Abstract

Natural Brewing Peptides with Enhanced Inhibitory Effects on Angiotensin I-Converting Enzyme †

Rita Ribeiro-Oliveira 1,*, Zita E. Martins 2, Miguel Ângelo Faria 2, Joana Beatriz Sousa 1, Isabel M. P. L. V. O. Ferreira 2 and Carmen Diniz 1

1 LAQV/REQUIMTE, Laboratory of Pharmacology, Department of Drug Sciences, Faculty of Pharmacy, University of Porto, 4050-313 Porto, Portugal
2 LAQV/REQUIMTE, Laboratory of Bromatology and Hydrology, Department of Chemical Sciences, Faculty of Pharmacy, University of Porto, 4050-313 Porto, Portugal
* Correspondence: up201303483@edu.ff.up.pt
† Presented at the 8th International Electronic Conference on Medicinal Chemistry, 1–30 November 2022; Available online: https://ecmc2022.sciforum.net/.

Abstract: Angiotensin-converting enzyme (ACE) inhibitors are anti-hypertensive drugs associated with several side effects. Natural compounds, namely bioactive peptides from brewing by-products—brewer’s spent grain (BSG) and yeast (BSY)—are promising alternatives, as they can inhibit ACE in vitro and are less likely to cause severe side effects, while maintaining therapeutic efficacy. However, the impact of oral administration on peptides’ bioavailability has not been assessed so far. Thus, the aim of this study was to understand in vitro the impact of the oral route on the effectiveness of BSG/BSY peptides as ACE inhibitors. Extracted BSG/BSY proteins were hydrolysed and sequentially subjected to simulated gastrointestinal digestion (INFOGEST), intestinal absorption and liver metabolism (co-culture of Caco-2 and HepG2 cells). MTT assay was used to assess BSG/BSY peptides’ safeness. The ACE-inhibitory potential of initial and final products (BSY, BSG and a mixture 50:50—MIX) at an identical concentration (0.857mg/mL) was measured (fluorometric assay) and compared with Captopril (1 µM, a clinically used ACE-inhibitory drug). Simulation of oral administration increased brewing peptides’ ACE-inhibitory capacity. When comparing the final peptides with captopril, BSY demonstrated identical potency, while BSG showed 22% greater efficacy; the new tested product MIX presented 30% higher inhibition. In conclusion, the current study shows that BSG, BSY and MIX natural peptides derived from the brewing industry enhance their bioactive properties as ACE-inhibitors after oral administration, validating the usefulness of these peptides to reduce the risk of, ameliorate or treat primary hypertension.

Keywords: hypertension; bioactive peptides; brewer’s spent grain; brewer’s spent yeast; ACE; ACE inhibitor; anti-hypertensive drug

Supplementary Materials: The following are available online at https://www.mdpi.com/article/10.3390/ECMC2022-13426/s1.


Funding: This research was supported by FEDER funds and National Funds (FCT/MEC, Fundação para a Ciência e Tecnologia and Ministério da Educação e Ciência) PTDC/OCE-ETA/32567/2017 and UIDB/50006/2020.
Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request.

Acknowledgments: Rita Ribeiro-Oliveira thanks the Portuguese Foundation for Science and Technology (FCT) for the Ph.D. grant SFRH/BD/146243/2019, funded by the European Social Fund of the European Union and national funds FCT/MCTES through the Norte’s Regional Operational Programme.

Conflicts of Interest: The authors declare no conflict of interest.