



Adoption of Non-Animal Methods

The Importance of: Innovation, Collaboration and Partnerships

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Senior Vice President - Global Product Stewardship
Procter & Gamble



Global Product
Stewardship

Safety • Sustainability • Regulatory • Technical Relations

P&G product portfolio



In me

Personal health care



On me

Oral care
Feminine care



Skin care
Grooming



Hair Care
Baby care



Near me

Fabric care
Family care



More than
5 billion
exposures per day
Positive assurance
of safety

Exposure

Responsible safety

Non-animal methods as the standard in safety



History

40 years and more than
\$450 million investment in animal
testing alternatives



Research

First skin allergy animal testing
alternative
Key innovator on Read Across
Today, using 50 animal testing
alternatives

Partnership

P&G official member of HSI
#BeCrueltyFree collaboration
Approx. 10 brands PETA certified
as Cruelty Free

3R's how we innovate – skin sensitization

DISCOVER Opportunity Areas

Refine

Reduce

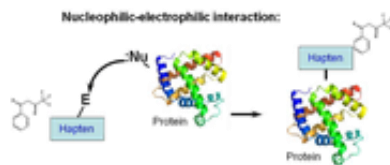
Replace

GENERATE Ideas

In Vivo testing
refinement

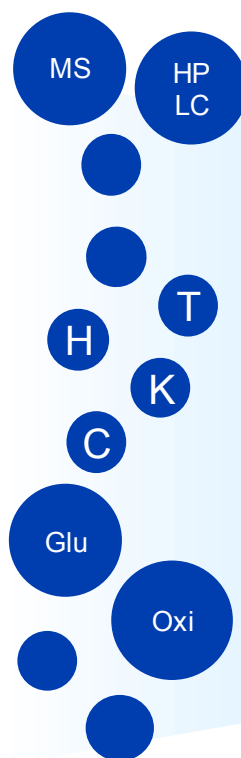
In Vitro test
development

In Chemico test
development



In Silico
Predictive modeling

CREATE Problem SEED 1



Solution SEED 2



Model SEED 3

Adverse
Outcome
Pathways

C K

Oxi

Peroxidase
Peptide
Reactivity
Assay

Bayesian
Network
ITS

INCUBATE

Industry
collaboration
Ring trials

Cell based
in Vitro

Defined
Approaches

In Chemico
approaches

Next Generation
Risk Assessment

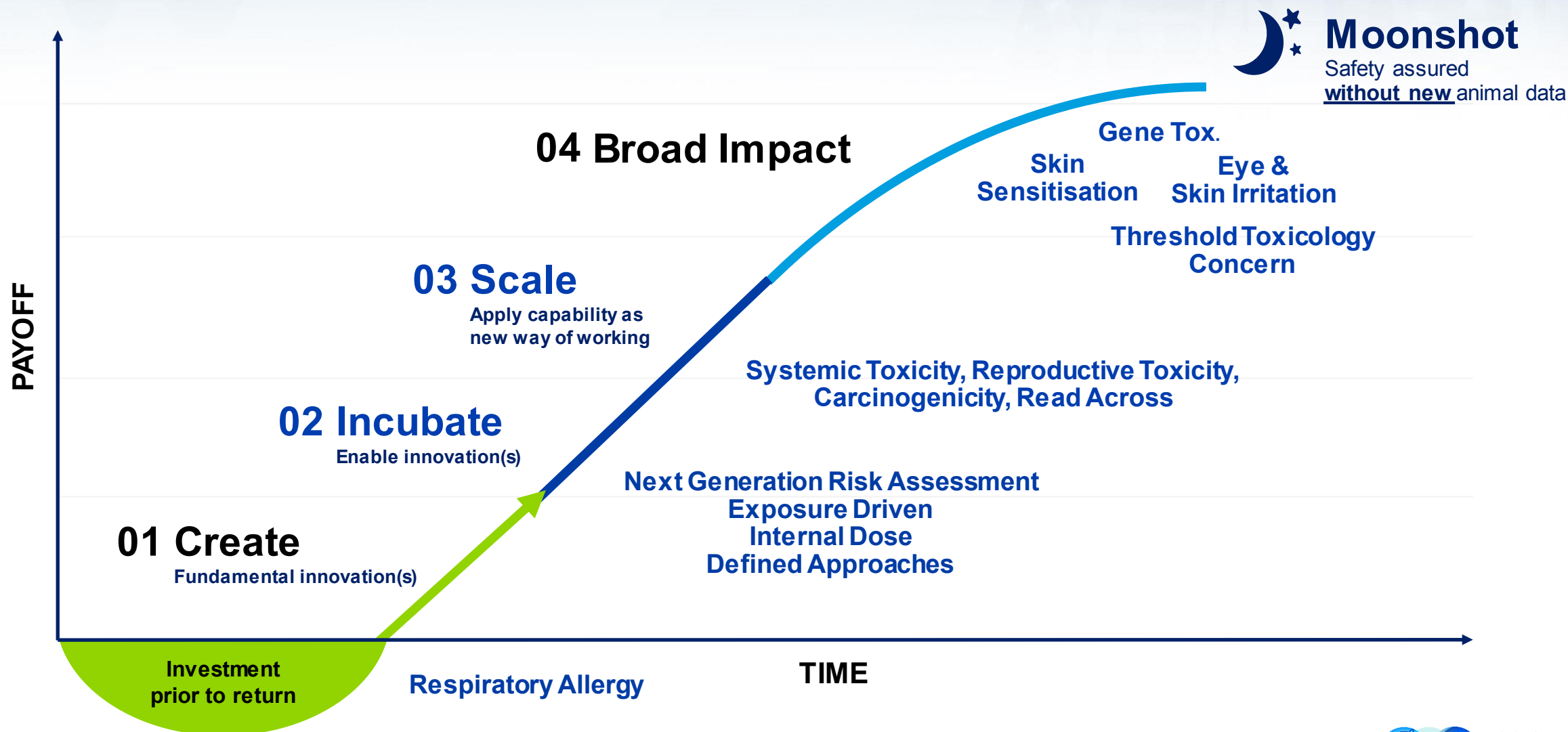
SCALE

Buehler Test
TG406

Local Lymph
Node Assay

Direct Peptide
Reactivity
Assay TG442c

3R's innovation – the journey so far



Read-across - stepping stone into the future

Leverages computational power to address safety questions on endpoints for which no full replacement models will be available in the foreseeable future

Advancing science

Expert-based RAX, uncertainty analysis, ontologies & frameworks, NAMs

Regulatory Toxicology and Pharmacology 56 (2010) 67–81

A framework for using structural, reactivity, metabolic and physicochemical similarity to evaluate the suitability of analogs for SAR-based toxicological assessments ²⁵

Shengde Wu ^{a,*}, Karen Blackburn ^a, Jack Amburgey ^b, Joanna Jaworska ^c, Thomas Federle ^a

Regulatory Toxicology and Pharmacology 114 (2020) 104667

Case studies to test: A framework for using structural, reactivity, metabolic and physicochemical similarity to evaluate the suitability of analogs for SAR-based toxicological assessments

