

Tailor-made biotech fibres for improved wound dressings

Scientists have developed a biotechnological process to produce bacterial alginate. The alginate quality is highly reproducible, making it suitable for the production of fibre-based medicinal products such as wound dressings.

In a joint research project called AlBioTex, researchers from the Hohenstein Institutes, B.R.A.I.N. AG, Rökona Textilwerk GmbH and Kelheim Fibres GmbH, established a biotechnological process to produce wound dressings from bacterial alginate. BIOPRO Baden-Württemberg was one of the initiators and also coordinated the project, which was funded under the BioIndustry 2021 funding programme. Thanks to the interdisciplinary cooperation between the research partners, the researchers are now able to carry out all production and processing steps from biotechnological production of the bacterial alginates to fibre production and production of textile surfaces.

Ideal for wound dressings

Alginate is biocompatible, can absorb large amounts of liquid such as wound exudate, and it promotes wound healing. This makes it an ideal wound dressing material. Alginate is a polysaccharide consisting of two monomers, guluronic and mannuronic acid, which are joined together by glycosidic bonds. The industrial application range of a particular alginate depends on the sequence and ratio of these two sugar monomers.

Biotechnological alginate has many advantages

Alginates are normally refined from brown seaweed, which is why they often vary in their chemical structure and hence physical properties. As environmental factors differ enormously between different sea zones where seaweed is harvested, alginates extracted from brown seaweed therefore differ considerably in the number of guluronic and mannuronic acid monomers. Complex treatment is required to refine alginates into a highly pure and biochemically defined form such as that used in medical applications for example. Another problem lies in the harvesting process. Brown seaweed harvesting is associated with enormous ecological problems as it harms the seabed and hence the ecosystem.

Biotechnological production of alginates has several advantages: it produces biopolymers with defined properties and consistently high quality, making the alginates suitable for medical use. The production of alginate in the laboratory avoids any damage to the marine ecosystem.



Alginates are extracted from brown seaweed such as *Macrocyctis*.
© U.S. National Oceanic and Atmospheric Administration (NOAA)

Soil bacterium *Azotobacter vinelandii* as alginate producer

The scientists used the soil bacterium *Azotobacter vinelandii* as a natural alginate producer. They were able to culture the bacterium as well as establishing, optimising and standardising the biotechnological production and isolation process of bacterial alginates. They also managed to optimise bacterial alginate biosynthesis and yield, as well as composition and hence properties of the alginates. The researchers were eventually able to use this biotechnological process to produce alginates that are particularly suitable for producing fibres for use in medicinal products.

Biotechnological nonwovens and wound dressings successfully tested

In a pilot production facility, the project partners were able to spin fibres from alginate and alginate-viscose and turn them into innovative nonwoven materials and wound dressings. When the new wound dressings were tested, the biotechnological alginate products turned out to be better than existing commercially available marine alginate-based wound dressings. The bacterial wound dressings absorbed up to 70% more liquid than comparable wound dressings.

The results from this research project will now form the basis for increasingly incorporating bacterial alginate into industrial production. In addition, the researchers will identify other areas of application for bacterial alginate and open up new markets for customised alginates.

New fields of application in the textile industry



The Hohenstein Institutes have plans to produce wound dressings from biotechnologically manufactured alginates. The first nonwoven textiles are already being tested.

© BIOPRO

The prospects are very good because the biotechnological process makes it much easier than it previously was to vary the material properties with precision. Companies interested in biotechnological alginate products are welcome to contact the project partners. There is a range of possible areas of application for which the technology could be licensed.

Article

01-Sep-2016

Christoph Bächtle

BIOPRO

© BIOPRO Baden-Württemberg GmbH

Further information

- ▶ [Hohenstein Institutes](#)
- ▶ [B.R.A.I.N.](#)
- ▶ [Kelheim Fibres GmbH](#)
- ▶ [Rökona Textilwerk GmbH](#)

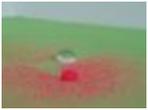
The article is part of the following dossiers



From plants to plastics



Sustainable textiles



Innovative textiles made possible by biotechnology

Biopolymere Biowerkstoffe

DER CLUSTER

medical
technology

textiles

algae

materials
research

biomaterials