Actions from Peer Review of the Draft Report on Carcinogens
Monograph on Night Shift Work and Light at Night
October 5, 2018

The National Toxicology Program (NTP) convened a Peer Review Panel ("the Panel") on October 5, 2018, to peer review the *Draft Report on Carcinogens Monograph on Night Shift Work and Light at Night*. Meeting information, including the draft monograph, is available at the NTP website.[1] A meeting report will be prepared and posted to the NTP website when completed.

The Panel[2] peer reviewed the draft monograph and provided its opinion on NTP's draft conclusions for the level of evidence for carcinogenicity from human studies and NTP's preliminary listing decision for persistent night shift work that causes circadian disruption and certain lighting conditions that cause circadian disruption. NTP will consider the Panel's peer review comments in finalizing the monograph. When completed, the monograph will be published on the NTP website.[3]

Night Shift Work

Exposure

The Panel concurred with the statement that a significant number of U.S. residents work (or formerly worked) night shifts.

Preliminary Level of Evidence Conclusions from Human Cancer Epidemiology Studies

- The Panel recommended (4 yes, 3 no, 0 abstentions) that there is *sufficient evidence of breast carcinogenicity* for persistent night shift work from human breast cancer epidemiology studies. 'Persistent' is defined as long-term, frequent, and starting night shift work in young adulthood.

- The Panel voted to accept unanimously (7 yes, 0 no, 0 abstentions) NTP's level of evidence conclusion of *limited evidence of prostate carcinogenicity* for persistent night shift work from human cancer epidemiology studies.

- The Panel voted to accept unanimously (7 yes, 0 no, 0 abstentions) NTP's level of evidence conclusion that the *data available from human cancer epidemiological studies are inadequate* to evaluate the relationship between colorectal cancer and persistent night shift work.

- The Panel voted to accept unanimously (7 yes, 0 no, 0 abstentions) NTP's level of evidence conclusion that the *data available from human cancer epidemiological studies are inadequate* to evaluate the relationship between hormonal cancer and persistent night shift work.

- The Panel voted to accept unanimously (7 yes, 0 no, 0 abstentions) NTP's level of evidence conclusion that the *data available from human cancer epidemiological studies are inadequate* to evaluate the relationship between lung cancer and persistent night shift work.

Preliminary Listing Recommendation

The Panel voted to accept (6 yes, 0 no, 1 abstention) NTP's preliminary policy decision that persistent night shift work that causes circadian disruption should be listed in the *Report on Carcinogens* as *known to be a human carcinogen* based on sufficient evidence of carcinogenicity from studies in humans. This

[1] https://ntp.niehs.nih.gov/events/past/index.html?date=2018-10-05
[2] https://ntp.niehs.nih.gov/ntp/about_ntp/monopeerrvw/2018/october/roster20181005_508.pdf
[3] https://ntp.niehs.nih.gov/go/717273

conclusion is based on the following: (1) there is a collective body of evidence from cancer epidemiological studies and mechanistic studies in humans and in experimental animals, (2) human epidemiological studies provide evidence that persistent night shift work is associated with an increase in female breast cancer risk, (3) animal and in vitro mechanistic studies provide evidence that circadian disruption plays a role in the cancer pathway, and (4) human mechanistic studies provide evidence that night shift work is associated with circadian disruption and similar biological effects as that observed in animal cancer models. There is limited evidence that night shift work is associated with an increased risk of prostate cancer.

Light at Night

Exposure

The Panel concurred with the statement that a significant number of U.S. residents are (or were in the past) exposed to light at night.

Preliminary Level of Evidence Conclusions from Human Cancer Epidemiology Studies

- The Panel recommended unanimously (7 yes, 0 no, 0 abstentions) that the *data available from human breast cancer epidemiological studies are inadequate* to evaluate the relationship between outdoor light at night and breast cancer. The Panel recommended revisions to the supporting evidence: (1) findings of an increased risk of breast cancer among individuals with high exposure to outdoor light at night are based on a limited number of studies and (2) there is substantial uncertainty of exposure and circadian response.

- The Panel voted to accept unanimously (7 yes, 0 no, 0 abstentions) NTP's level of evidence conclusion that the *data available from human breast cancer epidemiological studies are inadequate* to evaluate the relationship between indoor light at night exposure and breast cancer.

- The Panel voted to accept unanimously (7 yes, 0 no, 0 abstentions) NTP's level of evidence conclusion that the *data available from human breast cancer epidemiological studies are inadequate* to evaluate the relationship between transmeridian travel exposure and breast cancer.

Preliminary Listing Recommendation

The Panel voted to accept (6 yes, 1 no, 0 abstentions) NTP's preliminary policy decision that certain lighting conditions that cause circadian disruption should be listed in the *Report on Carcinogens* as *reasonably anticipated to be a human carcinogen*. The Panel recommended that the supporting evidence should refer to 'certain lighting conditions' and not 'light at night'. This conclusion is based on strong evidence that certain lighting conditions act through mechanisms that are likely to cause cancer in humans. Toxicological and mechanistic data indicate that exposure to certain lighting conditions cause (1) melatonin suppression and other types of circadian disruption, which lead to the proliferation and growth of breast or mammary-gland cancer in experimental animals, (2) biological effects that are characteristics of recognized carcinogens, and (3) melatonin suppression in humans. 'Certain lighting conditions' refers to excessive light at night exposure combined with insufficient exposure to daylight.