Toxicological Risk Assessment of Medical Devices

Medical devices can consist of diverse materials: polymers, metals, ceramics, composites, etc. Manufacturing process, packaging, and sterilization may introduce additional chemical substances into the final product. Any chemical or material that may leach or be released from a medical device into the patient must be considered a potential health risk and assessed toxicologically.

The standards ISO 10993-1 and -18 recommend to perform a complete chemical characterization and toxicological assessment of all medical device's chemical constituents and extractables and leachables (E&L) prior to any biological testing (Fig., Steps 1-3).

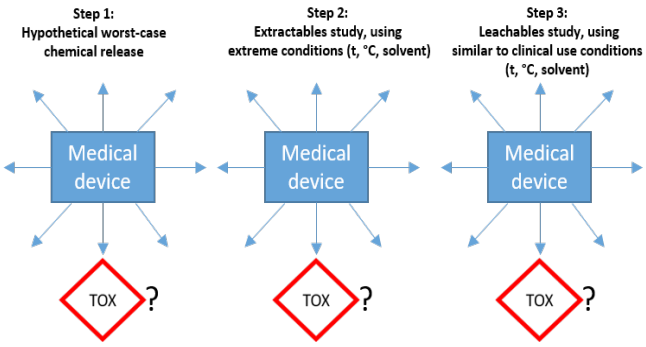

Figure: Chemical characterization and toxicological risk assessment of potentially releasable substances from medical devices.

The extent of the chemical characterization strongly depends on the medical device in question. It shall start with the determination of the chemical composition of the device. This information is then used to establish the hypothetical worst-case release of chemicals (HWCRC) from a product (Fig., Step 1). The HWCRC represents the total exposure of the patient to all medical device's chemical constituents (i.e. "it all comes out"). The HWCRC is further assessed toxicologically. If the HWCRC represents an unacceptable risk to patients, the medical device's extractables profile should be identified (Fig., Step 2) and assessed toxicologically. If this also represents an unacceptable risk for patients, the medical device's actual chemical release under clinical use conditions (leachables profile) should be characterized (Fig., Step 3). If the identified leachables represent an unacceptable risk for patients, the medical device should undergo further assessment (e.g. biological testing) or other mitigation activity should be evaluated according to ISO 10993-1 and -17. Whenever the toxicological risk assessment based on chemical characterization establishes that the medical device represents an acceptable risk to health, the chemical characterization process is completed.

E&L are a group of substances that include sterilization and process residues, additives, degradation products, plasticizers, monomers, etc. A complete E&L profile is essential for the safety assessment of medical devices. Therefore, E&L's identification requires a broad range of analytical methods such as ICP-, LC-, and GC-MS.

The RMS Foundation can advise costumers on performing chemical characterization and offers toxicological risk assessments provided by toxicologists according to ISO 10993-17. A toxicological risk assessment report documents the determination of the allowable limits for the substances identified. The report also states whether the identified E&L pose an acceptable or unacceptable risk to patient health. Finally, a recommendation is given whether further biological testing is necessary.

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Our offers for toxicological risk assessment of medical devices:

- Toxicological risk assessment of a hypothetical worst-case chemical release according to ISO 10993-17
- Toxicological risk assessment of extractables and leachables (E&L) according to ISO 10993-17
- Systematic literature reviews to collect toxicological data according to ISO 10993-1, Annex C

Other services:

- Analysis of the chemical composition, degradation products, and residuals of medical devices
- Analysis of inorganic E&L

Discuss your questions with us! We are happy to advise you.

Contact for toxicological risk assessment according to ISO 10993-17:

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More information as well as our service catalogue can be found on our website.

RMS Foundation has been certified according to ISO 9001 and is an ISO/IEC 17025 (type C) accredited laboratory.

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