Lush Prize Conference

Wednesday 11 and Thursday 12 November 2020

Can BIG DATA Replace Animal Testing?

THE 2020 LUSH PRIZE

SUPPORTING ANIMAL-FREE TESTING


The Lush Prize is a major initiative aiming to bring forward the day when safety testing takes place without the use of animals.
It focuses pressure on toxicity testing for consumer products and ingredients, in a way which complements the many projects already addressing the use of animals in medical testing.
A collaboration between Lush Cosmetics and Ethical Consumer Research Association, it provides £250,000 funding in each prize cycle.

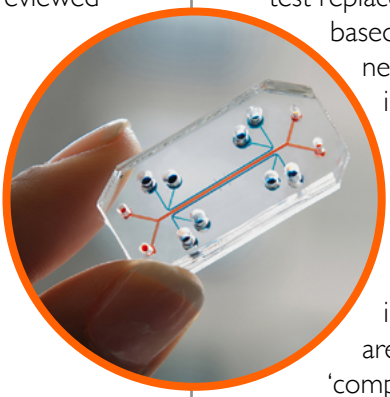


Welcome to the Lush Prize 2020 Conference

Although we're not flying people around the world to attend the Lush Prize awards this year, we wanted to keep up with the conferences that had grown off the back of the awards because we felt they were useful for everyone involved in the project. This one is six months late, and taking place (like much else) on Zoom, but we hope it will be just as good.

Why are we looking at 'big data' this year?

In 2019 the Lush Prize reviewed its awards criteria to address some of the significant scientific and other advances that have taken place in the seven years since we began our work.



At the core of our new strategy is a focus on projects most likely to lead to practical non-animal tests as part of the shift towards New Approach Methodologies (NAMs) which could be accepted by regulators.

When the prize began in 2012, its science prizes were asked to focus particularly on projects working in the area of 'Adverse Outcome Pathways' (AOPs) or on developing pathway understandings generally.

Since then, it has become clear to the Prize's judges and advisors that, in terms of developing practical test replacements – often based upon these new pathways and increased mechanistic understanding – two other emerging technologies are also going to play an increasingly important role: these are: 'organ-on-a-chip' and 'computational toxicology'.

Therefore, going forwards, our science awards (in Science, Training or Young Researcher categories) are therefore now likely to be working in one of three fields:

- Adverse Outcome Pathways,
- Organ-on-a-chip approaches, and
- Computational toxicology.

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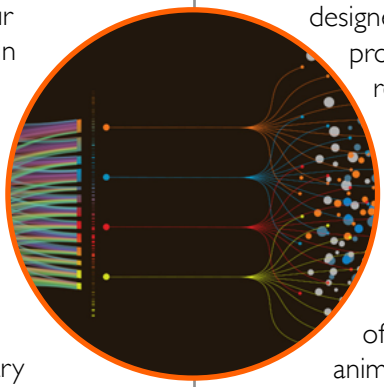
The role of Big Data

Our 2015 conference looked specifically at AOPs. Our last conference (in Berlin in 2018) focussed particularly on the role of organ-on-a-chip technologies. This event is therefore exploring the third part of the jigsaw - computational toxicology. In order to try to make it accessible to more people, we decided to call it Big Data instead.



In the first day we hope to learn about where the cutting edge of computational toxicology is and also about its developing role in COVID-19 research. Although toxicity testing has been the main focus of Lush Prize, we felt it important to make space for discussion relevant to biomedical research too.

The second day has two sessions designed to explore the prospects for the regulatory acceptance of big data analyses. It looks like this might be tantalisingly close for some endpoints.

One of the challenges of moving away from animal models to a whole new paradigm (the goal of the Lush Prize) is that complex validations are often required against tests with a scientific basis which is to some degree, flawed (a mouse is not a human). The big data approach has the potential to finesse this catch 22 situation, at least in some circumstances. We hope to learn more today.

Rob Harrison, Lush Prize

Can Big Data Replace Animal Testing?

Big data is the term given to the process of extracting and analysing large quantities of data. This could be from large 'platforms' which may be open access or specific data libraries. Cutting edge advances in artificial intelligence (AI) and machine learning aid big data analysis in new ways.

Big data is used in many ways, not only for science, but business, finance or technology (e.g. cloud computing) and the 'mining' of big data can find predictive trends or patterns to a far higher quality and speed, where other methods fail.

