



NTP

National Toxicology Program



Shift Work at Night, Artificial Light at Night, and Circadian Disruption

**Workshop and Webcast
March 10 to 11, 2016**

National Institute of Environmental Health Sciences

Update from the National Toxicology Program's Workshop on Electric Light-Related Exposures

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Division of the National Toxicology Program

National Institute of Environmental Health Sciences





Outline

Background on NTP, ORoC, and OHAT

NTP's interest in electric light-related exposures

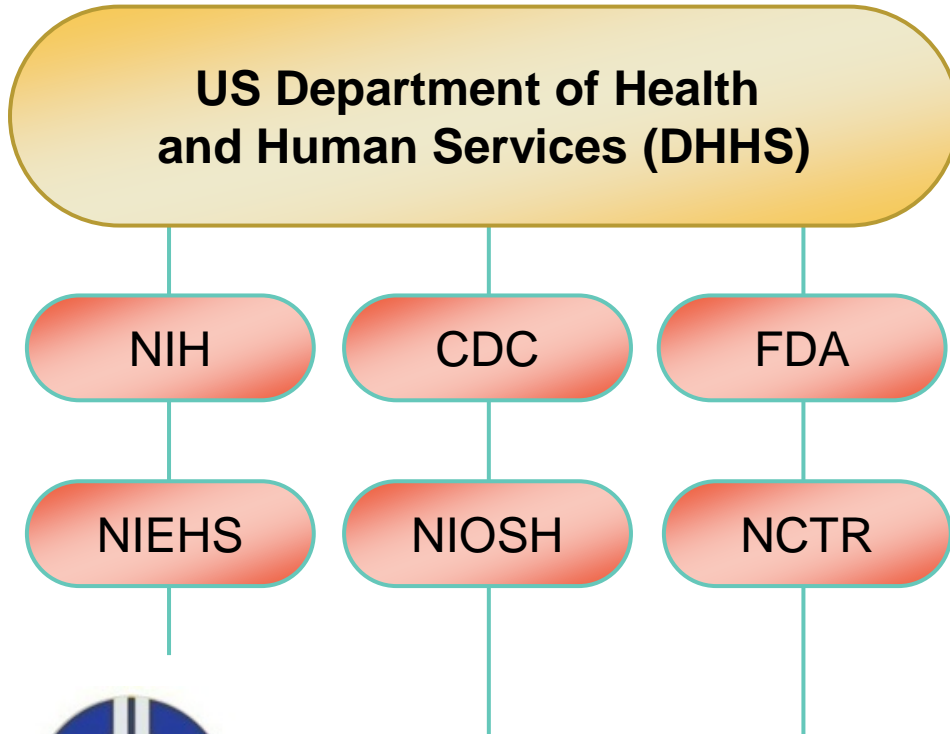
NTP workshop update

Current NTP activities



National Toxicology Program (NTP)

Evaluates agents of public health concern



- **Interagency program**

- Headquartered at the National Institute of Environmental Health Sciences (NIEHS)
- National Institute for Occupational Safety and Health (NIOSH)
- National Center for Toxicological Research (NCTR)

- **Research**

- Thousands of agents evaluated in comprehensive toxicology studies

- **Literature analysis activities**

- Office Report on Carcinogens (ORoC)
- Office of Health Assessment & Translation (OHAT)



