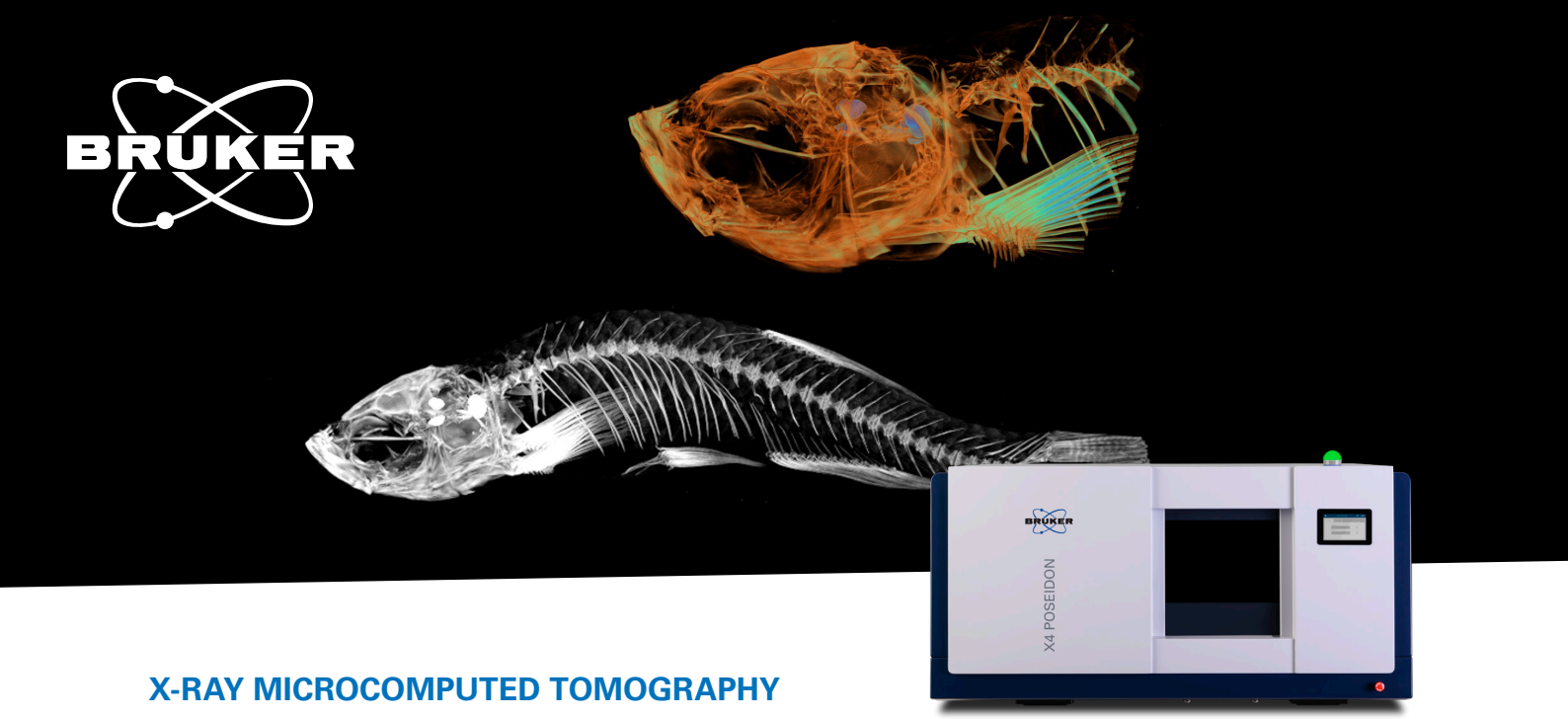

X-RAY MICROCOMPUTED TOMOGRAPHY

X4 POSEIDON – Zebrafish

Innovation with Integrity

Zebrafish (*Danio rerio*) have become a prominent model organism in biomedical research due to their conserved genetic similarity to humans, rapid development, and transparency during early life stages. MicroCT has emerged as a powerful imaging modality for non-destructive, high-resolution, three-dimensional visualization of zebrafish anatomy, facilitating detailed studies of their internal structures.

MicroCT provides comprehensive visualization of adult zebrafish organs in situ. Contrast-enhanced microCT, using agents like iodine, has been employed to differentiate soft tissues, allowing for detailed volumetric analyses of individual organs. MicroCT enables monitoring of skeletal development in zebrafish larvae and adults. This approach facilitates the quantification of bone volumes and mineral content during various developmental stages, providing insights into bone formation and potential phenotypic variations.

Zebrafish possess a unique regenerative capacity, particularly within their cardiovascular system. MicroCT aids in visualizing the structure and morphology of the heart and vasculature, quantifying blood flow dynamics and cardiac volume, and monitoring the impact of genetic mutations or drug treatments on cardiovascular function.

In cancer and tumor modeling, zebrafish serve as a powerful tool due to their genetic similarity to humans and the ease of inducing tumorigenesis. MicroCT enhances this research by visualizing tumor growth and vascularization in three dimensions, quantifying tumor volume and metastatic spread, and monitoring the therapeutic efficacy of potential treatments in preclinical trials.

