

Red Blood Cells Disease (hereditary spherocytosis): Propolis effect

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ABSTRACT

Propolis is a resinous substance collected from plants by bees, used since the Egyptian civilization. The hereditary spherocytosis (HS) is a type of transmission of hereditary anemia. Clinically, individuals usually present from asymptomatic conditions to severe haemolytic anaemia.

The objective of this study was to evaluate the effect of two propolis extracts, in the osmotic fragility of patient red blood cell (RBC) membrane with HS. It was found that propolis decreased the erythrocytes membrane fragility, being the effect of Bornes propolis more pronounced. The obtained results suggest that in vitro, the membrane fragility may be increased under oxidative stress conditions in patient RBC's, and the protection effect of propolis is due to its antioxidant properties. These results open doors for future investigations in order to elucidate the mechanisms, and identify the most relevant compounds involved in the fragility of the erythrocyte membrane.

INTRODUCTION

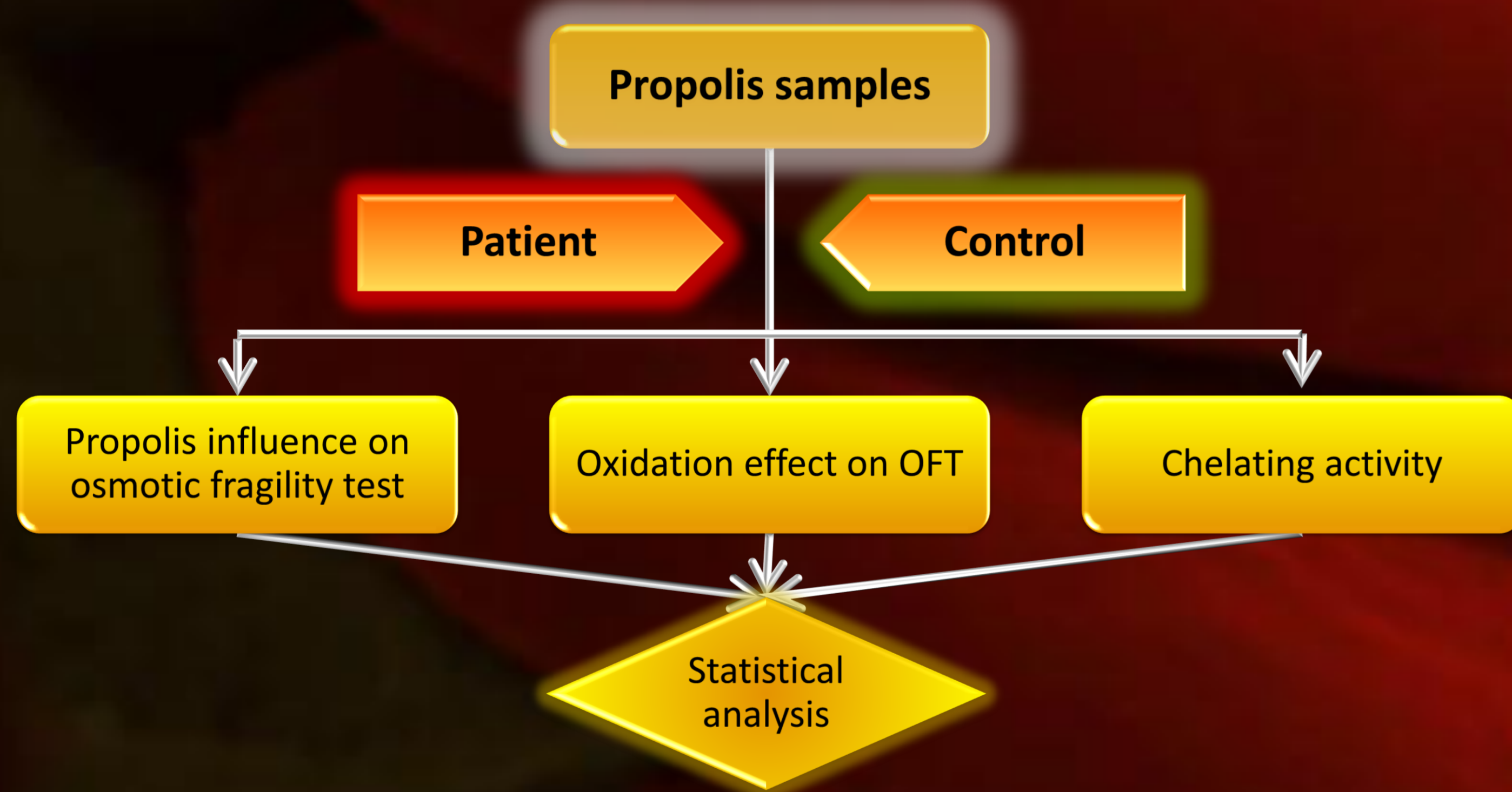
Propolis is a beehive product produced by bees of *Apis mellifera* specie^{1,2}. The study of propolis properties that can be used in Human Health studies is important, since it has been shown to have many biological properties^{1, 3, 4, 5}.

