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Annals of Medicine

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/iann20

Profiles of elemental concentrations in human: contribution of X-ray fluorescence to discrimination between healthy and diseased tissues and prediction of alterations in tongue carcinoma

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To cite this article: Luísa Zagalo, Pedro Oliveira, Maria João Oliveira, Luísa Gonçalves, Carlos Zagalo & José Brito (2021) Profiles of elemental concentrations in human: contribution of X-ray fluorescence to discrimination between healthy and diseased tissues and prediction of alterations in tongue carcinoma, Annals of Medicine, 53:sup1, S26-S27, DOI: 10.1080/07853890.2021.1896905

To link to this article: https://doi.org/10.1080/07853890.2021.1896905

Published online: 28 Sep 2021.

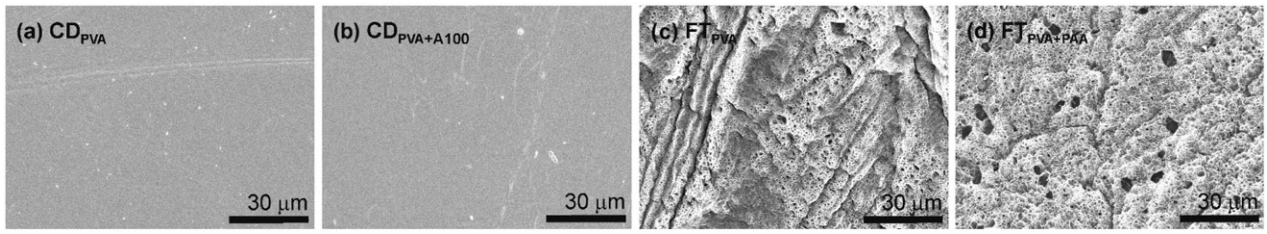

Figure 1. Microstructure of (a) CD_{PVA}, (b) $CD_{PVA+A100}$, (c) FT_{PVA}, and (d) $FT_{PVA+PAA}$.

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Acknowledgements

To Fundação para a Ciência e a Tecnologia for funding through the research project PTDC/CTM-CTM/29593/2017 and the unit projects UID/EMS/50022/2019 (LAETA - IDMEC), UID/QUI/00100/2019 (CQE), and UID/BIM/04585/2019 (CiiEM). To Kuraray for providing the PVA powder.

References

[1] Baker MI, Walsh SP, Schwartz Z, et al. A review of polyvinyl alcohol and its uses in cartilage and orthopedic applications. J Biomed Mater Res B Appl Biomater. 2012;100(5):1451–1457.
[2] Oliveira AS, Seidi O, Ribeiro N, et al. Tribomechanical comparison between PVA hydrogels obtained using different processing conditions and human cartilage. Materials. 2019;12(20):3413.

DOI: 10.1080/07853890.2021.1896904

Profiles of elemental concentrations in human: contribution of X-ray fluorescence to discrimination between healthy and diseased tissues and prediction of alterations in tongue carcinoma

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ABSTRACT

Introduction: It has been shown that the concentrations of some elements, for example K, Ca, Cu, Fe, and Zn, may differ significantly between the healthy area and the tumour area in the same human tissue [1]. Most studies conducted so far are focussed on specific elements which are a priori known to be involved in physiological or pathological processes, and thus risk neglecting the potential role of the excluded elements in those processes [2]. The role of elements considered in isolation has been questioned because it ignores the important interactions amongst the various elements [3]. However, even when concentrations of various elements are obtained in the same study, comparisons between healthy and diseased tissues, or correlations between the various elements, both intrinsically multivariate, are often implemented with univariate methods, which may result in observed effects or the inability to detect such effects [4]. The methodologies in this study, which complement multielement determinations by X-ray fluorescence spectroscopy (XRF) and X-ray diffraction (XRD) in several types of biological samples, with multivariate data analysis methodologies, provide an important contribute to fill existing gaps in current knowledge of the role elements in such metabolic pathways.
Materials and methods: Samples consisted of five matched pairs (10 samples) of normal and tumour human tongue tissue. In the developing work, the XRF and XRD techniques are applied in the determination of the concentration profile of several elements of interest, in samples of healthy tissue and tongue carcinoma, with the objective of developing a classification system based on the profile of elemental concentrations which allows to discriminate between healthy tissue and carcinoma, and thus clarify the role of these elements in the aetiology of the disease.
Results: Potential differences in Ca, Fe and S were observed. Intrasampling tests determined that samples were inhomogeneous which may affect the ability to discriminate between normal and tumour tissues.
Discussion and conclusions: It is highlighted that the limited number of samples prevents any conclusive findings for now nevertheless results provide areas of focus for upcoming study.

