



National Toxicology Program
U.S. Department of Health and Human Services

**Draft Report on Carcinogens Monograph on
Light at Night
Peer Review Draft**

Running title: Draft RoC Monograph on Night Shift Work and Light at Night

Appendix A: Literature Search Strategy

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Appendix A: Literature Search Strategy

Introduction

The objective of the literature search is to identify published literature that is relevant for evaluating the potential carcinogenicity of circadian disruption and/or light at night. As discussed in the Concept Document for shift work, light at night, and circadian disruption (https://ntp.niehs.nih.gov/ntp/roc/concept_docs/2014/shiftworkconcept_508.pdf), the goal of the literature search strategy is to identify information on environmental exposures associated with circadian disruption and/or light at night for the broad range of subjects covered by a RoC monograph, as listed below:

- Properties and Human Exposure (focusing on the U.S. population)
- Human Cancer Studies
- Studies of Cancer in Experimental Animals
- Mechanisms and Other Relevant Effects

A.1 General approach

Database searching encompasses selecting databases and search terms and conducting the searches. Searches of several citation databases are generally conducted using search terms for the individual environmental exposures, combined with search terms for cancer and/or specific topics, including epidemiological and mechanistic studies. A critical step in the process involves consultation with an information specialist to develop relevant search terms. These terms are used to search bibliographic databases.

Citation databases, including PubMed, Scopus, and Web of Science, were searched up until December 2017 for epidemiological studies evaluating cancer and shift work, light at night, or transmeridian travel using the strategy outlined in the table below. In addition, searches were conducted to identify other types of unnatural light exposures (such as the use of consumer electronics or exposure scenarios associated with social jet lag). Because this exposure scenario is less defined than the other exposure scenarios, these search terms were limited (e.g., combined using the word “and”) by terms focused for circadian disruption before being combined with epidemiological and cancer search strings. Cancer studies measuring biomarker-related circadian disruption or among shift workers or people exposed to LAN were retrieved by these searches.

The results for the Animal Cancer, Specific Biomarkers, and Mechanisms searches were then processed in EndNote to remove duplicates before being transferred to Health Assessment Workplace Collaborative (HAWC) for screening. Review at Level 1 identifies studies that should be included in the next level of review for (1) Exposure, (2) Human/Biomarkers, (3) and (4) Mechanisms (including animal cancer studies). Review at Level 2 includes more detailed tagging for specific topics covered by a particular section of the monograph. The HAWC assessments for Human/Biomarkers (<https://hawcproject.org/assessment/390/>) and Mechanisms (<https://hawcproject.org/assessment/393/>) are publically available. Human cancer studies were processed directly by the RoC epidemiologist who screened studies in this area of the review, and searches were run on a daily basis up until August 2018.

Figure A-1 illustrates the overall approach to the searches and screening and the numbers of citations identified. Table A-1 highlights the general concepts searched and databases consulted. To review all the terms used, please refer to the full search strings below.