Scan parameters

- Detector: 16 MP sCMOS
- Voxel size: 3 µm
- Source: Transmission type
- Source settings: 50 keV, 5 W
- Filter: No filter
- Rotation step: 0.2° over 360°

Cover Image: A zebrafish imaged at 3 µm isotropic voxel size

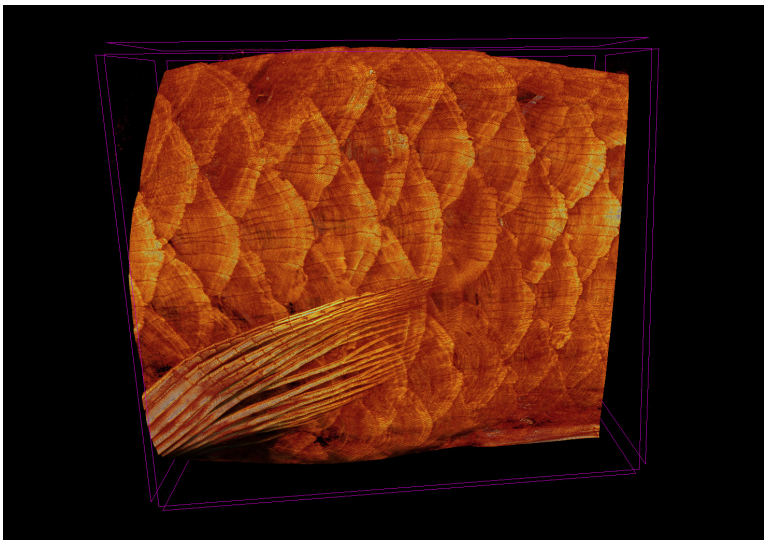

Figure 1: 3D rendered image of a zebrafish showing its scales, 3 µm isotropic voxel size

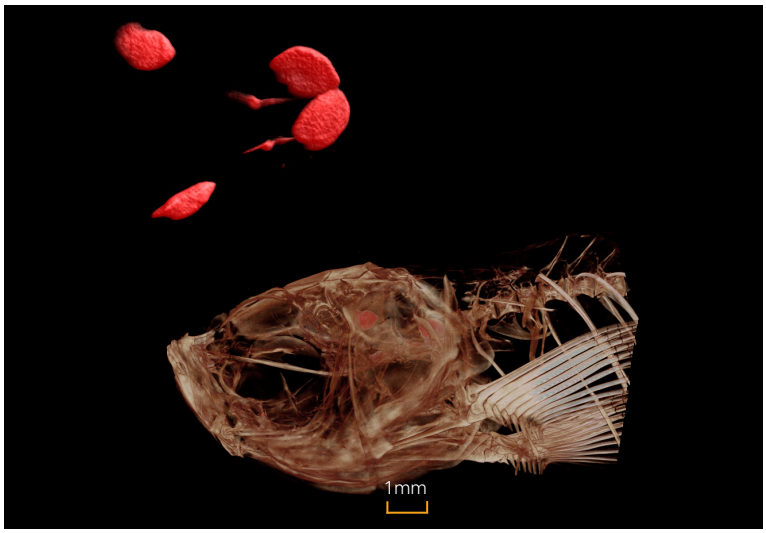

Figure 2: 3D volume rendering of: Top – otoliths inside the zebrafish head; Bottom – zebrafish head bones, 3 µm isotropic voxel size

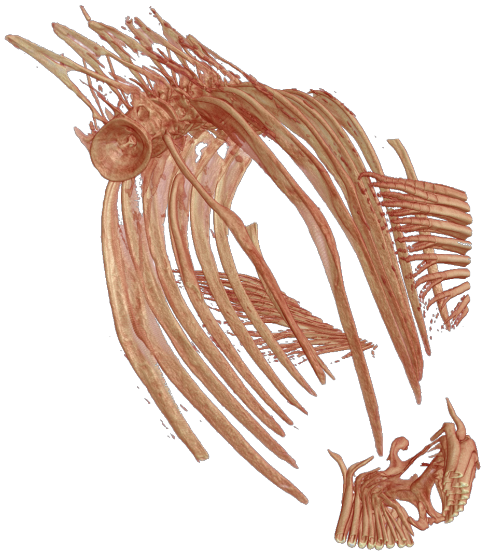

Figure 3: 3D rendered image of the zebrafish spine, 3 µm isotropic voxel size

The X4 POSEIDON microCT system, with a high-resolution sCMOS detector, enables precise analysis of zebrafish's internal structure. The transmission X-ray source, paired with the sCMOS detector, provides a focused, intense X-ray beam for exceptional resolution and contrast. Combined with fast acquisition and low noise, this system ensures high-speed, high-resolution 3D imaging, ideal for studying multiple aspects of the zebra fish.

The Bruker 3DxSUITE software package includes all the necessary tools for image processing and analysis, allowing the creation of 3D models through volume and surface rendering algorithms (Figure 1, 2, and 3).

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