POLICY STATEMENT

International Dental Journal 2019; 69: 23–24

doi: 10.1111/idj.12472

Nanoparticles in dental practice

Adopted by the FDI General Assembly: 7 September 2018, Buenos Aires, Argentina

CONTEXT

Nanoparticles are present in nature or can be purposely manufactured and are used to a large extent in everyday life, e.g. in cosmetics like sunscreen containing zinc oxide nanoparticles[1,2].

Nanoparticles are intentionally added/embedded into dental products to improve material properties. In addition, nanoparticles can be by-products from milling processes for fillers and thus get embedded in many dental materials.

In the dental laboratory, dental technicians are exposed to nanoparticles as dust.

In the dental practice, dental personnel are mainly exposed to nanoparticle dust produced by grinding and polishing dental materials, irrespective of nanoparticles being present in the material. The lungs are the prime target organ. Recent risk assessment has shown that the health risk for dental personnel after inhalation of nanoparticles as dust is likely to be low. No data are available regarding the effects of long-term exposure of dental nanoparticles for dental personnel. Despite exposure to dental nanoparticles for many decades, there are no indications of an increased rate of lung disease for dental personnel.

Patients are exposed to dental nanoparticle dust or debris but to a much lesser extent than dental personnel. Recent risk assessment has shown that the health risk for patients for both inhalation of nanoparticles or ingestion from wear is likely to be low. Available information is limited, especially regarding the effect of dental material nanoparticles on vulnerable patient groups, such as those with asthma or chronic obstructive pulmonary disease.

Current evidence suggests that the general risk of titanium nanoparticles from dental implants in the alveolar bone is likely to be low.

Recently, nanoparticles have become a matter of public and scientific concern. National and international agencies are dealing with nanoparticles and their safety as they may cause adverse effects due to their size and possibly their chemical composition.

SCOPE

This FDI Policy Statement covers the effects of nanoparticles in and from dental materials on the health of patients and dental personnel, and on the environment.

DEFINITIONS

For the purpose of this document, a nanoparticle is defined as a particle having one or more external dimensions in the size range from 1 to 100 nm.

PRINCIPLES

Effective oral healthcare must be based on high quality and safety. As nanoparticles in dentistry have become a matter of concern, FDI has analyzed the most recent data on the matter to advise and protect patients, dental personnel, and the environment.

POLICY

FDI supports the following statements:

1 FDI agrees to promote research on the health effects of ingestion/inhalation, and cell and tissue exposure to nanoparticles from dental materials.
2 In the dental laboratory, dental personnel must follow available relevant national/international occupational health safety regulations. In countries where no regulation is available, efforts should be made to reduce the risks by wearing filtering masks and providing effective local ventilation in the laboratory. Encapsulated powder/liquid systems may further reduce the dust exposure.

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3 In order to minimize any possible risk to dental personnel in practice and patients, the amount of generated dental nanoparticle dust should be kept to a minimum and the following measures are recommended:
   a Proper sculpting of the restorations before setting/curing may reduce the amount of material that is cut during the finishing and polishing step.
   b Adequate amount of water coolant and effective suction when grinding and polishing intraorally whenever possible.
   c Effective local ventilation in the treatment area and the installation of ventilation devices designed for air purification purposes could also be considered.
   d Encapsulated powder/liquid systems may further reduce the dust exposure.
   e Common surgical face masks and FFP3 (FFP=Filtering Face Piece) reduce exposure to nanoparticles. Attention should be given to ensuring a close fit of the mask.
4 Available data on possible adverse reactions derived from nanoparticles in and from dental materials by manufacturing and processing dental materials and environmental exposure are sparse, and more research is necessary. When developing dental materials and application methods, emphasis should be given to minimizing nanoparticle exposure.

KEYWORDS

Nanoparticles, dentistry, dental personnel, dental materials, patients.

DISCLAIMER

The information in this Policy Statement was based on the best scientific evidence available at the time. It may be interpreted to reflect prevailing cultural sensitivities and socio-economic constraints.

REFERENCES

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