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Novel biosensor for use on teeth

Daniel Zimmermann
DTI

PRINCETON, NJ, USA: Princeton University researchers have successfully tested a special kind of biosensor that could help to prevent disease by detecting even small amounts of harmful bacteria more quickly than conventional methods. Using a “tattoo” made from silk and gold and attached to a cow’s tooth, they were able to transmit a signal wirelessly to a nearby receiver.

With the method, developed in collaboration with the US Air Force and the American Asthma Foundation, the researchers hope one day to be able to detect not only bacteria but also DNA or particular viruses. In lab tests conducted at Princeton’s School of Engineering and Applied Science this year, they were able to detect pathogens responsible for surgical infections and stomach ulcers, among others.

The signals are received from a gold antenna on a tattoo that is attached to an array of graphene—very small particles of carbon—that triggers a signal when in contact with bacteria



The sensor consists of a graphene layer printed onto a bioresorbable silk substrate. (DTI/Photo Princeton University, USA)

through attached proteins called peptides. Therefore, the device does not require any power supply, the researchers said.

The sensor is held in place by a water-soluble silk base derived from insect cocoons. In this way, the researchers said, the sensor can be used on different kinds of

biomaterials, like teeth or skin, and washed away or dissolved by body enzymes after use.

According to the researchers, there is still a long way to go before such a biosensor could be in regular use, since the sensor is still too large to fit on human teeth and its lifetime and trans-

mission distance are short. They admitted, however, that a few modifications to the design of the sensor could increase its transmission distance in the future.

Most traditional biosensors are based on substrates like silicon, which makes them heavy and uncomfortable to wear. [1]

Biomaterial stimulates healing

A group of researchers from South Korea, Switzerland and the US has found that blood platelet biomaterial significantly improves the healing process after placement of dental implants. In a case study conducted in Italy, they observed beneficial short- and long-term results after the replacement of a fractured central incisor.

The material seems to act as a bio-membrane that protects the implant from the oral environment. It also appears to stimulate the growth of cells and to accelerate gingival healing and maturation. After seven days, they found that the gingival aesthetic profile was well defined. At six months, they reported a satisfactory final result that was still stable and aesthetic after two years.

According to the researchers, L-PRF is simple, inexpensive and easy to prepare in only 15 minutes. Moreover, it is free of additives, such as anticoagulant, a substance that prevents the clotting of blood, or chemicals for activation, they said. [2]



US Marines prepare for the deployment of military forces during the Pacific-Partnership mission in 2011. The annual campaign provides medical and dental relief to more than 20,000 people in South-East Asia. (DTI/Photo courtesy of US Navy/Kristopher Radder, USA)

► ASIA NEWS, page 2

Australian dentistry gets boost

The Australian government has announced to provide over AUS\$500 million to oral health care services in the country over the next four years. The cash injection is supposed to lower waiting lines for public dental services and help dentists to relocate to remote or underserved areas, among other measures. [1]

Geistlich celebrates market entry

The Swiss company Geistlich has recently celebrated the successful registration of Bio-Oss in Japan. Besides the bone substitution material, the company also aims for the market approval of an indication extension of Bio-Oss for implantology as well as its collagen membrane for bone regeneration Geistlich Bio-Gide in 2012. [2]

Astra Tech backs up implant line

Astra Tech has presented new clinical data confirming the clinical effectiveness of its dental implant system. The results gathered through the company’s global research programme show almost 100 per cent survival rates for the company’s OsseoSpeed implants in sites like the posterior mandible.

Recent multicentre studies have also demonstrated the safety and predictability of OsseoSpeed 3 mm narrow implants and OsseoSpeed Profile implants, company officials said at the Astra Tech World Congress in May.

Since 2011, Astra Tech has been part of DENTSPLY, a US dental company that manufactures and distributes the ANKYLOS and XiVE implant systems through its German-based subsidiary DENTSPLY Friadent. [1]



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Dr Selma Camargo, DDS, PhD

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Dr Sebastian Ciano, DDS

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Dentists take part in military-led aid mission to Asia Pacific

International humanitarian campaign aims to provide treatment for more than 20,000 people

WASHINGTON, DC, & SAN DIEGO, CA, USA: In one of the worst natural disasters in recent times, the Boxing Day tsunami killed more than 200,000 people in South-East Asia. Following the catastrophe, humanitarian missions organised by the Pacific Partnership have been conducted in the region each year since 2006. Recently, the first support troops including military dental providers were deployed from around the world for this year's campaign.