National Toxicology Program

U.S. Department of Health and Human Services

<http://ntp.niehs.nih.gov>

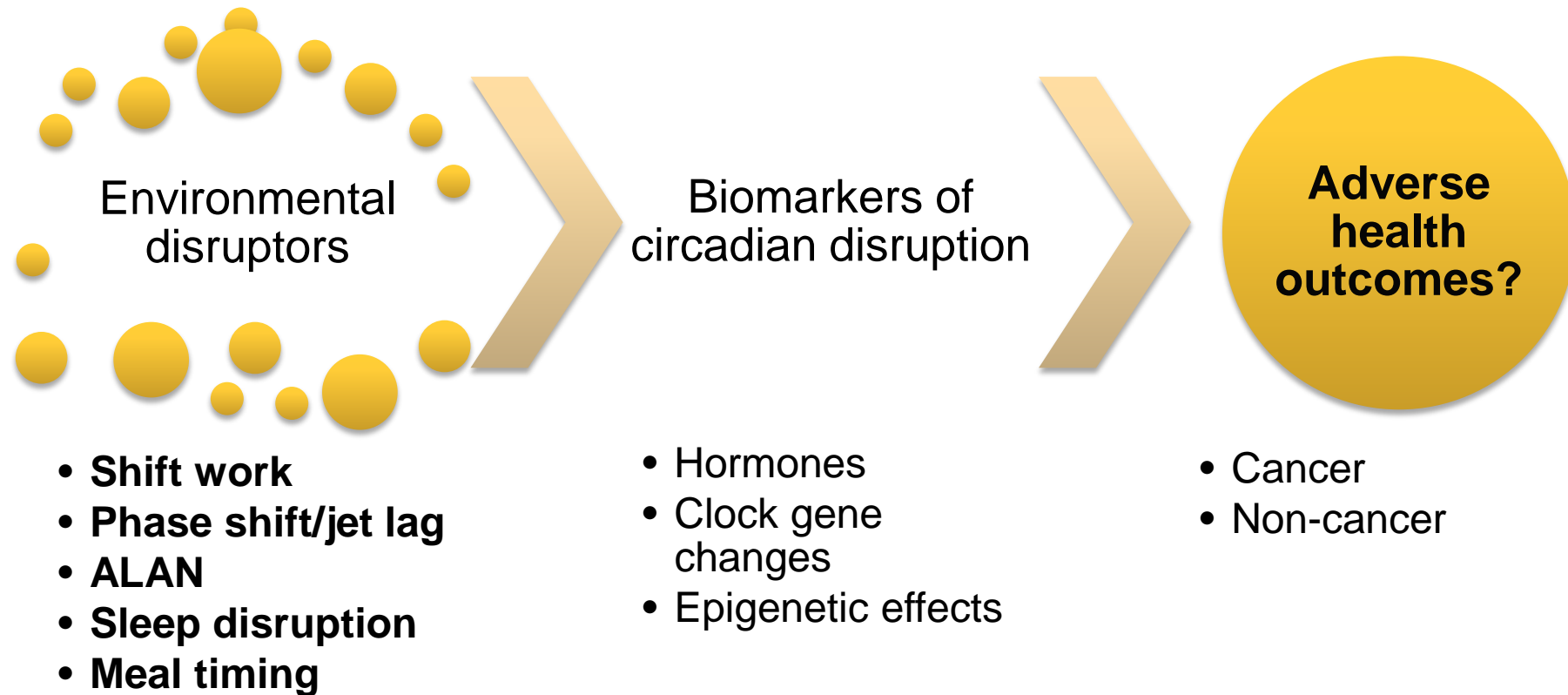


Defining the candidate substance is a challenge

- **Light at night (LAN)** nominated to ORoC (cancer) and OHAT (non-cancer endpoints)
 - IARC concluded that “**shiftwork that involves circadian disruption**” is probably carcinogenic to humans (Group 2A)
 - Urged to include more than shiftwork due to widespread LAN
- ORoC solicited public comment on “**shiftwork involving light at night**”
 - NTP Board of Scientific Counselors endorsed concept although challenging
 - First step to identify “candidate substance”
- NTP held **public workshop** at NIEHS March 10-11, 2016