Animal tests are still considered by many to be the 'gold standard' for the safety testing of chemicals. However, machine learning of toxicity test databases allows vast quantities of data to be read and compared using computational modelling to make predictions of chemical safety (a process known as 'read across').

This not only improves quality and reliability, but is shown to outperform toxicity tests in animals, which are known to have a limited ability to predict human safety to test substances. Comparing data for many known substances has also demonstrated the high reliability of the computer models used.

Big data analysis has the potential to replace animal use not only in chemicals testing, but disease research too. For example, the mining of biological data, genetic sequences and data from human populations has far greater capacity to investigate and understand disease, providing not only more human relevant – but individual patient relevant – information than animal models, which remain severely limited in their ability to replicate human disease.

Agenda - Day One

Wednesday 11 November 2020 (all times are GMT)

13.00: Introduction and Welcome to the Lush Prize Conference 2020

Panel 1: Can big data replace animal testing?

13.05 - 14.10

Chair: Rebecca Ram, Lush Prize

13.05: **Dr Tim Allen**, MIE Atlas Team, Cambridge University, UK
In Silico Models to Predict Human Molecular Initiating Events

13.20: **Dr Domenico Gadaleta**, Laboratory of Environmental Chemistry and Toxicology, Istituto di Ricerche Farmacologiche Mario Negri, Italy
Modeling of Molecular Initiating Events for Large-Scale Assessment of Chemical Toxicity

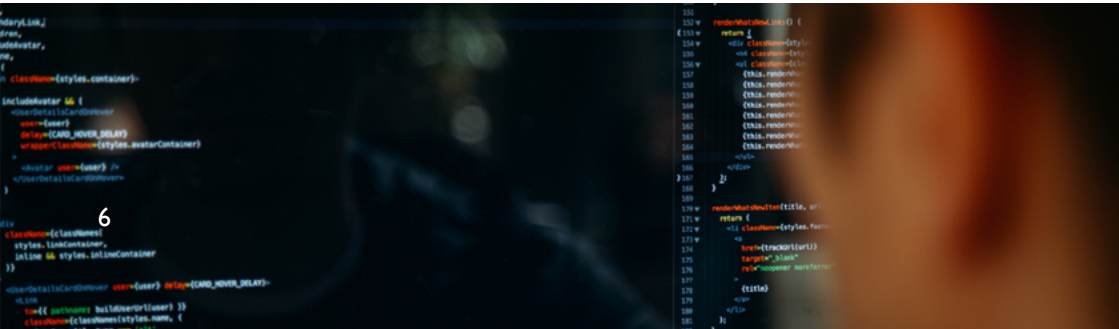
13.35: **Prof Hao Zhu,** The Rutgers Center for Computational and Integrative Biology, USA
Non-animal models for animal toxicity evaluations: applying data-driven profiling and read-across

13.50 - 14.10: Questions from the floor for a panel discussion

Fireside Chat/Coffee Break

14.10 - 14.30

Lush Prize judge Dr Gill Langley talks to **Prof Sue Gibbs** and **Pepik Henneman** from Helpathon, The Netherlands



Agenda - Day One - Part Two

Panel 2: Big data, animal testing and Covid-19
14.30-15.30
Chair: Rob Harrison, Lush Prize

14.30 - 14.45: **Rebecca Ram**, Safer Medicines Trust, UK
Participation in the COVID-19 Adverse Outcome Pathway (CIAO) Project

14.45-15.00: **Prof Thomas Hartung**, Centre for Alternatives to Animal Testing, John Hopkins University, USA
The pandemic and alternatives – a panacea for each other?

15.00-15.15: **Dr Jyotika Varshney**, VeriSIM life, USA
BIOiSIM: Next-generation AI/ML-based Hybrid Modeling to significantly reduce reliance on animal models for Preclinical/Clinical Drug Development

15.15-15.30: Questions from the floor for a panel discussion

Fireside Chat/Coffee Break
15.30-15.50
Lush Prize judge Nick Jukes talks to **Friedrich Mülln** from SOKO Tierschutz, Germany

Evening Event

Lush Prize 2020 Awards Ceremony
16.00 - 17.30: Livestream via www.lushprize.org and YouTube

Agenda - Day Two

Thursday 12 November 2020 (all times are UK)

