

today

SHOW
PREVIEW

Another record outcome



Koelnmesse Chief Operating Officer Katharina C. Hamma about IDS 2015 and what new offerings visitors can look forward to this year.

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Cone Beam Computed Tomography



Dr Lee M. Whitesides, USA, on the latest trend in maxillofacial imaging and why it should be considered a new standard of care.

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An eye on the industry



With more companies to be participating in IDS than ever before, there will be plenty of new products to see and discover.

» page 34

IDS sets up largest showcase ever for dental innovation

More than 125,000 expected for bi-annual event in Cologne



IDS[®]
2015

More visitors than ever will be attending the International Dental Show (IDS) in Germany, representatives of the organiser Koelnmesse and the Association of German Dental Manufacturers announced at a press conference last December in Bergisch Gladbach near Cologne. They said that over 125,000 professionals are expected at the world's largest dental showcase, which will be held again in a month's time, to learn about the latest developments and trends in dentistry.

With registrations in early December already surpassing those from the 2013 show, a record number of dental

*Representatives of Koelnmesse and the German dental industry look forward to another record-breaking International Dental Show. (Photograph: Daniel Zimmermann, DTI)

companies have already registered for the five-day event. Owing to the increase, the show will occupy an additional hall at the Koelnmesse fairground, extending the overall exhibition space to 150,000 m² for the first time.

According to Koelnmesse Chief Operating Officer Katharina C. Hamma, almost every fourth company exhibiting at IDS is from outside Germany.

"The high level of internationality and the wide range of exhibits are unique worldwide. This is why the International Dental Show is a must-attend event for anyone who is involved in the dental business," she said.

Chairman of the Association of German Dental Manufacturers Dr

Martin Rickert said that, while the show will cover the entire spectrum of dental products, a special focus will be on the ongoing digitalisation in dentistry and linking of different systems for better diagnostics and treatment. The latest developments, including new and improved filling materials in conventional fields like restorative dentistry, will be on display as well. As a first, IDS 2015 will have Career Day, which is intended to serve as a meeting platform for the industry and young dentists. Professional visitors will also have the opportunity to experience the use of new technologies as part of the novel Know-how Tours, which are being organised in collaboration with two well-known dental practices in Cologne. Proven features, like the Speakers' Corner lecture forum and Dealers' Day on the

first day of the show, will be continued.

Held every two years in the Rhine city, IDS is one of Germany's oldest trade shows and is organised by the dental industry in Germany. In recent years, it has developed into one of the most important global exhibitions for dental products and services, attracting professionals from over 140 countries. Most companies choose to premiere their newest product developments here. ◀

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Know-how Tours: IDS takes visitors to Cologne's top dental offices

■ The next International Dental Show (IDS) will be held in Cologne from 10 to 14 March 2015. In addition to Career Day, the organisers have a new exciting excursion in store for visitors: the IDS Know-how Tours. The tours offer exclusive visits to two of the most prestigious dental practices in Cologne and are aimed at interested dentists who would like to network and share their expertise on the latest and most advanced dental techniques with their colleagues.

On 10, 11 and 12 March, after the closure of the dental fair, interested participants can choose between a visit to the practice of Dr Ali Teymourash in Cologne's PAN Clinic or the premises of Dr Cyrus Alamouti and Dr André Melchior, who have recently moved into their new practice, Alamouti & Melchior, in Cologne's MediaPark.

The dental office led by Teymourash, is located in Cologne's city centre on the PAN Clinic's premises. He will open his doors to the groups in this guided tour entitled "Dentistry—Made in Germany", and provide an interesting insight into his Cologne dental office



where they focus particularly on implantology, periodontics, cosmetic dentistry, paediatric dentistry and endodontics. The importance and use of IT, 3-D techniques and the subject of patient-handling in daily practice will also be addressed. Other topics include interdisciplinary collaboration, anaesthesia, ENT, neurology, physiotherapy and osteopathy.

Under the motto "Dentistry 3.0" Alamouti and Melchior will give a guided tour through their architecturally and functionally impressive rooms with their state-of-the-art equip-

ment at the MediaPark. Industry peers can expect a trendsetting mix of different disciplines and types of treatments under one roof. These include new treatment concepts, microscope use and DVT- and laser techniques. Additional topics that will be covered are interdisciplinary collaboration, laboratory use, sleep medicines and orthopaedics.

Transfers to both practices, including a brief sightseeing tour of the city, will start directly from the show grounds. Interested persons will soon be able to register online on the official IDS website. ◀◀

IDS organisers introduce Career Day

■ More than 2,200 companies from about 58 countries are expected to attend the International Dental Show (IDS) in Cologne from 10 to 14 March 2015. To enable companies to address pupils, trainees, students and other persons interested in a career in the dental profession directly, the IDS organisers are introducing Career Day.

To bring new dental talent into the profession, the Association of German Dental Manufacturers and Koelnmesse are arranging Career Day at IDS for the first time. This initiative is aimed at accelerating communication and information exchange between the companies exhibiting at IDS and newcomers to the profession or persons interested in a career in the dental industry. Career Day will take place on Saturday, 14 March, at the Speaker's Corner in Hall 3.1.

Career Day offers university graduates, trainees in the fields of dentistry and dental technology, as well as pupils and school leavers wanting to find out about training and career opportunities in the dental industry, an

overview of the various spheres of activity of the participating companies. In addition, it offers fully trained persons or career changers information about further training options and career opportunities in the industry.

According to the organisers, Career Day presents IDS exhibitors with the perfect opportunity to make presentations about professional training, continuing professional development and career advancement. Brief presentations to introduce a company can be booked at the Career Day stage in Hall 3.1. In addition, the Recruitment Lounge connected to the presentation area offers facilities for individual meetings and presentations in discreetly partitioned areas.

Career Day will also be featured on the IDS website. Interested parties can easily arrange meetings with candidates and those using the online scheduling facility. However, spontaneous meetings are also possible. All exhibitors involved in the initiative will be mentioned on the IDS homepage and in a specially printed flyer. ◀◀

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DTI keeps IDS visitors up to date with daily e-newsletters

■ In collaboration with German publisher OEMUS MEDIA, Dental Tribune International (DTI) will be publishing a new edition of the *today* daily newspaper during the International Dental Show (IDS) this year in Cologne. In ad-

dition to the print edition, DTI will be providing the latest news from the event online to subscribers worldwide through its *today* e-newsletter on a daily basis.

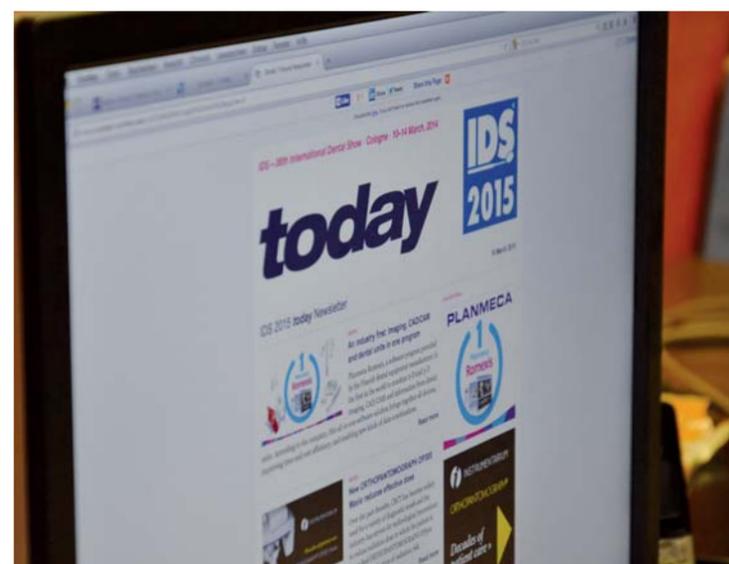


Photo Claudia Duschek, DTI

dition to the print edition, DTI will be providing the latest news from the event online to subscribers worldwide through its *today* e-newsletter on a daily basis.

today is the official IDS trade show newspaper and has become the ultimate business guide for visitors to and exhibitors at the world's largest dental exhibition. From 10 to 14 March, a dedicated on-site editorial team will work closely with the organisers and dental societies to cover press conferences, lectures, presentations and contests during IDS.

In addition, exclusive interviews, industry reports and image galleries will be published in the newspaper and online at www.dental-tribune.com.



Subscribers to the *today* e-newsletter will receive current exhibition highlights and news every day. Furthermore, an e-paper version of the respective daily issue will be available through the newsletter.

Subscribing to the *today* e-newsletter can be done by visiting the Dental Tribune International Website or scanning the QR Code. To collect free samples from DTI's extensive portfolio of print publications, visitors are invited to pass by the company's Media Lounge in Hall 4.1, Booth D066-F065. ◀◀

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Orthodontics to be central topic at IDS 2015

■ Digital technologies have become increasingly important in a number of dental disciplines. In particular, orthodontics has been given new impetus through digital processes. Thus, the 2015 International Dental Show (IDS) will be giving special attention to the technical and digital innovations in the field, including the manufacture of and treatment with digitally produced orthodontic devices.

thetically motivated treatments today involving lingual orthodontic braces or aligners, which are less visible and now widely digitally manufactured. In this area in particular, digital processes provide many benefits. For instance, intra-oral scanners and specialised software can help capture the position of the teeth and create a digital representation of the treatment goal. Digital technologies also help match lingual braces to the progression of the individual patient's lingual tooth geometry, and braces can be applied to the teeth properly and positioned correctly using CAM-produced trays, in which the braces are positioned.

“Acceptance of orthodontic devices has increased not least because they have become more delicate and therefore less visible,” announced Dr Markus Heibach, Executive Director of the Association of German Dental Manufacturers, one of the organisers of IDS. “For trade visitors interested in orthodontics, IDS is therefore worth a trip.”



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Braces are the most common orthodontic treatment. They are usually placed owing to medical indications, aiming to facilitate proper masticatory function, for example. However, there are also an increasing number of aes-

“Here you can extensively exchange ideas with specialists from exhibiting companies, as well as with experienced users, about current procedures and the latest developments in orthodontics,” he said. ◀◀

Digital technology determines daily routine in modern dental practice

■ Digital dental procedures are increasingly becoming an essential part of the daily routine in the modern dental practice. They render patient management and treatment planning processes more economical and increase time efficiency. At the upcoming

International Dental Show (IDS), digital technologies will thus form a core subject, with many exhibitors presenting their latest product solutions in the field.

International Dental Show (IDS), digital technologies will thus form a core subject, with many exhibitors presenting their latest product solutions in the field.

Overall, both patients and dentists benefit from the use of digital technologies. They help shorten treatment



time and reduce the number of work stages, and enable the dentist to immediately examine and explain preparations on screen. Furthermore, the data gained through digital procedures can be quickly processed in the dental practice and sent to dental laboratories.

Products presented will include software for efficient patient management and integrated treatment planning, as well as digital imaging devices, including CBCT and CT, which have been used alongside conventional radiographic techniques in recent years.

The 36th IDS will take place from 10 to 14 March 2015 in Cologne. According to the latest figures provided by IDS organiser Koelnmesse, 2,200 exhibitors from 58 countries have already confirmed their participation. ◀◀

At IDS 2015, the digital technology offerings available for dental practices will form a focal point for all visitors in the fields of dentistry and dental technology. The product ranges to be exhibited contribute to simplifying workflows and, as a result, to reducing treatment times. They create synergies with the digital range for dental laboratories, yielding positive implications for practice management and therapeutic procedures. That is why the state of the art in digital technology for dental practices will be a major topic at IDS 2015, said Dr Martin Rickert, Chairman of the Association of German Dental Manufacturers.

IDS 2015 will also give special attention to digital scanners, which offer a wide range of advantages for patient-specific restorations and implant planning. In particular, intra-oral scanners will be in the spotlight, as they have contributed significantly

ingly gaining importance, in addition to milling processes with ceramic or precious metal materials.

Prosthetics and implantology to be core subjects at IDS 2015

■ Successful prosthetic or implant therapy measures require intensive collaboration between dentists and dental technicians. At the International Dental Show (IDS), which will be held in Cologne from 10 to 14 March 2015, visitors to the biennial event will have the opportunity to see the latest innovations in dental prosthetics and implantology exhibited by manufacturers from around the globe.

the patient in the selection and manufacture of prosthetic and implantological structures and materials.

ingly gaining importance, in addition to milling processes with ceramic or precious metal materials.

Teamwork between dentists and dental technicians is becoming increasingly important, especially with regard to backward planning, in which individual implant prostheses are planned backwards from the desired treatment result. In light of the diversity of new developments in methodology and material science, dental technicians in particular are central to the realisation of complex treatments, assisting the dentist and

The collaboration between dental practices and laboratories is supported by a number of new developments from the dental industry. For instance, modern CAD/CAM software and its increasing networking with digital procedures has enormously increased precision and allows for early involvement of the patient in the planning of his or her dental prosthesis, resulting in a prosthesis that corresponds with the expectations and financial means of the patient.

“The IDS makes an important contribution to successful dialogue between dentists and dental technicians. At the same time, this leading trade fair offers the dental industry an incomparable showcase and discussion forum for those innovations that drive the collaboration between the laboratory and dental practice forwards,” said Dr Markus Heibach, Executive Director of the Association of German Dental Manufacturers (VDDI).

With regard to innovative materials for alternative manufacturing methods, build-up processes, such as selective laser melting of powder metallurgical materials and sintering of cobalt-chromium alloys, are increas-

At the 2015 show, more than 2,000 exhibitors will be showcasing their latest products in the field over 150,000 m². Alongside the exhibition, dental professionals will have the opportunity to attend numerous lectures and presentations. ◀◀

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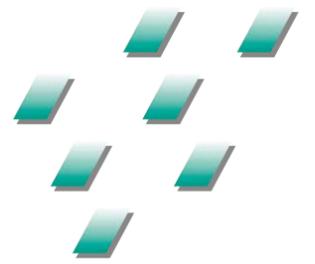
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Another record outcome for IDS

An interview with Koelnmesse Chief Operating Officer Katharina C. Hamma

■ With registrations in early January already surpassing those for the 2013 show, a record number of dental companies will be at the next edition of the International Dental Show (IDS). Over 125,000 dental professionals are also expected at the world's largest dental showcase, which will be held in Cologne in Germany in about a month's time. *today international* had the opportunity to speak with Chief Operating Officer Katharina C. Hamma about the challenges that come with organising such a large event and what new offerings visitors can look forward to this year.

today international: According to the latest figures released by the Association of German Dental Manufacturers, the domestic market for dental products and services has exhibited very strong development over the last two years. Would you consider this to be the main reason for the ongoing growth of IDS?

