Hip and spine simulator in the RMS

There are continuous developments of new implant materials and new implant designs, which have to be submitted to realistic preclinical tests. The wear test with a simulator is an important one for artificial joints.

The producers optimise the implant materials and try out new approaches in order to develop even more wear-resistant implants. The same applies to the design, which should permit easier handling, better anchoring in the bone or more versatility.

The prototypes of these new implants are submitted to realistic preclinical tests in simulators. The hip simulator, for example (figure 1), simulates the applied loads during gait according to ISO 14242-1. Due to the servohydraulic basis with four independent control cycles, the simulator in the RMS Foundation provides a free programming of the load and motion curves. Thus it permits to apply loads and carry out motions such as they occur in the hip (figure 2) or in the spine. Hence, our joint simulator can be used for the wear tests of both artificial hips and intervertebral disc implants.
In the simulator, the implants in the six motion stations are arranged in the same manner as in human hips. In addition, there are two soaking specimens on the simulator, which are exposed to the same load but are not moved. The tests in the simulator are performed at 37 °C in a protein-containing solution based on bovine serum, similar to the synovial fluid in the hip joint. Usually, a test takes 5 million cycles, which corresponds to 5-10 years in the patient. The weight of the components is regularly measured and thus the wear determined, as shown in figure 3 for a standard polyethylene inlay of an artificial hip joint. The polymeric components can be artificially aged according ASTM F2003-02 prior to the test. Optionally, the morphology and size of the wear particles and the concentration of released metallic ions can be determined after the simulator test.

Figure 1: Servohydraulic 6-stations hip and spine simulator.

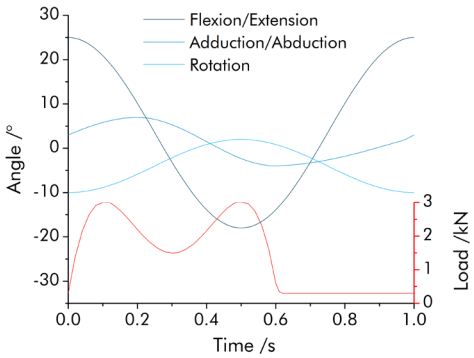

Figure 2: Load and motion curves for the hip according to ISO 14242-1.

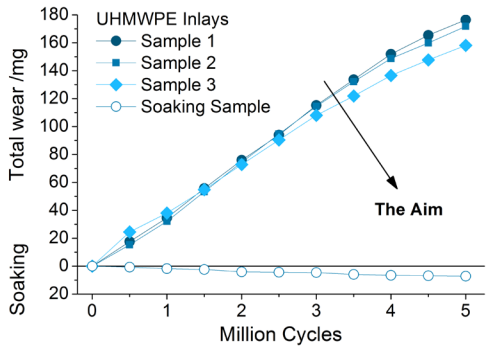

Figure 3: Wear and soaking of an inlay of a tested hip joint pairing with a CoCrMo head (Ø 32 mm). The inlay was made of ultra-high-molecular-weight polyethylene (UHMWPE).

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Our equipments for wear testing:

- Hip and spine simulator by EndoLab, Thansau/Rosenheim Germany: Servohydraulic 6-station simulator for the testing of hip implants according to ISO 14242-1/-2 or intervertebral disc implants according to ISO 18192.
- Pin-on-disk testing device OrthoPOD™ by AMTI, Watertown, USA: Six-station testing device with freely selectable load and motion cycles to test and determine the wear behaviour of two sliding partners according to ASTM F732-17.

Feel free to contact us regarding your specific requirements. We are happy to answer your questions.

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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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