Karen Blackburn ^{a,*}, Donald Bjerke ^b, George Daston ^c, Susan Felzer ^c, Catherine Mahony ^c, Jorge Naciff ^c, Steven Robinson ^c, Shengde Wu ^a

Regulatory Toxicology and Pharmacology 114 (2020) 104667

Application of structural and functional pharmacokinetic analogs for physiologically based pharmacokinetic model development and evaluation

Corie A. Ellison ^a, Shengde Wu

TOXICOLOGICAL SCIENCES 151(2), 2016, 447–461

Grouping 34 Chemicals Based on Mode of Action Using Connectivity Mapping

K. Nadira De Abrew, ^{a,1} Raghunandan M. Kainkaryam, ^a Yuqing K. Shan, ^a Gary J. Overmann, ^a Raja S. Settivari, ^a Xiaohong Wang, ^a Jun Xu, ^a Rachel L. Adams, ^a Jay P. Tiesman, ^a Edward W. Carney, ^{a,1,2} Jorge M. Naciff, ^a and George P. Daston ^a

Knowledge exchange

Outreach to ECHA, OECD Toolbox, Scientific Societies



Collaboration with regulators

CE-Seurat LRSS



Collaboration and partnership



50+
partners globally

1000+
publications

Training and presentations
in major scientific
conferences and industry /
NGO / regulatory workshops

Defining the future: Towards 4Rs “system biology revolution”

Regulatory Toxicology and Pharmacology 114 (2020) 104668



ELSEVIER

Contents lists available at ScienceDirect

Regulatory Toxicology and Pharmacology

journal homepage: www.elsevier.com/locate/yrtph



New ideas for non-animal approaches to predict repeated-dose systemic toxicity: Report from an EPAA Blue Sky Workshop



Catherine Mahony^a, Randolph S. Ashton^b, Barbara Birk^c, Alan R. Boobis^d, Tom Cull^e, George P. Daston^f, Lorna Ewart^{g,h}, Thomas B. Knudsenⁱ, Irene Manou^j, Sebastian Maurer-Stroh^{k,l}, Luigi Margiotta-Casaluci^m, Boris P. Müllerⁿ, Pär Nordlund^{o,p}, Ruth A. Roberts^q, Thomas Steger-Hartmann^r, Evita Vandenbossche^e, Mark R. Viant^s, Mathieu Vinken^t, Maurice Whelan^u, Zvonar Zvonimir^j, Mark T.D. Cronin^{v,*}

Toward common goal

consumer / academia / regulator / NGO / industry

- **Safety assurance from fundamental understanding**
- **Assess more chemicals more quickly**
- **Generate and leverage new knowledge:**
Next Generation Risk Assessment
 - ✓ Invest and build confidence to assess safety without new animal data
 - ✓ Consider exposure-based risk assessment vs. hazard-based C&L
 - ✓ Human relevance of high dose animal testing
 - ✓ Speed-up the uptake and implementation
 - ✓ Open source & case studies

Closing thoughts: the third age of biology



**Classification
and Inference**

01



**Experimentation
and reductionism**

02



**Synthesis, systems
and prediction**

03



Improving everyday life.