Antibacterial measures for biofilm control
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Chapter 6-II

Media coverage
of a scientific project on 3D printable
antimicrobial composite resin

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Abstract
Our manuscript on the development of a 3D printable antimicrobial composite resin, within the first weeks after being published in Advanced Functional Materials, immediately received tremendous attention from both national and international mainstream media. Even though our research project received enormous attention and positive recognition at the social media platforms, the impact of these reports is a double-edged sword. The public attention of this research project could be largely attributed to recognition by the general public of its potential societal impact that the research outcome might generate but was not based on its true scientifically proven content. Therefore, it remains a challenge for researchers to reach the public with their research project, and properly guide this process so that the right information and interpretation are spread.
In October 2015, our manuscript on the development of a 3D printable antimicrobial composite resin (chapter 6) was published in Advanced Functional Materials (Yue et al. 2015), and immediately received tremendous attention from both national and international mainstream media. The work described in this article presented a novel polymeric material which shows positive surface charge after photo-curing (polymerization) without leaching of any non-polymerized components nor toxicity to human tissue cells. The positive surface charge of the material demonstrated a bactericidal effect when in contact with bacteria that generally have a negative cell surface charge (killing on contact). The material provides sufficient mechanical and favorable physicochemical properties for a variety of clinical applications, including 3D printing (Yue et al. 2015).

The aim of this chapter is to summarize the media coverage on this novel 3D printable antimicrobial composite resin and discuss the double-edge sword effect of social media on scientific work.

During the project in 2014 two Dutch newspapers had already reported the study in, ‘De Telegraaf’, and ‘Dagblad van het Noorden’, which are two daily newspapers with the largest circulations in the Netherlands and in the North of the Netherlands, respectively (Figure 1 and 2). With the progress of the study and subsequent publication, various news websites in de The Netherlands and in China reported the outcome with enthusiastic and exciting titles (Figure 3) (Groninger Internet Courant 2014; Nu.nl 2014; RTV Drenthe 2014; Ouderenjournaal 2014; Nationale zorggids 2014; Radio Westerwolde 2014; Lunchradio 2014). The reports on the research project were informative and generally accurate about the functionality of the material and its promising potential for clinical applications. After the online publication (The Wiley Online Library 2015) on October 9th 2015 the attention from the media became tremendous. In different parts of the world, i.e. India, China, Russia, Canada, United States of America, Nigeria and in Europe articles were posted on local websites or reported on radio and television. Direct contacts were sought out with the researchers in the Netherlands and from Germany for live radio interview (BNR eyeopener radio interview 2015), television interview (BBC World Service 2016) etc. In addition, reports were posted in social media platforms like Twitter and Facebook. In the same month, on 26th of October 2015, Google showed 4 pages of hits on ‘3D printable antimicrobial resins’.
With the increasing number of scientific publications every year, even professionals can only manage to read critically a very small percentage of scientific articles related to their work (Bouter and Knotterneus 2000). Therefore, publications in local journals or on social media have become an important channel to obtain knowledge and updates for professionals and the general public alike (ERiC; 2010). Reports on the world wide web can spread information easily and speedily. On the website of Altmetrics.com a tool can be found which enables an analysis of how different scientific disciplines are represented in modern media types. This website is a specialized search engine and is able to search for scientific articles that are mentioned in “blog posts, tweets, and mainstream media”. It offers an interesting possibility to measure the impact of research in the modern media. According to a study for Altmetric scores for papers published in high-ranking journals, Nature, Science and PNAS had an average score of 70 (Wilbertz 2013). The paper of 3D printable antimicrobial composite has a score of 134 points on Altmetrics (Figure 4) indicating a relatively large resonance in the mainstream media.

Even though our research project received tremendous attention and recognition at the social media platforms, the impact of these reports is a double-edged sword. Scientific articles, which are written in jargon language are written by scientist for scientists, and can therefore be difficult to interpret by people outside the scientific domain. This can lead to distortion of the content of the papers. One example was found on the website of ‘New Scientist’ (New Scientist 2015), where a report stated; “...of the University of Groningen in the Netherlands have developed an antimicrobial plastic, allowing them to 3D print teeth that also kill bacteria” (Figure 5). This statement by itself is not incorrect, but implied that such a 3D printed tooth is functional and therefore can be used as a replacement for lost teeth or implants, which is entirely misleading. Other news reports had provoking or catchy titles, like: “Never brush again” (Chemie is overal 2015) or “New 3D-printed teeth also kill bacteria” (Dental products report 2015) or “Lost a tooth? Soon your dentist can print another and it keeps your mouth clean as well” (Figures 6). Some of these reports were accurately, while others remained vague about the actual content causing a multiple interpretable message. One report on the UK RuG website (Newsletter from University of Groningen) first posted the report with the title: “Never brush again”, changed only later to “New adhesive for braces keep the teeth clean” (Figure 7) (University News UK 2015).
Clips of news reports

**Figure 1:** Article from a Dutch Newspaper ‘De Telegraaf’ about braces that kill bacteria, published in May 2014. Title translated in English: “Bacterial killing braces”.
Figure 2: Report from a Dutch Newspaper ‘Dagblad van het Noorden’ about braces that kill bacteria, published in June 2014. Title translated in English: “Braces kill bacteria”.

