



National Institute of
Environmental Health Sciences

Division of the National Toxicology Program

State of the DNTTP

FY 2021

December 8, 2021



State of the DNTP FY 2021

Brian R. Berridge, DVM, PhD, DACVP
Division of the NTP
National Institute of Environmental Health Sciences

NTP Board of Scientific Counselors Meeting
December 8, 2021



Celebrate DNTP and all that we've accomplished in FY
2021!



Aims of This Presentation

- Reflect on our accomplishments over the past year and create a broader visibility for the breadth of what we do
 - Note: Specific accomplishments represent exemplars rather than an exhaustive accounting of what we've done
 - Note: "It takes a team!" so there is limited identification of specific DNTP staff
- Recognize how our accomplishments align to our Strategic Realignment and our recently introduced DNTP Strategic Priorities
- Get your feedback on our 'State of the Union' and input on our future

Outline

- Establishing a prioritized strategic portfolio
- DNTP by the Numbers
- Progress in Processes
- Progress in People
- Summary

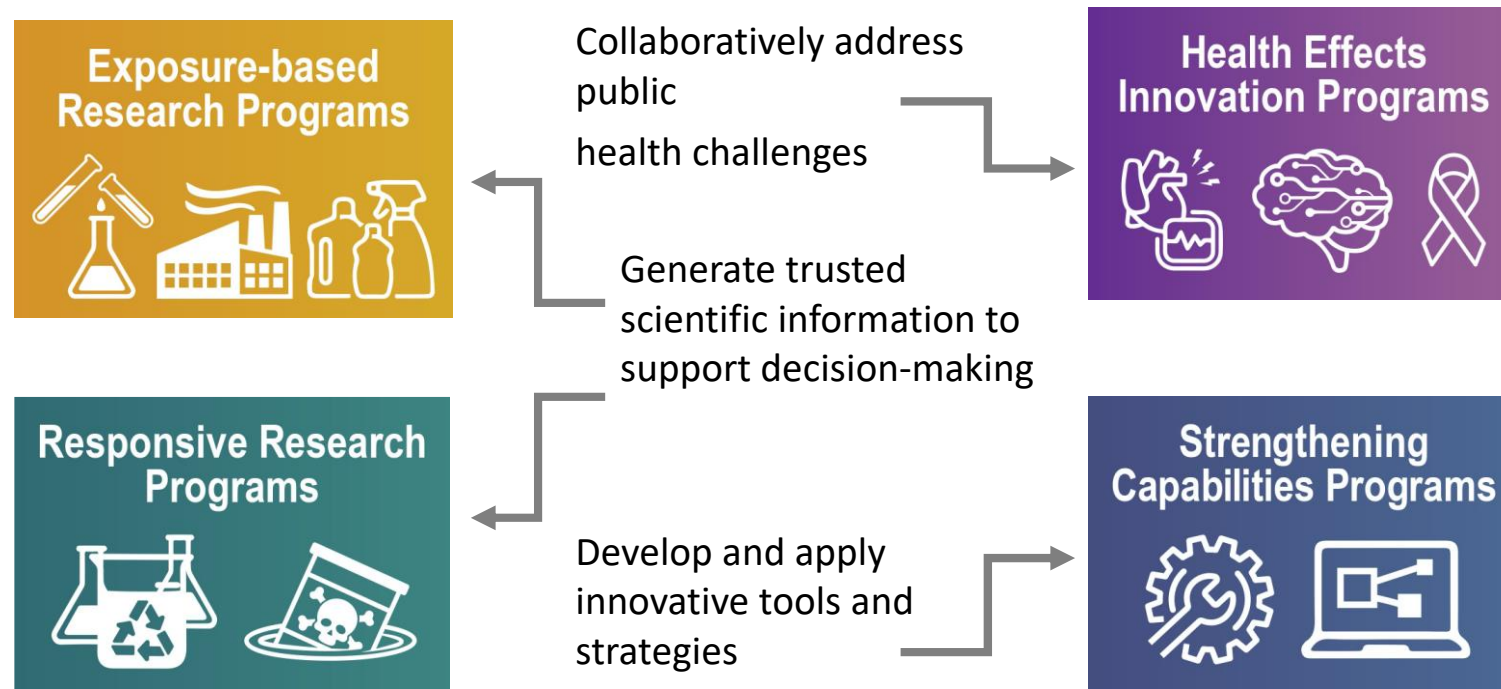
Organized Our Research Portfolio Using a Strategic Framework Based on 3 Objectives

- Accelerate our progress toward becoming a more predictive, precise, and preventive science through the deliberate application of a translational toxicology pipeline of capabilities
- Provide an evidence-based approach to identifying and understanding potential environmental contributors to contemporary and common diseases
- Improve our ability to conduct and communicate substance-based hazard evaluations that are more translational, innovative, and responsive



Identified 4 Strategic Areas of Focus for Our Research Portfolio

- Webpages were set-up on the NIEHS website
 - [<https://www.niehs.nih.gov/research/atniehs/dntp/strategic-plan/index.cfm>]



- Established **10 Research Programs** across the 4 Strategic Areas of Focus

Rolled-out Our Program Research Priorities Aligned to the 3 Strategic Objectives

Objective 1. Accelerate our progress toward becoming a more predictive, precise, and preventive science through the deliberate application of a translational toxicology pipeline of capabilities

Exposure-based Research Programs



Responsive Research Programs



1.1 Define and apply an innovative approach to identifying and characterizing hazards of **complex and/or combined exposures** for existing project areas (botanical dietary supplements, natural mineral fibers, HIV therapeutics)

1.2 Develop and apply defined approaches to infer hazard across specific structural (organohalogen flame retardants) and functional (personal care products) **substance classes**

1.3 Develop and qualify effective tools and approaches to support **timely research responses** to emerging public health issues and the assessment of **safer alternatives**

Program Research Priorities, cont'd

Objective 2. Provide an evidence-based approach to identifying and understanding potential environmental contributors to contemporary and common diseases

Health Effects Innovation Programs



2.1 Define and apply a suite of **screening approaches** to evaluate bioactivities critical to understanding carcinogenicity, cardiovascular toxicity and altered neurodevelopment

2.2 Characterize the likelihood that specific environmental exposures represent human-relevant carcinogenic, cardiovascular and developmental neurotoxic hazards by defining, developing and adapting a **pipeline of internal and external laboratory and computational assessment capabilities**

2.3 Develop and apply an approach to identify and characterize the contributions of environmental exposures to a specific cardiovascular **disease** (gestational hypertension) and cancer (early onset colorectal carcinoma)

Program Research Priorities, cont'd

Objective 3. Improve our ability to conduct and communicate substance-based hazard evaluations that are more translational, innovative and responsive

Strengthening Capabilities Programs



3.1 Develop and evaluate a suite of **complex in vitro 3D cellular systems** (spheroids, organoids) to model human-relevant organ-specific toxicity to support current portfolio priorities



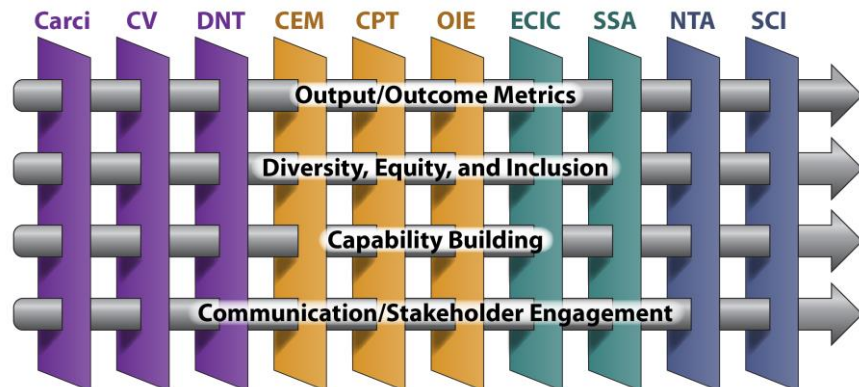
3.2 Develop and evaluate a suite of **multiscale computational models** to support current portfolio priorities



