

TXRF uncovers nutrient deficiencies of COVID-19 patients

Introduction

SARS-CoV-2 infections cause the current coronavirus disease (COVID-19) pandemic and challenge the immune system with ongoing inflammation. Several redox-relevant micronutrients are known to contribute to an adequate immune response, including the essential trace elements zinc (Zn) and selenium (Se). Total Reflection X-ray Fluorescence (TXRF) analysis is a well-established method for rapid quantification of trace elements in biological matrices ([Lab Report XRF 434](#)).

COVID-19 studies

The TXRF spectrometers S4 T-STAR and S2 PICOFOX installed at the Institute for Experimental Endocrinology, Charité Berlin, Germany were intensively used during recent COVID-19 studies. About 171 serum samples of 35 surviving COVID-19 and non-surviving patients were analyzed and compared with a healthy cohort. While the combined deficit of Zn and Se was observed in only 0,15% of healthy people, a deficit occurred in about 20% of surviving and 50% in non-surviving patients (see fig. 1 for comparison of the Zn status of patients with controls). In addition, the concentration trends of micronutrient and selenoprotein P (SELENOP, the major storage of Se in biological systems) were compared over the first weeks in the hospital. Notably, the study indicates the first time that the decrease of SELENOP is a consequence of COVID-19 (fig. 2).

Conclusion

It has been concluded that a personalized Se and Zn supplementation may support convalescence of COVID-19 patients. Further, sufficiently sized and well-controlled intervention studies are currently conducted.

Literature

The content of the article is an extract of detailed research studies, which are published here
 [1] Heller et al., *Prediction of survival odds in COVID-19 by zinc, age and selenoprotein P as composite biomarker*, *Redox Biol.* 38 (2021) 101764
<https://doi.org/10.1016/j.redox.2020.101764>
 [2] Moghaddam et al., *Selenium deficiency is associated with mortality risk from COVID-19*, *Nutrients* 2020, 12(7), 2098
<http://dx.doi.org/10.3390/nu12072098>

Lab report XRF 434

Trace elements in biological matrices and their impact in clinical chemistry

Recent TXRF webinars about clinical applications

<https://www.bruker.com/events/webinars/do-it-yourself-metal-analysis-in-biological-and-medical-samples.html>

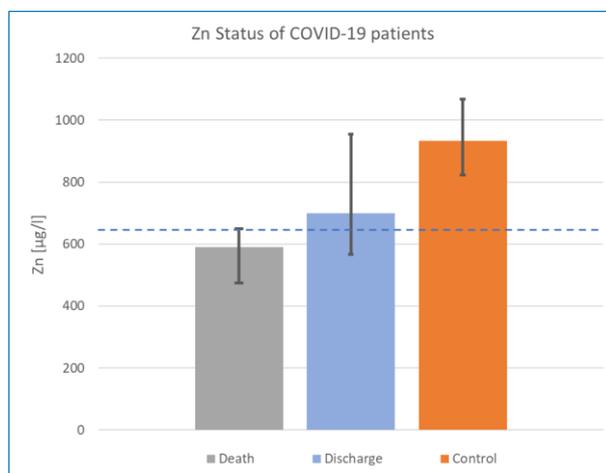


Fig. 1: Comparison of the Zn status from patients with COVID-19 and healthy controls. The dashed line at 642.5 µg/l indicates the threshold for Zn deficiency. The graph is a simplified extract of the original figure in Heller et al.

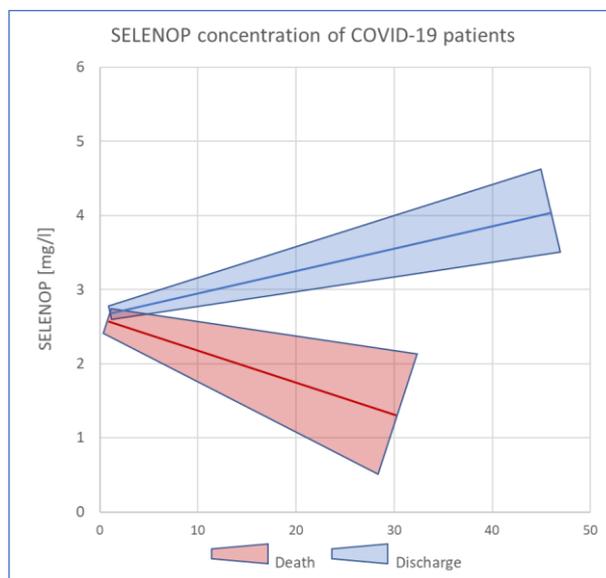


Fig. 2: Dynamic levels of the selenoprotein P concentration over the first weeks in hospital demonstrate the decline in non-recovering patients. The areas show the trend of all measured samples. The graph is modified from the original publication Heller et al.