WATERONLINE

INTERVIEW WITH PROF. EUGENE CLOETE, TEABAG WATER FILTER'S INVENTOR

Answers supplied by Prof Eugene Cloete, dean of the Faculty of Science at Stellenbosch University, South Africa, and inventor of the "teabag" water filter.

1. The Water Institute has a partnership with the Government and the enterprises to promote what kind of projects?

The Stellenbosch University Water Institute is a multi-disciplinary research enterprise that was set up in 2010 in response to the formidable and unprecedented challenges relating to water facing South Africa. The Institute functions across various faculties of Stellenbosch University, such as Science, Engineering and AgriSciences. It draws from the fundamental and goal-directed research undertaken by some of the most experienced scientists at our institution. Our research is done in collaboration with government and industry to solve water related challenges, to provide technology transfer and to develop human resources

The tea bag water filter is one of the many projects of the Stellenbosch University Water Institute. Other projects focus on biodiversity matters such as sustainable water management, small-scale water and wastewater treatment, the impact of water quality on the safety of agricultural produce, and the ethics surrounding freshwater management.

2. Amongst this projects there's the tea bag. How the ideas comes out? And how the project has grown? How many time takes it to come to an end?

I got the idea during a science faculty tour of Stellenbosch University's facilities. By then I was already working on ways to use enzymes to break down the gunge or slime that builds up on wet surfaces. Slime, the by-product of bacterial activity, is a huge problem in industry. It accumulates in water pipes, on filters, in tanks and pools, and scientists are constantly hunting for new and better ways to inhibit its growth. As I watched a Stellenbosch University student demonstrating how to spin nanofibres, filaments finer than a human hair, I thought to myself that it would not be a bad idea to make our own membranes from nanofibres instead of purchasing a filter. And why not incorporate the enzymes into the fibres themselves?

Two of my postdoctoral students then set upon the project and managed to incorporate a chemical into nanofibres, which they spun into a mesh on the surface of commercial water filters.
When bacteria-laden water was poured on to these filters, the super-fine nanofibre mesh provided a physical barrier to stop them going through and the biocide killed them off.

Then we stuck two of the filters coated with biocide impregnated nanofibres together, and filled the sachet with activated carbon, which removes impurities like heavy metals. It looked very much like a tea bag! We decided to make the filter disposable, just like a teabag is, so that it is easy to use and users know that they should only use one teabag for each litre of water they filter.

3**. How many people is involved in the tea bag project?**

The initial development team consists of inventor Prof Eugene Cloete, two research associates in the SU Department of Microbiology, Dr Michele de Kwaadsteniet and Dr Marelize Botes, as well as a handful of postgraduate students at Stellenbosch University in microbiology and polymer science.

4. **The biodegradable tea bag have active components which can turn drinking water. Can you explain it in details? How does it works?**

The environmentally friendly sachet, which not only resembles a teabag in size but also in looks, combines years of fundamental research on water purification, nanotechnology and food microbiology in a practical way. The inside of the bag is filled not with tea leaves, but with active carbon granules that remove all harmful chemicals, for instance endocrine disruptors. Once used to filtrate one litre of water, the biodegradable filter is thrown away and replaced by a new one. The filter's innovation literally lies within the bag itself. It is made from the same biodegradable material used to make rooibos tea bags.
This is coated with a thin film of biocides that is contained within minute nanofibres, and kills all disease-causing microbes. Bacteria and viruses can't move through the fibres, and are killed so that they do not concentrate inside the filter.

5. Actually it remains only a patent. When do you think it will start the production?

The research team at Stellenbosch University has gone through a painstaking development process to ensure that the concept that they developing in the laboratory is ready for full-scale production mode.

Equipment, for instance, had to be ordered from Czechoslovakia to do spinning of the nanothin fibre coating on an industrial scale. We are currently upscaling the project from laboratory scale to full production scale. We are hoping that the manufacturing plant will be up and running by March.

6. How many water can became drinking water with one tea bag (in litre)?

One litre of water can be cleaned with one tea bag, which then provides you with one litre of clean water.

7. Can the tea bag turn drinking all the kinds of water or sometimes it doesn't work?

No, the filter cannot desalinate seawater for instance, nor can it clean acid mine drainage. The filter is most suitable for cleaning running river water in rural areas where there is not contamination from heavy industrial development and direct disposal of untreated sewerage. The filter will however remove and kill 1 million bacteria per ml.

8. How many people in our Country can't have drinking water?

I do not have the relevant figures for Italy. However, I can give you a few facts about Africa. According to statistics from South Africa's Water Research Commission in 2009, only 58% of Africa's population has access to safe drinking water. In South Africa, 88% of South Africans had access to potable water by 2008.

9. This your brilliant idea, instead, what could change?

It can help meet the needs of people who live or travel in remote areas, communities whose regular water supplies are polluted with disease-causing germs or chemicals or whose water sources are not being treated to potable standards because of, for instance, flood and other disaster situations.

10. If you could think to a use in a timeline, what are the benefits of your invention?

This filter is part of the future of water provision because it represents decentralised, point-of-use technology. Decentralised "point-of-use" technology is the future when it comes to the provision of clean drinking water to people living near polluted streams and in rural areas where expertise is lacking to treat water to potable standards. Because it is simply impossible to build purification infrastructure at every polluted stream on the continent, we have to take the solution to the people.

11. Can we also say the science is at the service of society? What's your mission?

I believe the filter can help meet the needs of people who live or travel in remote areas, communities whose regular water supplies are polluted with disease-causing germs or chemicals or whose water sources are not being treated to potable standards. I believe it is of utmost importance to ensure a safe water supply for South Africa and the rest of the world. It is possible, but it requires innovation and action, and sometimes drastic action. The lack of access to safe water and sanitation has immediate and negative consequences, and creates a well-documented plethora of health, environmental and socio-economic problems. We want to make a contribution to clean water provision, because it is fundamental for a sustainable livelihood for especially vulnerable groups such as children, the elderly and the poor.

12. What will be the economic and social impact of your project?

We want to make a contribution to clean water provision, because it is fundamental for a sustainable livelihood for especially vulnerable groups such as children, the elderly and the poor. The lack of access to safe water and sanitation has immediate and negative consequences, and creates a well-documented plethora of health, environmental and socio-economic problems.

I believe the filter can help meet the needs of people who live or travel in remote areas, communities whose regular water supplies are polluted with disease-causing germs or chemicals or whose water sources are not being treated to potable standards. I believe it is of utmost importance to ensure a safe water supply for South Africa and the rest of the world. It is possible, but it requires innovation and action, and sometimes drastic action.

13. Why, in your opinion, the tea bag isn't still produced?

We are currently moving to full scale production and as soon as the distribution channels have been set up the product will be on the market.

14. In Italy, among many others, we have a big problem: on this time we discussed to privatized or not the water. What's your opinion about it?

In many parts of the world, privatization of water supply has been successful and in other parts of the world not so successful. Public–private partnerships seem to have worked the best, both in terms of guaranteeing quality and keeping costs down. The success or not will depend mostly on the management of the process and public buy –it is essential.

Silvia Parmeggiani