Strategies for synthesizing evidence across large, complex database



Human epidemiological studies of health outcomes

Animal models, mechanistic studies: humans, animals, *in vitro*



David Blask, PhD, MD
Tulane University

Andrew Coogan, PhD
Maynooth University, Ireland

Mariana Figueiro, PhD
Rensselaer Polytechnic Institute

Michael Gorman, PhD
University of California, San Diego

Janet Hall, MD
NIEHS

Johnni Hansen, PhD
Danish Cancer Society

Randy Nelson, PhD
The Ohio State University

Satchin Panda, PhD
The Salk Institute

Michael Smolensky, PhD
University of Texas-Houston Health
Sciences Center

Richard Stevens, PhD
University of Connecticut

Fred Turek, PhD
Northwestern University

Roel Vermeulen, PhD, MSc
Utrecht University



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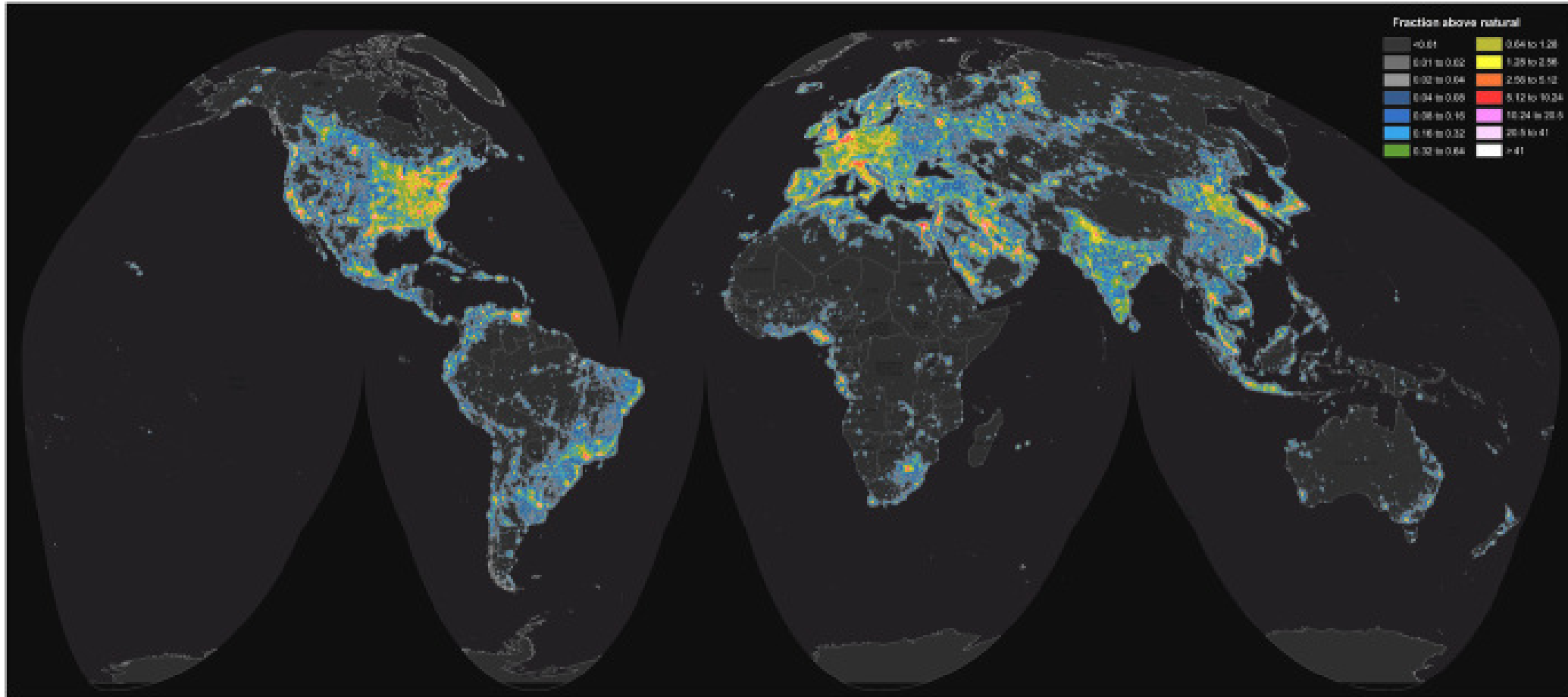
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Workshop Takeaways





