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# Human studies and experimental studies for nanosafety

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How we learn from occupational diseases induced by exposure to conventional particles and how we prevent diseases from new materials by bridging the above with human studies and experimental studies? Many studies focus on specific effects of particles to obtain the knowledge on safe by design, but also we should understand non-specific effects of particles. The idea of mixed-dust pneumoconiosis (MDP) tells us the existence of commonality in the effects of different types of particles. The pneumoconiosis-inducing effects of dusts are known to depend on the content of the crystal silica in them. This idea gives a basis for occupational exposure limit by Japan Society for Occupational Health. The commonality of particles in induction of fibrosis can be described histopathologically by comparison with silicosis or asbestosis. Size, surface area or charge of the particles may influence these effects. A recent pilot study also generates a hypothesis of common effect of exposure to particles on autonomic nervous system in humans. Exposure to different-sized titanium dioxide and heart rate variability (HRV) was monitored in workers. The result showed that the number of particles with diameter less than 300 nm was associated negatively with HRV parameters of parasympathetic function, although the number of bigger particles did not show such associations with the HRV parameters. Understanding the non-specific effect of particles on lung and cardiovascular/autonomic nervous system might be useful for setting exposure limit of nanomaterials.

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