

## **NCU – Summative report for 2013**

**Report submission date:** 06.03.14

**Principal investigator:** Eero Pukkala

**Project title:** Work and cancer: in-depth studies initiated by the NOCCA project

**NCU grant received (€):** 70 000

**Project commencement and completion dates:** 2012 - 2014

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**1. Briefly describe the project in a language understandable to non-scientists (max. 100 words)**

The aim of this project is to identify work-related factors that are associated with increased (or decreased) cancer incidence.

**2. Summarize the major findings of the project (max. 400 words)**

Each of the numerous studies published from this project reports important findings. As an example, the study “Cancer incidence among firefighters – 45 years of follow-up in five Nordic countries” describes the cancer incidence pattern among over 16,000 firefighters with more than 2500 cancer cases. There was only a small excess in the overall cancer incidence, but quite high and statistically significant excesses e.g. for prostate cancer in younger ages; and for multiple myeloma, adenocarcinoma of the lung, and mesothelioma in older ages.

Another study used the NOCCA data base database to elucidate a cluster of cholangiocarcinoma among workers in a small printing shop reported from Japan. There was 2.3 fold risk intrahepatic cholangiocarcinoma among printers in the Nordic countries. This is a good example of using massive NOCCA data to confirm alarming findings from small studies.

**3. Describe how the project has increased our knowledge of the prevention, cause and/or cure for cancer (max. 150 words)**

Because the NOCCA data set is larger than any earlier study on work and cancer incidence, it has increased knowledge of associations of rare exposures and rare cancers which did not exist at all before. The findings of NOCCA studies are systematically requested for instance for the IARC monograph evaluations, and institutes of occupational health.

**4. Outline how Nordic cooperation has added value to this project (max. 100 words)**



Most of the findings could not have been in a study in one Nordic country alone. The international collaboration also brings wide scope of expertise in the research team.

## **5. Publications resulting from the NCU research grant**

Seven published and two submitted peer-reviewed articles.

One book chapter.

One international course, related teaching materials.

Numerous presentations in scientific congresses.

For details, see pages 2-4

**Published/accepted/preliminarily accepted articles**

**1. Occupational exposure to trichloroethylene and perchloroethylene and the risk of lymphoma, liver, and kidney cancer in four Nordic countries.**

Vlaanderen, J., Straif, K., Pukkala, E., Kauppinen, T., Kyyrönen, P., Martinsen, J.I., Kjærheim, K., Tryggvadottir, L., Hansen, J., Sørensen, P., Weiderpass, E. *Occup. Environ. Med.* 2013; 70: 393-401.

**2. Incidence of cancer of the oral cavity by occupational group: Estimation of relative incidences by indirect standardization and bayesian hierarchical models.** Karhunen, V. Master's thesis in Statistics. University of Oulu, Finland 2013 (56 pages).

**3. Performance of the Finnish Information System on Occupational Exposure (FINJEM) in epidemiologic, surveillance and other applications.**

Kauppinen, T., Uuksulainen, S., Saalo, A., Mäkinen, I., Pukkala, E. Submitted to *Annals Occup. Hyg.* (August 2013).

**4. Tetrachloroethylene exposure and bladder cancer risk: A meta-analysis of dry cleaning worker studies.** Vlaanderen, J., Straif, K., Ruder, A., Blair, A., Hansen, J., Lyng, E., Charbotel, B., Loomis, D., Kauppinen, T., Kyyrönen, P., Martinsen, J.I., Pukkala, E., Weiderpass, E., Guha, N. Revised version submitted to *Environ. Health Perspect.* (November 2013).

**5. Cholangiocarcinoma among workers in the printing industry: Using the NOCCA database to elucidate the generalisability of a cluster report from Japan.** Vlaanderen, J., Straif, K., P., Martinsen, J.I., Kauppinen, T., Pukkala, E., Sørensen, P., Tryggvadottir, L., Weiderpass, E. Kjærheim, K.: *Occup. Environ. Med.* (Published Online First: 28 August 2013 doi:10.1136/oemed-2013-101500).

**6. Performance of the Finnish Information System on Occupational Exposure (FINJEM) in epidemiologic, surveillance and other applications.**

Kauppinen, T., Uuksulainen, S., Saalo, A., Mäkinen, I., Pukkala, E. *Ann. Occup. Hyg.*, 2014; 1–17 (doi:10.1093/annhyg/met074).

**7. Cancer incidence among firefighters – 45 years of follow-up in five Nordic countries.**

Pukkala, E., Martinsen, J.I., Weiderpass, E., Kjærheim, K., Lyng, E., Tryggvadottir, L., Sørensen, P., Demers, P.: *Occup. Environ. Med.* (in press, accepted January 2014).

**8. Tetrachloroethylene exposure and bladder cancer risk: A meta-analysis of dry cleaning worker studies.**

Vlaanderen, J., Straif, K., Ruder, A., Blair, A., Hansen, J., Lyng, E., Charbotel, B., Loomis, D., Kauppinen, T., Kyyrönen, P., Martinsen, J.I., Pukkala, E., Weiderpass, E., Guha, N. Revised version submitted to *Environ. Health Perspect.* (August 2013).

**9. Occupational exposure to solvents and acute myeloid leukemia: a population-based case-control study in Nordic countries.**

Talibov, M., Kautiainen, S., Martinsen, J.I., Kjærheim, K., Lyng, E., Sørensen, P., Weiderpass, E., Tryggvadottir, L., Kauppinen, T., Kyyrönen, P., Pukkala, E. Submitted to *Scand. J. Work Environ. Health* (December 2013).