According to Mission Commander US Navy Captain James Morgan, who spoke to reporters before embarking, the joint exercise will see repeated visits to regions and islands in Indonesia, the Philippines, Cambodia and Vietnam during the next two months. Up to 100 dental providers will be taking part in the mission, which is budgeted at US\$20 million and expected to resume in early August.

"While at a host nation, I expect we'll see anywhere from 60 to 100 patients daily, and sometimes, patients need more than one procedure performed," commented William Robinson, a US Air Force major and dental provider from San Antonio.

Besides dental services like teeth cleaning and extraction, military personal will also provide other medical and engineering aid, as well as training to local medical professionals.



US Sailors stand in ranks at a promotion ceremony during Pacific Partnership 2011 onboard the amphibious transport dock ship USS Cleveland in the Arafura Sea. (DTI/Photo courtesy of US Navy, USA/Michael Russell)

Approximately 1,000 professionals, both military members and civilians, are expected to join the mission, which, according to Captain Morgan, is supported by non-governmental organisations such as the San Diego Pre-Dental Society and intended to enhance international cooperation, as well as regional capability for future emergency response. Several countries, including France, Singapore and South Korea, are participating for the first time, he said. Besides the US, Canada, Japan, New Zealand and Australia have contributed resources regularly since the beginning.

The last mission in 2011 provided treatment to more than 21,000 patients.

The Partnership is hosted by the US Navy, which also provides major transportation and logistic support through the USNS Mercury, one of its two currently operating hospital ships. According to Captain Morgan, it will offer capacity for between 100 to 150 surgeries per day offshore and on land.

With almost 200 ships and more than 500,000 troops in the region, the US Pacific Fleet is currently the largest naval military power in the Asia Pacific region. During a visit to the region in November last year, US president Barack Obama announced his intentions to strengthen US-AP relations to promote stability in the region, of which the Partnership is considered an essential part. [DTI](#)

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Elexxion signs new distributor for Asian markets

Dental Tribune Asia Pacific

HONG KONG/RADOLFZELL, Germany: Dental laser specialist elexxion has reported that it has signed a new distribution agreement with Global Dental Supplies in Hong Kong. The five-year contract will give the dental distributor the exclusive rights to distribute elexxion's laser technology for use in dentistry in several Asian countries.

Currently, the German company sells its products through its subsidiaries and dealers in selected markets, such as India and

Japan. The distribution rights for Hong Kong and Macau were previously held by Healthcare Dental, which did not renew its contract with elexxion after 2009, company officials said.

Besides elexxion dental lasers, Global Dental Supplies also distributes products from the German implant company BEGO, Sunstar, Bisco and GC, among others.

"With Global Dental Supplies we have a strong partner that gives us the opportunity to systematically expand our sales and marketing activities in Asia," commented elexxion CEO Per Liljenqvist.

He said that his company could benefit from the agreement in terms of product registration and exhausting new distribution channels in the region.

The latest elexxion product offering includes the delos 3.0, a novel Er:YAG/diode laser combination indicated for a wide range of dental applications.

In addition, the company distributes the pico mobile diode laser and duros, an Er:YAG dental laser device claimed to facilitate efficient hard-tissue surgical preparation and bone ablation tasks. [DTI](#)



View of Hong Kong harbour.

AD

Regulation in Malaysia gets revamped

Daniel Zimmermann
DTI

PUTRAJAYA & KUALA LUMPUR, Malaysia: Medical device regulations are being stepped up in Malaysia with the upcoming launch of a new governmental agency that will require local manufacturers and importers to have their products officially registered before they enter the market. The Medical Devices Authority, which will replace the current Medical Device Control Division, will operate under the authority of the Ministry of Health and be led by the country's Director-General of Health.

As part of the 2011 Medical Device Act ratified by the Malaysian parliament late last year, the regulatory changes are intended to protect domestic businesses from patent infringement and patients from the health risks posed by low-quality devices. From November, all products will be classified into four risk categories, ranging from low to high, Ministry of Health officials commented. They said that non-compliant companies will be fined a maximum of RM200,000 (US\$65,600).

