

environmental exposure to bisphenol A (BPA). This study aims to examine the association between nightshift work and prostate cancer risk among Hong Kong Chinese men after take into account more environmental exposures.

Methods We consecutively recruited 431 incident prostate cancer cases and age frequency matched 402 controls who had complete information on nightshift work. After receiving written consents, trained researchers interviewed participants using a standard questionnaire to obtain information on socio-demographics, smoking, dietary habits, habits of using plastic food containers, family cancer history, and occupational history and nightshift work. A newly developed novel cumulative BPA exposure index (CBPAI) was used to estimate chronic BPA exposure. Odds ratio and 95% confidence interval (95% CI) was performed using multiple logistic regression analysis.

Results The mean age of prostate cancer cases was comparable to the controls (69.4 vs 68.2 years). Compared with the controls (39.1%), more cases were less educated with a higher proportion of 'primary school or below' (41.1%). More cases than controls were the nightshift workers (13.5% vs 7.5%). After adjustment of age and socioeconomic characteristics, the OR of nightshift work to prostate cancer was 1.87 (95% CI: 1.16 to 3.01), and the OR retained statistical significance (OR=1.76, 95% CI: 1.07 to 2.89) after environmental exposures mainly from dietary sources were further adjusted.

Conclusions Results from this study provided supportive evidence that there might be a link between nightshift work and prostate cancer. The main merit of this study is that more environmental risk factors were considered in quantifying the association.

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1656d WHAT SHOULD WE TELL SHIFT WORKERS TO DO TO REDUCE THEIR CANCER RISK?

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Introduction In 2007, a working group of the International Agency for Research on Cancer classified shift work that involves circadian rhythm disruption as probably carcinogenic to humans. We carried out a review of the human epidemiological and mechanistic evidence, along with relevant health and safety policies and practice, to identify practical measures that should be undertaken to reduce the risk of cancer among shift workers.

Methods A literature search was carried out of the Proquest Dialogue databases, which includes MEDLINE, in order to identify the relevant scientific literature published from 2005–2015. In addition, we carried out an internet search for current health and safety policies and practices for managing shift workers.

Results There is evidence from the epidemiological studies that the increase in breast cancer risk amongst women who have worked night shifts is relatively modest and could be zero. Other risk factors for breast cancer associated with night work, such as poor diet, should be addressed by employers. Evidence for other cancers remains limited and inconsistent. If a mechanism exists, it is most likely to be night-time suppression of melatonin production. There has been limited evaluation of interventions to manage shift workers and research in

this area is fragmented. Health and safety policies provide little on prevention.

Conclusion Health and safety practices for shift workers should address reduction of health risks by choosing shift rotations that minimise impact on circadian disruption, by employers facilitating female workers to attend breast cancer screening and by promoting and facilitating a healthy lifestyle.

1656e CURRENT PROGRESS AND STATE OF SCIENCE IN POPULATION STUDIES OF CIRCADIAN/SLEEP DISRUPTION ON CANCER RISK AND SURVIVAL, AND CIRCADIAN PHASE BIOMARKERS

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Melatonin (5-methoxytryptamine) is an indoleamine produced primarily by the pineal gland, which is secreted exclusively during the dark phase of the light-dark cycle in humans. Several decades ago, reports indicated that melatonin possesses oncostatic properties, leading to novel hypotheses that diminished secretion of melatonin might promote the development of cancer. Growing evidence also demonstrates that visible light, including electric light, can acutely suppress melatonin production— a phenomenon often referred to as 'circadian disruption' particularly if it occurs at night, as commonly observed in shift workers.

In 2007, the International Agency for Research on Cancer classified shift work as a possible carcinogen, based on convincing experimental evidence and supportive, but still limited, epidemiologic data. Indeed, experimental data has consistently demonstrated that circadian disruption can promote carcinogenesis in animals; specifically, exposure to light at night and phase shifts in the light-dark cycle have accelerated tumour development in rodents. In humans, epidemiologic data continues to accumulate, with the majority of existing studies indicating that shift work is related to a modest increase in the risk of breast cancer. Initial studies have identified links between shift work and other cancers as well, although this evidence is very limited.

In this presentation, I will review epidemiologic studies of circadian disruption/sleep and cancer risk, including some preliminary studies on cancer survival, and with additional emphasis on circadian phase biomarkers (melatonin/cortisol).

1602 SHIFTWORK IN THE 21ST CENTURY: OLD AND NEW PROBLEMS AND APPROACHES

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Aim of special session This session is expected to be interactive, providing the attendees with both an understanding of the social and physical harm than may come with working shifts, and an evaluation of different countermeasures developed to help ameliorate these problems. The question and answer portion is meant to be both 'ask the expert' for those

just entering this area of occupational health, and an interchange among the research delivery communities on what else may or may not help and why.