Katharina C. Hamma: The prospects for the International Dental Show 2015 are excellent once again and in March, Cologne will become the global meeting point for the international dental industry. We are expecting more than 2,150 companies from 56 countries at the world's biggest trade fair for dentistry and dental technology a new exhibitor record for IDS.

Of course, the strong German domestic market, all sectors of which are traditionally completely covered at IDS, makes a large contribution towards the success of the industry's leading trade fair. Thus, the current growth recorded by the International Dental Show is attributable to the participations from abroad. In 2015, the share of international exhibitors is 70 per cent, which means a significant increase has been achieved compared to the previous event.

Which countries do they come from?

The international scope and the breadth and depth of products and services on offer at IDS are unique on a worldwide scale. This is underlined by the ongoing success story of IDS, to which a new chapter is added every two years.

At this point it looks like more foreign companies than ever will be attending the show. Here in Cologne, they can reach customers from all over the globe, while visitors can learn about the latest innovations from dental manufacturers from Europe, North and South America, the Middle East and Asia Pacific. After Germany, the countries with the largest share of exhibitors are the US, South Korea, China, France, Switzerland, Taiwan, Turkey, Israel and the UK. Overall, there will be 16 joint booths at IDS, which are being organised in collaboration with public or private export promotion organisations and associations.

With regard to visitors, approximately 50 per cent came from outside Germany in 2013. Overall, we saw people attending from 149 countries. In addition to large contingents from the

key markets in Europe (France, Italy and the UK), our growth was driven by increasing participation by dental professionals from Eastern Europe, particularly from the Balkans. Attendance by those from North and South America also increased significantly. Most new visitors are mainly from the Middle East and East Asia, however.



*Katharina C. Hamma, Chief Operating Officer of Koelnmesse.

Connecting existing technologies will be a main focus at IDS. What challenges does this development pose in terms of infrastructure and logistics?

That is right. Every two years, the IDS is a technical and logistic challenge, which we always master with exceptional success together with the GFDI, thanks to our experience and capabilities. Numerous exhibitors carry out elaborate live demonstrations at their stands or present state-of-the-art devices and equipment.

Correspondingly, the technical equipment available in the exhibition halls of IDS has to be both flexible and compatible. In addition to the stand construction, we provide our exhibitors with a sophisticated, technical infrastructure, such as for example PC systems, audiovisual media, the appropriate electronics or lighting and sound technology that is adapted to their requirements. An elaborate exhibition stand also involves the companies carrying out correspondingly intensive construction activities. Here, apart from supplying the necessary technical equipment, we provide our customers with the additional support of the trained and flexible service staff of our service provider.

What other fields of dentistry will be prominent at IDS?

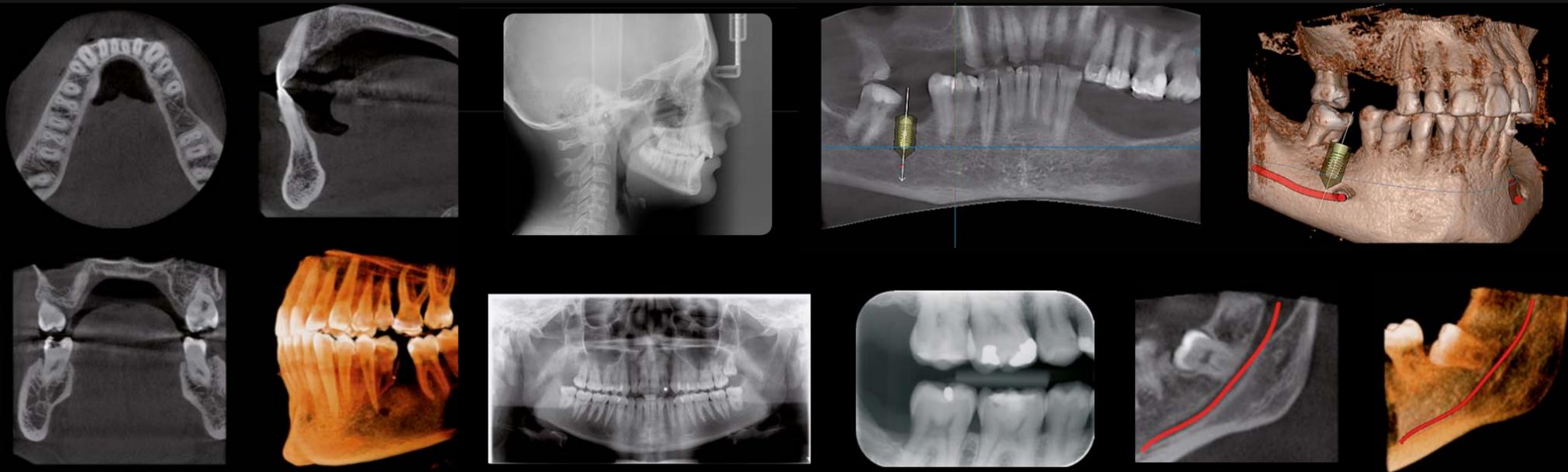
Once again, the whole spectrum of the dental industry, including all leading providers, will be represented. This ranges from products and services for dental practices to laboratory equipment, infection control, maintenance and services.



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← The overall concept of IDS will remain unchanged with Dealers' Day on Tuesday, 10 March, and the Speakers' Corner in Hall 4.1. The Generation

we have professionals of all ages visiting the show.

By professionals coming together and sharing experiences, young den-

Rates for hotel rooms have risen again this year. How have you responded to this?

We have a special service for visitors and exhibitors seeking accommo-

“A leading trade show for the dental industry, IDS is an important cornerstone of our growing exhibition portfolio.”

Lounge for students and young dentists is also back and is being organised by the Federal Association of Dental Alumni in Germany (Bundesverband der Zahnmedizinischen Alumni in Deutschland). New to IDS are Career Day and the Know-how Tours. These are supplemented by the professional offering from the German Dental Association and the Association of German Dental Technicians' Guilds (Verband Deutscher Zahntechniker-Innungen).

With Career Day, you are seeking to appeal to young dentists. Is this age group becoming increasingly important?

IDS is a meeting point for dentists and dental technicians, as well as representatives of the industry, and research and development. As a result,

tists may benefit from the knowledge of the older generation. Just like in other industries, it is the new generation that is going to shape the future of our field. In this manner, we are supporting them in their professional development.

For the first time, IDS will also be offering the Know-how Tours. Who is the target audience for this?

This novelty at IDS 2015 is intended to allow visitors, particularly those from outside Europe, to visit two representative dental practices in Cologne on three nights during the show. There, they will have the opportunity to exchange knowledge with fellow colleagues and experience innovations and technologies already standard in German dentistry for use in their own practice.

ation. In order to be able to offer the best possible rates, Koelnmesse has partnered with 120 hotels in Cologne and surrounding areas. In total, 90,000 beds have been made available and can be booked through the IDS homepage. For IDS, however, it is always recommended that visitors plan and book hotel rooms very early on.

Cologne also boasts a very large commuting area within the Rhein-Ruhr zone. Public transport connections are excellent, so visitors who have booked a hotel outside of Cologne can still reach the fairground within a reasonable period. This way, one has more flexibility with regard to pricing.

Those who would prefer to stay in Cologne should plan ahead to ensure



that they can secure their accommodation of choice.

How does the growth of IDS compare to that of other Koelnmesse events?

It is fair to say that Koelnmesse is the number one trade show location for many industries. It also remains one of the largest organisers of trade shows worldwide. A clear advantage is our modern venue, which is located right in the heart of the Rhein-Ruhr economic zone. It is also only a stone's throw from the Cologne city centre and, therefore, can be reached by public transport in a short period.

Overall, we organise over 80 exhibitions, conferences and guest events

for many different industries. Twenty-five of these events are among the leading trade shows in the world and, therefore, their scope is highly international. These are shows for interior design, food, and interactive games and entertainment, for example.

A leading trade show for the dental industry, IDS is an important cornerstone of our growing exhibition portfolio. It is also a consistent growth engine, which means that Koelnmesse is able to achieve growth in all of its events and to generate positive economic effects for the whole region.

Thank you very much for this interview. ◀

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SCANDEFA is organised by Bella Center and held in collaboration with the Annual Meeting organised by the Danish Dental Association (tandlaegeforeningen.dk).

Who visits SCANDEFA?

In 2014, over 10,000 dentists, dental hygienists, dental assistants and dental technicians visited SCANDEFA. More than 50 % of the visitors were looking to meet new suppliers, more than 60 % were seeking new products and professional inspiration, and more than 50 % intended to buy products/solutions.

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Dental practice costs in Germany keep increasing

■ The costs for dentists establishing their own practice in Germany have increased significantly, according to a report published by the Institute of German Dentists, a joint institution of the German Dental Association and the National Association of Statutory Health Insurance Dentists. The report shows that the costs for opening a private dental practice totalled approximately €427,000 in 2013—5 per cent more than in the previous year. An expert has called for policy to be amended.

According to the report, taking over of an existing practice was the

most common form of dental business start-up in 2013. Sixty-eight per cent of dentists chose this path to independence over establishing their own practice. The costs involved in take-over amounted to approximately €300,000, roughly the same as in 2012.

For Eßer, politics contribute to the uncertain future of young professionals in the country. According to him, there is no planning security owing to frequent government intervention. In addition, excessive administrative



burdens take up time necessary for treatment. Furthermore, practices are placed under significant pressure caused by increasing competition and the economisation of health care.

“Contract dentists are better able to organise and develop dental care independently. We therefore demand a clear statement of policy on the principle of self-administration of our profession and of self-employment. This is one of our central concerns,” said Eßer. ◀

“For medical care to continue at the current high level and to be comprehensive and offered close to the patient's residence, we need enough dentists who take pleasure in their profes-

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Tooth-whitening update: The crux of the matter

By Prof. Martin Jörgens, Germany

■ Adding to the already very strict laws and restrictions in the area of dental hygiene, on top of the constantly growing demands placed on dental practices, is yet another European Union directive relevant to the daily work routine in dental practices. The 2011/84/EU directive, which became effective on 1 November 2012, is intended to regulate the execution of tooth-whitening treatments. The primary aims of the directive are to protect patients from undesirable side-effects and to prevent non-dental professionals performing tooth-whitening treatments.

The impact on the entire area of tooth whitening is manifold and far-reaching. The crux of the matter is the new 6.0% limit of hydrogen peroxide in tooth-whitening products. Even the sale of products containing more than 0.1% and up to 6.0% hydrogen peroxide is restricted to dentists, who are only permitted to administer these products to patients after advising patients in detail about the product and its usage. The directive will also put an end to the online sale of tooth-whiten-

ing products, which has generally been associated with adverse side-effects.

The new regulation has been interpreted differently in each European country. Some countries, such as the Netherlands and the UK, regard it as the maximum upper limit and restrict the use of tooth-whitening gels with a higher concentration of hydrogen peroxide. In these countries, even registered self-employed dental hygienists are not permitted to perform tooth-whitening procedures without the supervision of a dentist an impractical state of affairs. This is also due to the new directive, which requires that a dental examination be conducted before commencing tooth whitening.

Advantages

Owing to these extreme interpretations of the directive, certain leading tooth-whitening products are no longer available or have been taken off the market in these countries. Germany has taken a much more pragmatic and practice-oriented approach:



in general, tooth whitening is performed by dental professionals, but can be conducted under the supervision of a dentist. Even before the directive, the Supreme Court had restricted cosmetic whitening treatments performed by non-dental professionals to a maximum hydrogen peroxide concentration of 6.0%. The new EU directive is very much to the advantage of

the dentist, as it no longer allows non-dental professionals to perform cosmetic whitening procedures. It also establishes legal certainty that dentists can still use products with a hydrogen peroxide concentration higher than 6.0% for medical whitening in order to treat discolouration due to tetracycline, trauma, or the use of medication or prolonged use of discolouring substances, genetically determined extensive discolouration, or highly discoloured teeth with devitalised roots, among others.

These treatments are therefore classified as medical indications and do not lie in the area of cosmetic indications.

Expertise

In my opinion, high-quality whitening procedures should only be performed by dentists or highly qualified dental nurses, hygienists or therapists. The incidence of side-effects, especially with products that contain a high concentration of hydrogen peroxide, is simply too high and irritation of the gingiva and hypersensitivity can only be avoided with substantial knowledge of the products and experience in their use.

Revolutionary

The implementation of the new directive requires substantial changes in dental practices, but also offers benefits in everyday tooth-whitening procedures by preserving tooth structure and rendering treatment more pleasant for the patient through new technologies. Long before the new directive came into effect, a number of forward-looking companies were already seeking not just a simple tooth-whitening alternative but a revolutionary new technology with novel treatment benefits.

The new PrevDent CrWR tooth-whitening system, for example, illustrates this new development clearly. For many years, PrevDent had distributed the BriteSmile in-office whitening system in many European countries, but this product falls outside of the hydrogen peroxide limit set by the new EU directive in some of those countries. After intensive research and a paradigm shift, PrevDent's development engineers developed an ideal combination based on the concurrent development in the field of surface protection with nanotechnology. The result is a combination of a 6.0% low-level hydrogen peroxide gel and nano-hydroxyapatite (nHAp). The potential of this interesting and pioneering invention can only be grasped

after an in-depth analysis of current studies on the topic of nanotechnology.

Ground-breaking

Current research in all areas of application of nHAp has provided ground-breaking results regarding the protection and long-term preservation of the tooth structure. Remineralisation of the enamel surface, detected with an electron microscope, has been observed, as well as extensive antibacterial effects on the tooth surface that appear to protect against caries and periodontitis. Comparative studies at the University of Pisa have shown that nHAp has a similar antibacterial effect to chlorhexidine, which is considered the gold standard in the field of periodontology. Nano-hydroxyapatite technology has also found its way into the field of filling materials. Researchers at the University of Maryland have already been using filling materials with nHAp for some time and the preliminary results are promising.

There are numerous successful applications of nHAp, including the following:

1. protection against caries by preventing *Streptococcus mutans* adhering to the tooth surface;
2. use in atraumatic restorative treatment as non-invasive caries therapy in countries with insufficient dental health care infrastructure;
3. addition of nHAp to composite materials for longer durability of fillings;
4. remineralisation of early carious lesions;
5. remineralisation of erosive enamel lesions;
6. regeneration and repair of enamel structures;
7. sealing of dentinal tubules and formation of a protective dentine layer;
8. formation of a protective coating against acid and subsequent reduction in hypersensitivity.

