fungicides use on NHL risk, overall and for multiple myeloma (MM), Chronic Lymphocytic Leukemia/Small Lymphocytic Lymphoma (CLL-SLL) and Diffuse Large B-cell Lymphoma (DLBCL).

Methods Nearly 1 82 000 participants affiliated in a health assurance system reported in the enrollment questionnaire (2005–2007) lifetime pesticide use with start and end year on 13 crops and were followed until 2013. Using the crop-exposure matrix PESTIMAT, associations between NHLs and benzimidazole fungicides exposure (overall and for benomyl, carbendazim, fenazaflore, thiabendazole and thiophanate methyl) were estimated using Cox models.

Results After exclusion of prevalent cases, individuals with incomplete agricultural profession history data or a zero tracking period, 1,133 NHL incident cases were identified from cancer registries (269 MM, 244 CLL-SLL, 190 DLBCL). Nearly 20% of participants were considered exposed (median duration from 7 to 20 years according to active ingredient). Increased NHL risk was observed with exposure to benzimidazole, overall, on any crops (NHL: HR=1.13, 95%CI=0.94–1.37, 150 cases, no duration relationship). Moreover, borderline positive associations were reported on specific crops: wheat/barley (NHL: HR=1.23, CLL-SLL: HR=1.42), beets (DLBCL, HR=2.19) and rape (DLBCL, 2.32). Significant increased risks were reported with MM for use of thiophanate-methyl on wheat/barley (HR=3.46, 23 exposed cases, no duration relationship) and with DLBCL for all 4 benzimidazole used on beets (HR from 2.34 to 2.57 and for the 2 used on rape (HR=2.39 and 2.46), although based on respectively 7 and 6 cases.

Conclusion These findings suggest positive associations between incidence of specific NHL subtypes, and exposure to benzimidazole as a chemical family or specific ingredients in this family.

01A.3 OCCUPATIONAL INSECTICIDE EXPOSURE, GLYCEMIC REGULATION AND BRONCHOCONSTRICTION: PRELIMINARY RESULTS FROM A SHORT-TERM COHORT STUDY AMONG SMALL-SCALE FARMERS IN UGANDA

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Introduction Epidemiological studies have suggested associations between exposure to some classes of non-persistent insecticides, airways obstruction (Doust et al, 2014) and diabetes mellitus (Evangelou et al, 2016). Yet the evidence is limited by cross-sectional study designs and exposure metrics based on self-reported information only. The purpose of this study is to investigate these associations in a strong study design employing objective exposure metrics.

Methods From September 2018 to February 2019, we are conducting a short-term cohort study in a population of 370 small-scale farmers in Uganda, half of which are conventional farmers and the other half working towards organic

certification. We examine participants before, during and after the October-November agricultural pesticide-spraying season. In each study round, participants perform spirometry, and glycemic regulation is assessed by analysis of glycated aemoglobin A (HbA1c) as well as fasting plasma glucose for a subgroup. Detailed questionnaire-based information on pesticide usage (frequency, intensity, duration, specific compounds, personal protective equipment etc.) is used to construct an internal task-exposure matrix. The task-exposure matrix will be validated by erythrocyte choline esterase (AChE) activity as a proxy for organophosphate and carbamate exposure, as well as passive pesticide samplers (silicone wristbands) worn by participants between the study rounds.

Results and discussion The baseline (pre-spraying season) data collection is finalized. Data collection for the two rounds of follow-up (during/after the spraying season) is ongoing. At the conference, we will present the first results on temporal changes across the spraying season in AChE and associations with glycated aemoglobin A, fasting plasma glucose and lung function.

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01A.4 ASSESSMENT OF PESTICIDE-RELATED POLLUTION AND OCCUPATIONAL HEALTH OF VEGETABLE FARMERS

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Objectives This study assessed the pesticide exposure and the occupational health of the agricultural farmers in the Philippines. The study site is one of the largest vegetable-producing province in the Philippines.

Methods This study used both survey questionnaire and physical health assessment, including mental state examination. The pesticide exposure was estimated based on the duration of years of use of pesticide, as well as the amount applied per spray application. The data results were segregated between gender because women are also heavily engaged in agriculture in this part of the Philippines.

Results The results showed that pesticide exposure usually happened during agricultural activities such as spray application in the field (63.9%), mixing (38.4%), loading (34.1%) and field re-entry (9.7%) The most frequently used pesticides were Tamaron (OP), Selecron (OP), and Dithane (Carbamate). The mean years of pesticide use was 14.23 years for males, and 15.4 years for females. For the exposure to pesticides, expressed in terms of number of years and amount used per spray application, the average exposure of the males was 2,024.43 ml-years; and for females, it was 993.55. Among farmers, 49% complained of being sick because of work. Of those who got ill, a large percentage of this, 69.8%, did not receive any medical attention. The most prevalent health symptoms were muscle pain (63.3%), easy fatigability (52.4%), and loss of appetite (27.5%). For the mini-mental state examination, abnormalities were found in 5.4% for males and 40.8% in females. The use of insecticide was associated with weakness, easy fatigability and weight loss.