To date, the registration of medical devices in Malaysia has been voluntary and imports have been largely uncontrolled.

Speaking to *Dental Tribune Asia Pacific*, Ultradent's General Manager for Asia Pacific, Nicolas Sondaz, said that no official information had yet been communicated by the ministry with regard to dental devices. His company, which sells restorative materials and tooth-whitening kits, among other products, opened its Asian headquarters last year in Kuala Lumpur.

"The process of product registration has been quite slow in Malaysia," he said. "We hope that the Ministry of Health will consider the size of the market and place the fee for each product registration accordingly." [DTI](#)

From left: G. Ubassy, Dental Technician, France | M. Roberts, Dental Technician, USA | M. Temperani, Dental Technician, Italy | D. Hornbrook, Dentist, USA | O. Brix, Dental Technician, Germany | U. Brodbeck, Dentist, Switzerland | G. Gürel, Dentist, Turkey | C. Coachman, Dentist, Germany | A. Shupperson, Dentist, New Zealand | A. Bruguera, Dental Technician, Spain | S. Kanaka, Dental Technician, Japan | S. Kina, Dentist, Brazil

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¹ M. Kern et al. "Ten-year results of three-unit bridges made of monolithic lithium disilicate ceramic"; Journal of the American Dental Association; March 2012; 143(3):234-240.
² Mean observation period 4 years IPS e.max Press, 2.5 years IPS e.max CAD.
³ See the IPS e.max Scientific Report Vol. 01 (2001–2011).
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Dear reader,



Daniel Zimmermann
DTI

When you are reading this words, I will have already departed to cover the 7th congress of the European Federation of Periodontology in Vienna. Thousands of professionals involved in periodontology and dental implantology are expected to gather in the Austrian capital in June to discuss latest research results and concepts to fight periodontal diseases.

Although occasionally overlooked, the prevalence of those diseases remains one of the biggest challenges that all professionals in every field of dentistry have to face nowadays in daily practice. From orthodontic treatment to long-term maintenance of dental implants, almost every clinical success depends on a healthy periodontium.

Owing to deteriorating trends in health like the obesity epidemic with its side effects in large parts of the US and Europe, this challenge is expected to rise considerably in the years to come, since periodontal inflammation and gum disease have been proven to be closely related to the general state of health.

Unfortunately, in many countries, periodontology still plays a minor role when it comes to dental education as well as the number of chairs and positions established at universities and dental schools.