Prevention

In the field of tooth whitening, the newest application concerns the prevention of hypersensitivity. The University of Indianapolis has been very active in this area of research. Browning et al. have demonstrated that the use of nHAp reduces hypersensitivity substantially during whitening. Moreover, Deschepper et al. – also from Indianapolis – have demonstrated a reduction in surface roughness when nHAp was used, as well as simultaneous sealing of the surfaces. These findings correspond with that of Kawamata et al., who established that the application of nHAp after whitening resulted in the restoration of the enamel structure. Additionally, Takikawa et al., already early on, indicated the positive effects of the use of an nHAp-containing conditioner that is applied after tooth whitening. To date, patients with hypersensitive teeth, who had to be pretreated with amorphous calcium phosphate, fluoride or other desensitisers, with simultaneous use of analgesics in order to avoid severe side-effects, have been the greatest challenge for us. Owing to the nanotechnology, we no longer need to be concerned about these side-effects and can perform whitening without any specific pretreatments.

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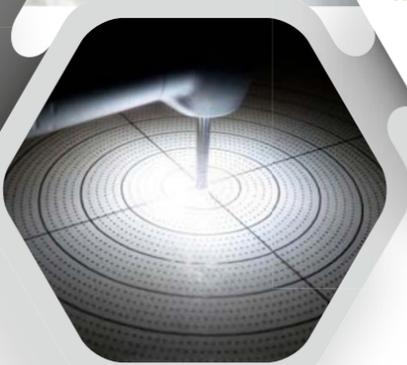
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No side-effects

Once nHAp comes into contact with the tooth surface, the nano-components seal the sensitive structure effectively and the whitening procedure can be performed without any side-effects. No hypersensitivity occurs during or after the tooth whitening. The tooth-whitening cycles are shorter: instead of three cycles of 20 minutes each, six cycles of 10 minutes each are recommended. This is also due to the low hydrogen peroxide concentration and has proven to be very successful. Owing to the more frequent and shorter cycles, freshly activated low-level hydrogen peroxide is applied to the surfaces. Furthermore, PrevDent responded quickly in the development of post-treatment products and introduced a toothpaste that contains nHAp. Studies at the University of Pisa have already demonstrated the toothpaste's desensitising effect. In addition, brushing one's teeth with the PrevDent nHAp toothpaste alone has a rewhitening effect, as the continuously remineralised surface reflects light better.

Bio-whitening

In addition to the positive effects of the use of nHAp described above, it has to be stated that the tooth-whitening effect of the PrevDent CrWR system is very good, even though the teeth do not appear to be quite as white directly after treatment. They have the same colour one would normally expect a day after conventional whitening with a higher-concentration gel. This is mainly because the



• Figs. 1 and 2: Teeth before bleaching (PrevDent Bleaching Kit).
• Figs. 3 and 4: Teeth after bleaching (PrevDent Bleaching Kit).
• Figs. 5 and 6: Teeth before and after bleaching (PrevDent Bleaching Kit).

teeth are not as heavily dehydrated. One day after whitening, however, the

colour of the teeth is identical to that of teeth whitened conventionally, but

without the painful side-effects. In the truest sense of the word, the proce-

cedure can be described as a bio-whitening.

The new technology extends the range of indications of tooth-whitening treatment. Furthermore, patients with highly discoloured teeth and fear of the side-effects can be treated earlier. Frequent whitening can be performed in shorter intervals completely free of side-effects. In my opinion, there are no longer any contra-indications to whitening treatments owing to the introduction of nHAp. In the future, treatment with nHAp is likely therefore to increase exponentially.

No more hypersensitivity

While further research is necessary, it has been determined that whitening with nHAp improves and seals the tooth structure and has made once-dreaded hypersensitivity a thing of the past. It remains to be seen how the market will react in the near future. Most certainly, more tooth-whitening products will be developed. Many manufacturers will seek to introduce similar nHAp-containing products to the market. In any event, this is a result of the new EU directive. It has given new impetus to the whitening market. ◀◀

Editorial note: This is a translated version of the article titled "Aktuelles Bleaching-Update nach der EU-Richtlinie 2011/84/EU—Die Zukunft gehört dem Nanohydroxyapatite (nHAp)", which was published in the 02/2013 issue of the German edition of the cosmetic dentistry magazine.

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Dental implant competitors shake things up

By Kristina Vidug, USA

In 2013, the global dental implant market—composed of the sale of dental implant fixtures, final abutments and other devices—was valued at over US\$3.7 billion. The European market, valued at nearly one-third of the global market at close to US\$1.2 billion, contracted through 2014, as uncertain economic conditions continued to reduce procedure volumes and as more low-cost competitors entered the market, driving down prices.

mestic product growth and high unemployment continue to render dental implant procedures—which are primarily paid out of pocket by patients—cost prohibitive, while alternatives, such as bridges and dentures, that are perceived as more affordable will represent attractive options.

Dental implants were invented in Sweden; as a result, it is not surprising that a great number of premium man-

More recently, however, some of the premium competitors have employed strategies to appeal to increasingly cost-conscious consumers. For instance, Straumann has reduced the price of its titanium implants by 15 per cent in Austria, Germany and Switzerland. While the price change only came into effect in the first quarter of this year, the strategy appears to have been effective because the company reported a 6 per cent rise in first-quarter revenue² compared with a 6 per cent decrease in the same period last year.³

The price reduction has come at a perfect time: while economic conditions begin to slowly improve, consumers are still extremely price sensitive. These price cuts therefore allow dental professionals to offer premium implant products to their patients at a reduced rate.

Straumann's price reduction is not its only foray into the value market. In the first quarter of this year, the company purchased US\$30 million worth of bonds from low-cost South Korean dental implant manufacturer MegaGen. The investment, which will be converted to shares in 2016, will help bolster Straumann's revenue while allowing it to participate in both the premium and value segments, thus appealing to a wide range of practitioners and patients alike.

Straumann is not the only company shaking things up in the world of dental implants. Zimmer Dental recently announced its acquisition of rival Biomet. While both companies are better known for their orthopaedic products, they are fairly significant competitors in the dental industry as well. Lay-offs are not uncommon when companies merge, especially when the companies in question offer the same types of products. This can have a negative impact on sales in the short term, as the newly conjoined companies' sale force decreases, leading clients to switch to other competitors.

However, this will not be the case with the Zimmer-Biomet merger, at least not in the short term, as the sales teams from both companies are expected to be retained through the merger. The cost of retaining both sales teams has been estimated at US\$400 million.⁴ While the effect of this acquisition on the market remains to be seen, the fact that the sales force will not be decreasing bodes well for the newly merged companies, likely resulting in an increased market share in the dental implant segment.

There is discussion of merger and acquisition activity among other companies in the segment too, with Nobel Biocare reportedly in talks to sell to private equity firms and strategic buy-

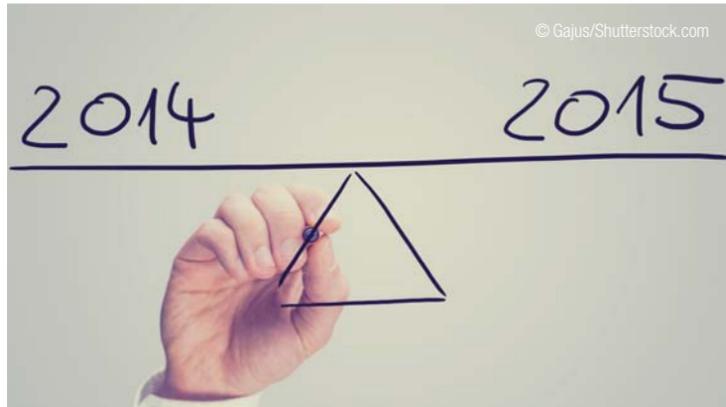


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ers. While these talks are still in the very early stages, what is certain is that there has been a great deal of activity in the competitive landscape in the past several years.

This, combined with the aforementioned economic factors, is turning this once stable and mature market into a dynamic, action-filled space. With the dental implant market set to rebound in Europe and with revenues expanding in other countries—particularly in the rapidly developing BRIC and Middle Eastern markets—the global industry is poised for even further change, and the competitive landscape could look entirely different a few years from now. ◀◀

Editorial note: A list of references is available from the publisher.



These factors hampered the expected economic recovery and resumption of growth projected for 2013.¹ As a result, the dental implant market will continue its decline before stabilising in 2015. Only then will the European market slowly begin to recover. Factors such as low gross do-

ufacturers are based in Continental Europe. In the past, premium manufacturers, such as Straumann and DENTSPLY Implants, were able to rely on their long-standing reputations in the market and the high quality of their products to command higher prices than did some of their competitors.

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Cone Beam Computed Tomography: Is dentistry ready for a new standard of care?

Dr Lee M. Whitesides, USA

■ Since its commercial introduction into dentistry in 2001, cone beam computed tomography (CBCT) has been rapidly evolving into a new standard of care in maxillofacial imaging. In just over a decade, CBCT has exploded onto the dental landscape and permitted dental professionals a degree of three-dimensional (3-D) anatomic truth in maxillofacial imaging previously unavailable and unattainable. Like many other new technologies, which have progressed from the extraordinary to the ordinary and thus gained acceptance by professionals and patients, CBCT has advanced from exceptional use to almost commonplace use in dentistry as cost decreases, access to the technology increases, and potential adverse patient interaction (i.e. radiation exposure) is attenuated. Today, CBCT is seen by many in dentistry as the standard operating procedure for many dental implant, orthognathic, orthodontic, or endodontic cases.

The advancement of CBCT in dentistry has caught the attention of manufacturers of radiological equipment. In 2001, only one company sold a CBCT system. In 2014 there are at least 20 companies selling CBCT machines and technology. Henry Schein, a leading distributor of dental equipment, has seen CBCT sales expand from 5% of their digital imaging sales to almost 50% of digital imaging sales in the last five years.

CBCT has also been recognised by general dentists and specialists as a means by which they can separate,



identify, and distinguish their practices as being on the vanguard of technology in patient care. Today's patients expect their dentist and physicians to be contemporary with technology and services. CBCT provides the doctor with a technology, which not only has significant advantages in treating patients but also has a noteworthy "wow" factor as the 3-D images are seen on a large screen in "real time" for the doctor and patient to view.

CBCT, like plain film radiographic studies, may be considered a revenue generator for a practice. The more a CBCT machine is utilised, the more revenue it will generate. Additionally, the owner may allow others in the profession to utilise the machine for a fee, thereby reducing his overall cost of operation.

Standard of care is a legal not a medical or dental concept. Standards

of care are constantly evolving as methods and techniques in patient care improve. An appropriate definition for standard of care may include such language as: the dentist is under duty to use that degree of skill and care which is expected of a reasonably competent and prudent dentist under the same or similar circumstances. Standards of care may be local, regional or national.

Standard of care influences

The influence of an emerging technology, like CBCT, into a new standard of care involves many criteria. These criteria include but are not limited to: court verdicts, expert testimony, literature support, professional guidelines, cost and availability of the technology, reimbursement by third party payers, and multi-specialty use and recognition.

Taken individually, these criteria do not constitute a mandate for any technology as a standard of care. Nor are these the only criteria one may use in determining standard of care. Taken together, these criteria provide strong evidence that CBCT technology has sufficiently evolved to be considered the standard of care in maxillofacial imaging in selected cases to assist the dentist in treatment for patients in need of dental implants, orthognathic surgery, manipulation of difficult impacted teeth, orthodontics, endodontics, and many other facets of dentistry.

The legal perspective

The legal system in the United States is complex and fragmented. No database exists to search verdicts in dental malpractice cases in which CBCT has played an important or pivotal role. For a new technology to become admissible as a standard of care in court, it must pass the Frye test. This standard comes from Frye v. United States which is a 1923 in a case discussing the admissibility of a polygraph test as evidence. The Frye standard maintains that scientific evi-

dence presented to the court must be interpreted by the court as "generally accepted" and expert testimony must be based on scientific methods that are sufficiently established and accepted.

In Frye, the court opined: "Just when a scientific principle or discovery crosses the line between the experimental and demonstrable stages is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognised, and while the courts will go a long way in admitting experimental testimony deduced from a well-recognised scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs."

In many jurisdictions and in Federal court, the Frye standard is superseded by the Daubert standard. The Daubert standard is used by a trial judge to make a preliminary assessment of whether an expert's scientific testimony is based on reasoning or methodology that is scientifically valid and can properly be applied to the facts at issue. Under this standard, the factors that may be considered in determining whether the methodology is valid are:

- theory or technique in question can be and has been tested,
- it has been subjected to peer review and publication,
- there is a known or potential error rate,
- the existence of maintenance standards controlling its operation,
- widespread acceptance within a relevant scientific community.

The theory or technique behind medical grade computed tomography and CBCT has been tested and proven sound over many years of application in the medical and dental arena. The Hounsfield unit is the widely recognised standard quantitative scale for describing radiodensity and provides doctors with a known standard and error rate in computed tomography. The widespread acceptance of CBCT by the medical and dental community is demonstrated by the ever increasing presence in dental and medical practices of the technology. Additionally, The Intersocietal Accreditation Commission, an accreditation organisation for medical and dental imaging, has developed guidelines and accreditation criteria for 3-D CBCT imaging. Thus CBCT appears to have satisfied both the Frye and Daubert criteria for acceptance as a standard of care technology.

Not to discount the value of CBCT imaging or its ability to successfully satisfy the Frye or Daubert criteria, the absence of CBCT is not de facto evidence of lack of a standard of care imaging. Many patients present to their dentist with uncomplicated cases where traditional two-dimensional radiographic studies are appropriate and provide the dentist with standard of care imaging of the patient. For the more complicated cases, 3-D imaging may be employed to provide the dentist with superior anatomic evidence

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in treatment planning and diagnosis. Three-dimensional imaging with CBCT can also be used in uncomplicated cases, but it may not necessarily be considered as the standard of care for every case in 2014.

Expert Testimony

An expert is a person with sufficient minimal qualifications to render an opinion on the subject at hand. Not all experts are created equal, and in fact in three states (Iowa, South Dakota, and New Hampshire) an expert need only be qualified in a related field to offer an opinion. Experts are used by the courts to educate the judge and jury as to what constitutes normal minimal acceptable care of a patient in a given environment.

Expert testimony is by definition the opinion of one practitioner. It is an opinion based on fact, evidence, experience, and knowledge which the expert believes to be relevant, valid, and upheld in the scientific community.

