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Interview

Waldemar Kütt,
DG Research,
breaks down
the bioeconomy
strategy review
and financial
incentives



The inner universe
of health

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Miraculous Microbiome

Synthetic biology

DNA-based apps for cell
diagnostics and therapeutics

Plastic recycling

Can enzymes solve the world's
biggest waste problem?

Pharma packaging

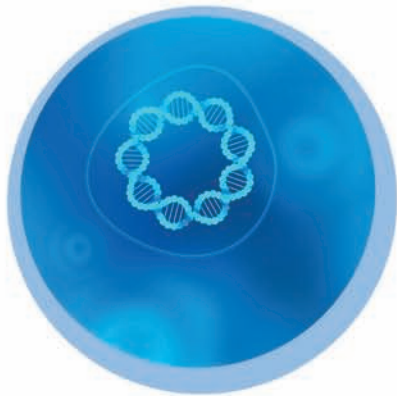
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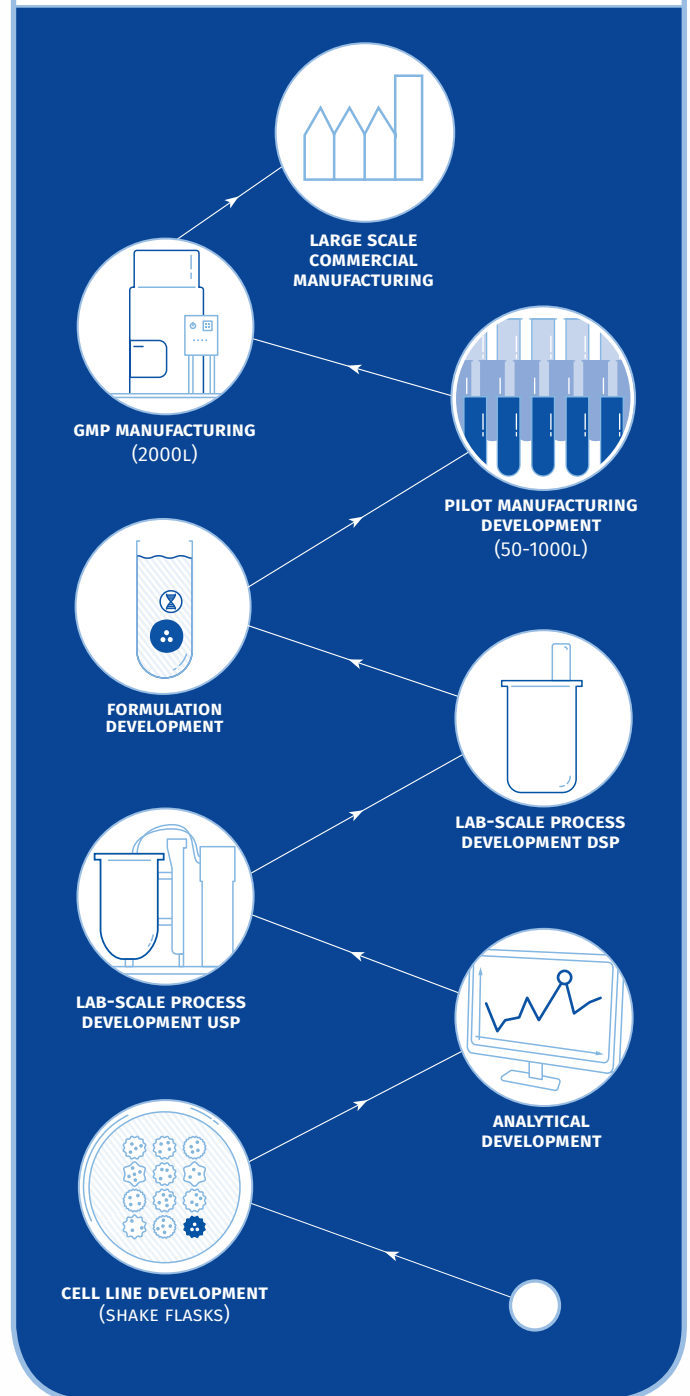


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Biotech enabling Europe to reach UN SDGs



JOHN BRENNAN is the Secretary General of EuropaBio. He has nearly 30 years' experience in the healthcare sector, the last thirteen of which were spent in the policy environment in Brussels, both working at the European Commission and in European trade associations for the healthcare industry. Prior to that he worked in the Irish National Standards Authority. Born in Ireland, John is a science graduate from Dublin, with post-graduate studies in quality management and environmental engineering.

The UN Sustainable Development Goals (SDGs) provide a powerful blueprint for coordinating global efforts to end poverty through economic growth, reducing inequality, and providing better education, health, job opportunities, and environmental protection.