13.00: Introduction and Welcome to day two of the Lush Prize 2020

Panel 3: The role of big data in Next Generation Risk Assessment (NGRA)

13.05 - 14.10

Chair: Troy Seidle, Humane Society International and Lush Prize judge

13.05-13.20: **Dr Chloé Raffali**, Toxicologist, Lush Cosmetics, UK
Advancing Animal-free Safety assessment Collaboration overview

13.20 -13.35: **Edoardo Carnesecchi**, Institute for Risk Assessment Sciences, Utrecht University, The Netherlands
Towards the development of innovative Quantitative Structure-Activity Relationship models for human and ecological risk assessment of emerging contaminants and their mixtures

13.35-13.50 : **Dr Vinicius Alves**, National Institute of Environmental Health Sciences, USA
STopTox: An in-silico platform as an alternative to animal testing for acute Systemic and TOPical TOXicity

13.50-14.10: Questions from the floor for a panel discussion

Fireside Chat/Coffee Break

14.10- 14.30

Hilary Jones, Ethics Director at Lush Cosmetics, talks to **Wu Hung** from Environment and Animal Society of Taiwan (EAST)

Agenda - Day Two - Part Two

Panel 4: Paving the way from big data to regulatory acceptance
14.30 - 15.30
Chair: Rebecca Ram, Lush Prize

14.30: **Clemens Wittwehr,** European Commission Joint Research Centre, Italy
The triangle of chemical safety – and how it will boost regulatory acceptance of mechanistic data

14.45: **Kristie Sullivan**, Physicians Committee for Responsible Medicine, USA
It takes a Village: The Role of NGOs in Regulatory Acceptance of NAMs

15.00: **Dr Nicole Kleinstreuer**, NTP Interagency Center for the Evaluation of Alternative Toxicological Methods, USA
From the 3Rs to the 4Cs: Communication, Collaboration, Commitment, and Confidence

15.15-15.30: Questions from the floor for a panel discussion

Closing remarks
15.30 - 15.40: Rob Harrison, Lush Prize

ATLA / Lush Prize Journal

During each Lush Prize cycle we work with the ATLA Journal (Alternatives to Laboratory Animals) to produce a special issue featuring the winners of the previous Lush Prize.

The latest journal includes a special feature by Lush Prize science consultants Jenny and Terry McCann about how they conduct their background research for the Science Prize to assist the Lush Prize Team in identifying key projects that are making major contributions to the field of animal-free toxicology research.

The ATLA / Lush Prize journal is open access and available to download on ATLA's website at https://journals.sagepub.com/toc/atla/48/1_suppl

Speakers A-Z

Dr Tim Allen

Tim Allen is a Research Associate at the MRC Toxicology Unit, University of Cambridge. He completed his PhD in 2016 on Molecular Initiating Events (MIEs) and how computational methods can be used to predict them. Since then he has undertaken post-doctoral work in the Department of Chemistry in Cambridge, the United States EPA and the MRC Toxicology Unit. This has included work using quantum chemistry density functional theory calculations, 3D QSARs to quantitatively predict MIEs and state-of-the-art machine learning approaches such as deep learning neural networks. Tim has also served as a member of ILSI Europe's expert group on the application of AOPs in food ingredient risk assessment and has presented his research at over 20 national and international conferences.

Day One. Panel 1: Can big data replace animal testing?
Presentation: *In Silico Models to Predict Human Molecular Initiating Events*

Dr Vinicius Alves

Vinicius Alves is a computational chemist with experience developing and implementing innovative cheminformatics and molecular modeling approaches for pharmaceutical and environmental research.
In 2018, he received a Lush Prize Young Researcher Americas award for his work on the development of machine learning-based web applications for chemical toxicity assessment as an alternative to animal testing. Currently, he is a Research Fellow at the National Institute of Environmental Health Sciences.

Day Two: Panel 3: The role of big data in Next Generation Risk Assessment
Presentation: *STopTox: An in-silico platform as an alternative to animal testing for acute Systemic and TOPical TOXicity*

Edoardo Carnesecchi

Edoardo Carnesecchi is a PhD candidate in Toxicology at the Institute of Risk Assessment Sciences, Utrecht University, while working at the OECD, within the Environment, Health and Safety Division. His PhD project – in a joint collaboration with the European Food Safety Authority (EFSA) and the Institute for Pharmacological Research Mario Negri – aims to develop and test innovative alternative methods to animal testing such as Quantitative Structure-Activity Relationship models for human-health and ecological risk assessment of emerging chemicals and their mixtures.
After his Bachelor Degree in Environmental Health and Safety, Edoardo carried out his MSc in Food Science & Technology at the Catholic University of the Sacred Heart (Milan), while joining EFSA where he worked on several projects such as "MixTox" on chemical mixtures and EFSA's chemical hazards database "OpenFoodTox".