When reviewing a case for suspected malpractice the expert examines many things, including, but not limited to: chart notes, radiographic studies, depositions, and professional correspondences. In the last five years, the author has noticed a remarkable increase in the number of cases in which plaintiffs and defence attorneys, as well as experts, rely on pre and/or post-procedure CBCT imaging studies to assist in proving malpractice or defending good practice. Post-treatment radiographic imaging to prove malpractice or support good practice is not new to medicine. In fact in the years preceding WWI, some of the highest malpractice claims were awarded in cases where post-treatment radiographs played a pivotal role.

Logic would dictate that if plaintiffs and defence counsels and experts are making CBCT part of their strategy, then CBCT must be not only prevalent and pertinent but of significant value in the formation of an opinion by an expert (and the jury) when reviewing a case. CBCT can be seen as an additional and important piece of information to help explain why the doctor did what he did or why an unfortunate outcome occurred. Additionally, CBCT provides powerful and easily understandable images for layperson jury.

Recognising the value that CBCT adds to a case does not necessarily indicate that CBCT is the standard of care in each and every case. The decision to obtain a CBCT study before the procedure is determined by the dentist based on his experience and knowledge of the case.

Literature Support

For any technology to be considered as a standard of care, a plethora of literature in support for the technology should exist. The literature must discuss the risk and benefits of the technology, its application to patient care, and guidelines and protocols for acceptable use.

To assess the influence of CBCT in the dental literature, the author performed a PubMed literature search in October for the words cone beam CT, cone beam CT + dental, cone beam CT + dental implants, cone beam CT + orthodontics, cone beam CT + oral surgery, cone beam CT + endodontics in the search line. The results are in Table 1.

Evaluation of Table 1 data clearly shows a significant presence in the lit-

erature of articles pertaining to the use of CBCT in the various disciplines in dentistry. The vast majority of literature discovered pertains to addressing the use of CBCT in treatment planning and diagnosis of patients in dental implant therapy, oral and maxillofacial surgery, orthodontics, and endodontics. Articles on new applica-

tion criteria for 3-D CBCT imaging. In a recent survey of OMFS residency programmes, 87 % of programme directors acknowledged the use of CBCT in patient care by their residents.

The American Association of Endodontists (AAE) and the American Association of Oral and Maxillofacial

| Key words in search | Number of articles | Year article first appeared |
|-----------------------|--------------------|-----------------------------|
| CBCT | 5,537 | 1988 |
| CBCT + dental | 1,951 | 1998 |
| CBCT + dental implant | 617 | 2002 |
| CBCT + orthodontics | 725 | 2003 |
| CBCT + oral surgery | 1,041 | 1998 |
| CBCT + endodontics | 313 | 2007 |

Table 1

tions of CBCT technology to patient care were also prevalent in the sample. Some articles addressed the risk and benefits of CBCT but none denounced CBCT as harmful to the patient or insignificant in treatment planning and diagnosis. Two similar PubMed reviews of the literature on CBCT were performed by authors Alamri et al (Applications of CBCT in dental practice: A review of the literature. *Gen Dent* 2012; 60(5): 390-400) and De Vos et al (Cone-beam computerized tomography (CBCT) imaging of the oral and maxillofacial region: A systematic review of the literature. *Int J Oral Maxillofac Surg* 2009; 38: 609-625). Both of these exhaustive articles demonstrate the plethora of literature addressing CBCT and its application in the many disciplines in dentistry.

Professional Guidelines

For a technology such as CBCT to become a standard of care in dentistry, guidelines for its use and application in patient care must be established by the organisational bodies of those disciplines in dentistry who employ the technology to treat patients. In dentistry, the dental practitioners most involved in the use and application of CBCT in patient care include general dentists, oral and maxillofacial surgeons, endodontists, oral and maxillofacial radiologists, orthodontists, and periodontists.

The American Dental Association has over 180,000 licensed dentists representing approximately 75 % of dentists in the USA. The American Dental Association published an advisory statement article in its principal journal, *The Journal of the American Dental Association*, in August 2012. The article discusses the many positive aspects of CBCT, but stops short of calling CBCT a new standard of care. Rather, the ADA encourages the dentist to use CBCT "selectively, as an adjunct to conventional radiography." The ADA further recognises the value and presence of CBCT by including CBCT-related courses at its annual meetings and continuing education courses during the year.

The American Association of Oral and Maxillofacial Surgery (AAOMS) has over 9,000 members representing approximately 95 % of oral and maxillofacial surgeons practising in the US. Literature addressing the application of CBCT in oral and maxillofacial surgery has been around since 2007. The AAOMS has offered continuing education in the use and application of CBCT for patient care as far back as 2011. The AAOMS has worked with the IAC to develop guidelines and accred-

itations." The article then lists nine of these "complex conditions". In summation, the position paper recognises the value of CBCT as an adjunct to 2-D images and "CBCT may provide dose savings over multiple traditional images in complex cases".

Literature pertaining to the use of CBCT in endodontics first appeared in the *Journal of Endodontics* in 2003. The American Association of Endodontists sponsor continuing education in endodontic related CBCT on their website and the organisation devotes valuable time at its annual meeting to CBCT as it relates to modern endodontics. Most residencies (44 of 47) in endodontics provide CBCT for patient care.

Literature pertaining to CBCT in dentistry dates back to 1998. The AAMOR devotes considerable effort to continuing education relating to CBCT both on its website, through CE events, and at its annual meeting. All seven ADA approved residencies in Radiology incorporate CBCT education and training into the resident curriculum.

The tremendous value of anatomic truth in complex orthodontic cases involving patients with cleft lip and palate, impacted teeth, and

maxillofacial deformities is widely recognised and discussed in the literature. Review of the AAO annual meeting lecture syllabus shows CBCT is a prominent topic for today's orthodontist. In a recent article in the *Journal of Dental Education* by Smith et al use of CBCT in orthodontic programmes in the US and Canada was evaluated. This article showed the following:
-83 % of orthodontic programmes have access to CBCT,
-73 % of programmes report "regular" use of CBCT in patient diagnosis,
-Areas of CBCT use focuses on diagnosis and treatment planning for: impacted teeth, craniofacial anomalies, TAD placement, TMJ assessment, upper airway analysis, and maxillofacial development.

Literature discussing CBCT in periodontics first appeared in the AAP journal over a decade ago. The American Association of Periodontist annual meeting agenda and the *Journal of Periodontology* demonstrate a heavy influence of CBCT in the field of periodontics. All 51 post-doctoral US periodontal programmes use CBCT in patient care.

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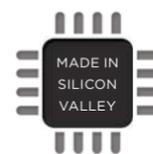
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implant continuing education with an excess of 25,000 active members, published a consensus report on CBCT in its journal *Implant Dentistry* in April of 2012. In the article, authored by many leaders in the dental implant field, the ICOI states: "The literature supports the use of CBCT in dental implant treatment planning particularly in regards to linear measurements, 3-D evaluation of alveolar ridge topography, proximity to vital anatomic structures, and fabrication of surgical guides." The ICOI reminds the dentist that use of CBCT must be justified in each case and should be considered as an imaging alternative where conventional radiographs may not provide sufficient anatomic truth. Literature discussing the application of CBCT in implant dentistry is ubiquitous and comprises the lion's share of research in applying CBCT technology to dentistry. The vast majority of post-doctoral residencies involved in dental implant patient care and all private dental implant training courses in the US incorporate CBCT in their dental implant education curriculum.

Many professional organisations in dentistry for general dentists and specialists have weighed in on CBCT by providing recommendations, guidelines, and a position paper. While these guidelines are beneficial in establishing a society or specialty's position on CBCT, they are not mandates. Recommendations, guidelines, CE programmes, and position papers are used by professionals to influence the practice of their discipline. As the practice of the discipline changes in response to many factors including, but not limited to court verdicts, expert testimony, literature support, professional guidelines, cost of the technology, and reimbursement by third party payers; the recommendations, guidelines, and position papers may facilitate the evolution of CBCT into a standard of care. Thus, in 2014 the professional organisations that comprise

dentistry may not formally declare CBCT is the standard of care for every patient, but these organisations do recognise the influence CBCT is having on the profession.

Educational Institutional Participation

For a technology to be considered a standard of care, those in the profession must be educated in its application in patient care. In US, 56 of the 57 dental schools (98 %) have CBCT available for patient care for pre-doctoral students. Forty-seven (84 %) incorporate CBCT education in their pre-doctoral curriculum. In a survey performed by the author and others 202 general practice residency (GPR) and advanced education in general dentistry (AEGD) programmes were surveyed regarding use of CBCT by their residents. Eighty-two programme directors responded to the survey. Of the 82 respondents, 56 (68 %) of program directors (PDs) responded affirmatively when asked if CBCT was used in patient care by their residents. The author also surveyed 102 PDs in oral and maxillofacial programs in the US. Fifty-four PDs responded. Of the 54 PDs responding 47 (87 %) affirmatively when asked if CBCT is used in patient care by their residents. In a phone survey of endodontic residencies, 44 of 47 PDs indicated their residents use CBCT in patient care. All seven ADA-approved oral and maxillofacial radiology programmes use CBCT in patient care. Additionally, all 51 periodontal residency PDs indicated that their residents employ CBCT technology in patient care. In orthodontics, 83 % of US-based orthodontic programmes use CBCT in patient care.

Cost and Availability

The cost of CBCT machines today range from US\$150,000 to US\$250,000 with yearly maintenance fees in the US\$8,000 to US\$20,000 range. As with any emerging technol-

ogy, advances create a secondary market for slightly used machines. Each new step forward in technology renders the CBCT machine of only a few years ago slightly out-of-date, despite its obvious value and its superiority to two dimensional films. As time progresses and advancement in the quality and capabilities of the newest machines demonstrate themselves, the slightly non-contemporary machine will represent a significant advancement for the dentist versus 2-D radiography, while not burdening the dentist with significant cost. This will undoubtedly lead to an increase in the number of dental professionals utilising CBCT in their practices. The bottom line for most practices in regards to CBCT machines is: can I afford this for my practice?

To determine affordability, the price of the machine (purchase and maintenance) must be considered against potential revenue generated by the machine. Revenue can be directly from patients, insurance companies, or from other dentists who utilise the CBCT machine. A cost-effective alternative to owning and operating a CBCT device can be the outsourcing of the study to a third party (dentist or facility) and in-sourcing the software necessary to employ the images in treatment planning and diagnosis.

CBCT machines are becoming ubiquitous as more dentist purchase the machines and more third party non-dentist owned imaging centres enter the market. Since more dentist and more patients are becoming exposed to the technology, patient acceptance will increase, facilitating the incorporation of CBCT into the mainstream culture of dentistry. The increasing omnipresence of CBCT technology will not singularly make it standard of care, but it will serve to increase patient awareness of the technology, which in turn will influ-

ence what the public perceives as a standard of care.

The insurance industry

Reimbursement from major insurance companies and government-sponsored health care is traditionally the last to embrace (i.e. pay for) a new service such as CBCT. Although codes for medical CBCTs have been around for decades, specific codes for in office CBCTs began to materialise in 2009. Current reimbursement rates for in-office CBCTs average around US\$300, provided the study is covered.

By providing dentists with a CPT code, the insurance industry has validated the technology of CBCT and thus acknowledged its value in treatment planning and diagnosis. As time progresses, insurance companies may, as they have in the past, require CBCT owner/operators to obtain a certification via the IAC or some other regulating entity for an owner/operator to qualify for financial reimbursement from any third party payer.

Two of the major malpractice carriers of the insurance industry (OMNISIC and MedPro) have influenced the evolution of CBCT as a new standard of care by offering coverage for CBCT owner/operators commensurate with the level of risk to which the owner/operators are exposed. Were CBCT studies believed to be of little value or represent minimal risk these leaders in the dental malpractice industry would not offer such coverage. Additionally OMNISIC requires the owner/operator to have CBCT images interpreted by a dental or medical radiologist to minimise risk.

Multispecialty use and recognition

Dentistry has nine recognised specialties; four (oral and maxillofacial surgery, endodontics, oral and maxillofacial radiology, and orthodontics) and the American Dental Association have produced literature to address the impact of CBCT on patient care. Of the remaining five specialties, periodontics and prosthodontics could logically be appropriate groups to produce a position paper on CBCT given their members participation in dental implant treatment of patients. Paediatric dentistry may soon provide a position paper once the long-term studies have been done to assess the risk versus benefits analysis with respect to the total overall radiation dose and its effect on the paediatric population. The specialty of dental public health is unlikely to weigh on the matter.

The value CBCT has in diagnosis and treatment of patients is widespread and recognised by medical disciplines such as plastic and reconstructive surgery, ENT, Craniofacial/CLP surgeons, and OMFS trauma surgeons. These medical disciplines recognise the high quality three-dimensional detail CBCT provides and assists doctors in the treatment planning and diagnosis of their patients. Such widespread and multidisciplinary application of CBCT imaging contributes to CBCT is becoming a new standard of care.

CBCT in the dental culture

Many in the dental profession acknowledge the benefit of 3-D imaging to patients and doctors. There is little dispute that CBCT provides superior representation of the anatomy versus 2-D plain films. Quality of product acknowledged, at least four aspects of CBCT must work their way through

the dental culture before CBCT becomes a standard of care: cost, availability, legal, and patient expectations. Two of these aspects (cost and availability) will more likely than not be determined by the invisible hand of the market as the Keynesians laws of supply and demand move the dental industry to provide the best possible service at a price patients and insurance companies are willing to pay. The third (legal) will be slowly determined in the court systems as attorneys and experts begin to rely more on CBCT in support of their clients' cases.

Patient expectations are difficult to accurately ascertain. We know patients expect our practices to be contemporary. Buying the latest and greatest machine for your practice may not be wise if cost exceeds benefits both clinically and financially. As CBCT becomes widely accepted and expected by our patients due to aggressive marketing or clinical relevance, incorporating the technology into one's practice may not be entirely necessary but prudent as others in the profession who possess the technology appear to be more contemporary and advanced in their patient care.

There are many questions yet to be answered definitively regarding CBCT:

1. Who is responsible (and liable) for interpreting the images?
2. Is an entire field of view interpretation necessary or simply the pertinent structures?
3. Must all images be interpreted by a board certified oral and maxillofacial radiologist or can the ordering doctor interpret the images?
4. What level of training is sufficient to own and operate the machine, as well as, and interpret CBCT images?
5. What cases deserve a CBCT?
6. If the patient refuses a CBCT and the dentist believes a CBCT is necessary for successful case completion, must the dentist complete the case without the CBCT study or can he refuse the case without fear of legal repercussions?

