment of skin infected with MRSA and its wound healing capacity in an animal model.

Material and Methods

The extraction of phenolic compounds from grape's peel, stem and seed was performed using ethanol/water (80:20) mixture. Carbopol gel (0.8%) was neutralized with triethanolamine and enriched with the extracts. Ten Wistar rats were inoculated by an intradermic injection of MRSA suspension, producing an abscess lesion. After 3 days, the skin epidermis was removed to open the wound (Figure 1). Group 1 (control) received an application of Carbopol gel and Group 2 received an application of Carbopol gel enriched with phenolic extracts (10%). After the treatment period, skin was collected to quantify colony forming units (CFU) of bacteria and to examine the following histological structures and processes: epidermal regeneration, granulation tissue thickness, fibroblast proliferation, angiogenesis and the presence of inflammatory cells.

Conclusions

Although phenolic compounds extracted from winery by-products seem to have a promising antibacterial activity *in vitro*, the same seems to not true *in vivo*.

References

Vázquez-Olivo, G.; Cabanillas-Bojórquez, L.A.; Elizalde-Romero, C.A.; Heredia, J.B. Phenolics from Agro-industrial By-Products BT - Plant Phenolics in Sustainable Agriculture: Volume 1. In: Lone, R., Shuab, R., Kamili, A.N., Eds.; Springer Singapore: Singapore, 2020; pp. 331–346 ISBN 978-981-15-4890-1.
Dev, S.K.; Choudhury, P.K.; Srivastava, R.; Sharma, M. Antimicrobial, anti-inflammatory and wound healing activity of polyherbal formulation. Biomed. Pharmacother. 2019, 111, 555–567.

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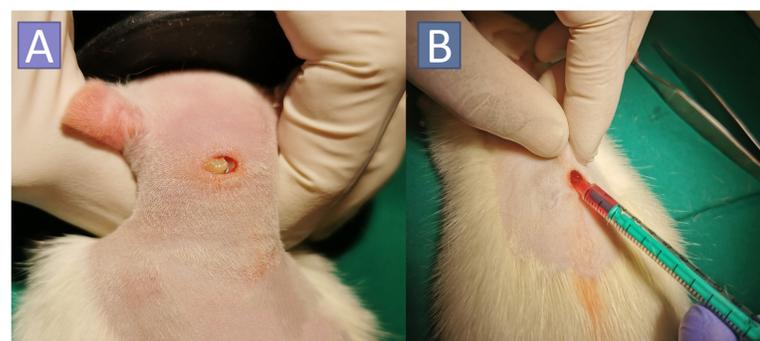


Figure 1. Abscess lesion (A); application of Carbopol gel enriched with phenolic extracts (B).

Results

Group 1 and 2 presented a similar number of CFU/mL (difference not statistically significant) (Figure 2) which is not in line with that obtained from previous *in vitro* studies in which phenolic extracts present antibacterial activity. Regarding the histological evaluation, the presence of histological structures was also similar except for the presence of inflammatory cells.

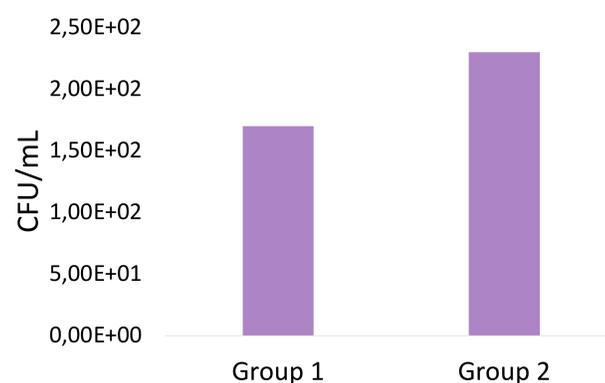


Figure 2. CFU/mL present in the skin of control group (Group 1) and treated group (Group 2).



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