Conclusion Pesticide exposure is considerable among the farmers. The occupational health conditions presented by the farmers can be linked with their pesticide investigation. Although this study has presented some risk factors associated with general health symptoms, further investigation should look into specific pesticide-health correlation.

01A.5 EMERGENT ROLE OF EPIGENETIC BIOMARKERS OF PESTICIDES EXPOSURE: A CASE STUDY AMONG WOMEN OF CHILDBEARING AGE LIVING IN MEKNES (MOROCCO)

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Pesticide exposure has been associated with acute and chronic adverse health effects. Current evidence supports that epigenetics may mediate these effects. DNA methylation (DNAm) is one of the broadly investigated epigenetic alteration. Therefore, to date, only limited human data is linking pesticide exposure to global DNAm alterations. Therefore, the aim of this study was to characterize pesticides exposure in women of reproductive age and investigate whether DNA methylation patterns were related to pesticides exposure level.

In a pilot study among 100 women from Meknes (Morocco), we measured 45 analytes (parent molecules and their metabolites) from three chemical families of pesticides: Organochlorines, organophosphates, pyrethroids, in urine and hair using HPLC/MS-MS and GC/MS. Commercial kits were used for quantification of 8-OHdG. We used LC/MS for measuring GSH. Pyrosequencing was used to measure Alu and LINE-1 methylation in DNA isolated from whole blood samples.

Pesticides are associated with genomic instability, which is proposed to be sensitive to nutritional intake and may also induce epigenetic changes. We evaluated the effect of life style and dietary intake on epigenetic instability in women. Our research prompts a re-thinking of the role of epigenetics on the understanding of the environmental exposure. We will then explore the role of epigenetic changes in the onset of cancer through the oxidative stress and DNA damage pathways.

01A.6 THE CARCINOGENICITY OF PESTICIDES USED IN NEW ZEALAND

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Introduction Yearly over 3000 tonnes of pesticide active ingredients are applied in New Zealand agriculture. Since the 1980's, epidemiological studies have reported increased risks of lymphopoietic cancers in agricultural sectors with high pesticide use. Here we aim to estimate the number and total volume of currently used pesticides in New Zealand that are

known or suspected human carcinogens, in order to inform interventions.

Methods For each of the pesticide active ingredients most commonly used in New Zealand, the carcinogenicity classification of three regulatory agencies (The New Zealand Environmental Protection Authority [NZ-EPA], the US Environmental Protection Agency [US-EPA], and the European Chemicals Agency [EU]) were extracted, as well as the classification of the International Agency for Research on Cancer (IARC) Monograph Programme. Total tonnes of active ingredients that are known or suspected human carcinogens was calculated for each classification.

Results None of the pesticides used in New Zealand are classified as known human carcinogens by any of the three regulatory agencies or IARC. Annually New Zealand uses 148–756 tonnes of active pesticide ingredients that are classified as suspected human carcinogens by the three regulatory agencies. If also including the pesticides classified by IARC as possible or probable human carcinogens, the upper estimate doubles to 1475 tonnes, representing half of the total volume of pesticide active ingredients used in New Zealand agriculture. The percentage and volume of active ingredients classified as suspected carcinogens by the three regulatory agencies was highest for the fungicides (8%–60%; 72–540 tonnes), followed by herbicides (3%–10%; 60–200 tonnes), and insecticides (8%, 16 tonnes).

Conclusions Although no known human carcinogens are used as pesticides, New Zealand's high use of pesticides that are suspected carcinogens requires a greater awareness of the presence of potential carcinogens in the agricultural sector and the development of an intervention strategy to reduce cancer risk.

Reproductive Effects

01B.1 MODELING INFERTILITY IN A COHORT OF CANADIAN TRADESWOMEN

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Introduction With few female occupational cohorts, little is known about the contribution of work exposures to female infertility.

Methods A cohort of 888 tradeswomen across Canada was established (450 welders and 438 in the electrical trades) to examine effects on the fetus, with investigation of infertility a secondary objective. Women completed an extensive questionnaire at recruitment and follow-up questionnaires every six-months for up to 5 years. At each contact she was asked about attempts to get pregnant and barriers to conception. Fertility issues were identified both by self-report of failure to conceive for ≥ 12 months and as the likelihood of conceiving in any month at risk. Determinants of infertility were examined in a Cox regression with time dependent covariates. Employment factors examined in each month were paid work, trade work and cumulative months in trade. Maternal age, prior conceptions, smoking, use of alcohol and BMI were examined as confounders.

Results 96 periods of infertility ≥ 12 months were reported among 38 women from welding and 52 from electrical trades giving the risk of infertility for welders relative to