Thinking about the future of ‘toxicology’

HESI Presentation to the National Toxicology Program
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International, non-profit leader in convening scientists from academe, government, NGOs, foundations, clinic, industry, and other scientific sectors seeking to build a safer, more sustainable world

Science for a Safer, More Sustainable World
Food Safety

Safe & Effective Medicines

Environmental Quality & Sustainability

Risk Assessment Methodologies and Enabling Technologies

• Diverse Science
• Human & Env Health & Safety
20,000 Citations of HESI’s 300+ Peer-Reviewed Publications, Around Globe, Across Sectors

- Global Reach
- Multi-Sector Scientific Impact
- Multi-Sector Participation
- Science for OECD & ICH
Objective
Create a broad picture of widely identified global and/or national science and health priorities and align those with priorities identified by our own diverse stakeholder base.
What is coming/growing and should be a focus for resources and effort?

National Health and/or Environment Organizations

International Health and/or Environment Organizations

SCIENCE AND HEALTH PRIORITIES AND PREDICTIONS

Global Health View
21 Issues for the 21st Century -- Result of the UNEP Foresight Process on Emerging Environmental Issues

UNEP, 2012
What is coming/ growing and should be a focus for resources and effort?

HESI Governance & Leadership Perspective

SCIENCE AND HEALTH PRIORITIES AND PREDICTIONS

HESI Scientific Committee Perspective

HESI Stakeholder View
# Science Foresight

**Perspectives for 2017-2020**

**External View**
- High density data
- Sensory data & tracking
- Regenerative medicine
- Genome editing
- 3D Printing
- Robotics
- Nanotech

**HESI View**
- Cell, immune, and gene therapy
- Personal monitoring data & role in health, disease, exposure
- Organ chips
- 3D printing
- Computational modeling

**Planetary Pressures**
- Climate Change
- Ability to sustain natural resources (water, air, minerals)
- Population growth
- Waste management

**Technology**
- Climate change impact on human and environmental health
- Environmental exposures and human/eco health outcomes
- Chemical substitutions and sustainability

**Population & Individual Sensitivity**
- Increased aging population
- Microbial resistance & disease
- Rates of NCDs in population
- Novel disease pathogens

**HESI View**
- Aging related disorders
- Neurological illness/safety
- Drug-drug interactions
- Safety of novel cancer therapies
- Impact of combined exposure

**Practice of Science**
- Epidemiology data & use
- ‘Alternative’ testing methods
- Data sharing and data access
- Predictive signatures & epigenetics
- Exposure in risk assessment

**Societal Influences**
- Global regulatory standards
- Role of social media in information collection and exchange
- Public perception of risk vs hazard
- Reduced research $ $$

[http://hesiglobal.org/scienceforesight/](http://hesiglobal.org/scienceforesight/)
For today – not focusing on specific project concepts

Will share an over-arching theme
Moving Toxicology from Defense to Offense
Toxicity = Avoid Harms/ ‘De-Risk’
Current

Tox on Defense

Toxicity = Avoid Harms/ ‘De-Risk’

Future

Offense

Toxicity = Quality of Life, Public Health
Neonatal abstinence syndrome
Retinopathy of prematurity
Neonatal brain, GI, lung injury
Neonatal Sepsis

Tox Role in Health PROMOTION

Nonclinical models of Neonatal Pediatric Drug Development
SURVEY OF EXISTING MODELS
NEONATE PHYSIOLOGY

ESTABLISHING A RESEARCH FRAMEWORK
STARTING DOSE IN NEONATES

MODEL APPLICATION/WORKSHOP

Cardio-Oncology

Do current approaches to assessing therapy related adverse events align with the needs of long-term cancer patients and survivors?
More on ‘Offense’
From the Foresight Map

Increasing Rates of Non-communicable Disease in the population
• Understanding mechanisms of toxicity to promote enhanced health.

Role of Microbiome and Microbial Health
• Opportunities to enhance drug efficacy, nutritional quality, ecological resilience and human and environmental health status

Natural Resource Limitations
• Informing new practices to preserve and extend natural or ‘engineered’ resources.
Why Apply this Concept ACROSS the Traditional Toxicology Portfolio?

- Enhances and illustrates impact
- Increases efficiency through cross-purposing effort
- Enhances potential partner and resource base
- Acknowledges historical progress in managing risk...
- Adheres to collaborative and multidisciplinary mission goals
What could that look like?
HESI is moving in this direction...looking forward to watching how/if others migrate as well!

Tox-Centric
- Immunotoxicology
- Ecotoxicology
- Mechanistic Tox
- Epidemiology
- Assay Driven Testing
- Risk Assessment Methods

Health Context
- Rheumatology/Immunology
- Environmental Stewardship
- Innovation Enabling Biology
- Real-world Evidence
- Decision-driven Strategies
- Public Health
Thanks for your attention

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