The OECD defines biotechnology as “the application of scientific and engineering principles to the processing of materials by biological agents.” More simply, it is the application of biology for the benefit of humanity and the environment. As such, sustainability is inherent in biotechnology. This makes biotechnology an innately sustainable approach when looking at addressing many of the Sustainable Development Goals. Biotechnology is capable of tackling diseases through innovative medicines, improving energy and food security, and helping to mitigate climate change, while at the same time creating high-quality jobs and growth.

Only for the Climate Action goal, and by enabling smarter, more sustainable products and materials, the CO₂ mitigation potential of industrial biotechnology is between 1–2.5 billion tonnes of CO₂ equivalent per year by 2030, according to a 2011 OECD study. This potential is equivalent to emissions from 490 million cars, in addition to the 10 million cars equivalent emissions mitigated through agricultural biotechnology if we take into account data from PG Economics.

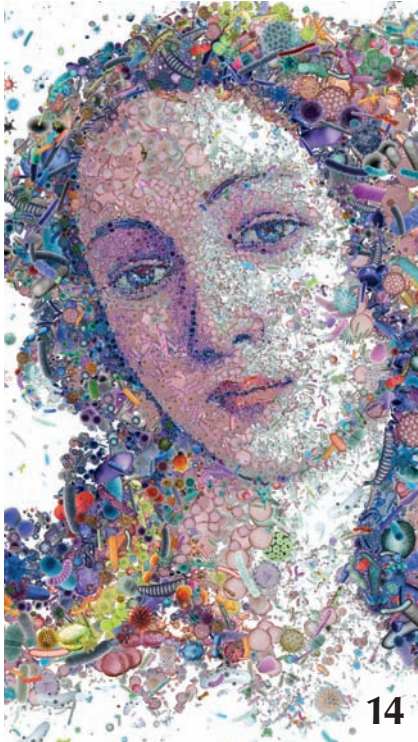
According to the International Service for the Acquisition of Agri-biotech Applications, agricultural biotechnology also contributes to goals around hunger and poverty by enabling farmers to grow more crops with fewer inputs, for example by making them resistant to certain pests.

Through innovative biologic medicines, healthcare biotechnology contributes to health-oriented Sustainable Development Goals by reducing the health and social burden of common diseases like cancers, cardiovascular diseases, diabetes, and chronic respiratory diseases, but also rare diseases, such as cystic fibrosis or spinal muscular atrophy. This in turn reduces the pressure on healthcare services and contributes to a healthier and more productive labour force, less hospitalisations, career interruptions, and work and school absenteeism.

The European Union itself has committed to implement the Sustainable Development Goals internally and externally. Given the contributions outlined above, biotech innovations must play a key role in Europe's and the world's response to the Sustainable Development Goals. ■

FREE EXCERPT

COVER STORY



Multiple sclerosis and the microbiome

It's growing increasingly clear – the bacteria that colonise your skin and gut from birth on are key sensors that can act as environmental triggers for many chronic diseases of civilisation, including MS. Gold rush fever has hit food manufacturers, pharma companies and independent teams. Everyone it seems wants to grab a piece of the pie with novel therapies or probiotics aimed at rebalancing patient gut microbiomes that have been thrown out of whack. But how far are we from seeing real cures? Here's an overview.

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BIOECONOMY

The plastic problem

The oceans are full of it, landfills are overflowing with it – characteristics like durability and lightness, which make plastic so attractive in packaging, also prevent its degradation in the environment. Recycling plastics is energy-intensive, and recyclates are usually low quality. Could enzymes be able to break down polymers for re-synthesis provide a solution to this most pressing of problems?



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SYNTHETIC BIOLOGY



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Cellular apps

Since the earliest attempts at genetic engineering, scientists have sought to influence cell behaviour and development. Synthetic biologists are now taking the idea to a whole new level with 'genetic circuits' that can turn cells into diagnostic sensors, therapeutic entities or tissue generators.

EDITORIAL

Follow food fads

The minutes from the 27 November meeting of the EU's High Level Group on Nutrition and Physical Activity sound a little like a Christmas wish list: "In 2030, all citizens will have the motivation, ability and opportunity to consume a healthy diet from a variety of foods, have healthy levels of physical activity and the incidence of diet-related diseases will have decreased significantly." There's no question that something needs to happen. Six of the seven biggest risk factors for premature death in Europe relate to how we eat, drink and move. A growing number of high-income consumers have already altered buying behaviours, and now pursue vegan, vegetarian, organic or "does-not-contain" lifestyles. But are they really healthy?