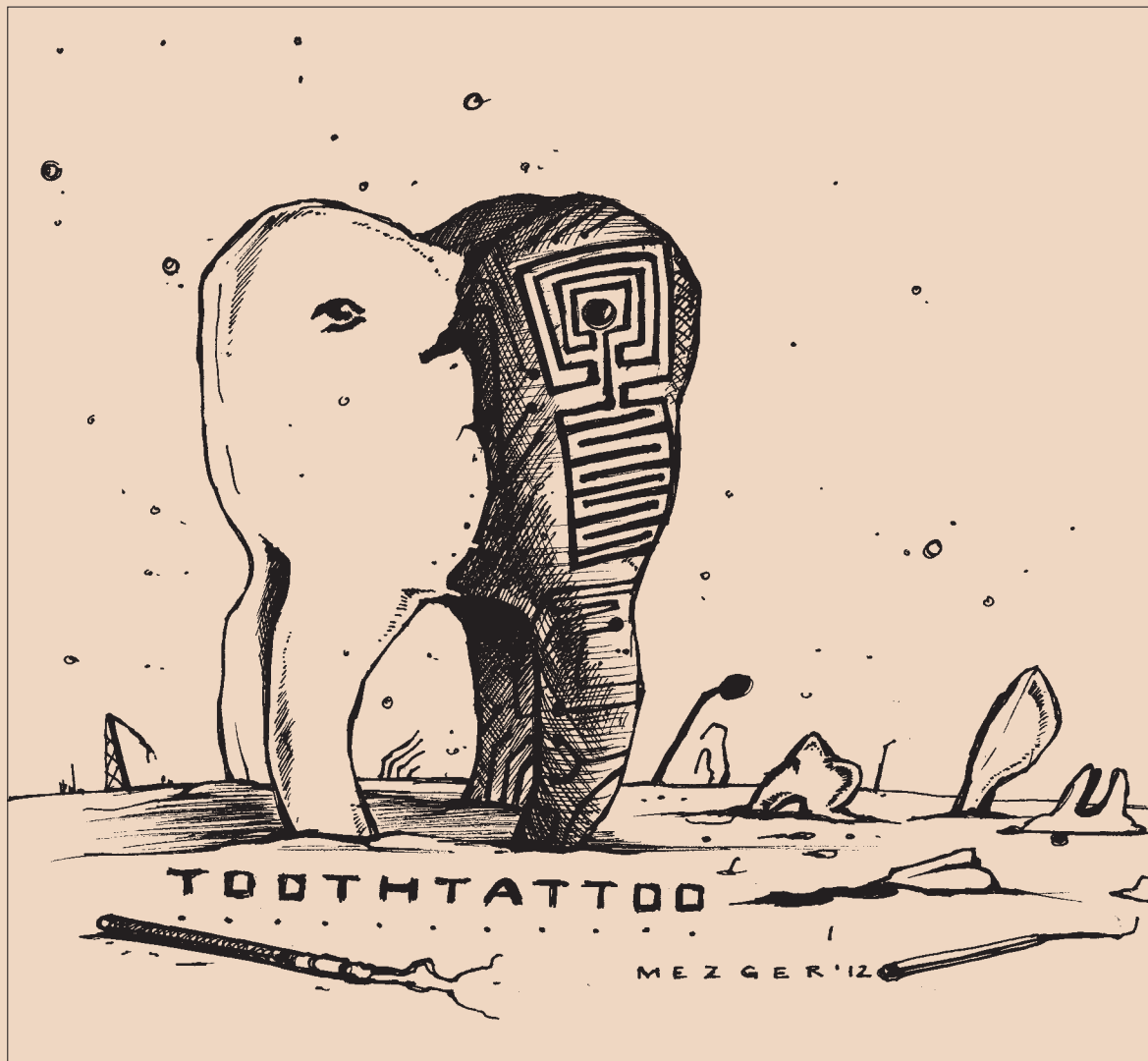
In addition, interdisciplinary cooperation between periodontists and other fields of dentistry is still lacking, despite the fact that dental professional organisations recommended to check the periodontal status before starting any treatment.

The participation of many dental implant specialists at this Europerio is a ray of hope that the dental community is beginning to understand that their future is not only depending on teeth but also on the tissue that surrounds them. [DTI](#)

Yours sincerely,

Daniel Zimmermann
Group Editor
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Vaccination against periodontitis



Professor Lior Shapira
Israel

Prevention of disease, in this case chronic periodontitis, is always better than cure. Developing a vaccine for periodontitis has been a hot subject for periodontal researchers. The old dogma was that the role of vaccination is to induce a humoral immune response, meaning protection by the production of memory B cells and antibodies against the

from Seattle was the leader in periodontal vaccination research. They vaccinated primates with whole-cell *P. gingivalis*, and demonstrated partial protection against experimental periodontitis. Interestingly, they found that the levels of specific antibodies against *P. gingivalis* were high in all animals that were exposed to the bacteria, immunized and non-immunized, and antibody production was not able to explain the protection achieved.

From then on, significant efforts were made in identifying molecules that are virulence fac-

taining the code for the adhesive part of an important cysteine protease of *P. gingivalis*, rgpA. The vector in bacteria was expressed by our own Dr. Asaf Wilensky, who produced a recombinant peptide and used it in vaccination experiments with mice, in which periodontitis was induced by inoculation of *P. gingivalis*, and bone loss was assessed using micro-CT.

A recent hypothesis is that targeting *P. gingivalis* may have a community-wide impact on the flora, and may be important for preventing chronic periodonti-

“...we still lack data from clinical trials in animals...”

pathogen. This dogma however is too simple. Recent evidence suggests that immunization can modulate the host response and shift the response, a key element in successful protection. The nature of the cellular response and which molecules are secreted to the site by these cells are critical to disease processes, as well as protection.

What is the process of developing a vaccine? First, we have to identify the key pathogens, and then identify and isolate virulence factors from the pathogens as candidate antigens. The candidate vaccine should be tested first in preclinical models followed by safety and efficacy tests in humans.