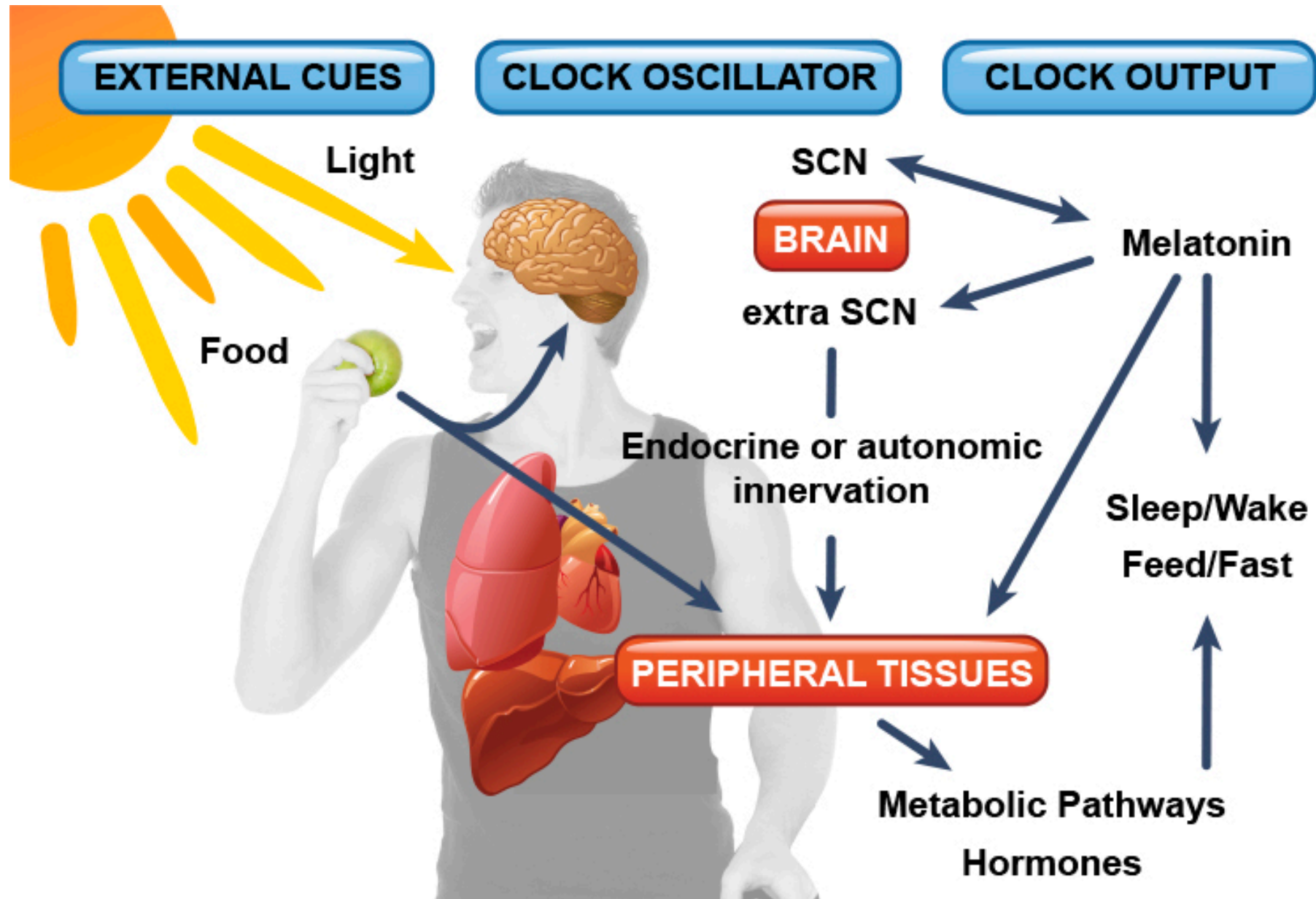
Light at Night (LAN) is pervasive



World map of artificial brightness as a ratio to natural sky brightness (Falchi et al. 2016)

