In my view, the invention that really says we're racing towards the future is the 3-D printer -- and what it can produce. The list of products that now can be made is as long as it is impressive: clothes, cutlery, camera lenses, musical instruments, a working gun and even pizza. You can even get a 3-D printed figurine [1] of yourself made at WalMart (if that's your thing).

But their greatest achievement of all may be the creation of superior medical devices. And one such product that's recently taken a massive leap forward are false teeth.

A group led by Andreas Herrmann of the University of Groningen in the Netherlands published a paper in the journal* Advanced Functional Materials *that described the printing of a 3-D tooth, and the science -- literally -- surrounding it.

The team hypothesized that it could create an antibacterial tooth by blending ammonium salts -- antibacterial, due to their positive charge -- with dental resin polymers (the conventional material used to make implants). To test the effectiveness, the researchers coated teeth made with the ammonium salts, as well as teeth made with just the resin polymers with a saliva solution containing *Streptococcus mutans*, which is the causative agent of tooth decay. Teeth with the antibacterial substance killed 99 percent of the bacteria, while the control killed just one percent.

Antibacterial teeth offer several benefits. First, according to the researchers, bacterial decay of dental implants costs patients in the United States millions of dollars annually. Further, many bacterial infections -- endocarditis, in particular -- stem from poor oral hygiene, and for this reason prophylactic antibiotics are often given prior to dental work being performed. Halitosis is also caused by bacterial growth, and therefore teeth could inhibit or prevent some causes of bad breath.

On the other hand, the oral microbiome would certainly be hindered by the presence of antimicrobial teeth. The healthy members of the oral microbiome have been shown to be important in protecting the oral cavity -- and the rest of the body -- from invading pathogens by successfully battling them for space and resources in the mouth. Some oral commensal organisms [2] do this by secreting molecules that inhibit the growth of gram negative bacteria, like *E. coli*. At this point it's
unclear what the effect will be of losing part of this front-line defense.

Bacteria have also developed resistance to ammonium salts [3], and an increase in their use could accelerate the spread of these genes, which could further complicate the long-term practicality of these implants.

The researchers admit there's still more work to be done on these devices. Specifically, they want to test the teeth's antimicrobial properties over a longer time period, since this study tested their efficacy only for six days. Because in reality, effectiveness is required for years in order for this device to be truly viable.

Source URL: https://www.acsh.org/news/2015/10/21/chew-on-this-3-d-printed-teeth-showing-real-bite

Links
[1] https://www.youtube.com/watch?v=dcX41EQ1JTo