Figure A-1. Literature search strategy and review

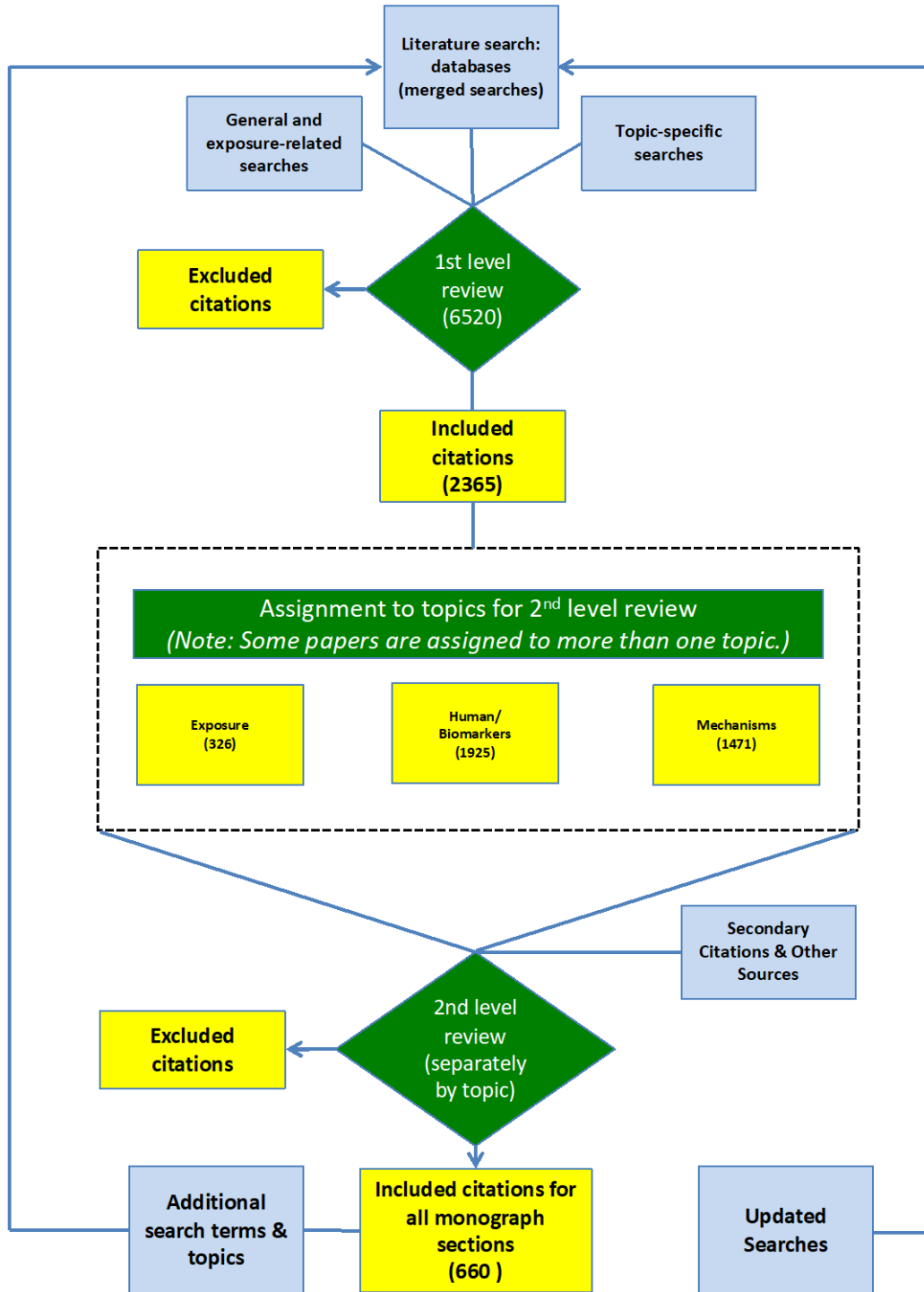


Table A-1. Major topics searched

Topic	Search Method	Databases searched
Human Cancer Studies	(shift work OR shiftwork OR night work OR "light at night" OR jet lag) AND (cancer OR tumor)	PubMed
Experimental Animal Studies	(Shift Work String OR Light String) AND Experimental Animals Studies Search AND OROC Cancer Search	PubMed, Scopus, Web of Science
Biomarkers Studies	OROC Cancer Search AND (Shift Work String OR Light String) AND Specific Biomarkers String AND (Humans & Epidemiology Combined String OR Experimental Animals Studies Search)	PubMed
Mechanism	(Shift Work String OR Light String) AND OROC Characteristics of Carcinogens Search AND OROC Cancer Search	PubMed, Scopus, Web of Science

A.2 Standard Searches

A.2.1 Shift Work

PubMed:

(work-schedule*[tiab] OR Alternative-shift*[tiab] OR duty-shift*[tiab] OR Midnight-shift*[tiab] OR night-call[tiab] OR night-shift*[tiab] OR nightshift*[tiab] OR night-work*[tiab] OR nightwork*[tiab] OR rotating-schedule*[tiab] OR rotating-shift*[tiab] OR shift-work*[tiab] OR shiftwork*[tiab] OR split-shift*[tiab] OR swing-shift*[tiab] OR third-shift*[tiab]) OR ((“personnel staffing and scheduling”[mh] OR “work schedule tolerance”[mh]) AND (shift* OR schedul*[tiab] OR hours[tiab] OR night[tiab] OR evening[tiab] OR duty-hour*[tiab] OR duty-period*[tiab] OR night-float*[tiab] OR overtime[tiab] OR on-call[tiab] OR 12-hour[tiab] OR twelve-hour[tiab] OR "long working hours"[tiab] OR "working long hours"[tiab] OR sleep[tiab] OR fatigue[tiab]))