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1602a MULTIPLE JOB STRESSORS OF NIGHT AND ROTATING SHIFT WORKERS THAT AFFECT HEALTH AND WELLBEING: BASIS FOR COMPREHENSIVE INTERVENTIONS FOR THEIR SOLUTIONS

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Multiple workplace xenobiotic, physical, and psychosocial factors can affect employee wellbeing and health, particularly when working nights. The human circadian time structure (CTS) is an unappreciated, yet potentially important consideration to establishing threshold limiting values, employee biological monitoring (BM) procedures, and recommended biological exposure indices (BEIs). Encounters by night workers, before CTS adjustment, to potentially harmful workplace contaminants and stressful physical conditions, occur during a different circadian stage than day workers. Numerous animal and human investigations document prominent circadian patterning in the biological tolerance to a broad array of chemical, biological, and physical stressors often found in occupational settings. Time-qualified for biological rhythms reference values, several currently utilised in clinical laboratory medicine, are likely to be of relevance to employee surveillance. Workplace psychosocial factors are additionally of great importance to employee wellbeing, with several demand-control-social support and effort-reward imbalance models serving to assess detrimental outcomes. Despite recognition the psychosocial workplace milieu can affect the physical and psychological health of dayworkers, there is a scarcity of knowledge of its impact on night and shift employees. Some studies indicate low job control, high physical demands, low supervisor social support, and high overcommitment can be more problematic for night than day shift workers. At-work violence is an additional psychosocial stress, with police officers, security personnel, bank employees, professional drivers, and other service employees in regular contact with the public, in particular, at elevated risk. The severity of workplace violence problems and their consequences is probably underestimated, especially when co-existing among stressors with known impact on workers' health. Practical considerations and recommendations

for action to mitigate the effect of these multiple job stressors of particularly high relevance to night and shift workers are presented.

1602b SLEEPINESS AND VIGOUR IN AIRLINE GROUND CREW SHIFT WORKERS MOVING FROM 8- TO 12-HOUR ROTATING SHIFT SCHEDULES: A PILOT FIELD STUDY

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Objective To investigate the effects of transition from 8- to 12 hour shifts on sleepiness and vigour of employees during morning and night shifts.

Methods Thirty-nine airline ground crew shift workers (mean age 38.9 ± 8.2 y; mean seniority 13.9 ± 7.1 y, 19 male) volunteered in a pilot study. During each round, employees were assessed during one morning and two night shifts, by completing a sleepiness questionnaire (the Karolinska Sleepiness Scale, KSS) hourly, and a vigour questionnaire (3 times in the 8 hour, 4 times in the 12 hour rounds) per shift. Repeated measures ANOVA was performed to compare changes in sleepiness and vigour levels in 8 hour and 12 hour shift plans, during day and night shifts.

Results For morning shifts main effects were found for sleepiness [$F_{(3,58)}=13.1$, $p<0.001$] and for shift plan [$F_{(1,18)}=7.4$, $p<0.014$]. Sleepiness levels rose throughout both morning shifts, and were lower during the 12 hour than during the 8 hour shifts. Furthermore, main effects were found for vigour [$F_{(1,25)}=11.37$, $p<0.001$] and for shift plan [$F_{(1,18)}=14.87$, $p<0.001$]. Vigour levels decreased in both morning shifts, and were higher during 12 hour shifts than in the 8 hour shifts. No interactions were found.

For night shifts main effects were found for sleepiness [$F_{(7,18)}=9.9$, $p<0.001$], and for sleepiness*shift plan [$F_{(3,81)}=3.2$, $p<0.023$]. During the 8 hour round, sleepiness consistently increased with a slight decrease towards the end of the shift, while in the 12 hour round sleepiness increased until 04:00 am, after which there was a decrease and again and increase towards the end of the shift.

Furthermore, main effects were found for vigour [$F_{(1,25)}=11.37$, $p<0.001$], and for shift plan [$F_{(1,18)}=14.87$, $p<0.001$], during the 12 hour shift round participants' vigour levels were higher than in the 8 hour shift round. Vigour levels decreased during the night in both rounds, no interaction was observed.

Conclusion An overall improvement was observed in somnolence and vigour indices of employees after the transition to 12 hour shift, which appears to be preferable over the 8 hour shift.

1602c SLEEPY ON THE NIGHT SHIFT? BIO-PSYCHO-SOCIAL FACTORS OF SUBJECTIVE SLEEPINESS IN FEMALE NURSES DURING THE NIGHT SHIFT

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