Lastly, as mentioned earlier, standard of care is an evolving concept. Darwin stated clearly any organism (or concept in this case) which is subject to the laws of evolution must adapt in response to outside forces in order to survive. The standard of care in dentistry is adapting to CBCT as forces (legal, financial, clinical, and consumer) act upon the industry to account for the powerful influence CBCT has on treatment planning and diagnosis of patients. While recognising that all that glitters is not gold, CBCT may soon represent a new gold standard by which many cases will be judged. ◀



• Dr Lee M. Whitesides

Dr Lee M. Whitesides is an oral surgeon from Dunwoody near Atlanta in the US.

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“It is unacceptable to neglect severe oral diseases”

An interview with Barts and The London School of Medicine and Dentistry Professor Wagner Marcenes, London.

■ In a report, researchers of the Global Burden of Diseases, Injuries, and Risk Factors Study have recently shed light on the global dimensions of severe periodontitis, which now affects over 700 million people worldwide. This study is a major effort involving more than 1,000 scientists to systematically produce comparable estimates of the burden of 291 diseases and injuries and their associated 1,160 sequelae in 1990, 1995, 2005 and 2010. *Dental Tribune UK* had the opportunity to speak with lead author Prof. Wagner Marcenes from Barts and The London School of Medicine and Dentistry in London about the findings and why they are a cause for concern.

Dental Tribune: Prof. Marcenes, the prevalence of severe periodontitis on a global scale has not increased significantly in the last two decades, according to your report. Why are the numbers worrying nevertheless?

Prof. Wagner Marcenes: Having more than 700 million people suffering from severe periodontitis is really worrying. Although the proportion remained the same in 1990 and 2010, the number of people needing periodontal treatment has increased dramatically. This is because worldwide more than one in ten people suffer from severe periodontitis and the

world population grew from 5.3 billion in 1990 to 6.9 billion in 2010. Moreover, severe periodontitis tends to develop during adulthood, showing a steep increase between the third and fourth decades of life. With more people living longer and retaining their teeth for life, the risk of developing severe oral health-related prob-

lems, particularly periodontitis, will be high. The world's population is expected to almost double by end of this century, implying that the number of people with severe periodontitis may at least double.

lems, particularly periodontitis, will be high. The world's population is expected to almost double by end of this century, implying that the number of people with severe periodontitis may at least double.

How do the results compare to the situation prior to the surveyed period?

We have updated the data from the first Global Burden of Disease (GBD) study and generated comparable figures in 1990 and 2010. Therefore, we were able to compare the current and the previous situation to our survey in 2010. Since the study is unique, we do not have global data before the first GBD study. However,

we know that oral diseases have decreased significantly in most industrialised countries, such as the UK and the US, in the last five decades.

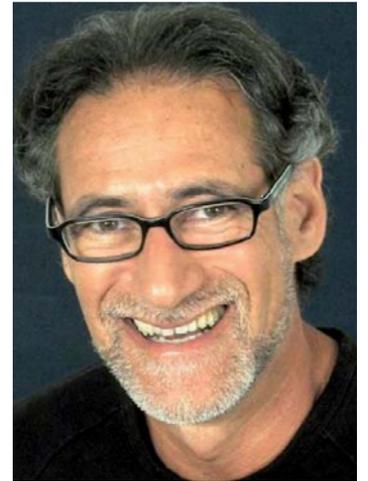
Severe periodontitis appears to be most prevalent in South America and east sub-Saharan Africa. What could be the reasons for that?

Our study was not actually designed to test risk factors of periodontal disease, but based on pure reasoning, I would say that, in addition to demographic changes, smoking and poor oral hygiene may be the main factors associated with it. This is speculation, but what we see at the moment is a growing number of people smoking in developing regions contrary to the trend in most developed countries. Nearly 80 per cent of the more than one billion smokers worldwide live in low- and middle-income countries. With 1,500 new cases every year, Argentina for example has the highest incidence of severe periodontitis, which is almost double the global average, and high

tobacco consumption. We cannot establish a cause and effect relationship, but I believe that the high incidence of periodontitis in these areas is most likely related to the habit of smoking.

In your report, you mention how difficult it is to determine disease

“With more people living longer and retaining their teeth for life, the risk of developing severe oral health-related problems, particularly periodontitis, will be high.”



Prof. Wagner Marcenes

adopted by the larger community of public health dentistry.

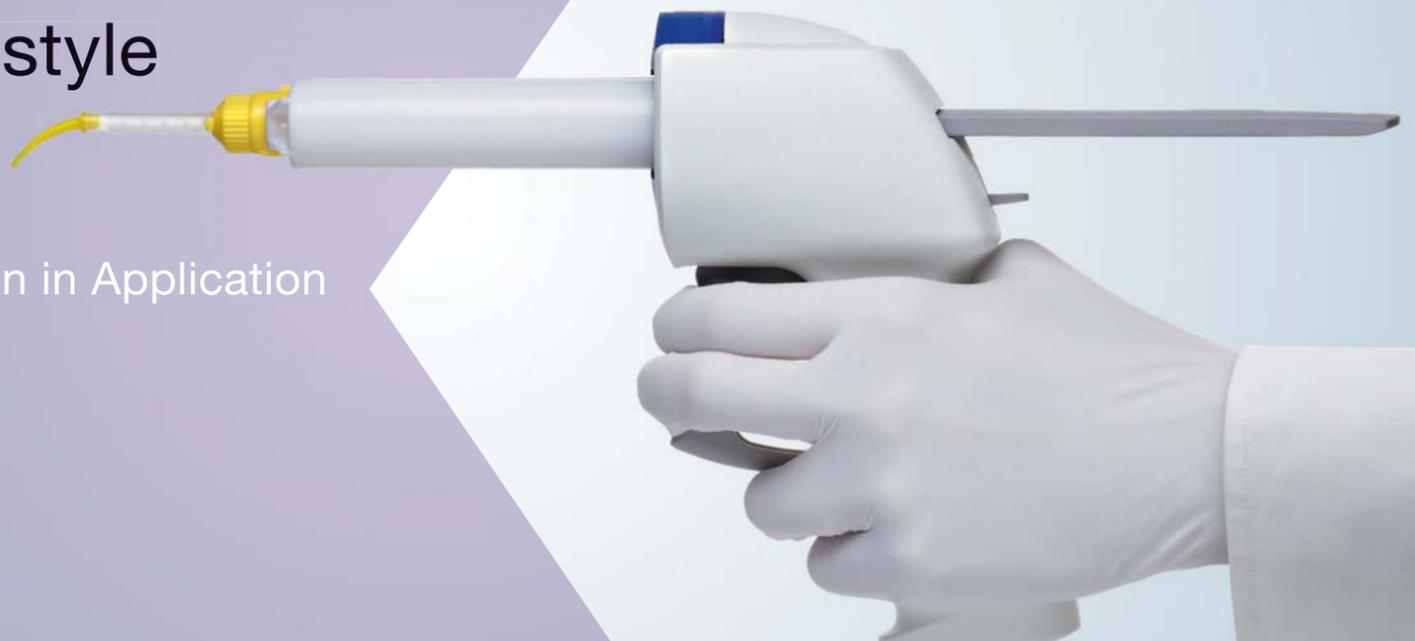
The choice of including only severe periodontitis and not less severe forms of periodontal disease, such as mild or moderate periodontitis and gingivitis, was because of their low impact (disability weight) on quality of life. Since periodontitis tends to progress from mild to severe if untreated, our numbers reflect only the tip of the iceberg, indicating the seriousness of the challenge to health professionals.

Why is the situation so little addressed by the dental community,

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Cost-benefit and affordability of dental implant restorations

By Prof. Hugo de Bruyn, Belgium

Nowadays, dental implants are well established in daily practice and are well known and accepted by the public. They allow anchorage of removable and fixed dental prostheses in a predictable way. The efforts of scientists in collaboration with the implant industry have led to continuous improvement in clinical outcomes owing to the modification of implant surfaces, implant design and prosthetic connections. Together with a better understanding of biology, these developments yield fewer implant failures despite the usage of implants in compromised or at-risk patients.

In their consensus reports, the European Association for Osseointegration stressed the need for additional research in the field of patient-centred treatment outcomes, including the economic impact of implant restorative treatments.¹ Patient-centred outcomes consider a number of parameters that are not always objectively measurable, in contrast to implant survival, bone loss, peri-implant health and incidence of complication, for example. Patient-centred outcome variables include patient satisfaction with a given treatment, improved masticatory ability and aesthetics, the absence of speech problems and the subjective evaluation of oral health-related quality of life.

In light of a growing interest in health economics, greater attention is also being given to the cost-benefit of tooth replacements. In economics, cost-benefit analysis compares the cost of making a product or delivering a service to the direct benefit to the in-

dividual or the society, including the revenue the product or service will generate in the long term. Applied to dental or medical care, this analysis would have to consider resource expenditure relative to potential medical benefits, such as longer survival, reduced pain or morbidity, and greater comfort. Such an analysis would seek to determine the best choice considering limited resources, and it would weigh the possibility of undesirable outcomes and side-effects against the potential of a positive treatment outcome.

A cost-benefit analysis would consider these aspects together with the costs involved in terms of chair time, patient-related time, handling complications, and satisfying patients' expectations and preferences. It has become a part of the process of determining necessity in delivery of qualitative care and it brings the patient to the centre of decision-making. In dental science, these aspects are largely uncovered.

In the context of implant treatment, it is well established that edentulousness and wearing of a complete denture have a number of negative physiological, functional and psychosocial effects. These influence oral function and aesthetics, as well as satisfaction, self-esteem, body image and quality of life.² Consequently, improving the retention of a denture by fixation on two to four implants or the fixation of a fixed complete dental prosthesis on four to six implants has a tremendous effect on oral health-related quality of life. However, adaptation to tooth loss varies individually and many patients

cope very well with fewer teeth and do not always desire replacements, let alone dental implants.

In Europe, the demand for tooth replacement is increasingly based upon normative and theoretical grounds and not always on patient-specific assessment. Clinicians are often stuck in dogmatic, non-evidence-based thinking. Often, they impose their personal view concerning the suggested treatment option. Some examples to illustrate this are favouring long implants and bone grafting instead of short implants, believing that the more implants the better, favouring overdentures on connected implants, believing that ceramics are better than acrylic teeth, and regarding aesthetics as being of sole importance.

Long-term clinical studies demonstrate that a single implant is the best option for a missing tooth. It has a greater initial cost, but has a survival rate of above 95% and can be considered more cost-effective than a three-unit conventional bridge.³ Studies have also found that implant-retained overdentures are worth the price given the increase in quality of life and treatment satisfaction. Furthermore, when patients' resources are limited, the two-implant solution is a better option from a cost-benefit perspective than a fixed dental prosthesis on four to six implants.

Unfortunately, patients' financial situation imposes a significant barrier to treatment choice. Although dental implants have become a mass product,

the price does not reflect normal economic trends in price reduction. On the contrary, prices rise yearly. The high-tech evolution of 3-D radiographic analysis, the use of stereolithographic guided surgery, the need for individualised aesthetics, and the increased use of additional regenerative procedures have all further increased the total cost. Although these techniques offer the ability to facilitate surgery and enhance aesthetics, the cost aspect is seldom taken into account.

One can question whether this does not lead to exclusive treatments for the happy few. In Europe alone, every year close to one million patients become completely edentulous. It is unlikely that they can afford dental implants. Research in Austria has found that the average person considers implants too expensive and blames the dentist for the high price.⁴ Additionally, 59% of the patients expected a lifetime longevity. A previous study showed that 23% of the patients would not opt for implants at all.⁵ Another study assessing treatment advice given after tooth extraction by Flemish general dentists in Ghent demonstrated that replacement was not recommended in 42% of cases. Of the remaining cases, 54% opted for a removable appliance and only one-fifth received advice for a single implant crown. It appeared that highly educated patients were more likely to receive a single implant, probably on grounds of financial affordability. Hence, despite evidence that a single implant is the best, cost-effective way to replace a missing tooth, it is seldom advised. It is obvious that other pa-



* Prof. Hugo de Bruyn is Chairman of the Department of Periodontology and Oral Implantology at Ghent University Hospital in Belgium.

tients' and clinicians' arguments prevail in the decision-making process.⁶

Given the current economic situation, dental health care expenditure will probably slow down or even be reduced. With budget cuts and savings deemed necessary in the EU for the coming decade, an insecure situation or the perception thereof by many patients will require difficult choices. In many countries, national health or private insurance seldom reimburses patients for implant prostheses, leading to large groups of patients requiring replacements but being without the means to pay for them. The remaining patients can afford dental implants, but have high and often unrealistic expectations regarding the device and are very critical.

It is a challenge for clinicians to deal with these economic factors and offer good treatment to as many patients as is feasible. The clinician should advise the patient which treatment option is preferable based on individual risk assessment, but the patient's preferences, including financial affordability, and the long-term cost-benefit aspects are gaining importance and cannot be neglected. ◀◀

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* Aerial view of Buenos Aires, the capital of Argentina. The South American country has the highest incidence of severe periodontitis in the world. (Photo Celso Diniz)

and how could it be better addressed?

The fact that a preventable oral disease is the sixth most prevalent of all 291 diseases and injuries examined in the 2010 GBD is quite disturbing and should cause all of us to redouble our efforts to raise awareness of the importance of oral health among policymakers. It is reasonable to prioritise life-threatening diseases that have a greater impact on quality of life; however, it is unacceptable to neglect severe oral diseases. Untreated caries in the permanent dentition is the most prevalent of all oral diseases and periodontitis the sixth, and untreated caries in the primary dentition is the tenth most prevalent disease in the world.

It is possible that the prevention and treatment of periodontitis are neglected because most health strategies target children at school and severe pe-

riodontitis is uncommon before the age of 20. I believe we need to seriously consider a change in strategy and target the adult population. Also, we should focus on determinants of health rather than the disease itself.

We call this the common risk factor approach. For example, many dental practices in the UK run smoking cessation programmes. This will not only reduce the number of cases of periodontitis but also help prevent life-threatening diseases, such as cancer and cardiovascular disease. Adopting the common risk factor approach would lead to the inclusion of oral health in the top five most relevant diseases. This is because oral diseases and serious life-threatening diseases share the same determinants, for example smoking, hygiene and diet.