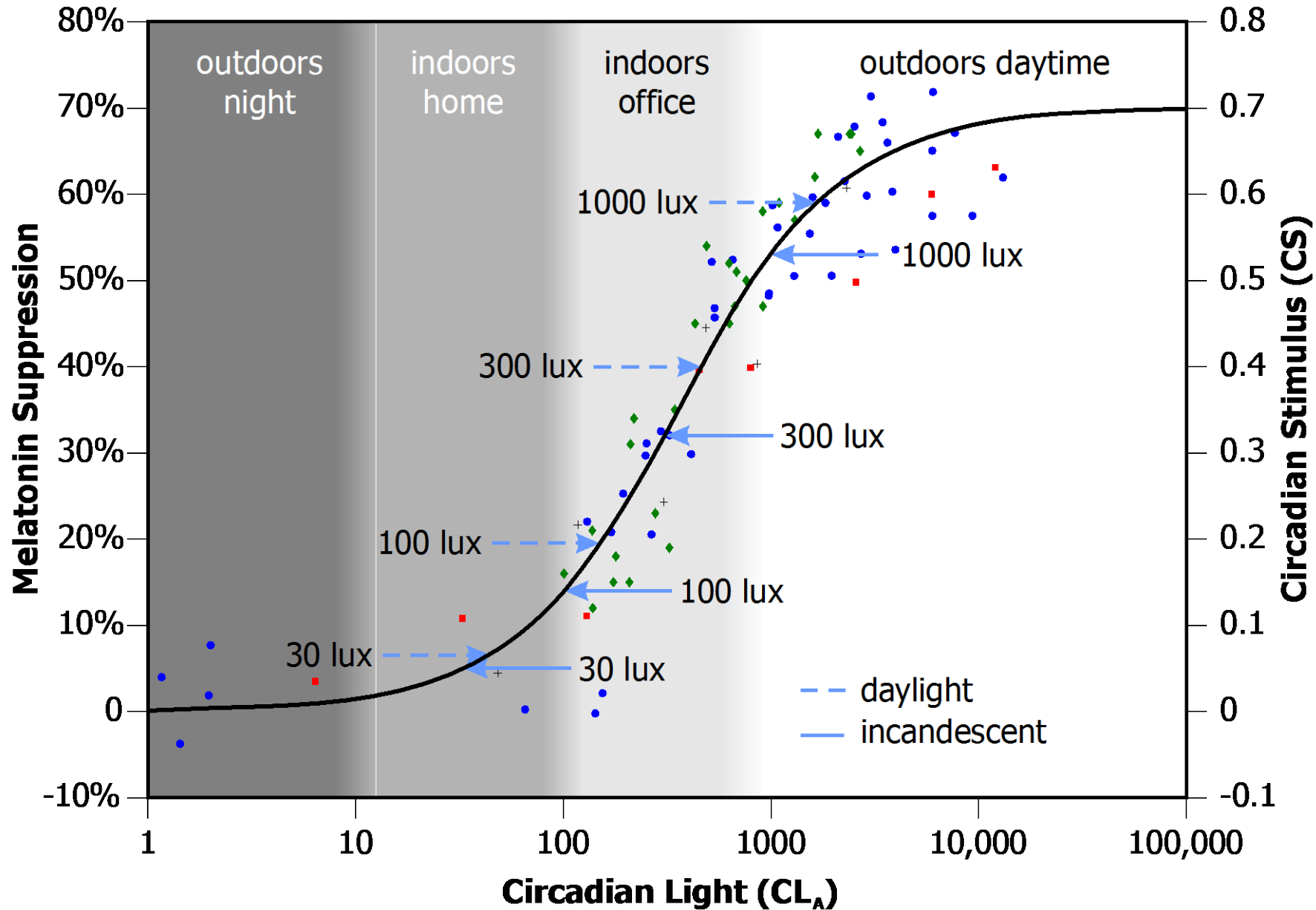


Clocks are everywhere



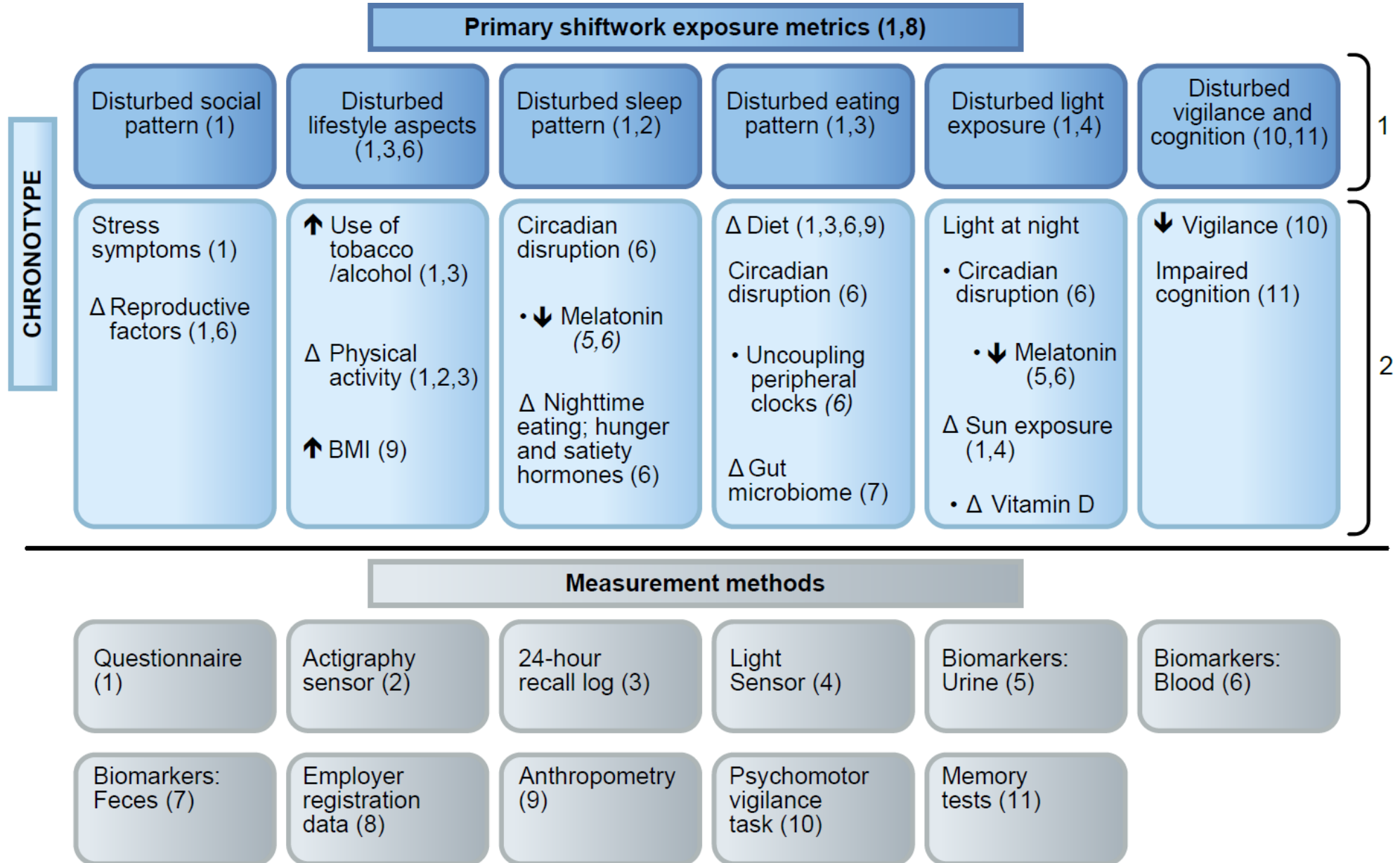


Circadian system response



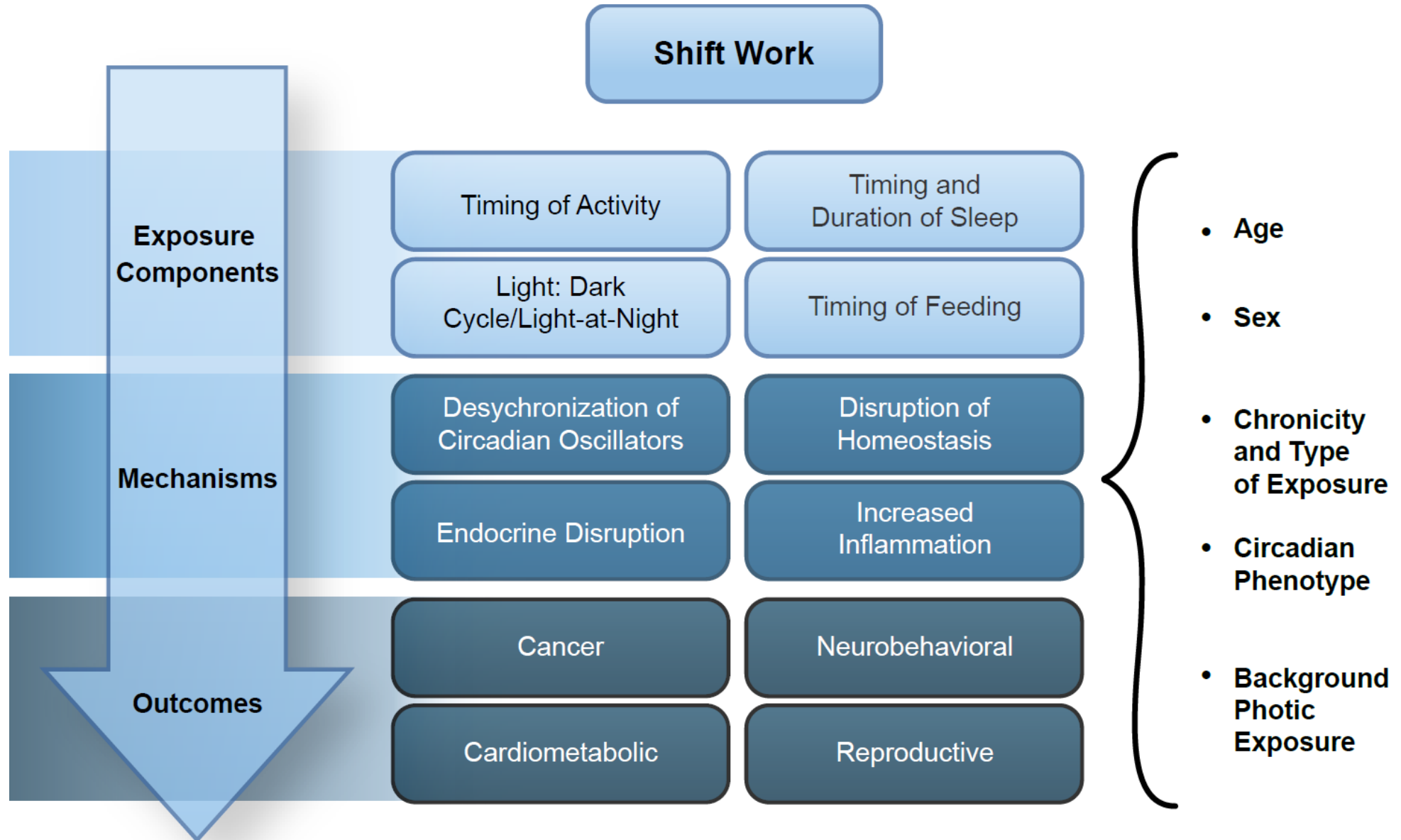


Shiftwork study design considerations



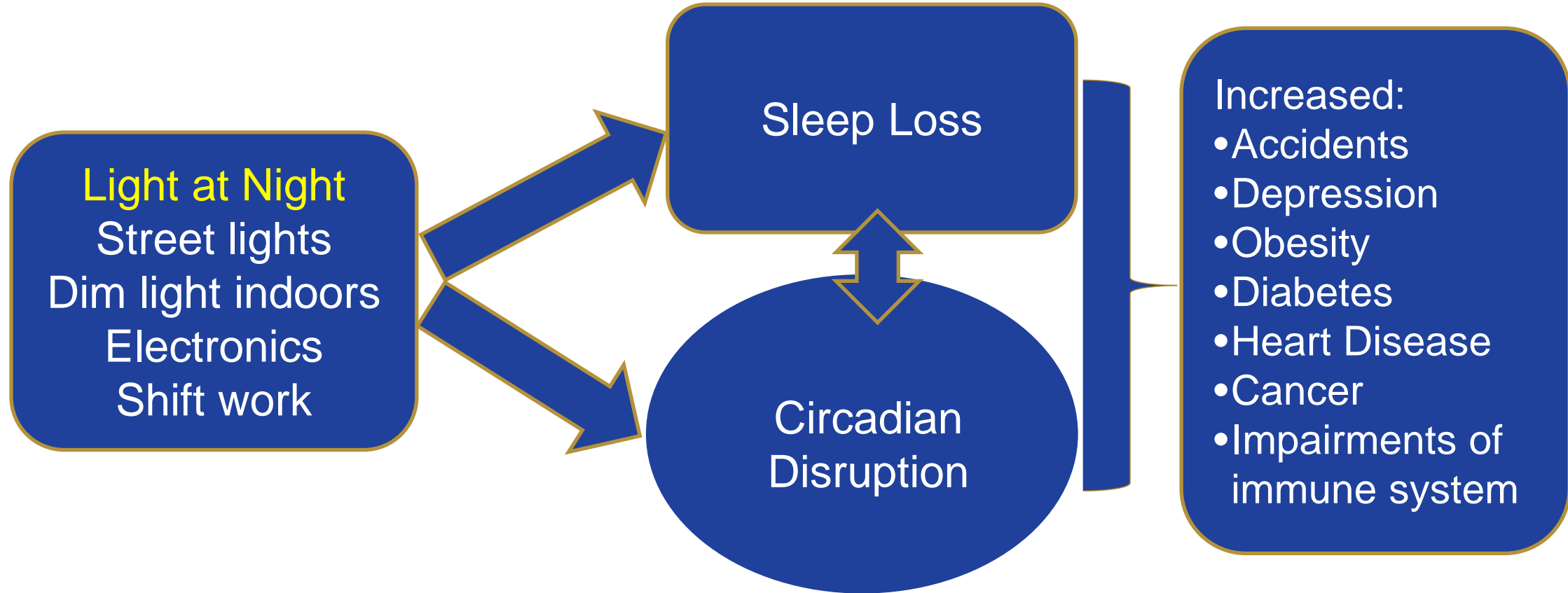


Animal models of shiftwork





Electricity as the enabler...



Proposed title: *Health consequences of electric lighting practices in the modern world*



- Increase visibility of pervasive exposures and potential health effects
 - >150 attendees, in person or via webinar
 - Videos of presentations and discussions available
