FACULTY OF MEDICINE AND HEALTH SCIENCE
Catholic University of Valencia

THE ROLE OF PARAOXONASE 1 (PON1) AS AN OXIDATION MARKER IN THE IMPROVEMENT OF MUSCLES AFTER AN INCREASE IN BETAHYDROXYBUTYRATE (BHB) IN BLOOD IN PATIENTS WITH MULTIPLE SCLEROSIS

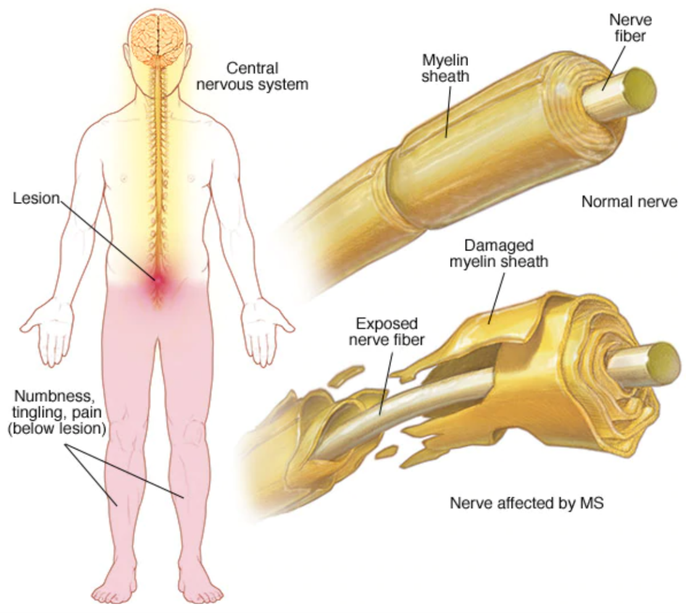
Jose Luis Platero[1], María Mar López-Rodríguez[2], Jose Joaquin Ceron[3], Julia Casani-Cubel[4] and Jose Enrique de la Rubia Orti[5]***
Doctoral Degree School UCV. joseluisplateroarmero@gmail.com [1]; Department of Nursing, Physiotherapy and Medicine. University of Almería. mlr295@ual.es [2]; Interdisciplinary Laboratory of Clinical Analysis, University of Murcia. jjceron@um.es [3]; PhD student UCV. juliacasani@mail.ucv.es [4]; Department of Nursing UCV. joseenrique.delarubi@ucv.es [5]***

INTRODUCTION

Multiple sclerosis (MS) is a chronic neurodegenerative disease of an autoimmune nature, which causes high oxidative stress and progressive loss of skeletal muscle.

The increase of beta-hydroxybutyrate (BHB) is outlined as its high levels show improvements in diseases of a neuronal nature. The effect of BHB related to anthropometric changes characterised by an increase in muscle mass has also been associated with the ability to restore mitochondrial activity, predictably by a decrease in ROS and RNS.

PON1 is a marker associated with low levels of oxidative stress and inflammation.



HYPOTHESIS

As a consequence of a nutritional intervention that increases the ketone bodies in the blood, PON1 could be a marker of the change in the oxidative state after a possible muscular improvement in patients with multiple sclerosis.

OBJECTIVES

The aim of the study is to assess the possible role of PON1 as a marker of oxidative status following possible muscle improvement in MS patients by increasing BHB in the blood.

MATERIAL AND METHODS

This pilot study was conducted over 4 months with 51 patients diagnosed with MS, who were randomly divided into an intervention group that received a Mediterranean isocaloric diet supplemented with 60 ml of coconut oil, and a control group that received the same basal diet without coconut oil.

Before and after treatment, anthropometric measurements and blood samples were taken, measuring serum PON1 and BHB concentrations to determine the role of PON1 in muscle improvement after increased BHB in the blood in MS patients.

RESULTS

Table 1: Comparison between the values obtained pre-test (before the intervention) and post-test (after the intervention) of the variable Beta-hydroxybutyrate (BHB) and percentage of muscle mass in the intervention group.

