How fundamental scientific research has revolutionized dentistry.

Professor Mehl, what does the term "biogeneric occlusal surfaces" actually refer?

The term "biogeneric occlusal surfaces" denotes the mathematical description of natural occlusal morphologies. It is based on the analysis of thousands of intact tooth surfaces and on objective algorithmic principles. This description is independent of specific expert knowledge and encompasses all previously valid occlusal concepts. The main advantage is that it is now possible to define all naturally occurring occlusal surfaces by means of just a few parameters and characteristics. This represents an effective data reduction. It is, in fact, comparable with the millions of different colours that can be described using the primary colours red, green and blue.

Why are patient-specific occlusal surfaces so important?

Occlusal surfaces have individual characteristics in terms of cusp positions and shape, fissure depth, tooth morphology, length and angular relationship. These features significantly affect the function of the masticatory system. For this reason dentistry has always attached top priority to creating dental restorations with natural occlusal surfaces – best of all occlusal surfaces which are as unique as the patient's fingerprints or DNA.

How did the development of the biogeneric principle come about?

Conventional wax-up and occlusion concepts cannot be transferred to a computer-aided design process due to the lack of the necessary metric data. If 10 dental technicians were asked to produce one and the same crown restoration, they would deliver 10 different occlusal designs. In most cases, with appropriate experience, these designs are clinically flawless aesthetic and highly functional. But as a scientist I am interested in metric and provable results that one can use with CAD/CAM. After all, nature created only one individual original tooth. Should it not be our aim, that the reconstruction result should correspond as closely as possible to the initial tooth?

What are the implications for practical CAD/CAM dentistry?

It is important that the restoration harmonizes with the overall clinical situation. This goal cannot be achieved by means of a "standard occlusal surface" which does not make allowance for natural diversity. In order to attain a patient-specific outcome the dentist has so far been forced to make numerous manual adjustments – either via the software or during the placement and milling.

What about the existing dental databases?

Dental databases were an important step on the way to patient-specific restorations. From a scientific viewpoint, however, the biogeneric principle offers simply more advantages. Regardless of how many teeth a very good dental database contains, it will never reflect nature's morphological diversity. The selection process of the correct tooth will always be subjective. By contrast, biogeneric is founded on the basis of objectively measurable criteria and takes account of metric parameters. As a result biogeneric is capable of reproducing each clinical tooth situation. It encompasses much more information than even the largest dental database.

How does the biogeneric principle function specifically?

Like a fingerprint each person's dentition has its own signature, its own DNA. Biogeneric succeeds in identifying the genetic blueprint that determines morphology and occlusion and hence obtains vital information for the reconstruction. In the case of inlays and onlays the biogeneric software uses the residual occlusal tissue surrounding the cavity of the prepared tooth. In the case of crowns the user creates digital impressions of the preparation and a further intact tooth, preferably the antagonist, adjacent tooth or contralateral (1). On the basis of the intact morphology the CEREC Biogeneric software can generate a matching restoration proposal (2). Scientific analyses demonstrate that the restoration proposal closely reproduces the original occlusal surface (3), individually for each patient.

1	2	3
Intact antagonist as basis source of information	Restoration: automatically generated initial proposal	The original occlusal surface