Recent research does indeed suggest that certain diets could prevent autoimmune reactions by rebalancing the stressed gut microbiome. In our cover story (p. 14), we investigate how the body's microbiota could help control the onset of multiple sclerosis by preventing the activation of the auto-reactive T-helper cells that everyone carries sleeping in their lymph nodes. Are probiotics set to become the pharmaceuticals of the future? Will the right foods soon become the best medicine of all?

All of us here at the EUROPEAN BIOTECH MAGAZINE wish you a merry Christmas (meal) and the happiest of New Years!



Thomas
Gabrielczyk
Editor-in-Chief



SPECIAL

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Learning to listen to your gut

MICROBIOME The adage ‘you are what you eat’ is more than folk wisdom. Evidence that the food you ingest has a major impact on your health grows by the day. It’s now clear the bacteria that colonise the skin and gut from birth on are key sensors for environmental triggers in chronic diseases of civilisation. Ever since research showed that restoring microbiome balance cures 90% of all *Clostridium difficile* infections, food manufacturers, pharma companies and independent teams have been tracking it in other indications – including multiple sclerosis.

When Dr. Terry Wahls was diagnosed with relapsing-remitting multiple sclerosis (MS) in 2000, she did what you would expect a professor for internal medicine at the University of Iowa to do. She began taking one of the ‘ABC’ medicines (Avonex/Betaseron/Copaxone, see p. 19) – compounds to suppress the autoimmune reaction in her Central Nervous System (CNS) that was targeting the myelin insulation that covered her neurons – and hoped for the best. When she ended up in a tilt-recline wheelchair three years later after developing the untreatable secondary progressive form of MS, she decided she had to find a way out on her own. The “strictly science-driven” expert for clinical trials began to comb scientific literature for alternatives to mainstream immuno-suppressive drugs (see p. 19), which are able to slow but not cure her neurodegenerative disorder. She ended up conducting experiments on herself.

Through a combination of electro-stimulation and a ‘paleo-like’ menu that cut down on gluten-rich foods and increased non-processed foods in her diet, the physician was back on her own feet in a year. She also no longer suffered from the heat intolerance and fatigue that are top causes of MS disability. Inspired by the recovery, she set up a foundation that eventually attracted 90,000 followers, then wrote a book to bring her message to

the 2.5 million people who suffer from MS globally. In it she says, “medication can’t take away your autoimmune disease, but your body can heal itself.”

Probiotics are the golden goal

Interestingly, the approach the physician takes to treating the neurodegenerative disease through the ‘Wahls Protocol’ comes at a time when public and science

are ready to listen. Around 70% of European consumers now say they believe healthy food positively impacts on health. A huge number of scientific publications have also linked the composition of an individual’s gut bacteria, or “microbiome”, to susceptibility for chronic diseases as different as diabetes, autism, chronic bacterial infections, cancer, Crohn’s disease, psoriasis, arthritis – and multiple sclerosis. When studies showed that fecal microbial transplants (FMT) can cure recurrent infections with antibiotic-resistant *Clostridium difficile* bacteria in nine out of ten cases, researchers and companies were hit with gold rush fever. A new area of endeavour was thrown open; it’s aimed at understanding which factors in the microbiome interact with the body to trigger diseases that have a feature in common – chronic, low-threshold inflammation.

As imbalances in the microbiome – scientifically dubbed ‘dysbiosis’ or ‘dysbacteriosis’ – are clearly dependent on what you eat, food companies have entered the space along with pharma firms. While AstraZeneca and Merck, Sharp & Dohme, and DuPont Nutrition have all installed large microbiome research centres and joint ventures in Europe, other big players are trying to cherry-pick best approaches from a [...]

» Read the full story in the printed issue.



SERGIO BARANZINI Director Human Genetics UC San Francisco and initiator of the International Multiple Sclerosis Microbiome Study (IMSMS)

? Is there industry interest vis-a-vis your new MS approach?

! Industry is interested, but in my view they’d like to see more evidence before jumping into it full force.

FREE EXCERPT



Biotech for breaking down a sea of waste

PLASTICS RECYCLING While bio-based polymers have been a hot topic for some years now, it's grown increasingly clear that where plastics end up is at least as important as how they're made. Current recycling technologies are limited, bringing either low-quality recyclates or high processing costs. But enzymes now offer a glimmer of hope. Working with the common plastic PET, a French firm is trying to prove biotech approaches can close the loop in the material's life cycle. They hope they'll soon be able to recycle the plastic endlessly and affordably.

>> Read the full story in the printed issue.

