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SPONSOR FEATURE

Multidisciplinary research into healthy ageing

The Mars panel discussion at this year's Lindau Nobel Laureate Meeting saw Nobel laureates and young researchers explore how crossing disciplinary boundaries improves outcomes from ageing research.

Continuing its eight-year collaboration with the Lindau Nobel Laureate Meetings, Mars convened a science breakfast and panel discussion at this year's 64th annual meeting dedicated to physiology and medicine. The discussion challenged current approaches to ageing research, and considered how the boundaries between academia, government and industry could be broken down to accelerate the translation of scientific discoveries into practice.

The lively debate brought together Nobel laureate Elizabeth Blackburn of the University of California, San Francisco; Hagen Schroeter, director of fundamental health and nutrition research at Mars, Incorporated; Claudine Gauthier, a post-doctoral fellow at the Max Planck Institute in Leipzig, Germany, and 100 young researchers to share their views on ageing research. Adam Smith, chief science officer at Nobel Media, moderated the hour-long discussion, which tackled topics as diverse as telomeres, dietary recommendations and science communication.

Schroeter kicked off the discussion by arguing that a broader conception of health — beyond “the absence of disease” — could lead to novel applications that address the



Hagen Schroeter (right), Elizabeth Blackburn (second right) and Claudine Gauthier (second left) explore the benefits of a collaborative approach to ageing research during the discussion moderated by Adam Smith (left).

needs of the world's ageing populations. Building on this, Blackburn triggered a discussion with the audience on how to develop a new gold standard of biomarkers from across the scientific spectrum to determine levels of health as we age, rather than levels of disease. “A re-evaluation of current approaches to integrate individualized life factors could better inform public

health policy discussions and contribute towards the goal of optimizing ageing,” said Blackburn after the event.

Gauthier advocated a move towards a more open exchange that would break down traditional disciplinary boundaries and accelerate the process of taking science from the lab to products, treatments or policy.

Mars science breakfasts at Lindau

Since 2010, Mars has hosted an annual science breakfast and panel discussion at the Lindau Nobel Laureate Meeting. These events facilitate the exchange of ideas between laureates and young researchers representing a wide range of scientific disciplines.



2010 – Howard-Yana Shapiro (left), chief agricultural officer at Mars, and Nobel laureate Françoise Barré-Sinoussi (middle), of the Institut Pasteur in Paris, France, led a discussion on how science can serve society.



2011 – The Productive Partnerships panel discussion featured Nobel laureate Elizabeth Blackburn (second right) of the University of California, San Francisco, and Frank Mars (right), president of Mars Symbioscience.



2012 – Nobel laureate Dudley Herschbach (second left) of Harvard University explored how to extend the possible with novel ideas and collaborative partnerships.



2013 – Nobel laureate Steven Chu (second right) of Stanford University in California and Howard-Yana Shapiro (right), chief agricultural officer at Mars, discussed how science can drive solutions that make better use of the planet's resources.

The future of flavanol research

Hagen Schroeter, director of fundamental health and nutrition research at Mars, Incorporated, answers questions on polyphenols and global networks.

What are flavanols?

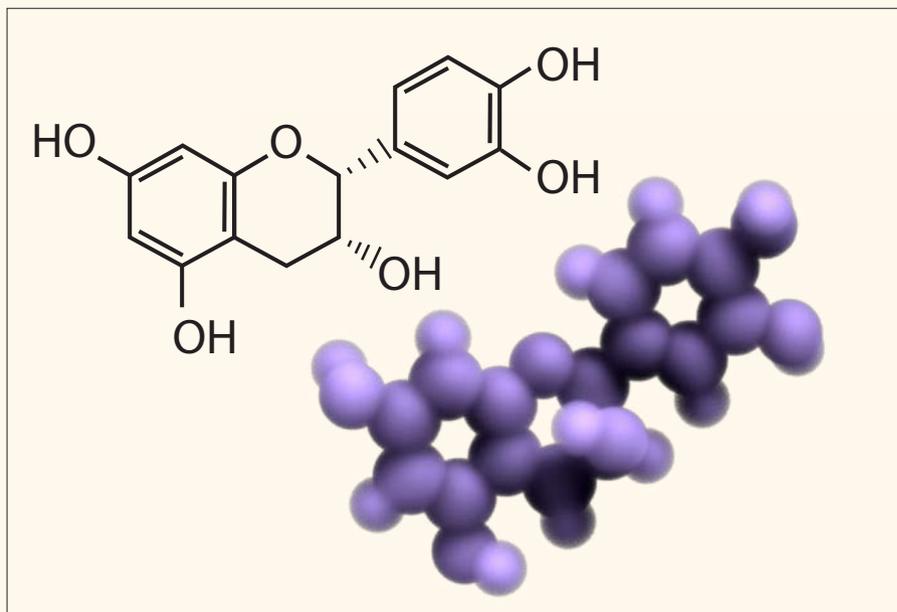
Hagen Schroeter: Flavanols represent a specific group of plant-derived bioactives in the flavonoid family, which in turn belongs to a larger class of natural compounds known as polyphenols. Dietary flavanols are found in cocoa beans, grapes, tea, berries and various other fruits and vegetables. There are four flavanol stereoisomers in nature, and one of these, (-)-epicatechin, is particularly abundant in certain cocoas. (-)-Epicatechin is one of very few polyphenols for which a direct causality chain has been established in humans that links dietary intake, absorption and systemic presence to an improvement in various surrogate markers of cardiovascular health^{1,2}.