Eighteen years ago, a research group headed by Roy Page

tors and may serve as good candidates for vaccine development, with most researchers concentrating on molecules derived from *P. gingivalis*. Some of its proteins were isolated and used for immunization studies. Many investigators focused on a specific group of important enzymes — cysteine proteases, which are considered to be essential for *P. gingivalis* survival and for disease pathogenesis.

Modern molecular biology offers new approaches to making vaccines by cloning genes from bacteria, expressing the protein antigen in other bacteria in culture and isolating the pure protein in the laboratory. This makes the preparation safer and easier to prepare. Professor Mike Curtis from the Queen Mary, University of London has cloned a gene con-

tis. So, how close are we to developing a periodontitis vaccine in 2012? Well, we still lack data from clinical trials in animals and there is not enough preclinical data. Therefore, we are still far from phase III experiments in humans.

Yet, there is hope. Better understanding disease pathogenesis in animal models will help us in developing the right vaccine for the right target. [DTI](#)

Contact Info

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Microbiological infections



Wim Crielaard
The Netherlands

Modern molecular analyses and in particular *next-generation sequencing* (NGS) techniques have revolutionised oral microbiology. Being able to analyse all oral bacteria, the oral *microbiome*, is of particular relevance and importance because it is well known that micro-organisms cooperate collectively in a *polymicrobial* ecosystem, causing chronic oral infections, such as periodontitis.

Studies of cultivable sub-gingival micro-organisms had already shown that the predominant bacteria in periodontally healthy sites are Gram-positive facultative rods and cocci. In periodontitis, there is a decrease in the number of these “healthy” organisms and an increase in the number of “pathogenic” Gram-negative rods and spirochetes.

Indeed, culturing sub-gingival micro-organisms has provided considerable knowledge on the pathogenic bacteria associated with periodontitis, but unfortunately this approach is limited by the fact that it focuses (by definition) on cultivable micro-organisms. As has been underlined frequently in the past, many oral bacteria cannot be cultivated and therefore conclusions are drawn on an incomplete picture. With this in mind, and because scientists started to realise that the polymicrobial ecosystem actively *sustains* oral health, even before NGS, molecular microbial analyses had been developed, which give a better, more complete overview of the oral microbial ecology in health and during disease.

Many molecular microbial analyses have been targeted at a selection of (pathogenic) micro-organisms, but only *open-ended* approaches, where there is no selection for specific species to be detected, can be used for oral microbiome studies.

The open-ended approach that has been most widely used for oral microbial communities and oral infections is the 16S rRNA gene clone-library approach. Indeed, by using this technique, several uncultivated bacteria were found to be associated with periodontitis, but after the first NGS study in which several orders of magnitude (i.e. millions) bacterial 16S DNA codes were analysed, it became clear that so far we had only explored the tip of the iceberg. [DTI](#)

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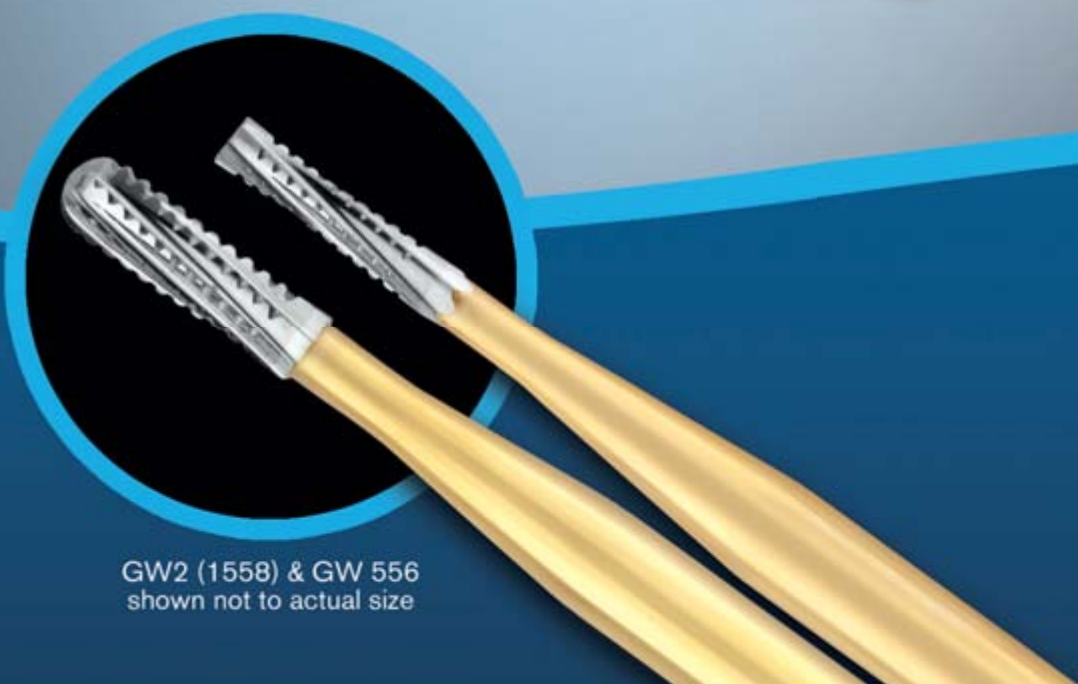