FREE EXCERPT



App design for the cellular processor

GENETIC CIRCUITS Since the earliest attempts at genetic engineering, scientists have sought to influence cell behaviour and development through the introduction of foreign genetic material. Synthetic biologists are now taking the idea to a whole new plane with app-like DNA-based software programs that turn cells into diagnostic sensors, therapeutic entities or tissue generators.

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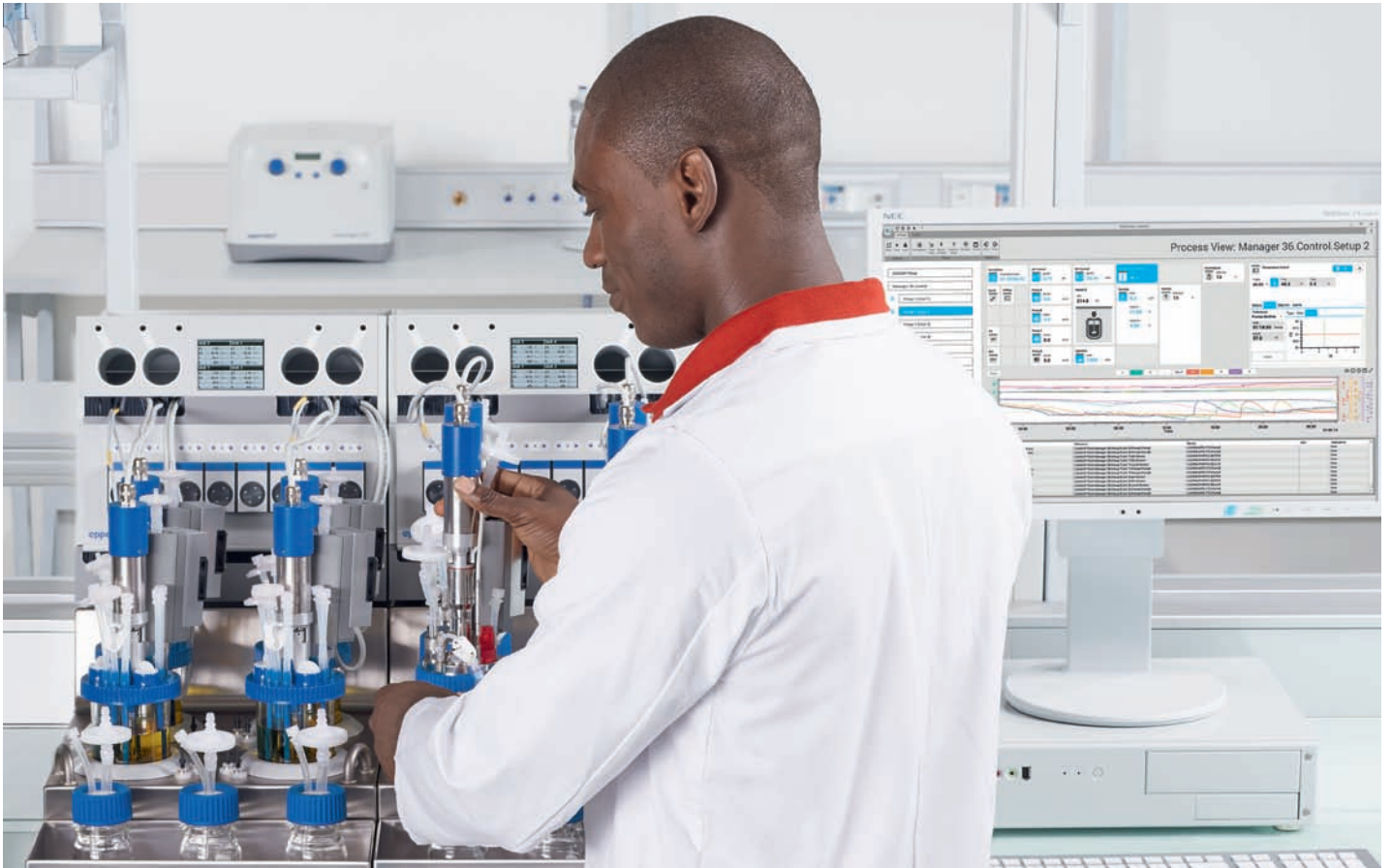
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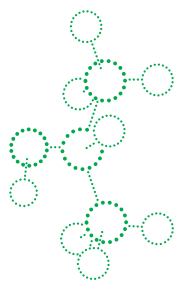
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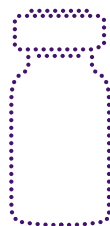
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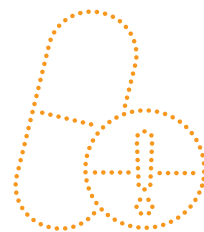
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