3.3 Assemble and support a robust scientific **cyberinfrastructure and advanced informatics tool** set to enhance and expand the delivery of DNTP knowledge products

Thematic Research Priorities

Identified high value opportunities to strategically implement contemporary and/or cross-cutting topics across all research programs



4.1 Refine current toxicology study and assessment approaches to better understand and account for **social determinants of health**

4.2 Selectively adapt current projects to address the disproportionate impacts of **climate change** on individuals and populations

4.3 Define creative approaches to effectively engage scientific, policy and community **stakeholders** to increase the impact of DNTP research products

Engagement with the NTP Board of Scientific Counselors

- Provided perspective of entire portfolio, how it is structured, areas of research focus
- Program Concepts (10) presented
- Total of 6 meetings over 12 months
- Business Owners' Group, multiple staff presenters, full PMT participation
- Received input and advice on program alignment, focus, value, opportunities, and challenges



NTP BSC Meeting - 08/04/21

David Eaton: Developing semi-quantitative, robust approaches to extrapolating in vitro concentration to in vivo 'target organ' concentration

...Now

Audio Transcript Chat Messages

Search transcript

01:55:07 And had these incredibly potent effects and changes in gene transcription and I was trying to figure out how do I go.

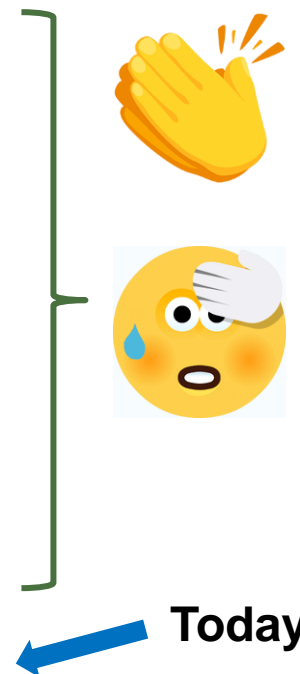
01:55:13 From my concentration that's in a medium for something that is highly lipophilic.

01:55:19 And it's all partitioning into the lipid and it depends on the ratio of lipid, up to the volume of the media and all that to try to figure out what's the concentration at the receptor.

Powered by Otter.ai

BSC Meeting Agendas 2020-2021

DATE	TOPICS	
Dec 3, 2020	<ul style="list-style-type: none"> - Operationalizing the DNTP strategic realignment - DNTP strategic planning framework 	
	DNTP PROGRAM INTRODUCTIONS	
Dec 4	Cardiovascular	Developmental neurotoxicity
Feb 2, 2021	Carcinogenesis	Combined exposures and mixtures
Apr 23	Occupational and inhalation exposures	Emerging contaminants and issues of concern
June 8	Novel tools and approaches	Consumer products and therapeutics
Aug 4	Safe and sustainable alternatives	Scientific cyberinfrastructure
Oct 20	CANCELLED	
Dec 8	Defining a Strategic Portfolio	

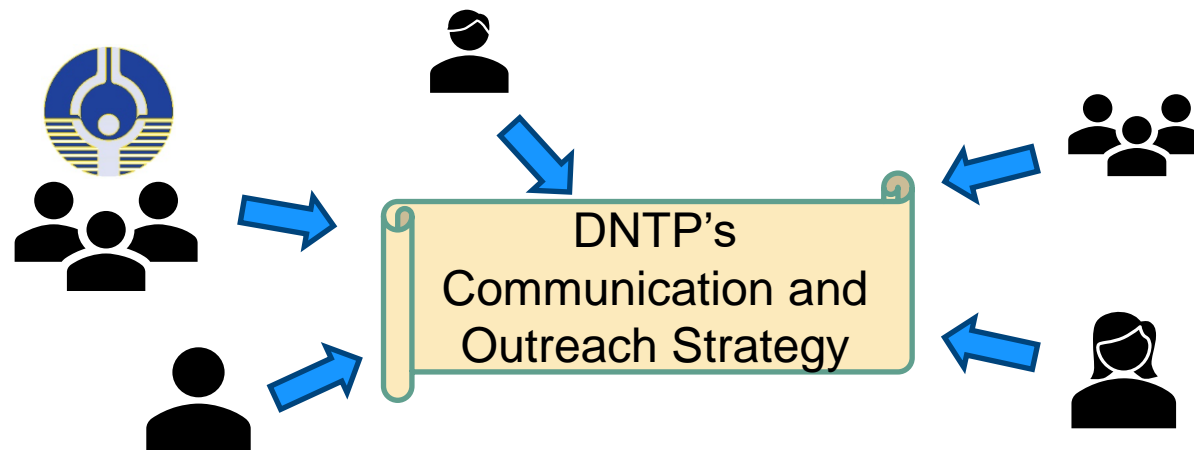


Today

Key: Exposure-based Research, Health Effects Innovation, Responsive Research, Strengthening Capabilities

Communication and Stakeholder Engagement – Thematic Research Priority

- BSC provided input to DNTP during Research Program introductions
- OPRO initiated discussions with DNTP staff around communications and outputs (May 2021)
 - Got DNTP staffs' input about current communications and stakeholders, and ideas for a future state
- Information gathering will be an iterative process to inform strategy development – *(more coming in 2022)*



