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Silicon and Calcium Functioning on Human Body

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Abstract: **This work briefly reviews the nutritional significance of silicon and calcium for human health. The study also highlights the harmful impacts associated with exposure to silica nano-particles and chemical alterations caused by water acidification. Acidification which results from expel of carbon dioxide to the seawater can both directly and indirectly affect the human health through intensifying the levels of exposure to chemicals compounds and trace metals as well as through altering the bioavailability of pollutants and bioaccumulation.**

Keywords: **acidification, silicon, calcium, human body, bioavailability.**

1. INTRODUCTION

While exposure to silicon-dioxide (SiO_2) nano-particles of respiratory systems can be seriously harmful to human body (e.g., Anwari, 2023a), silicon (Si) as a single trace element is considered to be essential for the synthesis of collagen and elastin and functioning of the connective tissues, bones, tendons, and joints. Si makes up nearly 30% of the Earth's crust, most commonly as crystalline silica, in particular quartz, which widely occurs in continental and marine deposits from the most ancient to recent environments (e.g., Varkouhi et al., 2022; Varkouhi and Papineau, 2023a, 2023b). This element does not take place in nature as uncombined, it is instead found mainly as silica (silicon dioxide) and silicates. Non-crystalline silica is another form of silicon dioxide, which is used by siliceous organisms to build their protective shells (e.g., Neagu et al., 2010; Varkouhi et a., 2017; Varkouhi, 2018; Varkouhi and Wells, 2020; Varkouhi et al., 2020a, 2020b; Varkouhi et al., 2021a, 2021b, 2021c).

Calcium (Ca) is necessary for healthy bones, muscles, nerves, and heart of a human. The low calcium condition is commonly treated and managed using calcium carbonate as an *inorganic salt (Fritz et al., 2023). This nutritional supplement is used when the content of calcium uptake from the diet is insufficient. Also, calcium carbonate is used as an anti-acid to relieve acid indigestion and upset stomach. The Ca and carbonate in the seawater can be absorbed by a variety of organisms, which use the combinations of these ions to develop their aragonite and calcite protective shells. These ions also combine to form other carbonate objects, such as ooids (e.g., Tucker, 1984; Varkouhi and Jaques Ribeiro, 2021).*

Seawater acidification, carbonate dissolution, and human health

The threats of ocean acidification for human health are far more devastating than those for other life forms. While the accumulation of carbon dioxide in the seawater and water acidification is dissolving carbonate shells and organisms globally, the impact of produced carbonic acid on human health involves understanding complexity, leading to more challenging management of this driving factor (Falkenberg et al., 2020). Contrary to direct stressors, including flooding, the change in carbonate chemistry, and elevated temperatures (Wernberg et al., 2016), acidified waters include complications with indirect impacts, e.g., the ecosystem-level complexity of indirect impacts. Accordingly, the dissemination of carbon dioxide alters the availability and nutritional value of producers and their consumers, and affects their poisoning to human tissues (Fig. 1). Therefore, the acidified seawater is considered to be a highly emerging health challenge of markedly higher complexity. This acidification process can also intensify the propagation of chemical and trace metals that are released to the ecosystem via natural and microbial degradation of source regions or anthropogenic practices and impact human health through direct or indirect exposure and food chain (e.g., Varkouhi and Amin Sobhani, 2005; Varkouhi, 2006; Varkouhi et al., 2006a, 2006b; Varkouhi, 2007a, 2007b, 2009, 2010; Anwari, 2023b, 2023c).