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Acknowledgements

The authors acknowledge cooperation with the McMaster University, namely Dr. Michael Farquharson and Dr. Jenasee Mynerich.

References

[1] Carla A, Fonseca J, Brito JAA, et al. Serum Zn levels in dysphagic patients who underwent endoscopic gastrostomy for long term enteral nutrition. Nutricion Hospitalaria. 2014;29:359.
[2] Carvalho ML, Brito J, Barreiros MA. Study of trace element concentrations in human tissue by EDXRF spectrometry. X-Ray Spectrom. 1998;27(3):198–204.
[3] Darvish-Molla S, Al-Ebraheem A, Farquharson MJ. The identification and differentiation of secondary colorectal cancer in human liver tissue using X-ray fluorescence, coherent scatter spectroscopy, and multivariate analysis. Appl Spectrosc. 2014;68(1):79–87.
[4] Sohrabi M, Gholami A, Azar MH, et al. Trace element and heavy metal levels in colorectal cancer: comparison between cancerous and non-cancerous tissues. Biol Trace Elem Res. 2018;183(1):1–8.

DOI: 10.1080/07853890.2021.1896905

PVA/chitosan hydrogels loaded with octenidine and 2-phenoxyethanol for wound dressings

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ABSTRACT

Introduction: Polyvinylacohol (PVA)/chitosan hydrogels are ideal candidates for the production of wound dressings as their combination can provide good mechanical and antibacterial properties, alongside the ability to be loaded and release drugs [1,2]. The main goal of this work is to evaluate the possibility of using PVA/chitosan hydrogels as platforms for the release of octenidine dihydrochlorate and 2-phenoxyethanol, a drug combination that has antiseptic, antibacterial and antimycotic properties.

Materials and methods: PVA aqueous solutions were prepared by dissolution at 90 °C and chitosan was added to get different mass ratios (3:1, 1:1) and a final polymer concentration of 5% w/w. The mixtures were poured in petri dishes and submitted to five cycles of freeze-thawing (18 h at −20 °C, 6 h at 23 °C in each cycle) to trigger polymerisation. After a washing step, they were lyophilised. Before testing, the samples were hydrated for 72 h. Swelling ratio, water content and degradation experiments in simulated exudate containing lysozyme were performed to assess the stability of the hydrogels. Contact angle was measured using captive bubble method and hydrogels structure was assessed using SEM. Drug loading was carried out by soaking the samples in Octiset® solution at room temperature. Drug release experiments were performed in simulated exudate using Franz cells.

Results: The hydrogels showed swelling ratios between ≈1300 and 2100% and high water contents of 93–95%. Degradation in the first 2 days in the presence of the protein was less than 37%. The hydrogels showed high hydrophilicity and porosity. Drug loading and release experiments (Figure 1) proved that the hydrogels are able to release both drugs in a controlled way during the first day.

Discussion and conclusions: The obtained results suggest that the proposed formulations possess drug retention abilities compatible with their use. They shall be suitable for the production of wound dressings with therapeutic properties. Further research should provide insight into the mechanical properties of the hydrogels, their antibacterial behaviour and the choice of a sterilisation method.

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Acknowledgements

The authors acknowledge funding from Fundação para a Ciência e Tecnologia (FCT) [projects UID/QUI/00100/2019, UID/BIM/04585/2019 and PTDC/CTM-BIO/3640/2014] and Bioceramed by providing chitosan.