DNTP by the Numbers: Products, Impact, Influence



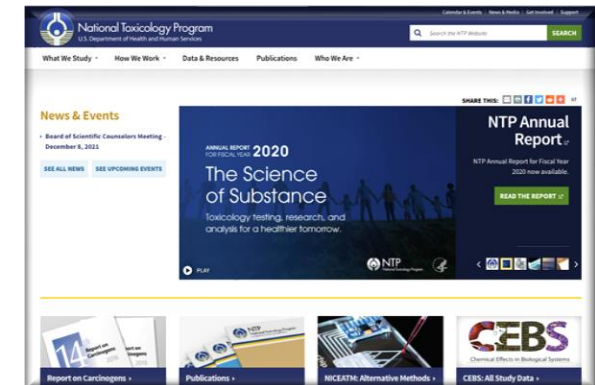
Journal and NTP
Publications



Public Health Impacts



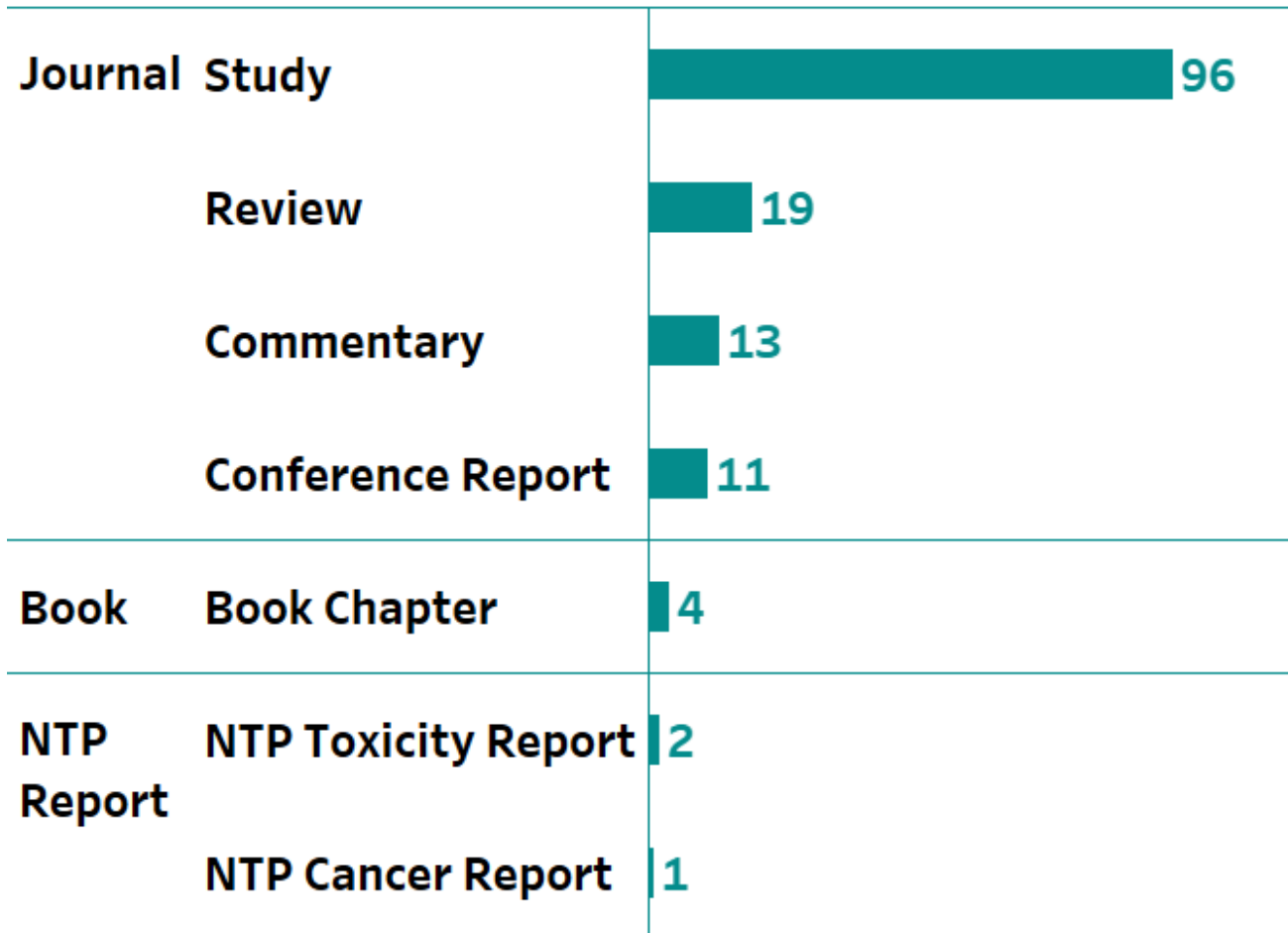
Media Attention



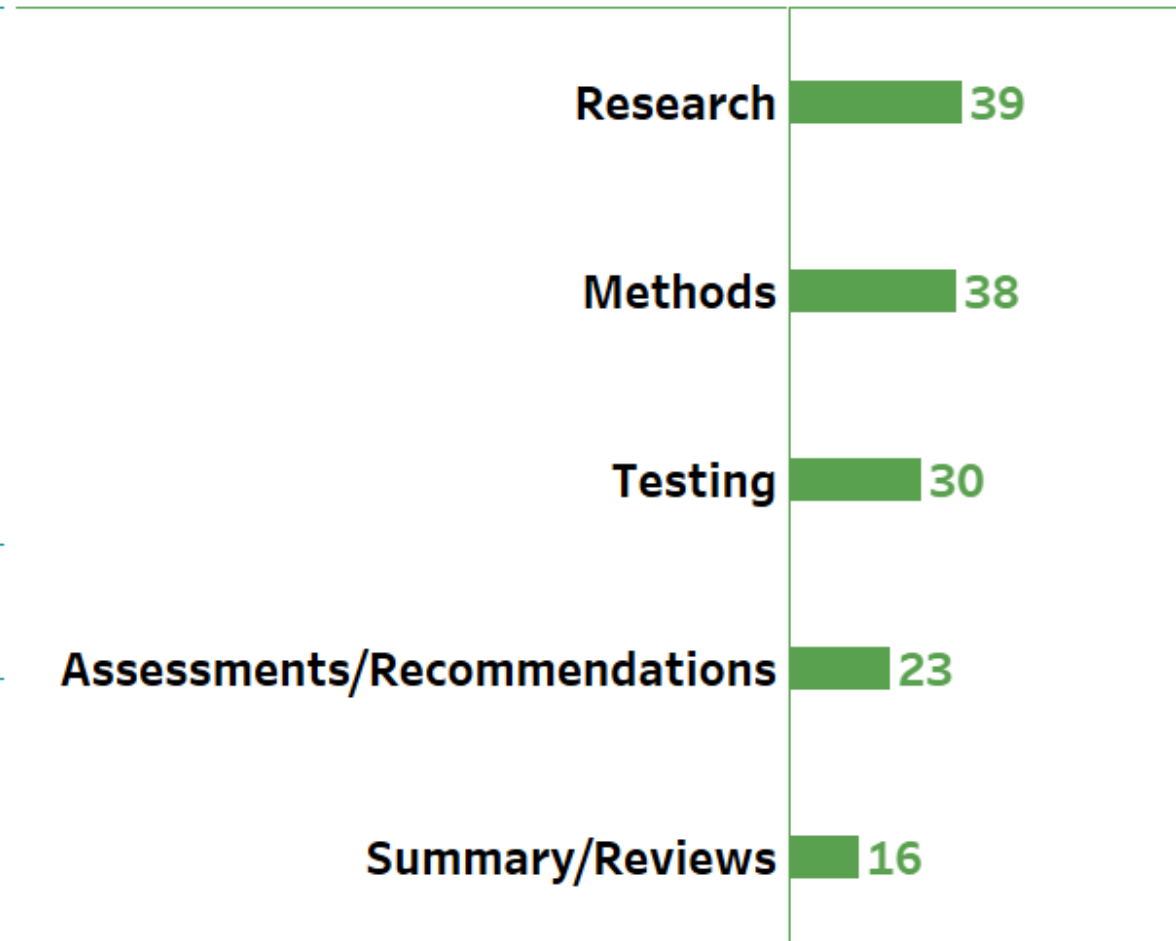
NTP Website Activity

FY 2021 Publication and Study Types

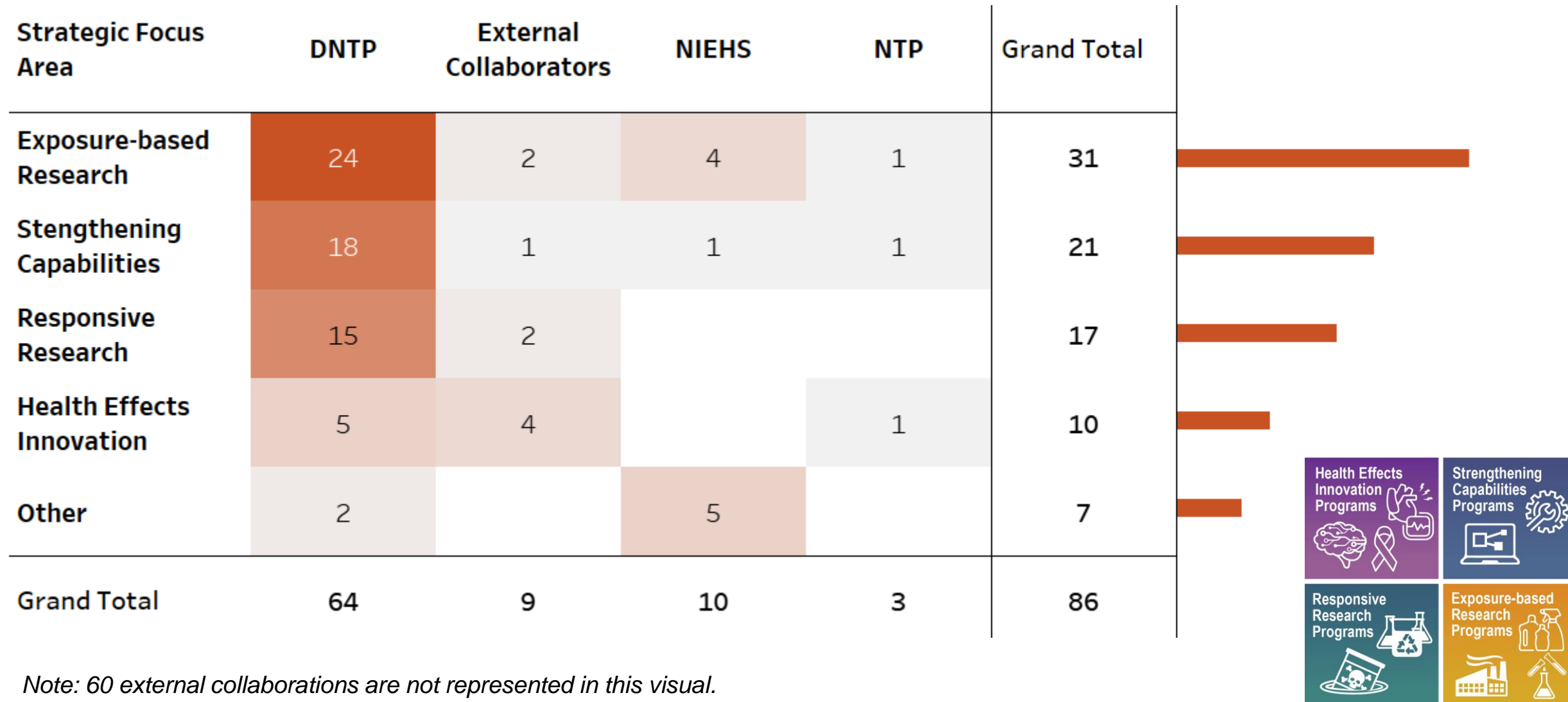
Publication Type — 146 Publications



Study Type — 146 Publications

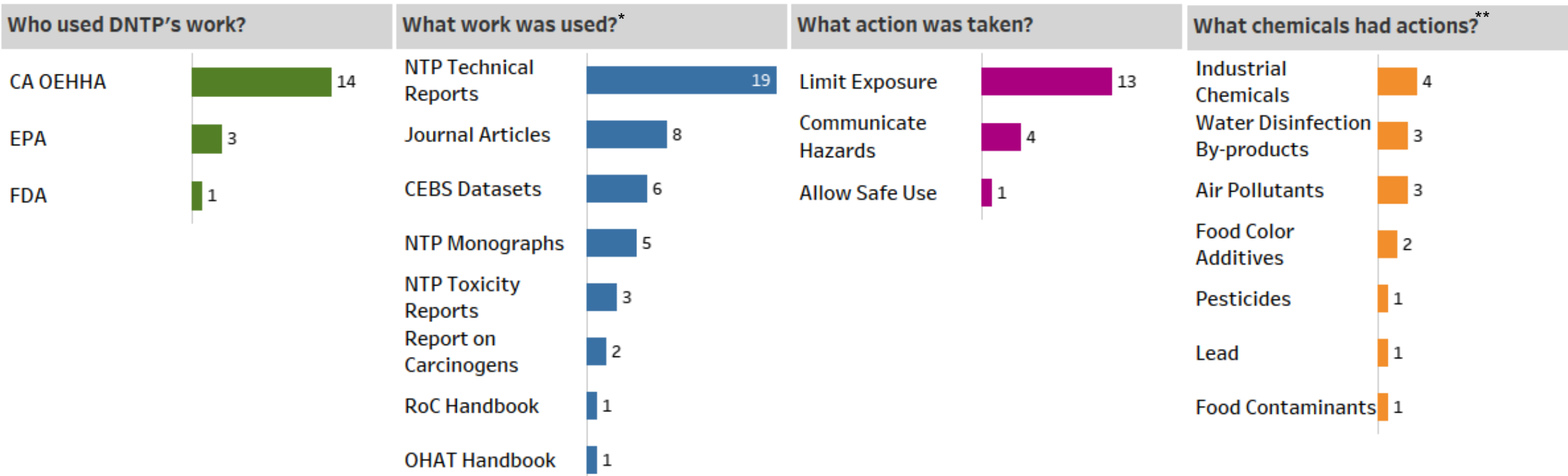


Publications Mapped to Strategic Areas of Focus





Impact of Our Work

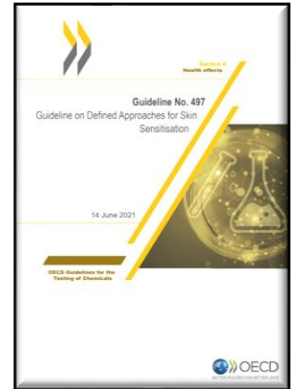


*Some work products were included in >1 action

**Some chemicals had >1 action

Impact of NICEATM's Work

- **Supported the 1st internationally harmonized Organization for Economic Co-operation and Development Test Guideline (TG 429)** that describes a non-animal approach for replacing animal test to identify skin sensitizers
 - Sponsored in collaboration with U.S. government agencies, Canada, and European Union
- Retrospective analysis of oral and dermal acute lethality studies **supported EPA's final guidance** to waive acute dermal toxicity studies for single-active ingredients used in pesticides
 - Guidance is expected to save up to 750 test animals annually from unnecessary testing



Outreach through Webinars and Workshops

- NICEATM co-organized public webinars to advance non-animal approaches

- Application of Animal-Free Antibodies (Oct 2020)	- Non-animal Approaches for Mixtures Assessment (Jan 2021)
- Accessibility of Recombinant Antibodies (Nov 2020)	- Introduction to Skin Sensitization and Contact Dermatitis (Sep 2021)

- ICCVAM held its public forum on May 27, 2021 – ICCVAM agencies described activities both to advance new approaches to safety testing of chemicals and medical products and to reduce the amount of testing required