Web of Science:

(TS=("work schedule*" OR "Alternative shift*" OR "duty shift*" OR "Midnight shift*" OR "night call" OR "night shift*" OR "nightshift*" OR "night work*" OR "nightwork*" OR "rotating schedule*" OR "rotating shift*" OR "shift work*" OR "shiftwork*" OR "split shift*" OR "swing shift*" OR "third shift*")) OR ((TS=("personnel OR "staffing" OR "work schedule tolerance")) AND (TS=("shift*" OR "schedul*" OR "hours" OR "night" OR "evening" OR "duty hour*" OR "duty period*" OR "night float*" OR "overtime" OR "on-call" OR "12-hour" OR "twelve-hour" OR "long working hours" OR "working long hours" OR "sleep" OR "fatigue"))))

Scopus:

(TITLE-ABS-KEY ("work schedule*" OR "Alternative shift*" OR "duty shift*" OR "Midnight shift*" OR "night call" OR "night shift*" OR "nightshift*" OR "night work*" OR "nightwork*" OR "rotating schedule*" OR "rotating shift*" OR "shift work*" OR "shiftwork*" OR "split shift*" OR "swing shift*" OR "third shift*")) OR ((KEY ("personnel staffing and scheduling" OR "work schedule tolerance")) AND (TITLE-ABS-KEY ("shift*" OR "schedul*" OR "hours" OR "night" OR "evening" OR "duty hour*"))))

OR "duty period*" OR "night float*" OR "overtime" OR "on-call" OR "12-hour" OR "twelve-hour" OR "long working hours" OR "working long hours" OR "sleep" OR "fatigue")
))

A.2.2 Light at Night

PubMed:

(light-dark-cycle*[tiab] OR light-cycle[tiab] OR light-cycles[tiab] OR dark-light-cycle*[tiab] OR Evening-light* OR Light-at-night OR Light-pollut* OR Night-light* OR Night-time-light* OR Nocturnal-light* OR bedroom-light* OR Sleeping-habitat*)

Web of Science:

TS=("light-dark cycle*" OR "light cycle" OR "light cycles" OR "dark-light cycle*" OR "Evening light*" OR "Light at night" OR "Light pollut*" OR "Night light*" OR "Night time light*" OR "Nocturnal light*" OR (bedroom NEAR/3 light*) OR "Sleeping habitat*")

Scopus:

(TITLE-ABS-KEY(("light-dark cycle*" OR "light cycle" OR "light cycles" OR "dark-light cycle*" OR "Evening light*" OR "Light at night" OR "Light pollut*" OR "Night light*" OR "Night time light*" OR "Nocturnal light*" OR (bedroom w/3 light*) OR "Sleeping habitat*"))

A.2.3 Animal Studies

The PubMed, Web of Science, and Scopus Strings are the same as described in the Handbook Appendix (https://ntp.niehs.nih.gov/ntp/roc/handbook/rochandbookappendix_508.pdf).

A.2.4 Humans & Epidemiology Combined

PubMed:

((humans[mh] OR human development[mh] OR household*[tiab] OR public[tiab] OR neighborhood*[tiab] OR human*[tiab] OR person*[tiab] OR people[tiab] OR age groups[mh] OR pediatric*[tiab] OR paediatric*[tiab] OR baby[tiab] OR babies[tiab] OR newborn*[tiab] OR infant*[tiab] OR toddler*[tiab] OR child*[tiab] OR youth*[tiab] OR youngster*[tiab] OR tween*[tiab] OR teen[tiab] OR teens[tiab] OR teenager*[tiab]) OR (("in utero"[tiab] OR prenat*[tiab] OR perinat*[tiab] OR neonat*[tiab] OR postnat*[tiab] OR adult*[tiab] OR juvenile*[tiab]) NOT (mice[tiab] OR mouse[tiab] OR rat[tiab] OR rats[tiab])) OR preschool*[tiab] OR pre-school*[tiab] OR kindergarten*[tiab] OR schoolchild*[tiab] OR student*[tiab] OR middle-age*[tiab] OR aged[tiab] OR elder*[tiab] OR senior-citizen*[tiab] OR seniors[tiab] OR retiree*[tiab] OR septuagenarian*[tiab] OR octagenarian*[tiab] OR sexagenarian*[tiab] OR nonagenarian*[tiab] OR centenarian*[tiab] OR nuclear family[mh] OR parent[tiab] OR parents[tiab] OR father*[tiab] OR mother*[tiab] OR sibling*[tiab] OR brother*[tiab] OR sister*[tiab] OR twin[tiab] OR twins[tiab] OR step-father*[tiab] OR step-mother*[tiab] OR step-daughter*[tiab] OR step-son*[tiab] OR aunt*[tiab] OR uncle*[tiab] OR niece*[tiab] OR nephew*[tiab] OR grandparent*[tiab] OR grandfather*[tiab] OR grand-father*[tiab] OR grandmother*[tiab] OR grand-mother*[tiab] OR grandchild*[tiab] OR granddaughter*[tiab] OR grandson*[tiab] OR spouse*[tiab] OR partner*[tiab] OR