 - http://ntp.niehs.nih.gov/go/workshop_ALAN
 - Workshop report to be submitted for publication early 2017
- Follow up on new research activities identified at workshop



- ORoC health hazard evaluation of cancer outcomes in progress
 - Separate assessments of human data for each exposure scenario
 - Night shift work, light exposures, transmeridian travel
 - Social jet lag, use of consumer electronics
 - Also summarize biomarker studies of circadian disruption in humans
- Considerations for OHAT non-cancer evaluations
 - French ANSES report on night shift work
 - Compelling evidence in experimental models but lack of epidemiological studies



- Need better measures of light, not just satellite data
 - Validation of detailed questionnaires
- Lack of epidemiological evidence of light effects
 - Add measures of light exposures to large cohort studies
- Lack of biomarkers of exposure and effects
- Need to compare diurnal animal models to nocturnal animals
 - Also melatonin-sufficient models
- Evaluate experimentally-induced diseases (e.g. exposures to known toxicants) under different light conditions



- **Organizers (NIEHS)**

- Windy Boyd*
- Ruth Lunn
- Kris Thayer

- **Moderators**

- Tania Carreón-Valencia (NIOSH)
- Claire Caruso (NIOSH)
- Michael Twery (NHLBI)

- **Rapporteurs**

- Gloria Jahnke (NIEHS)
- Tina Lawson (NIOSH)
- Katie Pelch (NIEHS)
- Kyla Taylor (NIEHS)

* Also served as a moderator

- **Technical support**

- Andy Ewens (ILS)
- Sandy Garner (ILS)
- Whitney Mitchel (ICF)
- Pam Schwingl (ILS)*
- Courtney Skuce (ICF)

- **Administrative support**

- Ella Darden (ILS)
- Anna Lee Mosley (Kelly Services)
- Tracy Saunders (ILS)

- **Webcast support**

- Nathan Mitchiner (NETE Solutions)

- **NTP Web Team**



Questions/Comments?

http://ntp.niehs.nih.gov/go/workshop_ALAN