- Vicki Sutherland co-chaired the organizing committee for two NIEHS workshops on the microbiome
 - The Impact of Environmental Exposures on the Microbiome and Human Health Workshops* – Feb 23-24, 2021
 - At the Crossroads of Exposures, Microbiome, and the Nervous System* – Sep 22-23, 2021
 - DNTP staff served on the organizing committee and/or as workshop moderators: Michelle Cora, Rachel Dee, Rachel Frawley, Dori Germolec, Laura Hall, Jean Harry, Mimi Huang, Kristen Ryan, Diane Spencer, Suramya Waidyanatha, Amy Wang, Shannah Witchey



Webinars and Workshops, cont'd

- Environmental Health Language Collaborative
 - Stephanie Holmgren led the NIEHS initiative to advance community development and application of a harmonized language for describing Environmental Health (EH) Sciences research
 - DNTP staff served on the planning committee including Jennifer Fostel, Ruth Lunn, Charles Schmitt, and Vickie Walker
 - 2 Webinars laid groundwork
 - The Value of Creating Language and Community in Catalyzing Knowledge-Driven Discovery in EH research (June 2021)
 - A Primer on Using Terminologies, Vocabularies, and Ontologies for EH Knowledge (July 2021)
 - Workshop: *Catalyzing Knowledge-Driven Discovery in EH Sciences Through a Harmonized Language* focused on achieving community agreement on the purpose and scope of the Collaborative and use cases for advancing the language used to describe EH research – Sep 9-10, 2021
 - <https://www.niehs.nih.gov/research/programs/ehlc/index.cfm>



DNTP by the Numbers: Media Mentions and Stories

4 Topics

8 Media Outlets

590k – 173.7M Potential Reach

17.2k Social Media Engagement



Our Work Continued to Have Public Interest and Longevity



Bisphenol A

The FDA made standards for food containers stricter following a 2008 National Toxicology Program report indicating the levels of BPA consumed by the U.S. Population at the time could negatively affect health.