Thank you very much for the interview. ◀◀



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Infection control in an era of emerging infectious diseases

By Eve Cuny, USA

More than three decades have passed since the emergence of human immunodeficiency virus (HIV) as a global pandemic. More than

tices in dentistry. Prior to the mid-1980s, it was uncommon for dentists and allied professionals to wear gloves during routine dental proce-

with an alcohol-soaked gauze sponge. This was despite our knowledge that hepatitis B virus (HBV) had been spread in clusters in the offices and

Today, many take safe dental care for granted, but there is still reason to remain vigilant in ensuring an infection-free environment for providers and patients. HIV has fortunately proven to be easily controlled in a clinical environment using the same precautions as those effective for preventing the transmission of HBV and hepatitis C virus.¹ These standard precautions include the use of personal protective attire, such as gloves, surgical masks, gowns and protective eyewear, in combination with surface cleaning and disinfection, instrument sterilisation, hand hygiene, immunisations and other basic infection control precautions. Sporadic reports of transmission of blood-borne diseases associated with dental care continue, but are most often linked to breaches in the practice of standard precautions.²

Emerging and re-emerging infectious diseases present a real challenge to all health care providers. Three of the more than 50 emerging and re-emerging infectious diseases identified by the Centers for Disease Control and Prevention and the World Health Organization (WHO) include Ebola virus disease (EVD), pandemic influenza and severe acute respiratory syndrome.^{3,4} These previously rare or unidentified infectious diseases burst into the headlines in the past several years when they exhibited novel or uncharacteristic transmission patterns.

Concern about emerging infectious diseases arises for several reasons. When faced with a particularly deadly infectious disease such as EVD, which can be spread through contact with an ill patient's body fluids, health care workers are naturally concerned about how to protect themselves if an ill patient presents to the dental clinic. With diseases such as pandemic influenza and severe acute respiratory syndrome, which may be spread via inhalation of aerosolised respiratory fluids when a patient coughs or sneezes, the concern is whether standard precautions will be adequate.

In addition to standard precautions, treating patients with these diseases requires the use of transmission-based precautions. These encompass what are referred to as contact, droplet and airborne precautions for diseases with those specific routes of transmission. Transmission-based precautions may include patient isolation, placing a surgical mask on the patient when he or she is around other people, additional protective attire for care providers, and in some cases the use of respirators and negative air pressure in a treatment room. In most cases, patients who are contagious for infections requiring droplet or airborne precautions should not be treated in a traditional dental clinic setting.

Updating a patient's medical history at each visit will assist dental health professionals in identifying patients who are symptomatic for infectious diseases. Patients with respira-



• Eve Cuny

tory symptoms, including productive cough and fever, should have their dental treatment delayed until they are no longer symptomatic. Additionally, health care professionals who are symptomatic should refrain from coming to work until they have been free of fever without taking fever-reducing medication for 24 hours.

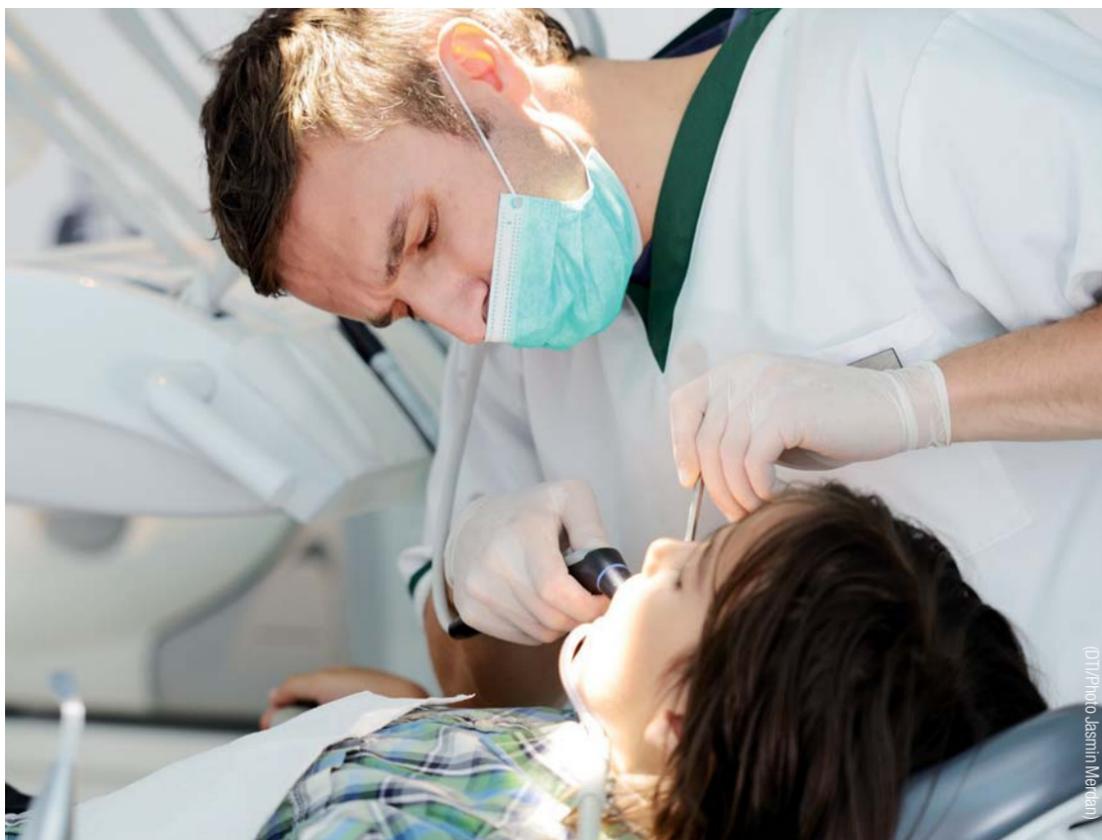
In most cases, a patient with symptoms as severe as those experienced with EVD will not present for dental care and therefore extraordinary screening and protection protocols are not recommended. If a patient is suspected of having a highly contagious disease, he or she should be referred to a physician, hospital or public health clinic.

Dental professionals should take action to remain healthy by being vaccinated according to accepted public health guidelines, understanding that the recommendations may differ according to country of residence. Performing hand hygiene procedures at the beginning of the day, before placing and after removing gloves, changing gloves for each patient, wearing a clean mask and gown or laboratory coat, and wearing protective eyewear are all positive actions that help prevent occupational infections. In addition, cleaning and heat sterilisation of all instruments and disinfection of clinical surfaces ensure a safe environment for patients. There is solid evidence that dental care is safe for patients and providers when standard precautions are followed, but patients and dental health care workers are placed at risk when precautions are compromised and breaches occur.⁷ ◀◀

Eve Cuny is an associate professor at the Arthur A. Dugoni School of Dentistry at the University of the Pacific in San Francisco in California in the US. She is also a consultant to the American Dental Association's Council on Scientific Affairs and expert reviewer for the Centers for Disease Control and Prevention.

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• During treatment the most contaminated areas are around the dentist's nose and his or her inner corner of the eye.

any other infection, it is possible to single out HIV as the primary stimulus for changing infection control prac-

dures. Many dental clinics did not use heat sterilisation, and disinfection of surfaces was limited to a cursory wipe

clinics of infected dentists and that dentists were clearly at occupational risk for acquiring HBV.

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Innovations with lasers could lead regenerative dentistry

Praveen R. Arany, USA

With the upcoming year, 2015, being designated as the year of light, the acknowledgment for the key role of light in multitude areas of our very existence and more specifically, in areas of human health are being widely promulgated.¹ Many references to the beneficial effects of light and specifically sunlight are replete in the literature across ancient civilisations.

Notably, the ability of concentrated light radiation in the management of Lupus vulgaris by Niels Ryberg Finsen received the Nobel Prize in Medicine and Physiology in 1903.² The all-pervasive nature of opto-photoelectronics in our current society is readily evident such as the simplest supermarket laser scanners and optical communications to precision medical lasers and more recent laser weapon systems. This is also perhaps best highlighted by this year's Nobel Prize in Physics to the inventors of the blue light emitting diodes (LEDs), a simple invention with profound impact on our current society.³

Clinical laser application

Dentistry has historically been a leading clinical specialty in adoption of new technologies. Light has been a central part of clinical dentistry from evolutions of operating lights and fibre optic illuminations to light cured restorations and more recently, optical imaging. Although lasers were commercially available since 1960's, the first dental laser for hard tissue applications was approved by the USFDA in 1997. Adoption for high power soft tissue applications has always been popular in many med-

ical fields such as surgery, oncology, dermatology and ophthalmology.

First discoveries

Following the invention of this exciting new tool, early biological concerns focused around the safety of this new device with natural comparisons being drawn to ionizing forms of electromagnetic radiation. Among the early pioneering studies, Andre Mester reported a peculiar phenomenon—high doses destroyed tissue in a precise and predictable manner but very low doses produced a startling improvement in wound healing and promoted hair growth.^{4,5} This was a surprising discovery on many accounts.

While high energy electromagnetic radiation, such as Gamma, X-rays and Ultraviolet, were able to achieve significant linear energy transfer generating biological damage (nucleic acid strand breaks), the effects of visible (and later infra-red) lasers did not appear to fall within these routine biological responses (Fig. 1). With much excitement, these initial observations spurred many investigations for the use of low powered lasers and other light devices (including filter-based broad light sources and LEDs) in many clinical and lab research studies.

Barriers in application

Unfortunately, a combination of the complexity of the early technology and a lack of understanding of its biological mechanisms has resulted in significant discrepancies in their reported therapeutic benefits. Hence, the lack of ro-

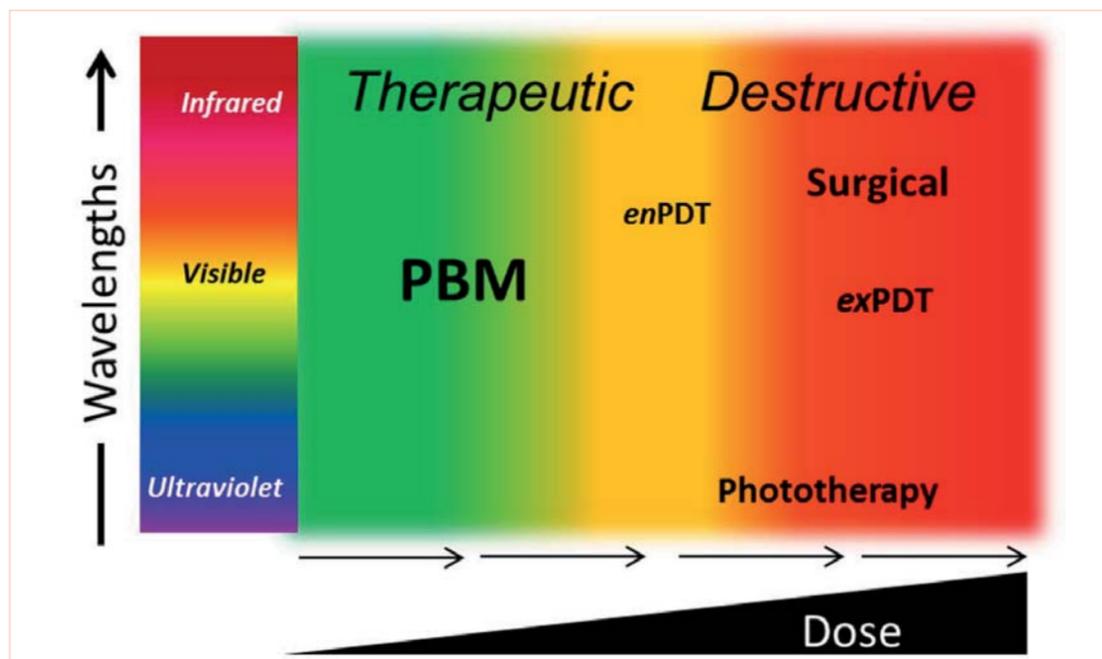


Fig. 1: The use of various wavelengths at different doses can be used for various clinical applications. The following acronyms are used in this figure PBM—Photobiomodulation; enPDT—Photodynamic therapy with endogenous chromophores and exPDT—Photodynamic therapy with exogenous chromophores (dyes).

bust clinical efficacy has largely relegated the field to being side-lined as a pseudo-scientific and alternative medicine field. Current problems in the field from its basic terminology that prevents accurate indexing of the literature, to appropriate disease or biological response-specific clinical dose recommendations appear to be major barriers. Nonetheless, development of low power applications has also shown significant progress specifically in the areas of traumatic brain injury, post-traumatic stress disorders, reversal of methanol toxicity and wound healing.⁶⁻¹⁵ In more recent years, mechanistic insights into light-biological tissue interactions have con-

tributed to our better understanding for the therapeutic applications of laser therapy.¹⁶⁻¹⁸

Defining photobiomodulation

Our operational definition for Photobiomodulation (PBM) is a form of phototherapy that utilises non-ionizing sources (including broad light, LEDs and Lasers) in the visible and infrared spectrum that result in therapeutic benefits such as alleviation of pain or inflammation, immunomodulation and promotion of wound healing and tissue regeneration. PBM is a non-thermal process involving photophysical and photochemical events at various length scales resulting in beneficial photobiological responses. Its clinical applications could be appended as PBM therapy.

Study 1: Activating TGF-β1

Based on prior reports, we began studies in 1999 to establish the parameters of the near infrared laser to effectively promote oral wound healing at low doses (3J/cm², 10 mW/cm², 5 min-

utes). We performed a, thorough literature search to evaluate possible biological pathways involved in promoting wound healing. There appeared to be distinct correlations with reported use of exogenous TGF-β1 and laser treatments in wound healing.

Based on these observations, we assessed the laser-treated healing response of oral tissues for TGF-β1 expression and noted increased expression immediately post treatment and at 14 days.¹⁹ The increase at 14 days correlated well with an increased in monocyte-macrophage influx, well-known cellular sources of TGF-β1. We next looked into the increased early expression of active TGF-β1 in these wounds. TGF-β1 is secreted as a latent growth factor complex when associated with a Latency Associated Peptide (LAP). The activation process involves dissociation of LAP from active TGF-β1 dimer that is well-documented with a wide range of physicochemical modalities such as proteases, extreme pH, heat, ionizing radiation and integrin binding among others. The early wound has abundant latent TGF-β from degranulating platelets present in the early wounds.