The hereditary spherocytosis (HS) is a congenital hemolytic anemia, with origin in the modification of erythrocytes membrane proteins, which leads to increased susceptibility to hemolysis and a decrease of the cell over-life⁶⁻⁸. The HS is the most common red blood cell (RBC) membrane disorder in European Caucasians, and in Japanese population⁹.

The aims of this work were to investigate propolis effect on erythrocyte membrane of patients with HS, and to evaluate the propolis effect in RBC's hemolysis after oxidative stress induced with H₂O₂.

This is an important work, because it is the first time it considers the application propolis in HS. These results and the information provided can be used for future investigations in order to elucidate the propolis mechanisms and compounds that affect the fragility of the erythrocyte membrane.

STUDY DESIGN



RESULTS AND DISCUSSION

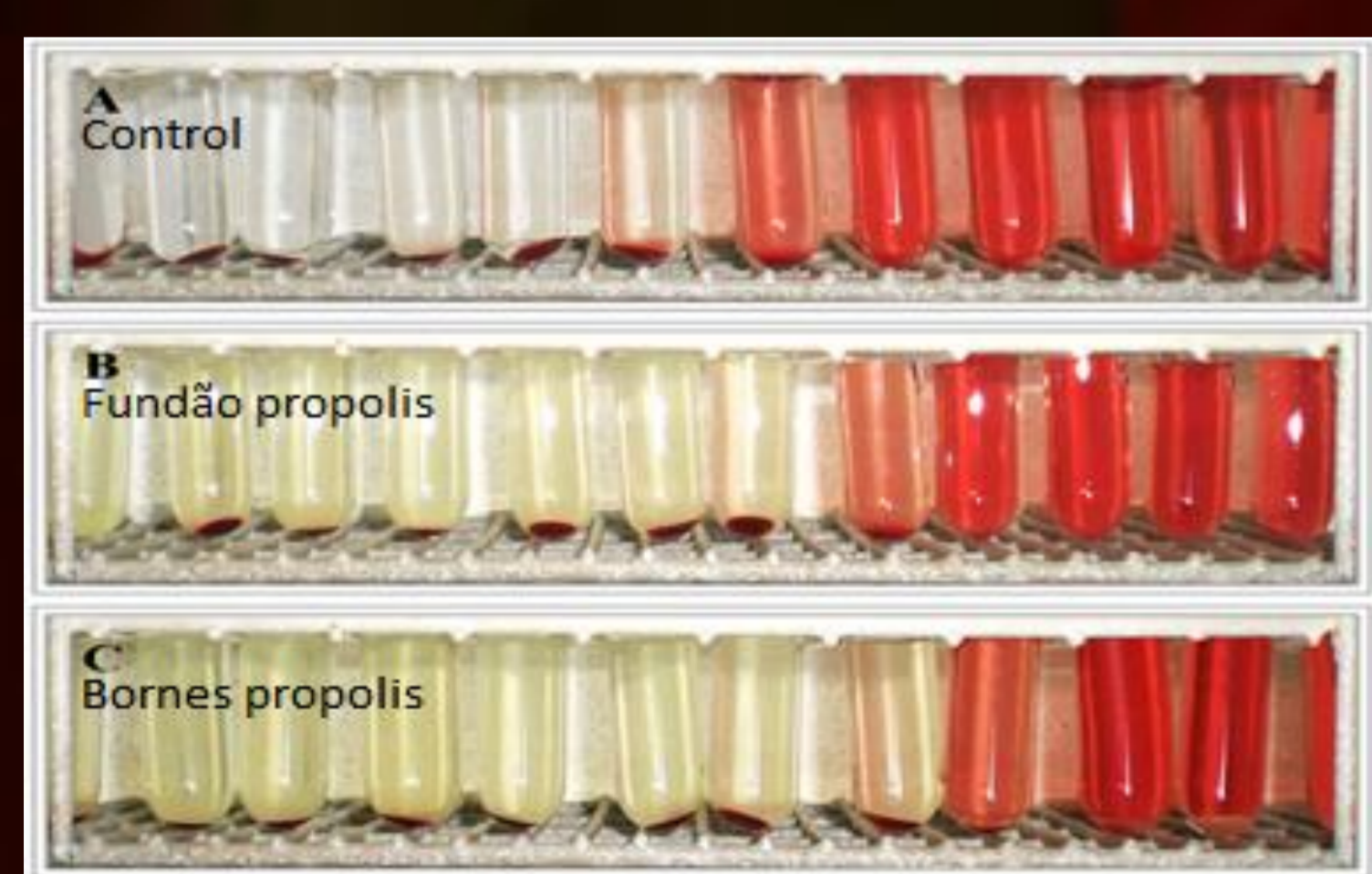


Fig. 1 – Osmotic fragility results of patient with hereditary spherocytosis

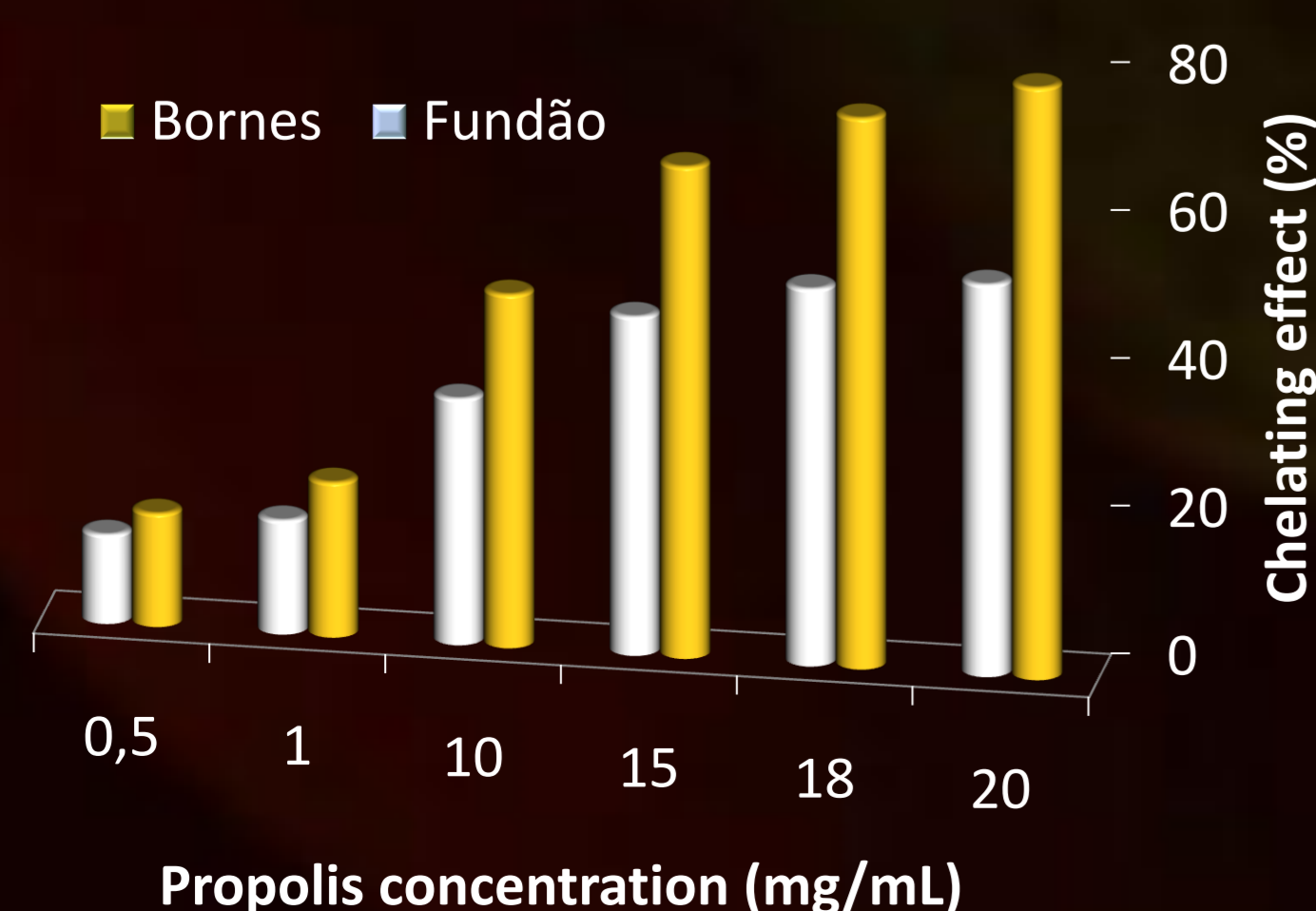
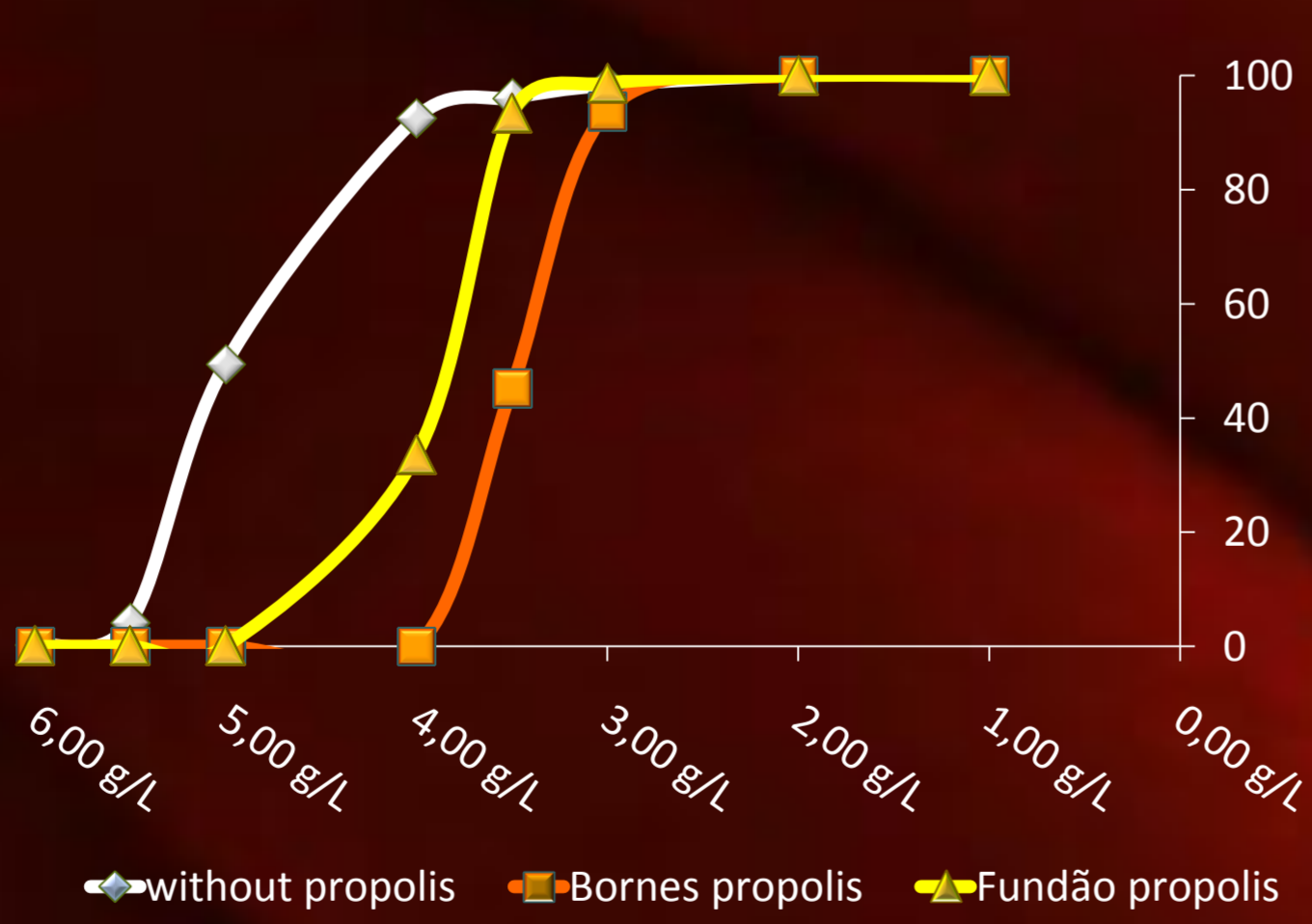