Day Two. Panel 3: The role of big data in Next Generation Risk Assessment
Presentation: *Towards the development of innovative Quantitative Structure-Activity Relationship models for human and ecological risk assessment of emerging contaminants and their mixtures*

Dr Domenico Gadelata

Domenico Gadaleta graduated in Medicinal Chemistry in 2012. In 2015, he obtained a PhD in Pharmacological Sciences at University of Bari working on the application of computational methods in medicinal chemistry for the rational design of new candidate drugs. Since 2016, he has worked as a researcher in the Laboratory of Environmental Chemistry and Toxicology of dr. Emilio Benfenati at Mario Negri Institute for Pharmacological Research in Milan. His research activity focus on the application of machine learning and artificial intelligence for the development of Quantitative Structure Activity Relationship (QSAR) models for the prediction of (eco) toxicological endpoints. He is co-author of nearly 30 articles in peer-reviewed scientific journals.

Day One. Panel 1: Can big data replace animal testing?
Presentation: *Modeling of Molecular Initiating Events for Large-Scale Assessment of Chemical Toxicity*

Professor Sue Gibbs

Prof. dr. Sue Gibbs is Chair in skin and mucosa regenerative medicine at both Amsterdam University Medical Center and Academic Center for Dentistry Amsterdam. Her entire career has focused on human skin and mucosa biology, in particular in animal alternative methods to develop novel therapeutic strategies for treating and preventing human disease. In vitro models are currently implemented for risk assessment and testing mode of action of compounds and novel actives, in collaboration with industry.
In 2015, she received the national "Daring in the Lab" prize by the Dutch Animal Protection society. Recently, her research has extended into the field of hair follicles and importantly "organ-on-a-chip", in particular immune competent "skin-, melanoma-, lymph node- and gut- on-a-chip". These models have the potential to provide a personalized medicine approach to treating human disease. She joined the TPI network in 2018 and helped initiate the Helpathon to assist scientists willing to transition to animal free innovations.

Day One. 14.10-14.30. *Fireside Chat*

Professor Thomas Hartung

Thomas Hartung, MD PhD, is the Doerenkamp-Zbinden-Chair for Evidence-based Toxicology in the Department of Environmental Health and Engineering at Johns Hopkins Bloomberg School of Public Health, Baltimore, with a joint appointment at the Whiting School of Engineering. He also holds a joint appointment for Molecular Microbiology and Immunology at the Bloomberg School. He is adjunct affiliate professor at Georgetown University, Washington D.C..
In addition, he holds a joint appointment as Professor for Pharmacology and Toxicology at University of Konstanz, Germany; he also is Director of Centers for Alternatives to Animal Testing of both universities. He is Chief Editor of Frontiers in Artificial Intelligence and the former Head of the European Commission's Center for the Validation of Alternative Methods (ECVAM), Ispra, Italy.

Day One. Panel 2: Big data, animal testing and Covid-19
Presentation: *The pandemic and alternatives – a panacea for each other?*

Pepik Henneman

Pepik Henneman is Director and co-founder of Mister Lion for societal change (Meneer de Leeuw). His entire career has been dedicated to the concept of sustainability and societal change. He is affiliated to the Dutch Research Institute for Transitions (DRIFT) at Rotterdam Erasmus University to bring the concepts of transition management into practice. He leads co-creation processes between local government, institutions and citizens on a broad range of European societal issues. In 2014, he led round table discussions for the think-tank on alternative financing for animal-free testing from a transition perspective, via the co-creative 'temporary innovation network' approach. This led to the first transition sketch which was published In Transitie!, together with the recommendation to continue the 'temporary innovation networks'. In 2017, Mister Lion was asked by the Ministry of LNV to help set up the temporary renewal networks, which forms the basis of the current TPI programme and the TPI Helpathon practice.