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Dr Cristiano Tomasi

“Evidence for risk factors related to a specific form is still weak”

An interview with Dr Cristiano Tomasi, Sweden, on aggressive vs. chronic periodontitis

Aggressive and chronic periodontitis share many clinical features yet are also different

in terms of development and progression. On occasion of Europerio 7 in Vienna this

month, Dr Cristiano Tomasi from the University of Gothenburg in Sweden spoke

with DTI Group Editor Daniel Zimmermann about the importance of early identification and why the identification of risk factors associated with both forms of periodontal disease remains difficult.

Daniel Zimmermann: Both chronic and aggressive periodontitis are complex infections. What is the basic microbiology underlying this disease?

Dr Cristiano Tomasi: Probably the most important microbiological feature is the establishment of a sub-gingival biofilm. The evidence suggests that periodontal disease is not related to a specific micro-organism but rather to a complex environment of many different species that live in symbiosis. In a susceptible subject, the biofilm challenge will prompt a host response that will lead to the destruction of periodontal support.

It is estimated that between ten and 15 per cent of adults in developed countries suffer from chronic periodontitis. Are there any figures available for the aggressive form?

This question is not easy to answer. In fact, even for chronic periodontitis, prevalence differs significantly, depending on disease definition and the population studied. Furthermore, most epidemiological studies have only addressed the prevalence of periodontitis, with no distinction between the aggressive and chronic forms.

The range in prevalence when mild cases are included may reach 40 per cent in a population. The prevalence of the aggressive form, according to one study, was four per cent for localised forms and two per cent for generalised forms in a population ranging between the ages of 18 and 30. Other studies have suggested prevalence of severe cases in a young population of up to eight per cent.

Generally speaking, we still lack epidemiological data from studies that directly address this question.

One of the main differences between both forms appears to be the age group in which they commonly occur.

Age remains an important parameter for distinguishing the two forms. While severe cases at age 20 are commonly recognised as aggressive, those at 60 are mainly diagnosed as chronic. The diagnosis of

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both forms, however, is clinical and basically follows the same steps.

A problem is that in many cases it is not actually possible to identify the age at which the periodontal disease started, so it is not easy to draw conclusions on clinical features related to age of onset.

What are the main challenges in differentiating between both forms?

I really think that the most important thing is to diagnose and intercept periodontitis as early as possible. A screening probing can reveal initial periodontal destruction and signs of inflammation quite easily, allowing for an early and effective intervention.

Marking the fine distinction between aggressive and chronic forms could be another step, but the implications of these studies would be more interesting for researchers than for clinicians. If we are successful in our treatment, is it really important what we call the disease? And if we are not successful, do we blame the name of the disease?

One clinical consideration may be that the systemic use of antibiotics as adjunctive treatment is supported by studies on aggressive cases, but I think that with regard to the problem of microbial resistance induced by excessive use of antimicrobials, this approach should never be the choice for initial treatment, but be considered after re-evaluation to accompany mechanical retreatment of the remaining diseased sites. This view, however, is not shared by some periodontologists, who view the first treatment attempt as the important one.

Both forms of periodontitis share risk factors. What are the most common?

Periodontal disease is clearly the result of an unbalanced host response to the microbial challenge. It is therefore obvious that the genetic set-up of the host and the microbial composition of the biofilm are recognised as risk factors for the development of the disease.

Environmental factors like smoking and stress have also been correlated with the progression of the disease and its most severe forms.