Fig. 2 – Chelating activity of propolis from two regions of Portugal

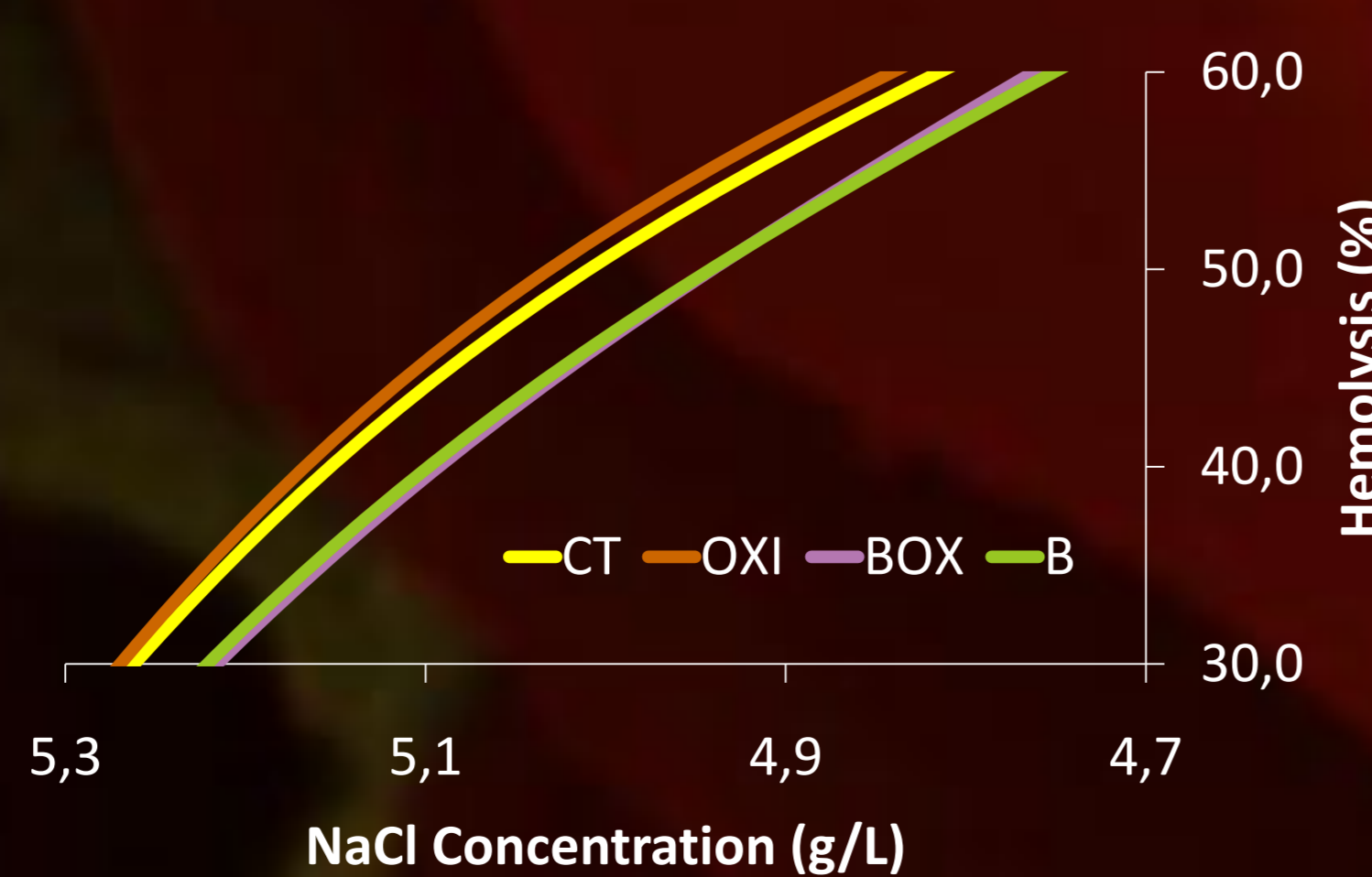


Fig. 3 – Oxidant effect on osmotic fragility of patient erythrocytes: CT – control ; OXI –oxidant; BOX – propolis and oxidant; B – propolis.