News Outlet	Potential Reach
MSN Canada	590K



5G Is Here, But What Is It Anyway?

While internet fears have been directed at millimeter waves, the National Toxicology Program says that since they “are likely to penetrate no deeper than the skin, there is less concern that these frequencies can cause harmful effects in the heart and brain”; that said, its scientists are working to better understand the effects of radio-frequency radiation more broadly on biological tissues.

News Outlet	Potential Reach
Bloomberg	39.6M



Fluoride Controversy

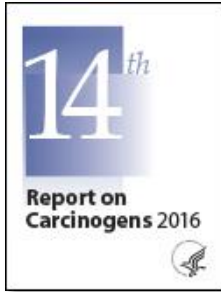
The National Toxicology Program concluded that fluoride is “presumed to be a cognitive developmental hazard to humans”...

“These findings suggest that the development of nonverbal abilities in males may be more vulnerable to prenatal fluoride exposure than language or motor abilities, even at levels within the recommended intake range,” they [Cantoral et al.] write.

...NASEM writes that NTP’s revised draft monograph “falls short of providing a clear and convincing argument” supporting its conclusion.

“We welcome NASEM’s new review because it should bring clarity to this issue,” said Dr. Johnny Johnson...president of the American Fluoridation Society,...“For more than a year, opponents of water fluoridation have weaponized the NTP’s draft monograph as they tried to pressure local communities to end water fluoridation...”

News Outlet	Potential Reach
AP News, PR Newswire	6.3M – 36M



Report on Carcinogens



Just like tobacco, alcohol is classified by the National Toxicology Program as a cancer-causing substance...



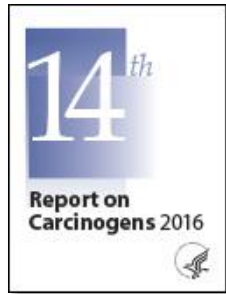
The company reported that benzene...was found in the aerosol products and advised affected consumers to throw them away.

The...National Toxicology Program has reported that occupational exposure to benzene...can increase mortality from leukemia.



M hydantoin...sometimes found in hair care products...releases a small amount of formaldehyde to keep the product fresh.

The Department of Health and Human Services' National Toxicology Program has said formaldehyde is known to cause cancer.



Report on Carcinogens, cont'd



People are exposed to substantially more acrylamide from tobacco smoke than from food.

...the US National Toxicology Program says it's "reasonably anticipated to be a human carcinogen," based on animal studies.

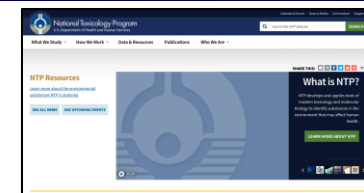


Does Brown Rice Really Have Arsenic in It?

...according to the U.S. National Toxicology Program, arsenic is linked to several cancers, including lung, skin, liver, and bladder cancers.

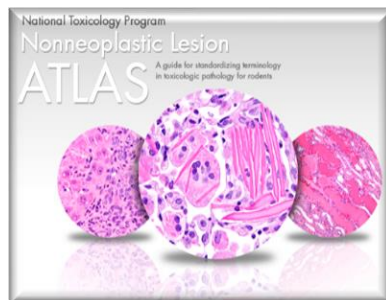
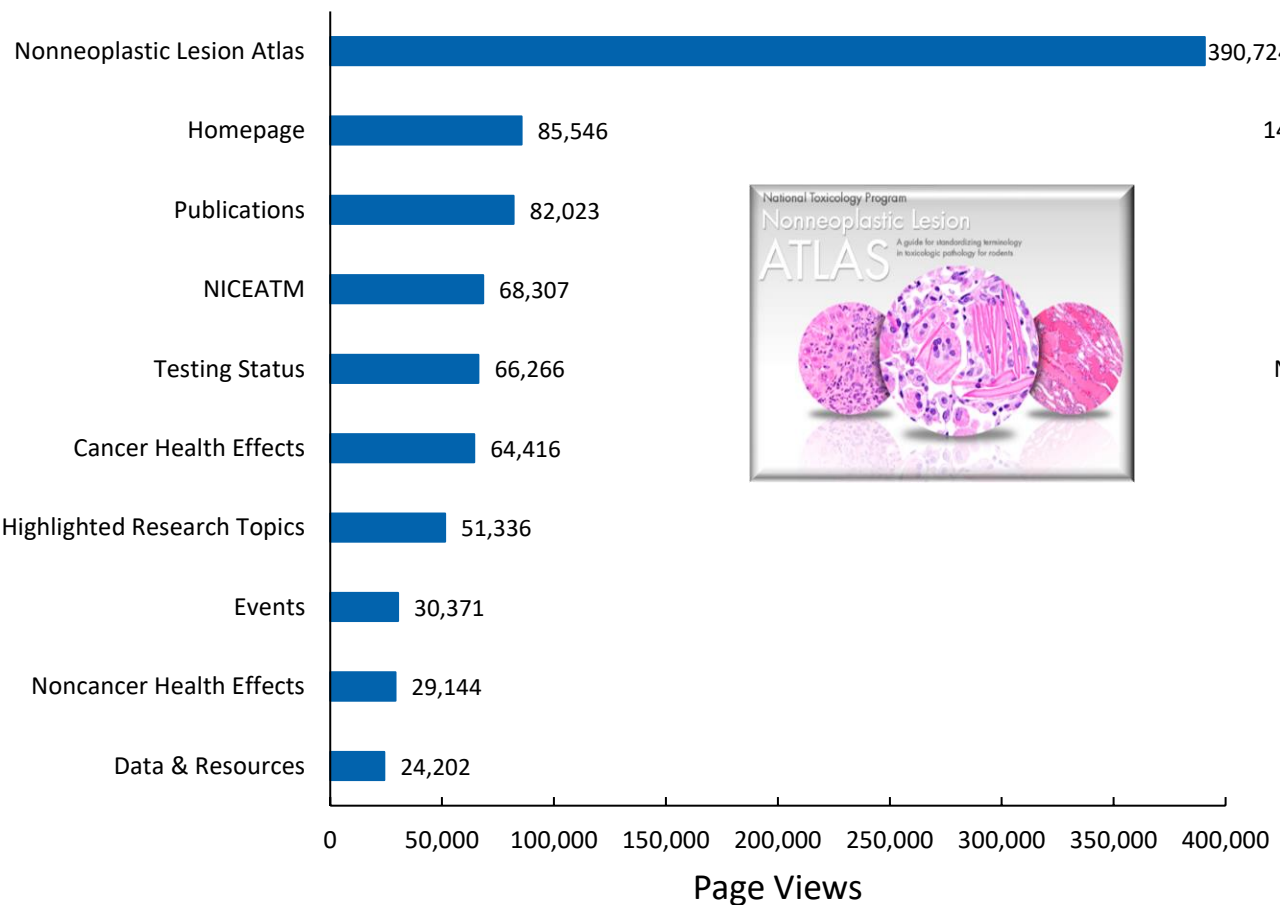
News Outlet	Potential Reach	Social Media Engagement
AARP, CNN, Everyday Health, MSN Canada, WebMD	0.7 – 173.7M	17.2k