Beugels doden bacteriën

GRONINGEN Orthodontisten van het UMCG doen onderzoek naar de mogelijkheid beugels en tandprotheses te maken van bacteriedodend materiaal.

De nieuwe protheses en beugels moeten voorkomen dat er tandplaque ontstaat dat zich ophoopt rondom de beugel. Deze plaque kan leiden tot gaatjes en witte vlekken in de tanden.

Ongeveer 40 procent van de jongeren van twaalf jaar en ouder krijgt een beugel, maar ook steeds meer volwassenen kiezen voor een rij rechte tanden. Uit onderzoek blijkt dat ongeveer 60 procent van alle patiënten uiteindelijk problemen ondervindt in deze twee tot drie jaar durende behandeling als gevolg van tandplaque. Van hen heeft 15 procent zelfs professionele zorg nodig vanwege aangehechte bacteriën.

Deze schade komt het meest voor bij jongeren. Volgens hoogleraar orthodontie Vijin Ren vindt kinderen in deze leeftijd poetsen sosweso lastig. „Met een beugel is dat nog veel lastiger. Bovendien worden composietmaterialen op de tanden gebruikt als lijm voor de brackets of slotjes.” De bacteriën hierop kunnen het glazuur aantasten, waardoor niet alleen witte vlekken kunnen ontstaan, maar ook gaatjes. Dit komt door de ontkalking van de tanden. Alleen al in Amerika blijkt dat deze nazorg een kostenpost van 500 miljoen dollar met zich meebrengt. „We hebben het dan nog niet eens over groeiende economieën als China, Brazilië en Turkije, waar orthodontie aan een enorme opmars bezig is”, stelt Ren. „Wereldwijd wordt er daarom hard gezocht naar nieuwe materialen.” Volgens Ren zal het nog even duren voordat de eerste bacteriedodende beugels beschikbaar komen. Zij wijst er nadrukkelijk op dat tot die tijd voorlichting over mondhygiène, goed poetsen en regelmatige controle heel belangrijk blijft.
Figure 3: Report from a Chinese mainstream media website reporting on 3D printable antimicrobial composite published in June 2014. Title translated in English: "Novel antibacterial material may pioneer 3D printing revolution in health care".
**Figure 4:** Score on Altmetrics.com in November 2017, of the paper: Yue J, Zhao P, Gerasimov JY, van de Lagemaat, Grotenhuis A, Rustema-Abbing M, van der Mei, Busscher HJ, Herrmann A, Ren Y. 2015. 3D-printable antimicrobial composite resins. Adv Funct Mater. 25(43):6756-67.

Figure 6: First sentence of news report from New Scientist [Internet]. 3D printed teeth to keep your mouth free of bacteria; cited 2015 Oct 16. Available from: https://www.newscientist.com/article/dn28353-3d-printed-teeth-to-keep-your-mouth-free-of-bacteria
**Figure 7:** Title of publication in 2015 saying: “Never brush again?” corrected to title saying: “New adhesive for braces keep the teeth clean” From: [http://archief.ukrant.nl/wetenschap-onderwijs/wetenschap-wetenschap-onderwijs/nieuwe-beugellijnm-houdt-tanden-schoon.html](http://archief.ukrant.nl/wetenschap-onderwijs/wetenschap-wetenschap-onderwijs/nieuwe-beugellijnm-houdt-tanden-schoon.html)

**Figure 8:** A 3D printed molar tooth with the newly developed contact-killing material. From: Yue J, Zhao P, Gerasimov JY, van de Lagemaat, Grotenhuis A, Rustema-Abbing M, van der Mei, Busscher HJ, Herrmann A, Ren Y. 2015. 3D-printable antimicrobial composite resins. Adv Funct Mater. 25(43):6756-67.
Misinterpretations in the news may understandably be related to the picture of a 3D printed tooth model from the original publication (Figure 8). Nevertheless, the main reason for reporting and rapid spreading of a distorted message is the lack of fact checking and the current model of ‘social media journalism’, which can easily result in a vicious circle of reporting ‘false’ or ‘misleading’ news (Social Embassy 2014).

To prevent the start of spreading of inaccurate news, the introduction of a plain language summary in addition to the scientific abstract, may aid journalists to formulate a realistic story with the correct conclusions, which eventually will help knowledge transfer to a broader public and encourage better connections between scientific research and its societal impact.