### **Analyses done/ongoing, manuscript finalisation in progress**

Occupational factors of mesothelioma (Nils Plato, Sweden). Three manuscripts drafted: "Occupation and mesothelioma in pleura and peritoneum in Sweden – updated incidence for males and females 1961-2009"; "Mesothelioma in Sweden; dose-response analysis for 29 different carcinogenic agents"; "Mesothelioma incidence and occupation in the Nordic countries – a follow up during four decades".

Occupation and oesophageal cancer (Elisabete Weiderpass, Jesper Lagergren, Sweden; ,manuscript "Occupation and risk of oesophageal adenocarcinoma and squamous-cell carcinoma: the Nordic Occupational Cancer study" drafted)

Formaldehyde exposure and risk of cancer at selected sites (Tom Grimsrud, Norway; manuscript soon ready for submission).

Cancer among veterinarians (Laura Laakso, Finland, in collaboration with veterinarians from other Nordic countries).

Opposite cancer patterns among fishermen and sea workers (Linda Kærlev and Johnni Hansen, Denmark, fishermen part in collaboration with Anu Turunen, Finland)

Does occupational variation explain the difference in colorectal cancer risk between Denmark and Norway (Elsebeth Lynge, Denmark; Jan Ivar Martinsen, Norway; manuscript "Colon cancer trends in Norway and Denmark by socio-economic group: a cohort study" soon ready for submission)

Changes in socioeconomic variation in incidence in cancers over time and region (Susanne Dalton, Denmark).

Physical activity at work and cancer risk in men (doctoral student Jorma Sormunen, Belgium, doctoral student supervised by Eero Pukkala)

Nordic study on dose-response analyses on wood dust and adenocarcinoma of nose (doctoral student Angelica Siew, Malaysia, supervised by Eero Pukkala; article drafted).

Does alcohol consumption explain the large occupational variation in risk of oral cavity and pharynx (doctoral student Laura Tarvainen, Finland, supervised by Nea Malila/Eero Pukkala).

Trends in cancer incidence among restaurant waiters; relation to changes in passive smoking? (doctoral student Jere Reijula, Finland, supervised by Kari Reijula/Eero Pukkala; article drafted).

Breast cancer among night shift workers (Tore Tynes, Jenny-Anne Sigstad, Norway). Report for national use drafted.

Occupation, smoking and bladder cancer phenotype: an investigation of the link between different carcinogens and tumour biology (James Catto, UK)

Cancer risk related to exposure to electromagnetic fields at work (doctoral student Mònica Guxens, the Netherlands, supervised by Roel Vermeulen; two articles drafted)

Shift work and risk of non-breast cancers (Johnni Hansen, Denmark)

Occupational variation in cancer patient survival (Arun Pokhrel, Nepal/Finland)

Asbestos exposure and cholangiocarcinoma (doctoral students supervised by Stefano Mattioli, Italy)

Occupational variation in incidence of granulosa cell tumours (doctoral student Saara Bryk, Finland, supervised by Annika Riska)

Adjusting effects of smoking and drinking using proxy variables (doctoral student Ville Karhunen, UK/Finland, supervised by Esa Läärä)

### **Book chapter**

**Role of registers in occupational cancer control** by Grimsrud, T.K. and Weiderpass, E. for the book "Occupational Cancer" by Springer, editors Sisko Anttila, Paolo Boffetta, and Kurt Straif (in press).

### **Workshop on occupational cancer**

NIVA course "Seeking Causes for Occupational Cancer" in Sannäs, Finland, on 17-20 September 2013 (<http://www.niva.org/start/#/view-54553-38>; course director Eero Pukkala, main lecturers from NOCCA team).

### **NOCCA-related lectures (selected examples)**

*Jan 2013* Danish Parliament (Johnni Hansen, Invited speaker: "Firefighters and risk of cancer")

*Mar 2013* National Board of Industrial Injuries in Denmark (Johnni Hansen, invited speaker: "IARC classification of occupational carcinogens")

*Jun 2013* ANCR Meeting, Reykjavik (Kristina Kjaerheim: "Cholangiocarcinoma in printing industry: using NOCCA to elucidate a cluster report from Japan")

*Jun 2013* ANCR Meeting, Reykjavik (Elisabete Weiderpass: "Occupation and mesothelioma in Sweden")

*Jun 2013* First international Blue light symposium, Tokyo, Japan (Johnni Hansen, invited speaker: "Night work and circadian disruption")

*Jun 2013* EPICOH meeting, Utrecht, the Netherlands (Johnni Hansen: "A comprehensive Danish Data linkage")

*Jun 2013* Center of Chronobiology, Ludwig Maximilian University of Munich, Germany (Johnni Hansen, invited speaker: "Shift-work and risk of cancer")

*Aug 2013* Combined European and Nordic Epidemiology Congress, Aarhus (Eero Pukkala plenary lecture: "Best examples of Nordic collaboration")

*Nov 2013* Seminar at University of Utrecht, the Netherlands (Eero Pukkala, invited lecture: "NOCCA as a tool of research on work and cancer")

*Dec 2013* Seminar series on registers as a data source for effectiveness and patient safety research, Research Centre for Comparative Effectiveness and Patient Safety (RECEPS), University of Eastern Finland, Kuopio (Eero Pukkala, invited lecture: "Nordic countries - Paradise of register-based cancer epidemiology?")

*Dec 2013* Nordic School for Public Health, Gothenburg (Eero Pukkala, invited lecture: "Methods for sophisticated register-based epidemiological research")