It is a more difficult task to determine risk factors that are clearly associated with one of the two forms of the disease. A few studies have shown specific bacteria to be associated with aggressive forms, but others have also reported aggressive forms without the presence of those bacteria. The same thing happened with specific genetic polymorphisms. New insights are expected to come from epigenetic studies, in which the activation of specific genes is related to local environmental factors.

“If we are successful in our treatment, is it really important how what we call the disease?”

How important would these be considered to be?

Unfortunately, it is still not clear. Some risk factors are related to the establishment of the disease, while others are

related to the progression rate. As I said before, the evidence for risk factors related to a specific form is still weak and the evidence not as strong as we would like it to be.

You have presented at the 7th congress of the European Federation of Periodontology. What can participants expect to take home from the presentation?

I hope to clarify the similarities and differences between the two forms of periodontitis. We will go through the most recent published results on those issues and try to sort things out as much as possible.

I see this as a real challenge. I will share my thoughts and my doubts on some questions that every clinician has to face on a daily basis.

Thank you very much for this interview. ■

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Conical internal connections will fuel future growth in European dental implant market

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The dental implant and bone graft substitute market is the most rapidly advancing segment of dental technology, and leading competitors in this market must consistently develop new products supported by research from scientific and academic organisations to remain competitive. Recent cases have demonstrated that when companies lose a segment of support from the scientific community, their market shares tend to suffer significantly.

The European dental implant and bone graft substitute market has been further challenged by recent economic instability and the eurozone crisis, which has created a consistent demand for lower-cost dental implant products. As a result, many lower-priced competitors have begun to seize larger market shares in almost every European market. In many segments, these competitors are either regional or sourced from overseas markets such as Brazil, Korea and Israel. Regenerative products and barrier membranes have been particularly affected by consumer austerity, as these products are discretionary in many cases.

However, a growing number of consumers continue to demand high-quality products, guarantees of service and scientific improvements, which only premium manufacturers are equipped to offer. Conical internal connections is one such recent innovation, and currently constitute the fastest-growing connection type in the dental implant industry.

Many dental implant and bone graft substitute companies have looked to expand their product portfolio or create new markets while they create package deals to offset competition from rapidly emerging lower-priced competitors. Significantly, many European and US companies involved in this market have begun to invest in rapidly emerging periphery markets such as Turkey.

Increasing prevalence of conical internal connections

Dental implants are connected to final abutments in one of three ways: internal connections, external connections or single-unit devices in which the implant and abutment are already attached. Furthermore, internal connections have two sub-segments: butt-joint internal connections and conical internal connections.

Research has shown that a lack of intimate fit of the im-



View of Istanbul at sunset. Turkey is expected to become one of the major growth markets for dental implants in Europe. (DTI/Photo Tatiana Popova)

“...this market is expected to overshadow butt-joint internal connections increasingly...”

plant in the abutment or movement of the implant can provide an area for bacterial growth. Conventional butt-joint connections provide a connection that can result in micro-movement between the implant and the abutment, creating a pump effect for bacteria into the connection area. When bacteria are present in the micro-gap, they can cause inflammation, tissue recession and bone loss. Recent clinical studies have demonstrated that, on average, conical connections offer a smaller micro-gap than butt-joint connections, in addition to a greater mechanical level of stability. As a result, conical connection types have become hugely successful in the dental implant market, and the majority of leading dental implant manufacturers have introduced conical internal connection products. Conical connection types will continue to represent one of the fastest-growing segments of the dental implant market.

Turkey one of the fastest growing markets in the world

Turkey is one of the fastest-growing dental implant markets, congruent with strong economic growth that weathered the recession far better than the US and nearly any region in Europe. The technology of dental implants in this country has advanced rapidly, as most of the major players in the European market moved quickly to gain a strong market share in Turkey. Additionally, this market benefits from low labour costs, which adds to the incentive for implant compa-

nies to establish domestic subsidiaries or local distribution partners, fuelling options for consumers. Turkey is also a popular destination for dental tourism, especially among patients from more expensive European markets. From 2008 to 2018, the Turkish dental implant, final abutment and computer-guided surgery market is expected to grow at a compound annual growth rate of 20.4 per cent.

that will offer lower-priced products to compete domestically and later internationally with larger implant companies.