In conclusion, the research project, described in chapter 6, received great public attention, which can be largely attributed to recognition by the general public of the significant societal impact the research outcome may generate. However, it remains a challenge for researchers to reach the public with their research project while guiding this process so that the right information are spread.

In addition we present here a list of the available mainstream media reports, with the title of the report and the link to the website in a chronological order. The search took place in August and September 2017 with Google using the term: “3d printable antimicrobial composite resin” and showed in total 139 hits including a free search.
Links of mainstream media reports

**English media**

- International Business Times [Internet]. Scientists invent antimicrobial 3D printing material that can kill 99% of bacteria; [cited 2015 Oct 19]. Available from: http://www.ibtimes.co.uk/scientists-invent-antimicrobial-3d-printing-material-that-can-kill-99-bacteria-1524674
- Rapid Ready by Digital engineering [Internet]. Dentists Prepare to Battle Bacteria with 3D Printing; [cited 2015 Oct 23]. Available from:
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- Dental Tribune [Internet]. Researchers develop antimicrobial 3-D printing material; [cited 2015 Nov 01]. Available from: http://www.dentaltribune.com/articles/news/europe/26385_researchers_develop_antimicrobial_3-d_printing_material_.html
- Chemie is overal [Internet]. Nooit meer poetsen; [cited 2015 Nov 16]. Available from: http://www.chemieisoveral.nl/nooit-mee-poetsen

• Jornal Denstistry [Internet]. Development of new media 3-D antimicrobial. [cited 2015 Dec 14]. Available from: http://www.jornaldentistry.pt/news/artigos/desenvolvimento-de-novo--material-de-impresao-3-d-antimicrobiano-

• BBC World Service [Video]. Science in action; [cited 2016 Jan 03]. Available from: http://www.bbc.co.uk/programmes/p039yg7h#play


• Dental Solutions [Internet]. 3-D teeth: The future of dentistry is here; [cited 2016 Feb 04]. Available from: http://blog.edentalsolutions.com/blog/index.php/3-d-teeth-the-future-of-dentistry-is-here

• Neesh Dental [Internet]. 3D Printer Substrate Kills Bacteria; [cited 2016 Mar 01]. Available from: http://neeshdental.com/2016/03/01/3d-printer-substrate-kills-bacteria/


Non-English media

• China 3D printing network [Internet]. 3D printed teeth that kill bacteria; [cited 2015 Oct 18]. Available from: http://news.mydrivers.com/1/452/452021.htm


• Science Net [Internet]. 3D print teeth can protect the mouth from bacterial infection; [cited 2015 Oct 19]. Available from: http://news.sciencenet.cn/htmlnews/2015/10/328884.shtm

• Botanwang.com [Internet]. 3D printed dentures can eliminate bacteria; [cited 2016 Oct 19]. Available from: https://botanwang.com/articles/201510/3d%E6%89%93%E5%8D%B0%E7%9A%84%E5%81%87%E7%89%99%E5%8F%AF%E4%BB%A5%E6%B6%88%E7%81%AD%E7%BB%86%E8%8F%8C.html

• New technology [Internet]. 3D print dentures can have antibacterial effect; [cited 2015 Oct 24]. Available from: http://digi.tech.qq.com/a/20151024/009121.htm

• Xenforo [Internet]. New technology: 3D print denture can have antibacterial effect; [cited 2015 Oct 24]. Available from: http://www.xenforo.cc/threads/192412/

• Xiaosen [Internet]. 3D printed dentures can also be antibacterial; [cited 2015 Oct 28]. Available from: http://www.xsfmp.com/cnew/newsView.asp?id=767


• ZM online [Internet]. Kunstzahn bekämpft Karies; [cited 2015 Okt 26]. Available from: http://www.zm-online.de/home/zahnmedizin/Kunstzahn-bekaempft-Karies_314723.html


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Chemie is overal [Internet]. Nooit meer poetsen; [cited 2015 Nov 16]. Available from: http://www.chemieisoveral.nl/nooit-meer-poetsen


Groninger Internet Courant [Internet]. Groningse orthodontisten werken aan bacteriedodende tandprothesen - geen gaatjes meer; [cited 2014 Jun 01]. Available from: http://www.gic.nl/nieuws/groningse-orthodontisten-werken-aan-bacteriedodende-tandprotheses


Ouderenjournaal [Internet]. UMCG test bacteriedodende materiaal kunstgebit; [cited 2014 Jun 02]. Available from: http://www.ouderenjournaal.nl/groningen/2014/06/02/umcg-test-bacteriedodend-materiaal-kunstgebit/


Rathenau Institute. 2010. Evaluating the societal relevance of academic research: A guide ERIC.


Wilbertz J. 2013. Evaluating societal relevance of research. s.n. p29


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