BRAIN innovations

Biological wound management

Aurase® is an enzymatic active ingredient developed by BRAIN for the treatment of open wounds. The active mechanism was inspired by the common green bottle fly.

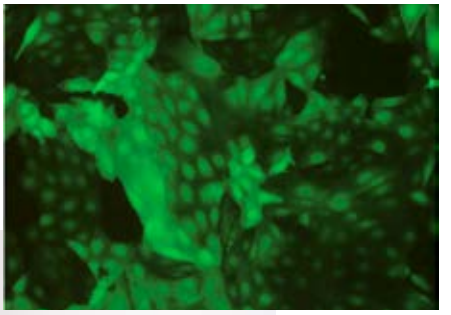
2010/099955

Extensive patent coverage is already in place for the commercial use of the Aurase® enzyme in 20 countries across all continents.

The number of patients with chronic wounds is on the increase due to demographic change and diet-related diseases. It is an established fact that the larvae of the common green bottle fly promote wound healing. Scientists at BRAIN decoded the mechanisms behind this healing effect and developed the Aurase® enzyme for new wound treatment products, as a less invasive alternative to potentially very unpleasant forms of treatment such as surgical debridement or maggot therapy. BRAIN is able to produce the biological active ingredient in an ultrapure form. SolasCure Ltd., a company established with BRAIN's participation, is currently preparing the certification and marketing for Aurase®.

Natural compounds for reducing perspiration

BRAIN technologies enable the development of biological deodorants and aluminium-free antiperspirants.



10 l

One individual's sweat glands can produce up to 10 liters of sweat per day.

Natural active ingredients that protect against perspiration and body odor are in great demand. These are also sought after as alternatives to products that contain aluminium and pose health risks if used in excess. Together with scientific partners, BRAIN has developed a new concept based on directly influencing primary fluid secretion in human sweat glands using natural compounds. This scientific achievement received the top award in the "Applied Research" category at the IFSCC Congress 2018, the world's major forum for insights into cosmetic science and skin biology. In the **TriP²Taste** and **TriP²Sensation** programs, BRAIN also offers unique cell-based assay systems for novel skin care products.

Calorie-free sweeteners

The **DOLCE** program is developing the next generation of natural sweeteners for healthier foods.

61 bn

The global sugar market comprises the production of approx. 185 million tons[1] and added value of more than US$ 61 billion.[2]

1%

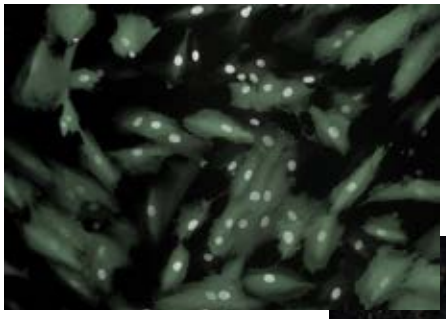
Natural sweeteners currently hold only one percent of the market.[3]

Excessive sugar consumption is a cause of illness and poses an enormous burden for health care systems. With this in mind, BRAIN launched the DOLCE program together with AnalytiCon Discovery and the French Roquette company. The core team offers food manufacturers and beverage companies the opportunity to join the programme. In early 2018, the partnership reached a key milestone by identifying and characterizing a series of highly intensive natural sweeteners and sweetness enhancers.

1 USDA 2017
2 Finanzen.net 01/2018
3 nutraceuticalsworld.com 2017

Healthy food without aftertaste

BRAIN has unique assay systems for identifying plant-based taste modulators.



5

The World Health Organization (WHO) recommends a maximum daily salt intake of 5 grams for adults.

25

Humans have about 25 bitter taste receptors, a comparatively high number. However, we have only three receptors in all for sweet tastes and umami.

Preparing healthy food is a broad field of application. Using special cell-based assay systems, BRAIN scientists in the **SALT-E** programme also devote their attention to reducing salt and fat, which can both lead to health problems if consumed in excess. Any compromises in terms of taste habits, some of which have evolutionary reasons, are to be ruled out. A bitter taste is a key issue in this connection, since it is often activated together with other taste receptors. Natural plant-based substances make it possible to develop alternative flavor carriers and mask bitter tastes.

Sustainable metal extraction in the circular economy

Microorganisms from BRAIN's BioArchives can extract precious metals from ores and waste streams with low impact and without the need for chemicals.

→ www.brain-biotech.de/bioxtractor

The Herald GLOBAL GAME CHANGERS 2018 INNOVATORS MAGAZINE
FINALIST

250

One ton of computer boards may contain up to 250 grams of gold and one kilogram of silver.

5 %

of the gold produced is extracted using biological processes, but this has to be followed by chemical treatment. That is not necessary using bio-based technologies from BRAIN.

Global demand for mineral resources is constantly growing, as is the dependence of regions like Europe on precious metal and technology metal imports. At the same time, ore content in mines is decreasing, while environmental protection requirements in this sector of industry are becoming more and more stringent. Classical recycling technologies find it hard to deliver when it comes to recovering specific metal fractions from waste streams. BRAIN has developed highly efficient technologies based on special microorganisms for green and urban mining. For urban mining, these technologies have already been transferred from lab scale to demonstration scale in BRAIN's BioXtractor. For green mining applications together with CyPlus GmbH, the process has been successfully scaled up to the metric ton level.

Nutrition & Health

Skin Care

Industrial BioSolutions

Bio-based freshness and product stability

Edible plants also provide actives that combat harmful organisms. BRAIN's **FRESCO** program identifies the best candidates.

220,000

bioactive natural ingredients of plant origin have been identified and structurally categorised so far that have potential for industrial applications.

Foodstuffs are subject to stringent freshness and quality criteria. Other market segments are just as sensitive in terms of hygiene and cleanliness. Innumerable products have to be protected from infestation by bacteria, viruses or fungi. Consumers are increasingly expecting this to be achieved by means of natural and sustainably produced active ingredients. BRAIN develops the corresponding bioactive substances that can also be used for medical products and paints and for preservatives, cleaning and other household products, apart from their uses in the food and feed industries. BRAIN **PerillicActive** is a forerunner of the extensive FRESCO program and offers natural freshness based on fermented orange oil.

Facts & figures

660 bn

Market analysts expect sales in biotechnologically produced chemicals to rise from around US$ 144 billion in 2010 to US$ 660 billion in 2025.[1]

11 %

It is expected that sales in industrial biotechnology will grow by about 11 % per year from 2010 to 2025 (CAGR 2010 – 25), far exceeding the anticipated growth of about 4.1 % in all chemical markets taken together (CAGR 2015 – 20).[1]

355 bn

Global sales in industrial biotechnology amounted to US$ 335 billion in 2016.[2]

1 m

The European Commission expects Europe's bio-based economy to create up to one million new jobs by 2030.[3]

> 350

BRAIN has unique product solutions and technology platforms that are protected by more than 350 patents and patent applications in some 50 patent families.

308

At the end of fiscal 2017/2018, the BRAIN Group employed a total of 308 colleagues including Management Board members, trainees and volunteers.

→ **www.brain-biotech.de/en**

1 German Bioeconomy Council (December 2016); Roland Berger, Grandviewresearch (2016)
2 USDA (March 2018)
3 European Commission (2018)