To print or not to print your meal

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What about a more chewable pasta or high protein cookies made with insects? 3D printed food seems an interesting solution for healthier eating, shortening meal preparation times and even fighting world hunger. But an avant-garde chef such as Ferran Adrià doesn't seem that passionate about printing his dishes.

In coming years, 3D printers may become household kitchen appliances, helping people save time when preparing meals or adding specific nutritious ingredients to their diet.

Several tests are already underway. For four years, the Italian company

Barilla, together with TNO, a research centre in the Netherlands, has been testing additive manufacturing prototypes to produce new shapes of pasta.

"After three years of effort, we have developed our device," explains Michela Petronio, R&D deputy head at Barilla. "At the moment, it is still a prototype allowing us to print pasta in shapes that otherwise can't easily be replicated. This is important because you feel differently when eating spaghetti or penne, and 3D printing opens a largely unexplored horizon in the field of food design."

The next steps will address the consistency and balance of different ingredients: "There is still a quite long way to go," says Petronio, "but our aim is to consider which applications are the most interesting for our consumers".

For home equipment, the first appliance available for sale may well be Foodini, built by Natural Machine, a Spanish company based in Barcelona that is hoping to sell it in a limited pre-series by late 2015. This appliance will cost about 1,500 U.S. dollars (1,357 euros).

"Our aim is to ease the way to prepare homemade healthier food, with an extra bit of fun on top," says Lynette Kucsma, co-founder and chief marketing officer at Natural Machine.

What makes Foodini different is its ability to not only print food, such as chocolate or sugars, but also to fill capsules with various sorts of ingredients. People can thus extend the range of printable food.

Both Barilla and Foodini use the same technology, known as fused deposition modelling (FDM), which produces a specific shape layer by layer.

Another technique is powder bed printing, in which a layer of powder is 'wetted' by a liquid, like water or fat, which functions as a sort of glue composing the food.

Or the printer can even allow a process also used with metals. Starting from a 3D CAD representation, it adds powder layers through laser sintering.

"The first technique is the closest to market," explains Daniël van der Linden, who works at TNO, "although powder bed printing offers more possibilities with regard to shape and scaling of the technology."

According to van der Linden, a professional 3D printer aimed at bakeries or sweet makers can cost between 5,000 and 10,000 euros. "Speed has to increase," he says. "We have moved from making a single piece of pasta in two minutes to 15 pieces, but the purpose is to reach a pace suitable for industrial production."

The advantages of 3D printed food seem interesting, but not for everybody. Ferran Adrià, the famous chef of the three-star Michelin restaurant El Bulli, in Spain, known for his deconstructivist cuisine and his avant-garde spirit, doesn't seem very keen on having a 3D printer in his kitchen.

"We have never used it," he says, "and our research is heading in other directions at the moment. I am not able to say now how this kind of equipment can affect professional catering, but I think that for home use, it will be the price to pay for making a difference. For now, I'm not planning to have it as part of my equipment."

Giorgio Calabrese, a doctor and nutritionist who teaches in several Italian and U.S. universities, harbours some doubts, too: "I think we need to consider that when eating, we always look for something appetising,"

he says. "So, it's one thing to prepare a small amount of food that consists of a mix of lyophilized, nutritious ingredients aimed at keeping a handful of astronauts alive, but quite another to prepare a meal to feed a family every day. I don't rule out that it will happen at some point, but I think we are still a long way off."

Our home printer will also allow us to print high protein cookies with worms. It may sound disgusting, but according to UN previews, in the next 35 years, the world population will grow to 9.5 billion, 2 billion more than today.

"A growing population means a greater demand for proteins that can also come from insects, algae or other plants instead of meat or fish," says van der Linden. "3D printing can provide a way of preparing these 'raw' ingredients and transform them in a non-striking way, at least for Europeans. In Asia or Africa, of course, people are not bothered about eating them."

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