We observed low power laser treatments were capable of activating the latent TGF-β1 complex. To further pursue this observation mechanism

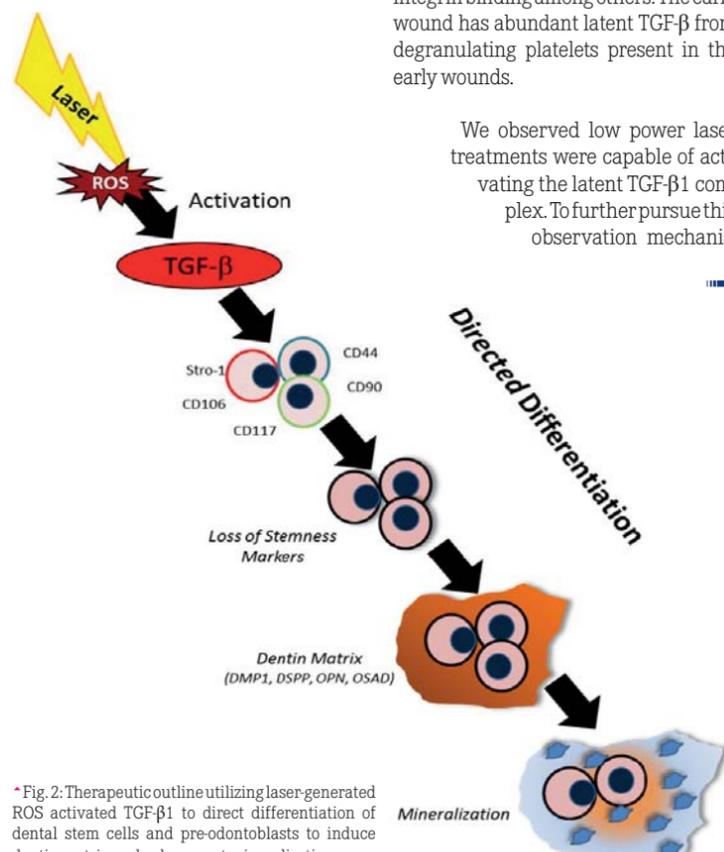


Fig. 2: Therapeutic outline utilizing laser-generated ROS activated TGF-β1 to direct differentiation of dental stem cells and pre-odontoblasts to induce dentin matrix and subsequent mineralization.

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tically, we noted that near infra-red laser was capable of generating reactive oxygen species (ROS). This highly reactive, transient chemical intermediate was sensed by a key methionine residue on the latent TGF- β 1 complex that resulted in a change in its conformation, resulting in its activation.²⁰

Study 2: Dentin regeneration

Having noted the effects of low power lasers on promoting oral mucosal wound healing in the prior study, we extended our clinical applications to dentin regeneration where TGF- β 1 has been shown to play a pivotal role in dentin physiology.²¹⁻²⁵ We noted the ability of low power lasers to promote dentin regeneration using human dental stem cells. To validate these observations, rodent pre-odontoblasts (MDPC-23) cells grown in a polymeric scaffold, simulating a 3-D niche were treated with low power lasers.

Laser treatments were able to induce dentin differentiation as evident by increased dentin-specific matrix deposition and mineralisation. To confirm the role of TGF- β *in vivo*, transgenic mice with lack of TGF- β receptor in all cells capable of inducing dentin (utilising a Dentin Sialophosphoprotein specific transgene) were generated. Experiments in these mice did not demonstrate any significant dentin induction following laser treatment validating the critical role of TGF- β activation in mediating its effects.

Previous studies have shown the therapeutic benefits of supplementing exogenous (recombinant) TGF- β for

reparative dentin, this study suggests the use of low power lasers can activate endogenous latent TGF- β 1 present naturally in the pulp-dentin complex to drive differentiation of resident dental stem cells (Fig. 2). Thus, this therapy can utilise the inherent repair-regenerative responses naturally present in native tissues.

Clinical Applications of Laser-Dentin induction

These observations have potent clinical implications where dentin would need to be therapeutically generated. The two directly relevant clinical scenarios are for pulp capping following deep carious lesions and for dentin desensitisation. In the former case, removal of decayed or damaged tooth structure approximating the pulp (close to or clear exposure) that require the use of pulp capping agents (such as Calcium hydroxide) could be potentially replaced with low power laser treatments.

In the second scenario, the use of low power laser treatments on exposed dentinal tubules could potentially generate an intrinsic dentin barrier that would relieve tooth sensitivity. This would be more effective than our current approach to extrinsically occlude exposed tubules modes.

The two major limitations of the current study were that we noted calcifications interspersed throughout the pulp chamber, spatially distinct from the laser-biological tissue interface. We believe this is perhaps a combination of the inherent near-infrared laser wavelength that readily permeates throughout biological tissue as well as the solu-

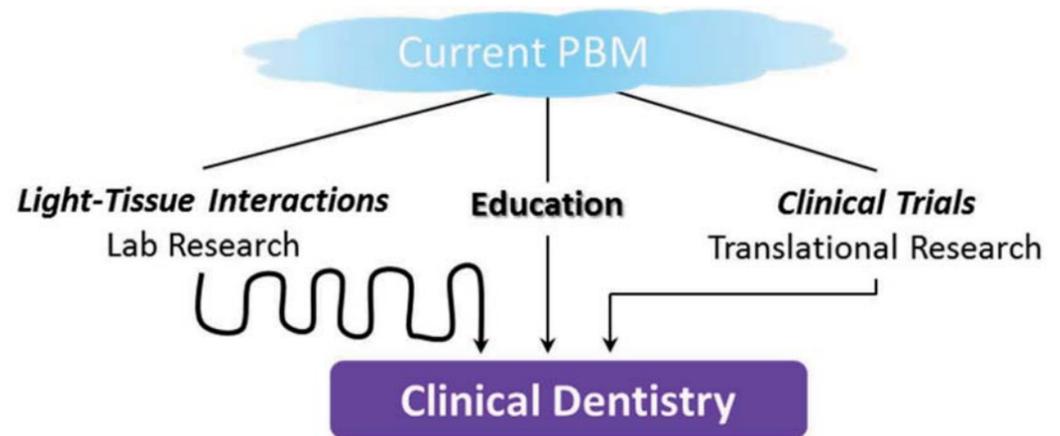


Fig. 3: Potential routes to move the field of PBM towards mainstream clinical dentistry. The wavy path from lab research to clinics is meant to reflect the multistep, tortuous basic science explorations in a wide range of topics that need to come together to aid in clinical translation.

ble nature of the activated molecules. This could be potentially addressed by better optical focusing techniques and use of specific reagents that absorb the radiant energy and spatially restrict the biological interphase.

A second limitation in this study was the observation that laser-generated dentin was a tertiary or reparative form that lacks pristine tubular structure. It appears that additional cues both biophysical (architecture) and biochemical (soluble, organizational), are likely necessary to promote morpho-differentiation of the newly induced dentin.

In attempts to further explore these molecular mechanisms, we have more recently extended developed a polymeric scaffold system with precise morphogen fields.²⁶ Using this model, we were able to extend our observations with dental stem cells and laser-acti-

vated TGF- β 1 mediated dentin differentiation to mesenchymal stem cells suggesting this approach could have significant potential with other stem cell types as well.

Conclusion

Both ROS and TGF- β are central biological mediators in a wide range of biological responses.²⁷⁻²⁹ The ability to selectively activate them in a spatio-temporally defined manner *in vivo* using low power lasers provides a significant clinical tool for various therapeutic interventions.

Questions on precise wavelengths, clinical protocol (delivery and dose ranges) and context of the pathophysiological response are all critical issues that need to be explored rigorously to enable further effective clinical translation of this therapy.³⁰ Further, the ability to effectively move this therapy into

mainstream clinical dentistry will require more basic research, development of robust clinical standards and education at various levels (basic dental training and continued education) (Fig. 3).

In the current era of personalised medicine and strategies to utilise sophisticated technologies and pharmaceuticals to individualise health care, the significant promise of lasers in clinical dentistry may indeed be the leading, pivotal technology that ushers in the new era of regenerative dentistry.

Acknowledgement

This work was supported by the intramural research program of the National Institute of Dental and Craniofacial Research, National Institutes of Health. ◀

Editorial note: A list of references is available from the publisher.

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VATECH GOES GREEN CT

Dedicated to develop products that are beneficial for human health and the environment, dental manufacturer Vatech has been developing a sustainable manufacturing process that the it says reduces waste and pollution. Branded Green Innovation, the company has been designing and manufacturing equipment that are "low dose and low radiation".

After the successful market launch of the PaXi3D Green in the US, devices are now manufactured

a bendable & soft exterior that allows clinicians to achieve an accurate diagnosis of interproximal caries, for example, through improved positioning. Damage caused by commonly used rigid sensors can be reduced this way.

Isometric imaging allows for less image distortion.

Supporting the entire oral surgery process, the user intuitive Ez3D-i software with the [3D PAN] tab makes everything "Quick" and "Smart". According to Vatech, Ez3D-i enables lingual-side diagnosis using volume panoramic programmes and sup-



porting to the company. Cross-sectional images take one second. With 3D Pan, implant simulation, even involving multiple implants, can be conducted.

With i-Cleaner, Vatech also offers a disinfection & packaging machine



and distributed under the Green CT brand. Along with this, Vatech is now introducing a new product range under the motto "low dose but with superior image quality".

With just 14.8 µm pixels, the intra-oral sensor EzSensor Soft comes with

ports effective exact location of a lesion in endodontic treatment whether it's near the apical area or not. It also offers various modes to determine the exact bone density.

Only one click is needed for a region-of-interest (ROI) diagnosis, ac-

automatic double wrapping functionality for the sensor and storage that works with UV light and minimises the risks of infection.

VATECH, KOREA
www.vatech.co.kr/indexE
Hall 4.1 Booth D090

INTRA-ORAL DEVICES FOR ALL PURPOSES

A leading market provider, the Italian company Brux offers a complete range of self-molding intraoral devices that are designed for specific needs. Developed to improve the quality of everyday life, they are recommended and used by dentists as an alternative to solutions commonly produced in dental practices.

Thanks to over thirty years' experience in the field of dental devices, the company has developed high performance self-molding bites such as the Dr Brux self-molding bite tray to prevent the effects of night-time

stability, the company offers its Brux mouthguards.

The proper care of all dental appliances is fundamental in order to avoid dental and mouth problems or infection. For this reason Brux has recently launched BiteSept, a new full spectrum disinfectant. The concentrated solution that can be diluted in water and is ideal for disinfecting and cleaning all removable intraoral devices, such as bite trays, orthodontic devices, mouthguards, mouthpieces, teeth whitening trays and removable prostheses.



bruxism as well as the Dr Russ bite tray for preventing sleep apnea and snoring. With Relax, the company also offers a daytime bite tray that was designed to counter the effects of stress.

With Brux Sport and Power, Dr Brux has developed two design that apply to all kind of sportsmen and sportswomen who want to improve their performance. Divers have the anatomic, thermos-formable mouthpiece Jax at their disposal. For a first-class protection with outstanding

According to the company, BiteSept is compatible with all plastic materials (silicone and EVA) and acrylic resins.

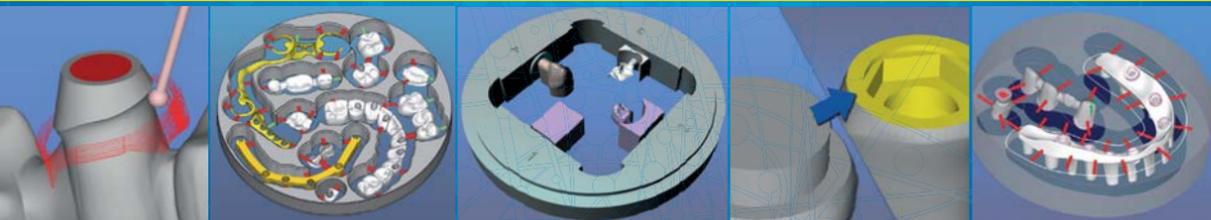
The high quality standards are also reflected in the Private Label service that BRUX offers to the many companies seeking top high-tech products that are 100% Made in Italy.

BRUX, ITALY
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Hall 11.2 Booth S052

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KOHLER LAUNCHES INSTRUMENTS FOR MINIMALLY INVASIVE EXTRACTION

Two new production series will be presented by German dental instruments manufacturer Kohler this year. The TRINOVO profile handle made of PEEK, a high-performance plastic which has been utilised in medical technology for decades, are low-weight and offer stability and

formed as atraumatically as possible.

MINVALUX BLACK instruments with and a ceramic coating are produced with a single working end and have especially been designed for minimally invasive extraction surgery, making it a suitable instrument for this kind of procedure. Owing to their ceramic coating, the MINVALUX BLACK instruments are extremely durable and long lasting. They also provide tremendous abrasion resistance



and produce lower wear through a reduced friction factor. Notably improved corrosion resistance is facilitated by the microscopically smooth surface. With the anti-glare surface there are no more disturbing light reflections.

Equipped with TRINOVO, the new MINVALUX BLACK instruments for a Minimally INVASive LUXation can be used to extract a tooth or root. They also allows to place an implant immediately afterwards, provided that the indications for this procedure are given. In such cases, the extraction should be per-

According to Kohler, MINVALUX BLACK instruments are also bio-compatible, tissue friendly and anti-allergenic.

KOHLER MEDIZINTECHNIK, GERMANY
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DEI SHOWS SYSTEM FOR PRODUCTION OF CARBON FIBRE PROSTHETIC STRUCTURES

Nowadays, carbon fibres are used in many industries, particularly in those where there is the need to have maximum performance with reduced weight. Owing to these characteristics carbon fibre also represents a new era in prosthetics. The creation of precise prosthetic structures, without retractions or expansions, strong and lightweight, and that could be carried out quickly in any dental laboratory without the aid of any space equipment, intelligent software, and external organizations, it was an aspect that many felt the lack.

offers shock absorption which is very important for implant prosthetics.

A result of newly developed technology, the resin used for impregnation of the fibres provides extraordinary strength. For use in the oral cavity it has been necessary to achieve a resin with high biocompatibility of natural origin that we called Dream Frame Bio Resin.

Owing to its strength, mechanics stability and micro-mechanical elasticity (shock absorption), Dream Frame provides an important option



With Dream Frame, the Italian manufacturer DEI wants to support dental technicians and to dentists in their work by offering high technology that offers great benefits, practicality and spare even costs.

The flexural strength of the fibre exceeds 250 GPa, which is significantly larger when compared to the forces occur in the oral cavity that are unlikely to exceed 70 to 80 kg. Compared to traditional materials it also

for manufacturing implant-prosthesis works. Its high precision removes the need post cementation to make passive the structure. Certainly it will be necessary to start with a dental impression in plaster or locking of transfer in order to have an accurate dental impression.