People Viewed NTP Webpages ~1M Times



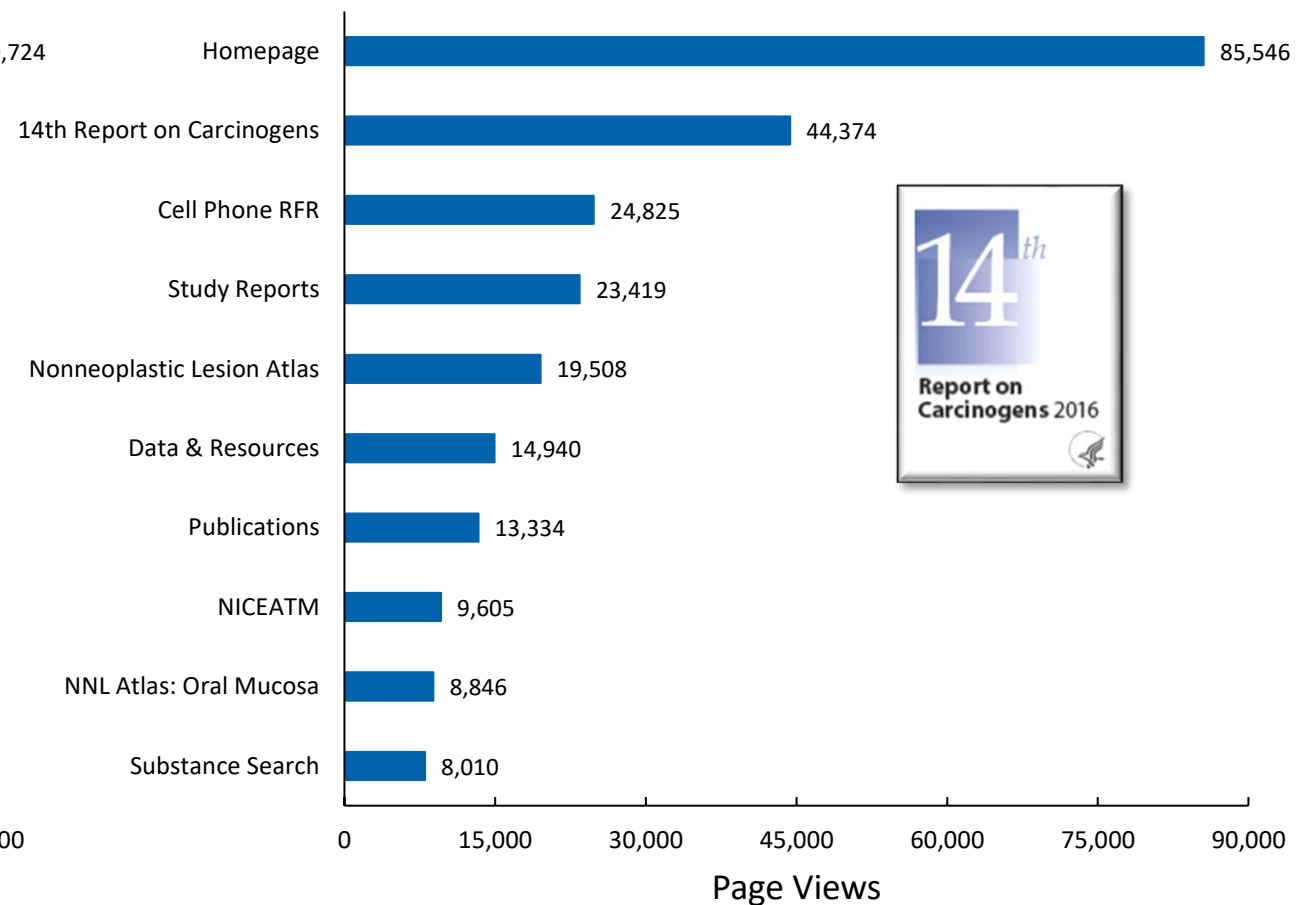
Top 10 Web Page Categories

(sum of views for all web pages within category)

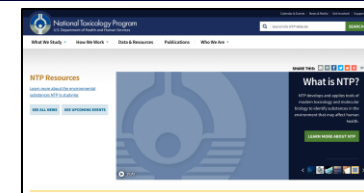


Top 10 Web Pages

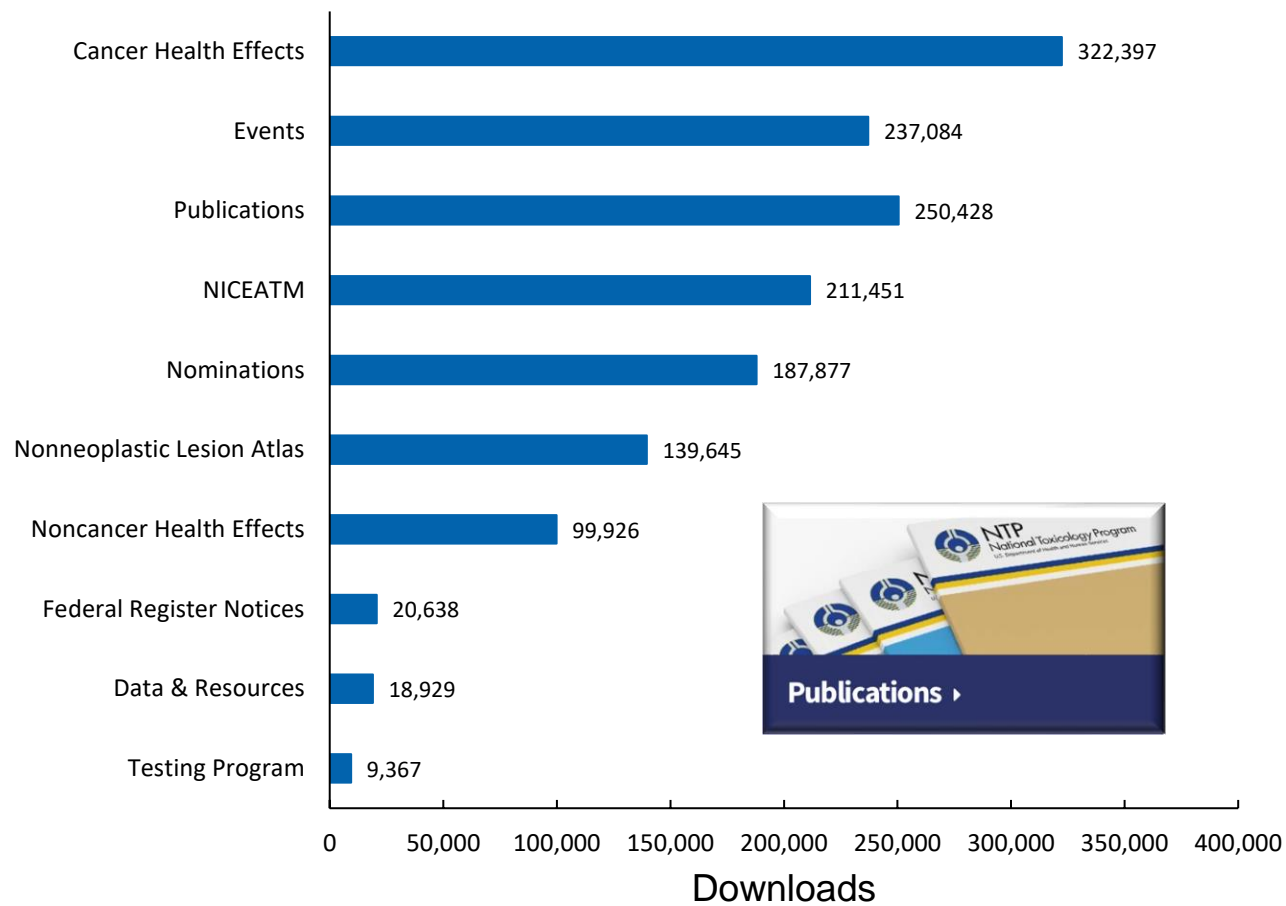
(sum of views for specific page/landing page)



