

The Role of Inorganics in Preeclampsia Assessed by Multiscale Multimodal Characterization of Placentae

Thomas Rduch, Elena Tsolaki, Yassir El Baz, Sebastian Leschka, Diana Born, Janis Kinkel, Alexandre H C Anthis, Tina Fischer, Wolfram Jochum, René Hornung, Alexander Gogos & Inge K Herrmann

Preeclampsia is one of the most dangerous diseases in pregnancy. Because of the hypertensive nature of preeclampsia, placental calcifications are believed to be a predictor for its occurrence, analogous to their role in cardiovascular diseases. However, the prevalence and the relevance of calcifications for the clinical outcome with respect to preeclampsia remains controversial. In addition, the role of other inorganic components present in the placental tissue in the development of preeclampsia has rarely been investigated. In this work, we therefore characterized inorganic constituents in placental tissue in groups of both normotensive and preeclamptic patients (= 20 each) using a multi-scale and multi-modal approach. Examinations included elemental analysis (metallomics), sonography, computed tomography (CT), histology, scanning electron microscopy, X-ray fluorescence and energy dispersive X-ray spectroscopy. Our data show that tissue contents of several heavy metals (Al, Cd, Ni, Co, Mn, Pb, and As) were elevated whereas the Rb content was decreased in preeclamptic compared to normotensive placentae. However, the median mineral content (Ca, P, Mg, Na, K) was remarkably comparable between the two groups and CT showed lower calcified volumes and fewer crystalline deposits in preeclamptic placentae. Electron microscopy investigations revealed four distinct types of calcifications, all predominantly composed of calcium, phosphorus and oxygen with variable contents of magnesium in tissues of both maternal and fetal origin in both preeclamptic and normotensive placentae. In conclusion our study suggests that heavy metals, combined with other factors, can be associated with the development of preeclampsia, however, with no obvious correlation between calcifications and preeclampsia.

type	journal paper/review (English)
date of publishing	30-03-2022
journal title	Front Med (Lausanne) (9)
ISSN print	2296-858X
pages	857529