Day One. 14.10-14.30. *Fireside Chat*

Wu Hung

Wu Hung has been a leading figure in Taiwan's animal welfare movement for over 25 years and advocated for the introduction of countless regulations and policies to improve the welfare of animals in Taiwan. He is the founder, president and chief executive of the Environment and Animal Society of Taiwan; roles in which he has served since 2000. He previously served as the secretary general for Taiwanese animal protection group, the Life Conservationist Association, between 1993 and 1999.
In addition to his leadership in the animal welfare movement, Wu Hung also plays an active role in environmental protection and social justice campaigns. Between 1995 and 2002 he was a founder and core member of the Ecology Conservation Alliance, in addition to the founder and president of the Social Movement Legislation Alliance. Both groups have since gone on to become formal registered organizations.

Day Two. 14.10-14.30. *Fireside Chat*

Dr Nicole Kleinstreuer

Dr Nicole Kleinstreuer is the acting director of the NTP Interagency Center for the Evaluation of Alternative Toxicological Methods (NICEATM), the US federal resource for alternatives to animal testing. At NICEATM, she leads domestic and international efforts to develop novel testing and analysis strategies that provide more rapid, mechanistic, and human-relevant predictions of potential environmental chemical hazards. Kleinstreuer's research focuses on mathematical and computational modeling of biological systems and their susceptibility to perturbations that result in adverse health outcomes. She has a secondary appointment in the NIEHS Division of Intramural Research Biostatistics and Computational Biology Branch, and adjunct faculty positions in the Yale University School of Public Health and the Eshelman School of Pharmacy at UNC Chapel Hill. She is the recipient of numerous prestigious awards including the 2016 Lush Prize Americas Young Researcher Award and the 2019 Society of Toxicology Achievement Award.

Day Two. Panel 4: Paving the way from big data to regulatory acceptance
Presentation: *From the 3Rs to the 4Cs: Communication, Collaboration, Commitment, and Confidence*

Friedrich Mülln

Friedrich Mülln is the founder of SOKO Tierschutz, a German organisation specialising in undercover investigations to expose animal cruelty. In 2003, Friedrich spent four months working undercover in the primate toxicity test lab Covance, revealing the first covert photos of primate experiments in Germany. SOKO conducted an undercover investigation in 2014 at the Max Planck Institute Tübingen, for which it won the Lush Prize for Public Awareness the following year.
Another covert investigation, in 2019, at the Laboratory of Pharmacology and Toxicology in Mienenbüttel, led to the lab being raided by police and having its licence to carry out animal experiments revoked. It was also forced to hand over all animals remaining at the lab to suitable third parties.

Day One. 15.30-15.50. *Fireside Chat*

Dr Chloé Raffali

Chloé Raffalli is a toxicologist and safety advisor for Lush Cosmetics UK and has always defended animal rights. She obtained her PhD in in vitro toxicology in 2018. The subjects of her research were skin sensitization to fragrances and their mechanism of action on skin cells, and the development of an innovative repeated exposure in vitro test on 3D skin models for the cosmetic industry. After her PhD, she joined Lush to work as a toxicologist where she evaluates the safety of products using animal-free methods. Chloe also leads Lush's collaboration with XCellR8, to develop innovative in vitro methods and prove the safety of both ingredients and finished products. Since 2019, she has been part of the Animal Free Safety Assessment (AFSA) worldwide organization. She contributes to online training initiatives for cosmetic toxicologists which promote innovation without new animal testing.

Day Two: Panel 3: The role of big data in Next Generation Risk Assessment (NGRA)
Presentation: *Advancing Animal-free Safety assessment Collaboration overview*

Rebecca Ram

Rebecca Ram is a scientific research consultant with a MSc in Toxicology and BSc in Applied Biology. After a decade working in phase 1-IV clinical trials in the pharmaceutical industry, she became a consultant to focus on alternatives to animal experiments and the campaign to end animal use in research, as well as continued work in some clinical research projects, for example the 100,000 Genomes Project. Rebecca has worked or provided scientific support for a number of organisations, including GSK, AstraZeneca, University College London Hospital, Simugen, Genomics England, Cruelty Free International, PETA, Animal Defenders International, Vier Pfoten (Four Paws), Animal Aid, TRACKS Investigations, One Voice France and most recently, the Lush Prize and Safer Medicines Trust.