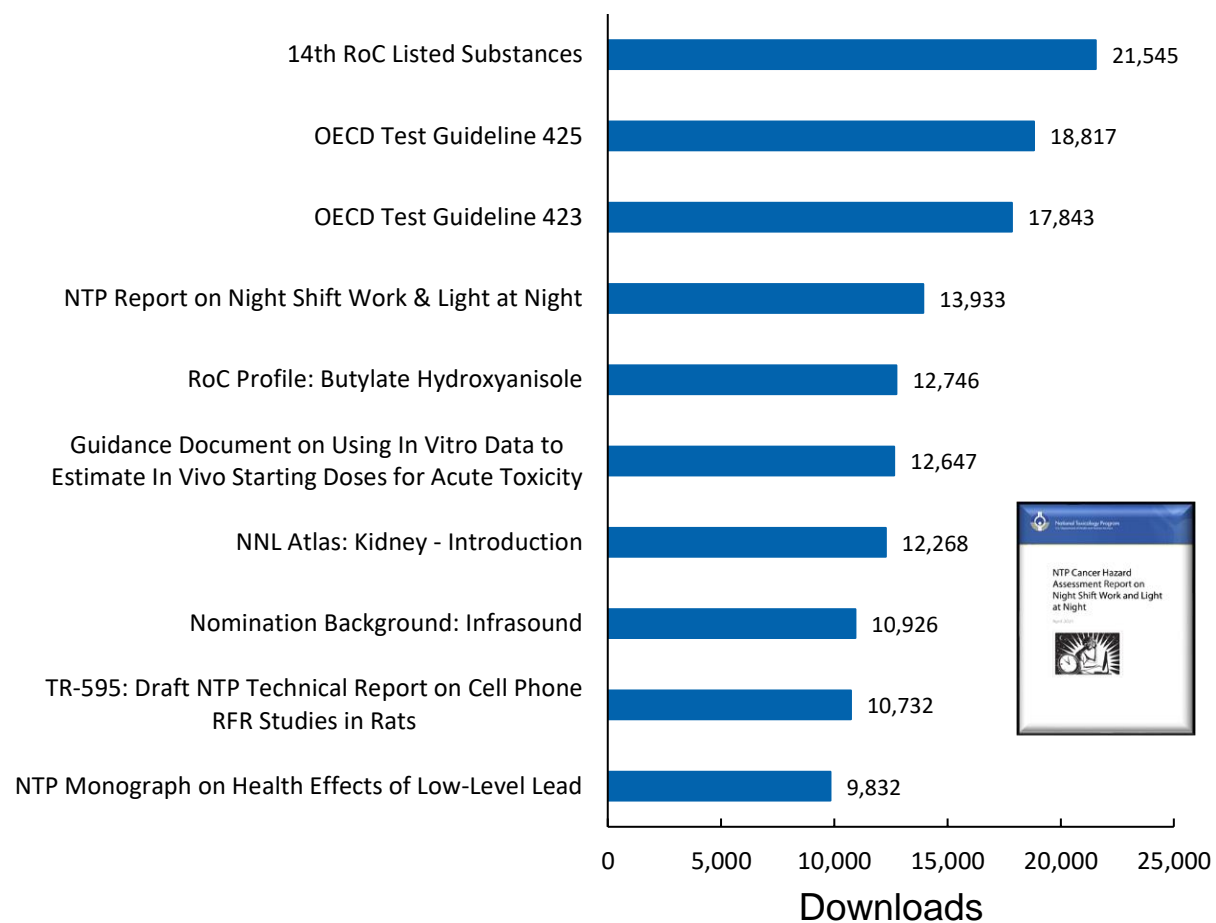
People Downloaded ~1.6M Items



Top 10 Downloaded File Categories
(sum of downloads for all files within the category)



Top 10 Downloaded Files
(sum of downloads for the specific file)



Databases Offered More Data and Tools



Integrated Chemical Environment

- Version 3.4 launched
- Improvements to tools for structure-based analysis (Chemical Quest), interactive visualization (Curve Surfer) and output graphics, data query and analysis, and chemical characterization
- Help videos, technical documentation, user guides, metadata, and more data

Total Pageviews	Total Downloads
15.3k	1.5k

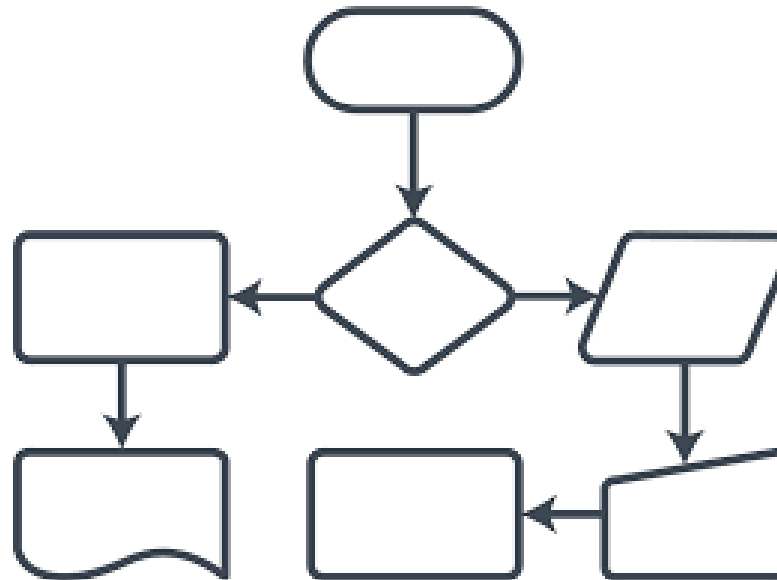


Chemical Effects in Biological Systems

- Established data dictionary of standardized terms that are linked to external ontologies to facilitate findability and data interoperability
- Created new data collections (e.g., all histopathology findings from NTP studies) and improved CEBS search options
- Hosted CEBS public site on Amazon Web Services cloud to enhance responsiveness and sustainability

Total Pageviews	Total Downloads
372.1k	39.k

Progress in Processes



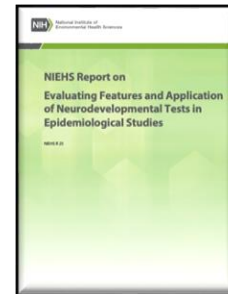
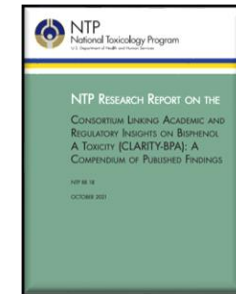
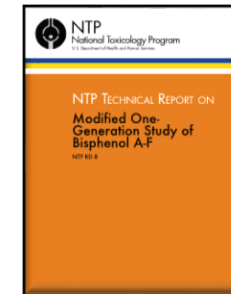
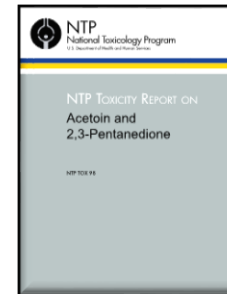
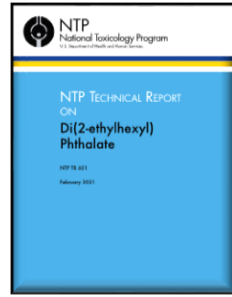
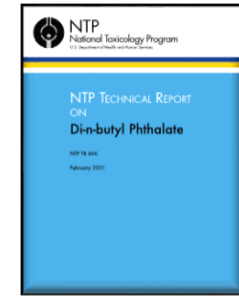
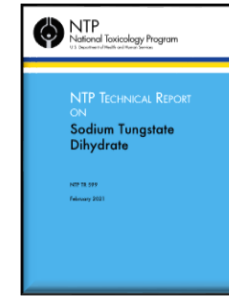
Reporting and Peer Review

