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Effects of Exposure to Silicon Dioxide of Human Body

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Abstract: **This study reviews the health risks caused by accumulation of silicon dioxide in human bodies. Among various forms of crystalline silica, SiO_2 nano-particles especially target respiratory systems due to their fine-grained nature, leading to serious health problems as they are fine-grained particles which can translocate to the body via crossing biological barriers. Therefore, exposure of soft body tissues to these particles should be minimised.**

Keywords: **silicon dioxide, human body, trace elements, exposure.**

INTRODUCTION

Silica (SiO_2) is composed of silicon and oxygen and commonly found in the environment as a natural material. Various forms of silica throughout the environment in soils, sediment, water, and air are composed of the same constituents, but may have various molecular structures. Silica is technically divided into two major groups, crystalline and amorphous. Although amorphous silica is a useful compound, forming the principal protective shell for many silica-secreting microorganisms, such as diatoms, radiolarians, and silicoflagellates (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), it can cause human health problems, in particular respiratory diseases in people exposed to its significant levels (Fig. 1). Excluding the other kinds of less common crystalline silica, the most abundant crystalline silica in the nature is quartz, which is mainly found in terrestrial and marine sediments deposited throughout the Earth's history in the oldest to the most recent environments (e.g., Varkouhi et al., 2022; Varkouhi and Papineau, 2023).

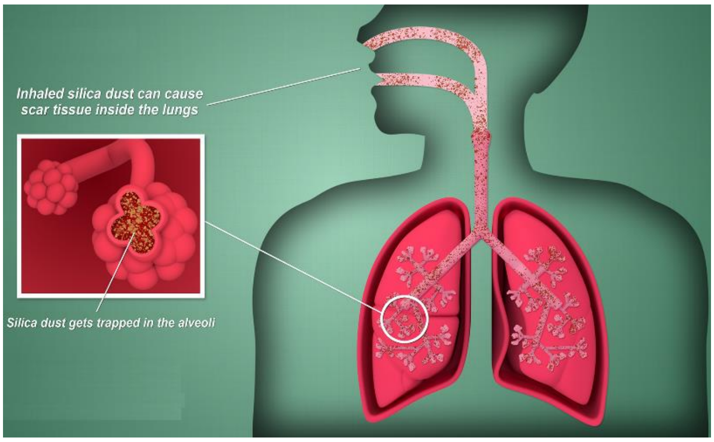

Fig.1. Respiratory diseases caused by breathing in nano-particles of crystalline silica (from St Vincent's Hospital Lung Health, 2023).

Exposure to silica

Urban and rural residents are exposed to silica through air, soil, sediment, certain forms of dust (e.g., concrete), food, and water. Amongst these, exposure to air is the most common. Nevertheless, silica particles in air are commonly big non-respirable materials, which cannot be easily breathe into the lungs. People working for certain industries, particularly who work in mining, drilling, and grinding areas are exposed to markedly higher concentrations of silica than the public (Rumchev et al., 2022). Hence, this is considered as a significant health issue for people who work in occupations dealing with silica-bearing compounds, including construction, mining, drilling, and sandblasting practices.

Silica in the form of nano-particles, produced by a variety of manufacturing activities, such as ceramics, painting, consumer products, cosmetics, and soups is extremely fine grained, and can be harmful when it translocates to vulnerable bodies via crossing biological barriers, including the blood–brain barrier (Gao et al., 2011). Silica nano-particles in association with other trace elements (non-essential and essential elements) are commonly released either from natural and microbial alteration of source areas or different anthropogenic activities to aquatic and terrestrial habitats, and affect human bodies 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, 2023a, 2023b). Their elevated levels in the blood circulation can also lead to intraperitoneal bleeding (Anwari, 2021).

Concluding statement

This work showed that exposure to silicon dioxide can develop health problems in human body. This is particularly critical for people working for occupations involved with compounds made of silica, including construction, mining, drilling, and sandblasting activities. Silica nano-particles are the harmful form of silicon dioxide associated with manufacturing practices, such as ceramics, painting, consumer products, and cosmetics, and translocates to vulnerable bodies through crossing biological barriers. Therefore, products made of SiO_2 should be used with extra caution.

REFERENCES

[1] Anwari, L. 2021. Prerupture diagnosis of a pregnant rudimentary uterine horn, Radiology CaseReports, v. 16, p. 764-768.

[2] Anwari, L. 2023a. 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. 2023b. 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] Gao, X., Yin, S., and Tang, M., et al. 2011. Effects of developmental exposure to TiO_2 nanoparticles on synaptic plasticity in hippocampal dentate gyrus area: An in vivo study in anesthetized rats, Biological Trace Element Research, v. 143, p. 1616-1628.

[5] 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.

[6] Rumchev, K., Hoang, D.V., and Lee, A. 2022. Case report: Exposure to respirable crystalline silica and respiratory health among Australian mine workers, Front Public Health, v. 10, 798472.

[7] St Vincent's Hospital Lung Health, 2023. https://www.svhlunghealth.com.au/conditions/silicosis

[8] 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

[9] 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.

[10] 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.

[11] 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.

[12] 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.

[13] 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.

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

[15] 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.

[16] 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.

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

[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. 2023. Silica botryoids from chemically oscillating reactions and as Precambrian environmental proxies, Geology, 51, p. 683-687.