Day One. Panel 2: Big data, animal testing and Covid-19
Presentation: *Participation in the COVID-19 Adverse Outcome Pathway (CIAO) Project*

Kristie Sullivan

Kristie is the Vice President for Research Policy at the Physicians Committee for Responsible Medicine (PCRM) and directs their efforts to promote human-relevant alternatives to the use of animals in medical research, education, and the testing of drugs, chemicals, and other products through scientific scholarship and outreach to companies, federal agencies, and legislators. She has a Master of Public Health in Toxicology and a BS in Biological Anthropology. Kristie also serves on a number of committees and expert groups in the US and around the world related to promoting new approaches, including the OECD EAGMST, which facilitates the AOP Programme. She is also a member of the Lush Prize judging panel.

Day Two. Panel 4: Paving the way from big data to regulatory acceptance
Presentation: *It takes a Village: The Role of NGOs in Regulatory Acceptance of NAMs*

Dr Jyotika Varshney

Dr. Jyotika Varshney is the Founder and CEO at VeriSIM Life (VSL), a San Francisco-based firm actively engaged in creating better medicines through AI-driven biosystem simulations to truly personalize patient treatment. Her relentless passion for reducing animal testing in research and coding led to the formation of VSL. Dr. Varshney has a background in Veterinary Medicine and holds a PhD in Comparative Oncology/ Genomics from the University of Minnesota. She is the inventor of VSL's core technology, and spearheaded initial development, optimization and scale-up of the platform. She has front-led numerous collaborative engagements with a host of industrial and academic institutes. Dr. Varshney is a dynamic and celebrated leader, and has received numerous awards as well as delivered keynotes at several conferences. Additionally, she serves on several advisory boards as Scientific/Technical advisors to help other Founders commercialize their frontier end science and technology.

Day One. Panel 2: Big data, animal testing and Covid-19
Presentation: *BIOiSIM: Next-generation AI/ML-based Hybrid Modeling to significantly reduce reliance on animal models for Preclinical/Clinical Drug Development*

Clemens Wittwehr

Clemens leads the project 'Protection of animals used for scientific purposes' at the Joint Research Centre (JRC) of the European Commission in Ispra, Italy. The use - and the acceptance - of mechanistic data, mostly derived from NAMs, both in the regulatory domain and in biomedical research is crucial for the reduction of animal tests and the paradigm shift away from the traditional black-box observational approach towards modern science. Clemens has - under the umbrella of an OECD initiative - and in collaboration with many international parties, led and now finalised a project delivering an OECD Harmonised Template to report mechanistic data. Clemens also co-leads the Adverse Outcome Pathway Knowledge Base group at the OECD and is currently busy running a crowdsourcing project to establish AOPs depicting COVID-19 pathogenesis. In addition, he works on ways to better share and disseminate knowledge about non-animal models and methods.

Day Two. Panel 4: Paving the way from big data to regulatory acceptance
Presentation: *The triangle of chemical safety – and how it will boost regulatory acceptance of mechanistic data*

Professor Hao Zhu

Dr. Hao Zhu is a Professor of Chemistry at the Rutgers University-Camden. His major research interest is to use cheminformatics tools to develop predictive models. All resulted models can be used to directly predict the chemical toxicity based on the public big data and molecular structure information. His current research interests also include intelligent data-driven modeling, artificial intelligence algorithm development and rational nanomaterial design. He is serving as the member of editor board (i.e. and as Ecotoxicology and Environmental Safety), member in multiple national scientific committees (e.g. NIH, EPA and etc) and grant review committees (e.g. EPA, DOD and etc). Dr. Zhu is author/co-author of 75 peer-reviewed journal articles and 7 book chapters with over 3,600 citations.

Day One. Panel 1: Can big data replace animal testing?
Presentation: *Non-animal models for animal toxicity evaluations: applying data-driven profiling and read-across*

The Lush Prize would like to thank

All of our judges for the knowledge and experience brought to the 2020 decision-making process.

Mark and Mo Constantine of Lush.

The Lush Prize Management Team:
Hilary Jones, Karl Bygrave, Karen Huxley, Kirsty Barnes and Sophie Walker from Lush; and Craig Redmond, Rob Harrison, Rebecca Ram and Alex Crumbie from Ethical Consumer.

Everyone from the Lush global PR and social media teams.

...and every single person who has played, and continues to play, a part in the inter-linked movements for animal compassion and scientific rigour.

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LUSH FRESH HANDMADE COSMETICS

ethical consumer

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