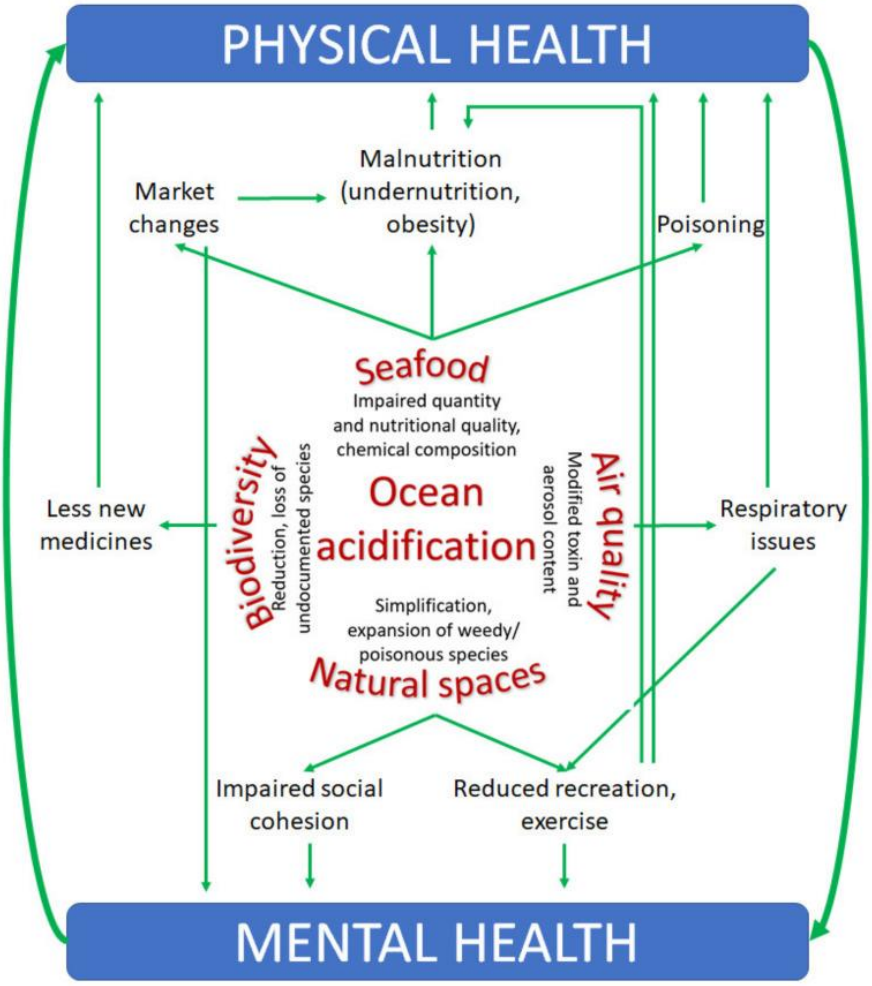

Fig.1. Negative impacts of acidified seawater on food chain, atmosphere, environment, and biological diversity (Falkenberg et al., 2020).

2. CONCLUSION

This study discussed the nutritional importance of silicon and calcium for human body. While the most abundant compound of silicon in the nature, the crystalline silica, can be a potential threat to the human respiratory system, carbonates as the common chemical compounds of calcium have no known negative effects on the body. Acidification of seawaters following huge release of carbon dioxide to the ocean however results in direct and indirect health issues along with impacts on the entire ecosystem. This process commonly affects the bioavailability of pollutants, and intensifies exposure to chemicals and trace elements.

REFERENCES

[1] Anwari, L. 2023a. Effects of exposure to silicon dioxide of human body, International Journal of Novel Research in Healthcare and Nursing, v. 10, p. 426-428, ISSN 2394-7330, https://doi.org/10.5281/zenodo.10376232

[2] Anwari, L. 2023b. Effects of lead and mercury poisoning on human body — An overview, International Journal of Novel Research in Healthcare and Nursing, v. 10, p. 379-381, ISSN 2394-7330, https://doi.org/10.5281/zenodo.10255396

[3] Anwari, L. 2023c. Toxic trace elements exposure during pregnancy and its associated health risks, International Journal of Novel Research in Healthcare and Nursing, v. 10, p. 346-351, ISSN 2394-7330, https://doi.org/10.5281/zenodo.10207484

[4] Falkenberg, L.J., Bellerby, R.G.J., Connell, S.D., Fleming, L.E., Maycock, B., Russell, B.D., Sullivan, F.J., and Dupont, S. 2020. Ocean acidification and human health. International Journal of Environtal Research and Public Health, 17, p. 4563.

[5] Fritz, K., Taylor, K., and Parmar, M. 2023. Calcium Carbonate. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK562303/

[6] Neagu, R.C., Cartwright, J., Davies, R.J., and Jensen, L. 2010. Fossilisation of a silica diagenesis reaction front on the mid-Norwegian margin, Marine and Petroleum Geology, v. 27, p. 2141-2155.

[7] Varkouhi, S., and Amin Sobhani, E. 2005. The study of environmental biogeochemistry of trace elements in fish of Khorramabad River Watershed, Journal of Environmental Science and Technology, v. 1, No. 24, p. 55-64, https://journals.srbiau.ac.ir/article_389.html

[8] Varkouhi, S. 2006. Studies of microbial biogeochemistry of Desulfovibrio Genus Bacteria on Quaternary deposits, ULUM-I ZAMIN (ISSN: 1023-7429), v. 15, p. 140-149.

[9] Varkouhi, S., Lasemi, Y., and Kangi, A. 2006a. Occurrence and distribution of trace elements in fish liver: Example from the Khorramabad River, Lorestan Province, Iran, In: The WSEAS International Conference on Environment, Ecosystems and Development; 2006 Nov 20–22. Venice (IT): World Scientific and Engineering Academy and Society (WSEAS), p. 59-63.