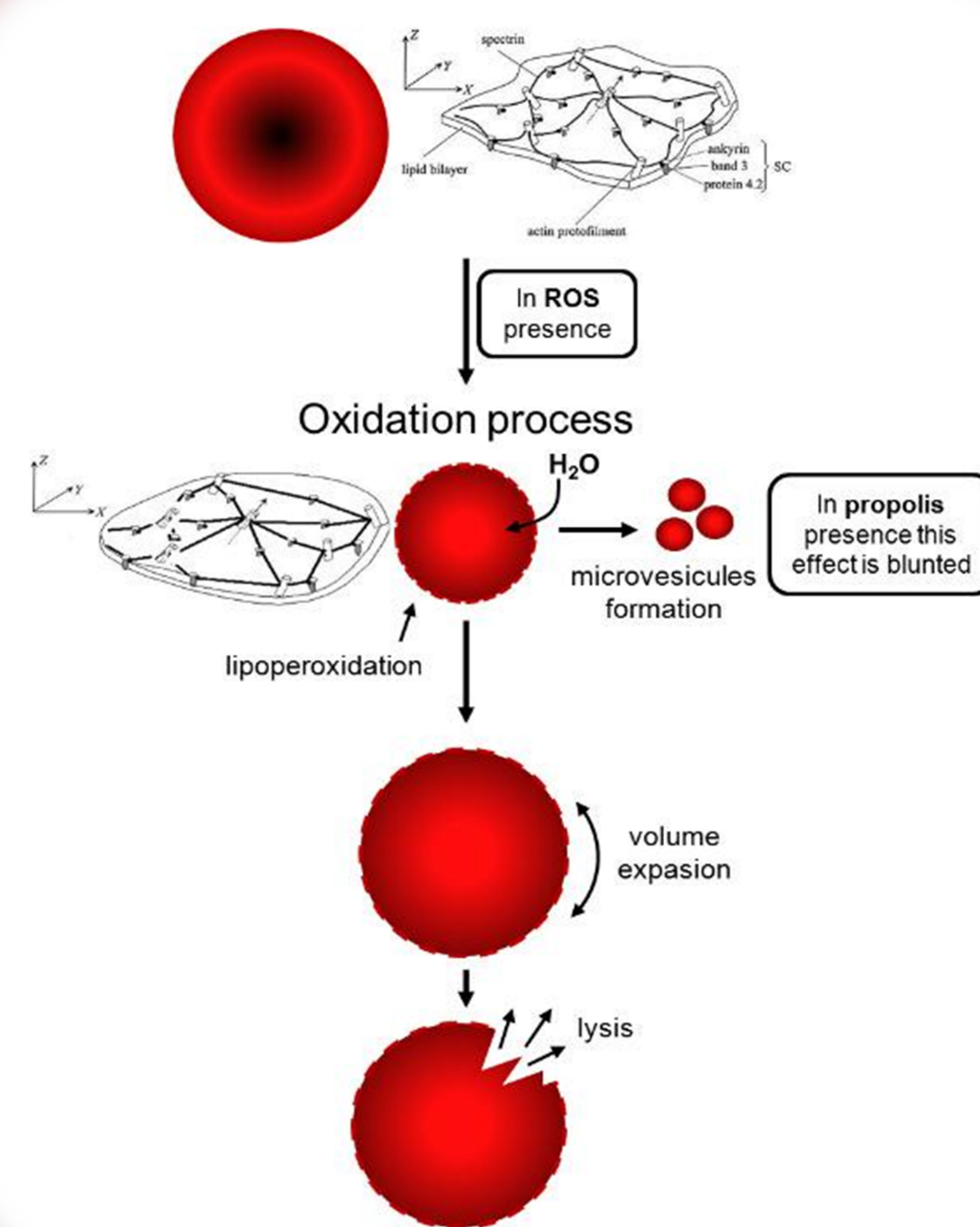


Fig. 4 – Hypothetic action mechanisms for propolis effect on osmotic fragility

CONCLUSION

- RBC hemolysis decrease with both propolis extracts. In the subject with hereditary spherocytosis, the Bornes propolis extract was more efficient than Fundão propolis extract (Fig. 1).
- HS RBC seem to be more prone to develop oxidative stress. As expected, Bornes propolis was showed a chelating activity twice higher that Fundão propolis (Fig. 2). This results its possible due to twice concentration of phenolic compounds in Bornes propolis, that can contribute to membrane stability, by chelating and antioxidant activities, decreasing the damages in the RBC membrane
- Osmotic fragility may be increased by oxidative stress conditions in RBCs of HS patient (Fig. 3), and when this test was performed in propolis presence this effect was blunted, supporting the concept that the protection of membrane integrity by propolis is due to its antioxidant properties.
- This work showed a high effectiveness of propolis in the membrane integrity, and open a field of future research which is necessary to identify the propolis compounds that act at on erythrocyte membrane fragility and confirm the hypothetic action mechanism made by our team (Fig. 4).

Bibliography

- Moreira L, Dias L, Pereira JA, Estevinho L. Antioxidant properties, total phenols and polinic analysis of propolis samples from Portugal. *Food and Chemical Toxicology*. 2008;46: 3482 – 3485.