DEI, ITALY
www.deiitalia.it
Hall 2.1 Booth A050

XO CARE PRESENTS XO DENTAL DIALOGUE AT IDS 2015

At the last IDS, the Danish family-owned manufacturer XO CARE from Denmark introduced XO VIP SHOW in a theater-like setting where a dental team and an XO manager presented "Extraordinary Dentistry". This year the exhibition concept will reach next levels under the headline XO DENTAL DIALOGUE.

According to XO Care, the event will start with a brief introduction to value creation in dentistry. Next, the audience is asked to rank the importance of the presented issues in relation to their own experience. During the following minutes, the two top issues are treated more in depth in a dialogue between a reference dentist and the manufacturer.

Prior and after the performance the audience is invited to relax in the XO Lounge next to the "classroom" and maybe have a look at the new equipment and instrument solution from XO.

With the XO DENTAL DIALOGUE, the manufacturer aims to create a setting that will involve the audience in the dialogue, thereby also enhancing the possibilities for continuous product improvements, and open innovation.

XO Care CEO Kim Sørensen says that his company and professional dentists share the same objective of constantly striving for the best working solutions—in response to challenges and requirements of modern dentistry.

Sørensen thinks that dentists have four professional objectives: "Performing perfect treatments, on calm patients, while maintaining the dental team's own health and finally making a good equipment investment."

"It is not only about choosing to work with the best dental equipment but also about exploiting the great advantages of the equipment, while performing quality dentistry," Sørensen concludes.

XO CARE, DENMARK
www.xo-care.com
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The pre-polishing step reduces all surface defects and prepares it for the final polishing while the second step brings high-shine to any composite surface, according to the company. Since only two polishers for all composite surfaces have to be applied, the polishing process is simplified and shortened considerably.

In addition to the special shape, the employed diamond abrasive leads to high shine surfaces under short application times. The applicability on all common composites and the high efficiency are other features of this innovative polishing system.

Key characteristic of Diacomp Plus is the unique flexibility. The polishing spirals adapt to any type of surface structure which makes it possible to polish all tooth surfaces



equally well with just one shape. Even the polishing of the occlusion is considerably simplified, according to EVE.

For more flexibility, the Diacomp Plus TWIST are available in both diameters 10 mm and 14 mm.

An additional advantage that comes with the application of Diacomp Plus TWIST is the maintenance of the initial surface structure. After the modelling of the composite surface with a metal instrument, the polishing process with the flexible spirals does barely alter the created structure.

Dentists also appreciate the excellent durability of the polishing system. Even multiple sterilization cycles do not alter the effectiveness of Diacomp Plus TWIST, the company said.

EVE ERNST VETTER, GERMANY
www.eve-rotary.com
Hall 10.1 Booth F041

DENTIST CAN SAVE TIME WITH BIEN-AIR'S NEW HIGH-POWER TURBINE

In an effort to address the time constraints dentists face in their daily practices routine, Swiss medical technology company Bien-Air Dental has announced that it will launch one of the industry's most powerful turbines at IDS 2015. By facilitating faster dental procedures, the Tornado is aimed to have the most positive impact on the efficiency and profitability of dental clinics around the world. Quiet and powerful, it will be the perfect time-saving option for forward-thinking practices, according to the company.

custom-designed ceramic ball bearings that are able of handling even the highest speed and heaviest loads."

In addition to the launch at Cologne International Dental Show (IDS) in March 2015, the Tornado will be available in June in all countries where Bien-Air products are traded.

BIEN-AIR, SWITZERLAND
www.bienair.com
Hall 10.1 Booth H050

Owing to a series of proprietary technologies, the Tornado delivers an outstanding power output of 30 Watts, which can be considered as one of the best in the industry.

"The Tornado sets a new benchmark in this category," says Marco Gallina, Vice President of Marketing and Product Management for Bien-Air Dental. "It addresses the number one concern of the dentist, which is lack of time, while promising users the level of quality and reliability they have come to expect from our company."

Operating at a sound level of 55 decibel, the Tornado skillfully combines performance with exceptional comfort for clinician and the patient. It comes with a number of new features such as a revamped spray/illumination system and an improved bur-locking mechanism.

"These innovations are supposed to complement some of our long-term proven technologies," Gallina points out. "In order to guarantee superior durability, the Tornado is fitted with



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Their implant system can be configured with internal connection, external and conical connections. While the international connection provides for a better cosmetic result and improved stabilisation of the prosthetic abutment on individual elements as well as in aesthetic areas, the external connection is a simple and intuitive solution for multiple and total rehabilitations.

Implant Technology System says to provide its customers with a fast and flexible service. Ordered goods are usually delivered within 24 hours. The company also provides its partners and its customers with a technical advisory services as well as commercial pre- and post-sales service that support them from both the clinical side as well as technological issues and logistics.

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ISASAN, ITALY
www.isasan.com
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LASCOD PRESENTS ANOTHER EVOLUTION IN IMPRESSION TAKING

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brought impression taking to another level. With the new Kromopan EDS, the company now takes another step forward and extends the dimensional stability dental impression during storage up to 168 hours.



While the high accuracy and elasticity clinicians remains unchanged, the material now sets extra quickly in the oral cavity allowing the perfect realisation of any prosthesis or functional intervention, the company said.

According to Lascod, Kromopan EDS offers performance which till now was believed to be unreachable. The company has been developing innovative solutions for over 60 years, earn recognition as a leading provider in dentistry.

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Advancing Dentistry with Stratasys 3-D Printing

An interview with Avi Cohen, Director of Global Dental for 3-D Printing Pioneer, Stratasys Ltd.

■ What are the main demands from dental and orthodontic labs and how have these demands changed in recent years?

The dental industry is, by its very nature, fast-paced and requires rapid turnaround. When patient care is directly affected by a technology, technicians will always look for innovations that can reduce time while improving quality and precision.

Dental technicians traditionally rely on steady hands and expert eyes to prepare crowns, bridges, etc., however, the traditional manual process is labor and time-consuming, subjected to human errors and requires materials that do not typically provide the best durability or aesthetic appearance. By using 3-D printing, dentists are able to reduce the time it takes to produce a dental mould and accelerate treatment time, crucially having a direct and positive impact on patient care.

Using Stratasys' PolyJet technology, featured in our Dental Series of 3-D printers, laboratories can print in ultra-fine 16 micron layers, dramatically increasing precision in comparison to traditional dental mould making. This avoids the need for patients to return to dental labs for corrective procedures and saves dentists both time and money.

Precision is always paramount in the dental industry and this remains a primary demand. In recent years, dental professionals have started to appreciate that digital dentistry is the new face of the in-



dustry. It is no longer a question 'if' they should implement it, but 'when'.

Are you seeing more dental and orthodontics labs move to digital dentistry? What do you think the reasons are for this?

With the cost of laboratory work becoming a major factor in dental restoration planning and therapy,

we are seeing an increase in the adoption of digital dentistry by dental labs. With an increased range of high-performance intraoral scanners and associated software now available on the market, more and more dental labs of all sizes are exploring and installing the level of technology that suits their company's size and budget.

Most notably, this year we have seen an explosion of devices dedicated to digital imaging, impressioning and CAD/CAM fabrication of restorations—both chairside and in the lab. With the roll out of new systems, materials and capabilities over the coming year, many believe that more dentists will begin to see the technology as a viable alternative for their practices.

Forward-thinking dental and orthodontic labs are continually considering to improve their processes, reduce lengthy milling time and stay ahead of the competition. Engineered to meet the demanding production needs of mid-size dental labs and mid-to-large-sized orthodontic labs, our newly launched Objet Eden260VS Dental Advantage supersedes Stratasys' popular Objet Eden260V Dental Advantage platform with new capabilities.

With labour costs as the main expense for dental and orthodontic labs, the Eden260VS Dental Advantage addresses this by a greater level of automation. Printing is done in a click of a button and thanks to the water soluble support, cleaning of models is a fully automated process. A single lab technician can design, print and have all models cleaned with no further post process required. The reduced cost per model has a knock-on effect to the labour cost.

By combining oral scanning, CAD/CAM design and 3-D printing, dental labs can accurately and rapidly produce crowns, bridges, stone



* Avi Cohen, Director of Global Dental for 3-D Printing Pioneer, Stratasys Ltd.

models and a range of orthodontic appliances. With a 3-D printer doing the hard work, dental labs eliminate the bottleneck of manual modelling.

We might look back at this year as the moment that dental laboratories passed the point of no return from a traditional manual workflow toward an all-digital design and manufacturing process. In many respects, digital dentistry is already here, with a growing number of laboratory owners incorporating it in some form into their strategic business models.

Thank you very much. ◀

AD

CARBON FIBRE FRAME COMBINED WITH GLASS-CERAMIC POLYMER FOR NEW GENERATION PROSTHESIS

 dream frame

Benefits

- Technologically advanced
- Maximum resistance
- Maximum biocompatibility
- Speed of execution
- Lightness (3 g per arch)
- Capacity to shock absorption
- Maximum comfort for the patient
- Costs drastically reduced
- Possibility to run diagnostic tests (CAT e NMR) without removal the prosthesis
- Eliminates the passive cementing
- High dimensional stability and precision



 monolithic composite method

Benefits

- Monolithic structure
- Maximum compactness
- No delaminations
- Maintenance of the vertical dimension: 20 µ after 200.000 cycles (like enamel)
- Colour stability
- Capacity of shock absorption
- Gold standard in implant prosthesis
- Excellent aesthetics
- Easy recovery



UBGEN PRESENTS A STEP FORWARD IN REGENERATION

Over the next 20 years, regenerative techniques will possibly allow to regrow lost tissue and organs of humans. Considered unreachable in many aspects, the prospects for regeneration looks promising than ever and clinicians look forward to what can be achieved in the years to come.

In addition, it analyses perpetually what is published in international literature and actively promotes clinical experimentations and trials. This all adds to greater reliability and better predictability for the clinician, thus providing the best possible solution for the patient, the company said.



The primary goal of UBGEN, an Italian manufacturer of ultra bone substitutes and ultra bone growth factors, among other products, is to combine clinical and scientific research with product innovation for the purpose of creating new and interesting concepts that focus on the well-being of the patient.

The company says to encourage a work environment that inspires respect, fairness and cooperation. Employees and contractors are encouraged and involved in everything the company does as well as in the processes that help to achieve its goals. UBGEN's products are all individually tested with automated controls and visual inspected by specialised staff prior to the sterilisation processes.

The company says it financially supports a number of scientific projects and clinical studies at several academic and private research institutions.

UBGEN, ITALY
www.ubgen.com
Hall 3.2 Booth E048

Useful information and travel tips

Organisers

Gesellschaft zur Förderung der Dental-Industrie, the commercial enterprise of the Association of German Dental Manufacturers (VDDI)

Koelnmesse

Exhibition opening hours

► Daily from 9:00 to 18:00

Admission online

- 1-day ticket: € 13.00
- 2-day ticket: € 17.00
- Season ticket: € 21.00
- 1-day ticket for students/special ticket for children accompanied by adults: € 7.50

Admission on site

- 1-day ticket: € 17.00
- 2-day ticket: € 21.50
- Season ticket: € 27.00
- 1-day ticket for students/special ticket for children accompanied by adults: € 8.50

IDS app

With an offline search, interactive hall plan, personal checklist and other interesting information regarding IDS 2015, the IDS app allows visitors to plan their trip at any time and from anywhere, according to Koelnmesse. Other services include a product database, information about the fairground, as well as integrated access to Business Matchmaking 365, a service that aims to bring visitors and exhibitors together even before the show. The app is free and can be downloaded from the iTunes Store and Google Play.

Press and media

Free copies of the *today international* daily show newspaper will be distributed on site and provide visitors with the latest from IDS 2015, new products and things to do in Cologne. Daily news updates, photographs and videos in English will also be available online at www.dental-tribune.com.



Passport and Visa

Owing to the Schengen regulations, nationals from a country of the European Union do not require a visa to enter the Federal Republic of Germany. All other foreigners require a visa for stays in the country. A visa is not required for semi-annual visits of up to 90 days for nationals of those countries for which the European Union has abolished the visa requirement. A current list is available on the website of the Federal Foreign Office at www.auswaertiges-amt.de/EN.

How to get to Cologne

Cologne/Bonn airport is served by most European and international airlines. With more than nine million passengers per year, it currently ranks number six in a nationwide comparison of passenger statistics. As official airline of IDS 2015, Lufthansa is offering visitors reduced rates for flights from over 250 cities in around 100 countries to the airports in Cologne, Düsseldorf and Frankfurt/Main. In order to make use of the discount, users must visit www.lufthansa.com/meetingsandevents and enter the code "DEZEDTD".

Visitors planning to travel by train can take advantage of the discounted fares offered by Deutsche Bahn (www.bahn.de/p/view/home/aktion/ids).

Airport transfer

Reaching Cologne by taxi (stand located at Terminal 2) costs between €25 and 30. A less-expensive alternative is the urban train (S-Bahn), which departs regularly from the Intercity-Express railway station in Terminal 1. With their IDS ticket, exhibitors and visitors can use buses, trams and urban trains on the local public transportation network of the Rhine-Sieg Transport Authority (VRS), including



low compared with other European countries and limited to larger department stores, hotels, restaurants and petrol stations. Maestro Cards, however, are accepted almost everywhere, with a few exceptions, like newspaper stands, bakeries and fast-food restaurants, which only accept cash. Banks are open from 8.30 to 16.30 on weekdays.

Medical insurance

Although the German health-care system has declined slightly recently, the country still has a high standard of medical care. Emergency treatment, however, can be costly and therefore travel health insurance, which is of-

ferred by most insurance companies, is highly recommended.

Weather

While average temperatures in Cologne range from 11 to 2 °C (51-35 °F), the weather in March can be very unpredictable. As spring starts on 20 March this year, warm clothes and rain gear are necessary when visiting the city.

Links

- www.germany.travel/en
- www.lonelyplanet.com/germany
- wikitravel.org/en/Germany
- www.cologne-tourism.com
- www.nytimes.com/2012/04/01/travel/36-hours-cologne-germany.html ◀◀

the transfer between the Koelnmesse fairground and the airport free of charge.

Banking and currency

As a member of the European Union, Germany uses the euro as legal tender. The exchange rate is about €0.87 to the US dollar (as at 4 February 2015). Credit card usage is still



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today IDS show preview will appear in advance of the 36th International Dental Show in Cologne, 10-14 March 2015.

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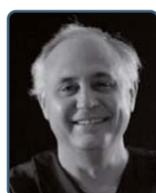
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