- Continued streamlined histopathology evaluation/peer-review processes to ensure Contract Research Organization's (CRO's) pathology data are close to being "final NTP data"
- Held several symposia to explore use of Artificial Intelligence to enhance efficiency of pathology assessments
- Initiated an internal collaborative editing process for revising draft Technical Reports to increase efficiency
- Established new NIEHS report series for reporting DNTP's work
 - DOIs will be assigned to reports and/or data
 - Reports will be searchable in PubMed
 - Working to set-up web access from NIEHS/DNTP and NTP webpages



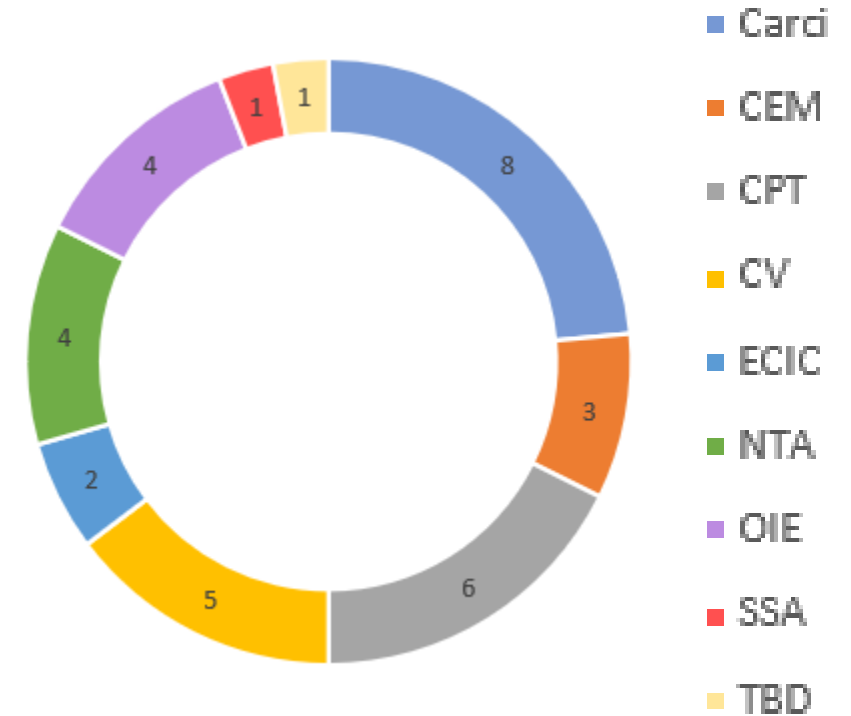
Peer Review, cont'd

- Used letter reviews for peer review of Developmental and Reproductive Toxicity (DART) reports with Level-of-Evidence conclusions
- Conducted fewer panel peer-review (remote) meetings and more letter peer reviews
 - 1 Panel peer review (April 2021) for 3 draft NTP Technical Reports
 - 11 Letter peer reviews for draft NTP Reports
 - 6 Toxicity Reports: Acetoin and 2,3-Pentanedione, Ionic liquids, Usnic acid, Usnea lichens, trans-Resveratrol, and *Aspergillus fumigatus*
 - 2 DART Reports: 2-((1-(4-Phenoxyphenoxy)propan-2-yl)oxy)pyridine and BPA-F
 - 1 Research Report: CLARITY-BPA compendium report
 - 2 NIEHS Reports: Neurological outcomes in epidemiology studies; NIEHS Specifications for Toxicity Studies (“living” report)



Research Portfolio Governance

- **34** Project and Program reviews by the Governance Team¹
- **48** DNTP staff participated in the Governance meetings
- PMT adoption of common template for project proposal evaluation and feedback
- Governance Review page on DNTP Wiki page for sharing documents, presentations, and review outcomes



¹ October 2020 to October 2021



People Progress



Supporting Teams and Building Project Management

- Portfolio, Program and Project Management Community of Practice (3PM-CoP)
 - Developed DNTP **project management workflow** from conception through closeout
 - Strategy - Adapt standard Project Management Body of Knowledge (PMBOK) processes to fit DNTP workflow
 - Supported acquisition and implementation of **project management software** replacing PPM Pro
 - Input to software requirements documentation
 - Feedback on software demonstrations to identify a FedRAMP authorized solution
 - Chemistry, toxicology, and pathology pilot group that will ultimately be available to all DNTP project managers
 - Worked towards **consistent project management terminology**



Addressing Work-Life Balance: DNTP Staff Recommendations

DNTP WLB Recommendations

Changes in Practice

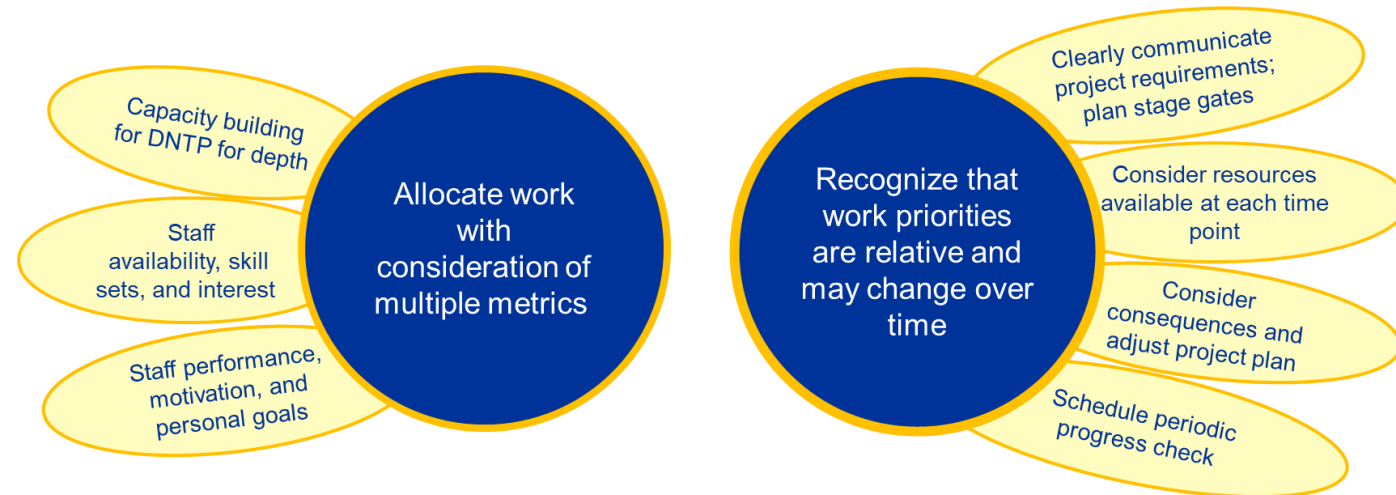
- Work allocation and prioritization
- Communicating expectations
- Processes and decision-making

Ways of Working

- Guidelines and Best Practices for effective working (email, meetings)

DNTP Input into Larger Institute Efforts

- Workforce
- Future work preferences
- Work-life balance resources



Summary

- DNTP has continued to be productive and impactful under extraordinary circumstances
- Change and resilience have become part of the fabric of DNTP
- Despite growing uncertainties and complexity in the context in which we work, we're maintaining focus on our priorities and innovating our future
- We're a model for what an effective research organization looks like in the 21st century



National Institute of
Environmental Health Sciences
Division of the National Toxicology Program

What an Amazing Team!

State of the DNTP



Questions?



Comments?