What is the Mars flavanol research programme?

HS: The Mars flavanol research programme began in the late 1980s. Today it represents an international research collaboration that brings together some of the world's leading research institutions to jointly advance the scientific understanding of the nutritional and biomedical properties of cocoa flavanols.

Together with our partners, Mars has adopted an approach that integrates insights from several scientific disciplines and across sectors to understand better how cocoa flavanols mediate their cardiovascular benefits. As a result, the scope of our research programme ranges from the molecular level to human physiology and clinical studies, and from food supply and food processing all the way to public health. Consequently, our network of collaborators brings together scientists from academia, government and industry, and multiple scientific fields that range from chemistry, analytics, biomedical research, nutrition and epidemiology to plant sciences, agriculture and applied food science.

A recent step forward was the completion of FLAVIOLA — a pan-European research project funded by the European Commission³. The outcomes of FLAVIOLA include novel and robust data sets on cocoa flavanol efficacy and safety that originated from various clinical dietary interventions in healthy populations. FLAVIOLA



The structure of (-)-epicatechin.

also generated epidemiological data on the habitual dietary intake of flavanols across the European Union, as well as insights with regard to inter- and intra-individual differences in flavanol efficacy as a function of age, sex and various lifestyle factors. Taken together, the results of this integrated research programme support the notion that flavanols can produce a range of meaningful cardiovascular benefits applicable to the general population and, as a result, have the potential to improve public health.

What are the next steps for flavanol research?

HS: Current data on flavanols and cardiovascular health are probably among the most comprehensive data sets for dietary flavonoids and polyphenols in general, but compared to nutrients with established dietary reference intake (DRI) values, gaps still exist. These gaps are largely related to scale, that is, the size and diversity of the populations studied, the duration of studies and observations, and the current dependence on surrogate endpoints in place of hard morbidity or mortality endpoints. Nevertheless, the data available today provide tenability and will enable larger-scale investigations in future. In this context, Harvard University's Brigham and Women's Hospital in Boston,

Massachusetts, the Fred Hutchinson Cancer Research Center in Seattle, Washington, the US National Institutes of Health, and Mars, Incorporated are collaborating to undertake the largest research trial to date aimed at investigating the cardiovascular health benefits of cocoa flavanols. This clinical dietary intervention will study the effects of cocoa flavanol intake on cardiovascular health in 18,000 men and women in the United States over a five-year period. Importantly, because of its duration, the number of people studied, and the cardiovascular mortality and morbidity endpoints that will be used, this public-private collaboration should provide rich data sets that address current gaps and allow for large-scale assessments that may lead to evidence-based dietary recommendations.

References

1. Schroeter, H. *et al.* (-)-Epicatechin mediates beneficial effects of flavanol-rich cocoa on vascular function in humans. *Proc. Natl Acad. Sci. USA* **103**, 1024–1029 (2006).
2. Schroeter, H. *et al.* Recommending flavanols and procyanidins for cardiovascular health: current knowledge and future needs. *Mol. Aspects Med.* **31**, 546–557 (2010).
3. www.FLAVIOLA.org

Mars' commitment to long-term research

As a private, family-owned business, Mars has the freedom to take a generational approach to its business, allowing it to undertake long-term, fundamental research in several diverse areas.

RICE SUSTAINABILITY

Climate change is driven predominantly by three greenhouse gases: carbon dioxide, methane and nitrous oxide. Rice produces all three of these greenhouse gases and is the largest contributor to agricultural methane emissions. To help address this problem, Mars is supporting a programme with the University of California, Davis and the University of Arkansas to identify mitigation strategies that lower the global-warming potential of rice production.



AFRICAN ORPHAN CROPS CONSORTIUM

As a founding member of the African Orphan Crops Consortium (AOCC) — an international effort to improve the nutrition, productivity and climatic adaptability of some of Africa's most important crops — Mars is contributing to work that aims to decrease malnutrition and stunting among rural children. The AOCC will sequence, assemble and annotate the genomes of 100 traditional African food crops to enable higher nutritional content for society in the decades to come.



CACAO GENOME SEQUENCING

Mars, IBM and the US Department of Agriculture launched a programme in 2008 to sequence, assemble and annotate the genome of the cacao tree, *Theobroma cacao*. The findings were made available to all through the Public Intellectual Property Resource for Agriculture (PIPRA) and the Cacao Genome Database. Breeders are currently using this knowledge to identify traits of disease resistance, enhanced yield, efficiency in water and nutrient use, and climate-change adaptability among the world's cacao trees. This will result in healthier, stronger and more productive cacao cultivars that will improve farmers' yields and incomes.