- Bankova V, Popova M, Bogdanov S, Sabatini A. Chemical composition of European propolis: expected and unexpected results. *Zeitschrift für Naturforschung*. 2002;57c: 530-533.
- Wang L, Mineshita S, Ga I, Shigematsu T, Matsuno T. Antiinflammatory effect of propolis. *Japanese Journal of Pharmacological Therapeutics*. 1993;24: 223-224.
- Amoros M, Lurton E, Boustie J, Girre L, Sauvager F, Cormier M. Comparison of the anti-herpes simplex virus activities of propolis and 3-methylbut-2-enyl caffeate. *Journal of Natural Products*. 1994;64: 235-240.
- Kimoto T, Aga M, Hino K. Apoptosis of human leukemia cells induced by Artepillin C, an active ingredient of Brazilian propolis. *Anticancer Research*. 2001;21: 221-228.
- Favero PR, Leonart MSS, Nascimento AJ. Electroforese de proteínas de membrana eritrocitária no diagnóstico de doença hemolítica por defeito de membrana. *Revista Brasileira de Análises Clínicas*. 2003;35: 45-47.
- Elisabeth TT, Henry ER. Partial Splenectomy for Hereditary Spherocytosis. *Pediatric Clinics of North America*. *Pediatric Hematology*. 2008;55(2): 503-519.
- Yawata Y. Cell Membrane. *Kurashiki, Japan: Wiley-VCH Verlag GmbH & Co.*; 2003.
- Grânjo E, Manata P, Torres N. Esferocitose Hereditária – prevalência dos défices proteicos da membrana do eritrócito. *Acta Médica Portuguesa*. 2003;16: 65-69.