Intervention	Pre		Post			
Group	Mean	SD	Mean	SD	Z	p
BHB (Mmol/L)	.06	.04	.10	.10	-2.005	.045*
Muscle Mass (%)	39.39	2.88	40.22	2.86	-2.955	.003*

BHB: Beta-hydroxybutyrate; PON1: Paraoxonase 1; SD: Standard Deviation;
Z: Willcoxon Test; Statistically significant differences p < 0,05

There was a significant increase in the levels of PON1 and BHB in the blood after the intervention, as well as in muscle percentage that also increased significantly.

Figure 1: Paraoxonase 1 (PON1) levels pre-test and post-test in control group (1A) and intervention group (1B).

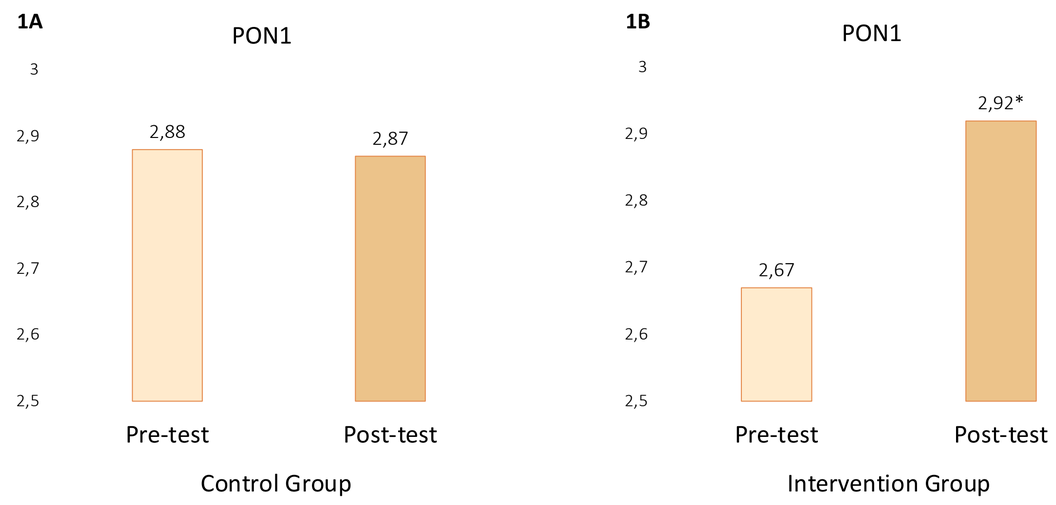


Figure 1 shows the comparison of the results obtained at the PON1 levels before and after, in both groups: control group (Figure 1A) and intervention group (Figure 1B).

CONCLUSION

The enzyme PON1 could be related to oxidation status when muscle improvement occurs in MS patients, after an increase of BHB in blood.

ACKNOWLEDGMENTS

The authors would like to thank all MS patients and the associations for their participation.

REFERENCES

1. Levy, D.; Reichert, C.O.; Bydlowski, S.P. Paraoxonases Activities and Polymorphisms in Elderly and Old-Age Diseases: An Overview. *Antioxidants* **2019**, 8, 118.
2. Castellazzi M, Trentini A, Romani A, Valacchi G, Bellini T, Bonaccorsi G, Fainardi E, Cavicchio C, Passaro A, Zuliani G, Cervellati C. Decreased arylesterase activity of paraoxonase-1 (PON-1) might be a common denominator of neuroinflammatory and neurodegenerative diseases. *Int J Biochem Cell Biol.* **2016**;81(Pt B):356-363. doi: 10.1016/j.biocel.2016.06.008.
3. Nafar F, Clarke JP, Mearow KM. Coconut oil protects cortical neurons from amyloid beta toxicity by enhancing signaling of cell survival pathways. *Neurochem Int*. **2017**;105:64-79. doi: 10.1016/j.neuint.2017.01.008.
4. Mayo Foundation for Medical Education and Research. *Myelin damage and the nervous system.* https://www.mayoclinic.org/diseases-conditions/multiple-sclerosis/symptoms-causes/syc-20350269