husband*[tiab] OR wife[tiab] OR wives[tiab] OR guardian*[tiab] OR caregiver*[tiab] OR caregiver*[tiab] OR men[mh] OR women[mh] OR men[tiab] OR man[tiab] OR boy[tiab] OR boys[tiab] OR boyhood[tiab] OR women[tiab] OR woman[tiab] OR girl[tiab] OR girls[tiab] OR girlhood[tiab] OR population groups[mh] OR vulnerable populations[mh] OR African-American*[tiab] OR Asian-American*[tiab] OR hispanic*[tiab] OR latina*[tiab] OR latino*[tiab] OR Mexican-American*[tiab] OR underserved[tiab] OR disadvantaged[tiab] OR underprivileged[tiab]) OR (epidemiolog*[tiab] OR epidemiology[sh] OR "epidemiologic studies"[mh] OR "double-blind method"[mh] OR "single-blind method"[mh] OR epidemiology[sh] OR case-control*[tiab] OR cohort[tiab] OR "cross sectional"[tiab] OR "follow-up study"[tiab] OR longitudinal[tiab] OR prospective[tiab] OR retrospective[tiab] OR case-reports[pt] OR "clinical trial"[pt] OR "observational study"[pt] OR "randomized controlled trial"[pt] OR "twin study"[pt] OR case-report*[tiab] OR clinical-trial*[tiab] OR observational[tiab] OR randomized-control-trial*[tiab]) OR ("research subjects"[mh] OR "human experimentation"[mh] OR patients[mh] OR "patient participation"[mh] OR human-subject*[tiab] OR research-subject*[tiab] OR client*[tiab] OR patient*[tiab] OR inpatient*[tiab] OR outpatient*[tiab] OR participant*[tiab] OR volunteer*[tiab] OR "occupational groups"[mh] OR "occupational exposure"[mh] OR occupation*[tiab] OR workplace[tiab] OR "work place"[tiab] OR work-related[tiab] OR administrator*[tiab] OR aides[tiab] OR assistant*[tiab] OR crew[tiab] OR crews[tiab] OR employee*[tiab] OR personnel[tiab] OR professional*[tiab] OR staff[tiab] OR technician*[tiab] OR worker*[tiab] OR educator*[tiab] OR instructor*[tiab] OR teacher*[tiab] OR clinician*[tiab] OR doctor*[tiab] OR physician*[tiab] OR pharmacist*[tiab] OR nurse*[tiab] OR residents[tiab] OR veterinarian*[tiab] OR adolescent[tiab]) OR "meta-analysis"[pt] OR workmen*[tiab] OR seroepidemiologic-stud*[tiab] OR ecological-study[tiab] OR ecological-studies[tiab] OR correlation-stud*[tiab] OR case-series[tiab] OR case-referent[tiab] OR record-link*[tiab])

A.2.5 Specific Biomarkers

PubMed:

(corticosterone[tiab] OR cortisol[mh] OR cortisol[tiab] OR melatonin[mh] OR melatonin[tiab] OR "body temperature"[mh] OR body-temperature*[tiab])

A.2.6 Characteristics of Carcinogens

The PubMed, Web of Science, and Scopus Strings are the same as described in the Handbook Appendix (https://ntp.niehs.nih.gov/ntp/roc/handbook/rochandbookappendix_508.pdf).

A.2.7 RoC Cancer String:

The PubMed, Web of Science, and Scopus Strings are the same as described in the Handbook Appendix (https://ntp.niehs.nih.gov/ntp/roc/handbook/rochandbookappendix_508.pdf).