EU medical tourism to strongly impact dental implant market

The EU directive on cross-border healthcare that comes into force in 2013 will have a strong impact on the European dental implant market. This directive will target the medical

rapidly developing the quality of the medical services they offer.

The UK features one of the highest rates of outbound dental tourism, as patients are unaccustomed to large out-of-pocket costs for procedures, owing to the legacy of the National Health Service. Whereas rich patients from developing countries used to come to prestigious hospitals in the UK and elsewhere for treatment, outbound medical travel from the UK has been growing far faster than inbound over the past decade, as UK patients are increasingly traveling abroad for lower-cost care. Figures suggest more than 50,000 citizens of the UK go abroad for treatment annually. The number of outbound medical tourists from the UK rose by 170 per cent from 2002 to 2009.

Dental implant companies follow success of conical internal connection

Internal connection types as a whole are becoming increasingly dominant in the dental implant market. Conical internal connections and butt-joint internal connections represented 85.4 per cent of implants with an internal connection in 2011. Conical internal connections is the fastest-growing segment of the market and expected to increase at a compound annual growth rate of 10.1 per cent by 2018.

NobelActive (Nobel Biocare) was one of the foremost early successes of conical connection types, and was rapidly adopted by consumers owing to clinical results demonstrating its greater stability and smaller micro-gap between implant and abutment. The majority of large companies now offer a conical connection, as this market is expected to overshadow butt-joint internal connections increasingly owing to the greater stability and perceived smaller-diameter micro-gap offered by conical internal connections. Many companies are combining these connection types with tapered shape and surface treatments as the current generation of premium products. [DTI](#)

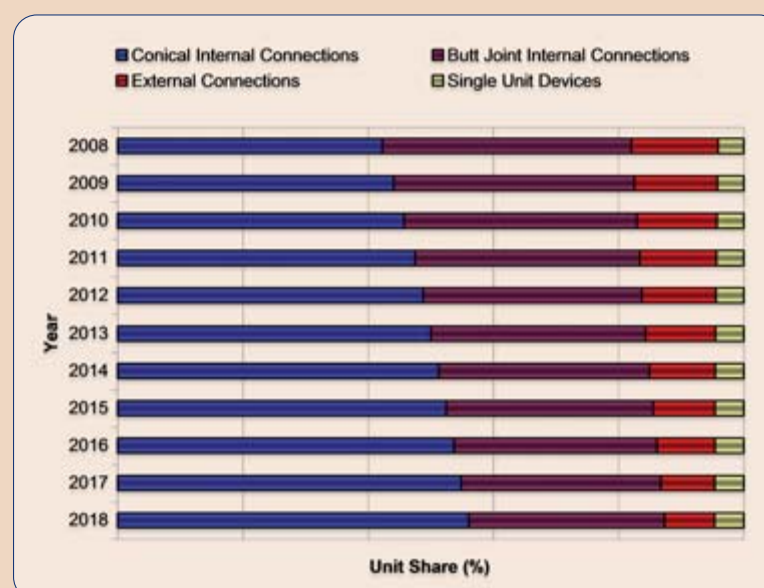


Fig. 1: Unit share by connection type, Dental Implant Market, Europe, from 2008 to 2018. (Image courtesy of iData Research Inc.)

In May 2011, AGS Medikal Ürünleri, the first major Turkish company to produce dental implants, commenced operations in the province of Trabzon, on the coast of the Black Sea. The company was established with an initial 5 million Turkish lira investment. Market experts predict that the company will soon be joined by other Turkish dental implant manufacturers

tourism market, which is significant, as dental treatment procedures account for nearly half of medical tourism in most major markets. The directive gives patients the right to be reimbursed for treatment they receive in other EU countries. This could lead to more Western Europeans traveling to Eastern Europe, including Poland and Bulgaria, which are

The information contained in this article was taken from two detailed and comprehensive reports published by iData Research (www.idataresearch.net), entitled “European Markets for Dental Implants, Final Abutments and Computer Guided Surgery” and “European Markets for Dental Bone Graft Substitutes, Dental Membranes and Tissue Engineering.”

iData Research is an international market research and consulting firm focused on providing market intelligence for the medical device, dental and pharmaceutical industries. For more information and a free synopsis of the above report, please contact iData Research at dental@idataresearch.net.