

Scientists launch first comprehensive database of human oral microbiome

March 26 2008

Scientists know more today than ever before about the microbes that inhabit our mouths. They know so much, in fact, that gathering all of the relevant bits of information into one place when designing experiments can be a job in itself. Now, grantees of the National Institute of Dental and Craniofacial Research (NIDCR), part of the National Institutes of Health, and their international colleagues intend to solve this problem with the launch of the first comprehensive database of the oral microbiome, or the approximately 600 distinct microorganisms currently known to live in the mouth.

The free online compendium is called the Human Oral Microbiome Database (HOMD). The database goes live today as the digital equivalent of an Oxford dictionary of oral microorganisms, providing detailed biological entries for each species and an extensive catalogue of the thousands of genes that these microbes express. The site is located at <http://www.homd.org> and is overseen by scientists at The Forsyth Institute in Boston and King's College London in England.

“The HOMD fills a critical research need,” said NIDCR director Lawrence Tabak, D.D.S., Ph.D. “The oral microbiome is extremely rich in data, and HOMD becomes the essential search engine for scientists to view and retrieve this information, generate novel hypotheses, make computational discoveries, and ultimately develop more biologically sound therapies to control oral diseases.”

According to Floyd Dewhirst, D.D.S., Ph.D., a leader of the project and

a scientist at The Forsyth Institute, HOMD also introduces the first comprehensive nomenclature system to bring order to the naming of uncultured or previously unnamed oral microbes. The standardized numbering system helps to eliminate the Babel of confusing names and uninformative database designations that have frustrated scientists and sometimes hindered their research.

The database also categorizes each microbe by its 16S rRNA sequence, a distinctive fingerprint of genetic information that scientists have used for the past two decades to identify microorganisms. This sequence information allows the microbes to be placed in a family tree that shows how they are related to one another. For those organisms whose DNA has been sequenced, HOMD provides online tools to view and analyze all of their genes and proteins. Each category of information in the database is interlinked, readily searchable, appropriately annotated, and will be frequently updated to remain current.

Dewhirst noted that although HOMD has officially opened to scientists, the database remains an ongoing project. “We’ve already assembled a great deal of useful information for the research community, but we will continue to expand and refine the database for the next several years,” said Dewhirst. “I can see the Human Oral Microbiome Database serving as a valuable model for other microbiome databases now and in the years to come.”

Informally called “biology’s next revolution,” microbiome studies have opened a needed window into the complex microbial communities that occupy most parts of the human body. These studies will define how microbes contribute to sustaining health and, when their community dynamics are perturbed, play a role in common chronic disease, such as tooth decay and periodontal disease in the mouth. In December 2007, NIH launched the Human Microbiome Project that initially will sequence all of the genes, or genomes, of 600 representative

microorganisms sampled from microbial communities in the mouth, skin, digestive tract, nose, and female urogenital tract. Additional studies are either under way or under development.

Among those already well under way is a NIDCR-supported project to compile a full catalogue of the complete genomes of all oral microbes. It has generated a tremendous amount of data and, coupled with the decades of more traditional studies of oral bacteria, the need for a comprehensive, user-friendly database has become a priority.

“The oral microbiome is currently better understood than those of other sites in the body, such as the intestine,” said Dr. Bruce Paster, Ph.D., also at The Forsyth Institute and another project scientist. “Since oral microorganisms appear in infections throughout the human body, the HOMD database certainly will be useful to physicians. Likewise, microbiologists in industry will find HOMD helpful because oral microbes sometimes contaminate food or the drug manufacturing process.”

Source: National Institute of Dental and Craniofacial Research

Citation: Scientists launch first comprehensive database of human oral microbiome (2008, March 26) retrieved 1 May 2024 from <https://medicalxpress.com/news/2008-03-scientists-comprehensive-database-human-oral.html>

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