[10] Varkouhi, S., Lasemi, Y., and Kangi, A. 2006b. Geochemical evaluation of toxic trace elements in recent wind driven sediments of Zahedan Catchment Area, WSEAS Transactions on Environment and Development, v. 2, p. 1359-1368.

[11] Varkouhi, S. 2007a. Biogeochemical evaluation of trace elements in fish liver; Case study: Khorramabad River Basin, Lorestan, Iran. Iranian Journal of Science & Technology, Transaction A. v. 31, p. 53-61.

[12] Varkouhi S. 2007b. Geochemical evaluation of lead trace element in streambed sediments. In: The WSEAS International Conference on Waste Management, Water Pollution, Air Pollution, Indoor Climate; 2007 Oct 13–15. Arcachon (FR): World Scientific and Engineering Academy and Society (WSEAS), p. 262-268.

[13] Varkouhi, S. 2009. Lead in Sarbaz River Basin sediments, Sistan and Baluchestan, IRAN, Integrated Environmental Assessment and Management, v. 5, p. 320-330.

[14] Varkouhi S. 2010. Lead contamination of streambed sediments in Veysian River Basin, Lorestan Province, Iran. Water and Geoscience, ISSN: 1790-5095, ISBN: 978-960-474-160-1, p. 144-147.

[15] Varkouhi, S., Tosca, N.J., and Cartwright, J.A. 2017. Biogenic silica diagenesis and anomalous compaction in sedimentary basins, The International Meeting of Sedimentology, October 2017, International Association of Sedimentologists, Toulouse.

[16] Varkouhi, S. 2018. Biogenic Silica Diagenesis under Early Burial in Hemipelagic Marine Sediments, DPhil Thesis, University of Oxford, 428 p.

[17] Varkouhi, S., and Jaques Ribeiro, L.M. 2021. Bimineralic Middle Triassic ooids from Hydra Island: Diagenetic pathways and implications for ancient seawater geochemistry, The Depositional Record, v. 7, p. 344-369.

[18] Varkouhi, S., and Wells, J. 2020. The relation between temperature and silica benthic exchange rates and implications for near-seabed formation of diagenetic opal, Results in Geophysical Sciences, v. 1–4, p. 100002.

[19] Varkouhi, S., Cartwright, J.A., and Tosca, N.J. 2020a. Anomalous compaction due to silica diagenesis — Textural and mineralogical evidence from hemipelagic deep-sea sediments of the Japan Sea, Marine Geology, v. 426, p. 106204.

[20] Varkouhi, S., Tosca, N.J., and Cartwright, J.A. 2020b. Pore water chemistry — A proxy for tracking the signature of ongoing silica diagenesis, Journal of Sedimentary Research, v. 90, p. 1037-1067.

[21] Varkouhi, S., Cartwright, J.A., Tosca, N.J., and Papineau, D. 2021a. Arrested versus active silica diagenesis reaction boundaries — A review of seismic diagnostic criteria, Basin Research, v. 34, p. 640-661.

[22] Varkouhi, S., Tosca, N.J., and Cartwright, J.A. 2021b. Ongoing biogenic silica diagenesis — Interstitial-water chemical signals, EGU General Assembly 2021, April 2021, European Geosciences Union (EGU), Vienna, http://dx.doi.org/10.5194/egusphere-egu21-24

[23] Varkouhi, S., Tosca, N.J., and Cartwright, J.A. 2021c. Temperature–time relationships and their implications for thermal history and modelling of silica diagenesis in deep-sea sediments, Marine Geology, v. 439, p. 106541.

[24] Varkouhi, S., Papineau, D., and Gue, Z. 2022. Botryoidal quartz as an abiotic signature in Palaeoarchean cherts of the Pilbara Supergroup, Western Australia, Precambrian Research, 383, 106876.

[25] Varkouhi, S., and Papineau, D. 2023a. Silica botryoids from chemically oscillating reactions and as Precambrian environmental proxies, Geology, 51, p. 683-687.

[26] Varkouhi, S., and Papineau, D. 2023b. Supplemental Material: Silica botryoids from chemically oscillating reactions and as Precambrian environmental proxies, Geological Society of America. Journal contribution. https://doi.org/10.1130/GEOL.S.22595947.v1

[27] Wernberg, T., de Bettignies, T., Joy, B.A., and Finnegan, P.M. 2016. Physiological responses of habitat-forming seaweeds to increasing temperatures, Limnology and Oceanography, 61, p. 2180-2190.