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P-771 EXPOSURE OF HIGHLAND HMONG VILLAGERS TO PESTICIDES IN NORTHERN THAILAND

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Introduction:
Change from subsistence farming to production for the market has become common in the developing world. Government restrictions on land use, population growth and demand for manufactured goods caused many highland minority people in northern Thailand to change from traditional "organic" land-extensive, labor-intensive subsistence slash-and-burn to fixed-field production of cash crops with heavy use of pesticides. Previous cross-sectional surveys in 3 rural highland Hmong communities revealed high levels of cholinesterase inhibition (CI) among all ages and both sexes, and suggested seasonal and geographic variations in CI levels. This paper reports associations of seasonal variations in pesticide use with CI levels, chromosome aberrations (CA) and protective behavior among members of randomly selected households in one highland Hmong village.
Methods:
To study relationships between seasonal variations in pesticide use, CI and chromosome aberrations (CA) and demographic variables we observed and interviewed consenting household heads concerning pesticide use and protective behavior (use of protective clothing, staying out of fields after spray, etc.). We collected finger stick and venous blood from each consenting member of sample households 4 times: April 2002 (the time of highest pesticide use), October 2002 (after pesticide use stopped), January 2003 (3+ months after the last use of pesticides) and April 2003 (when pesticide use was high again). We used a rapid test to measure CI, and measured CA by a WHO standard method.
Results:
Paired measurements of CI in the same individuals were significantly higher in April 2002 than in October 2002 (after pesticide application stopped) $p < .001$, and higher in April 2003 than in October 2002 and January 2002 ($p < .001$). Numbers of cells with chromosome abnormalities in the same individuals were higher in April 2002 than in January 2003 ($p = .025$). Members of the village population, including women and children who were not actively involved in pesticide application showed similar seasonal variation of CI and CA associated with seasonal use of pesticides, although levels were generally lower among those who do not themselves apply pesticides.
Discussion and conclusions:
CI and CA are widespread in this population. CI appears to be largely reversible over time in the absence of pesticide use; CA appears decline after a period of non-use, but does not reach pre-pesticide use levels. Thus CA appears to be cumulative. This suggests long-term and widespread health effects of use of pesticides in this population.

P-772 DOCUMENT RETRIEVAL, INFORMATION ASSESSMENT, AND PRELIMINARY PRIORITIZATION OF RADIOACTIVE AND NON-RADIOACTIVE RELEASES FROM A LARGE NUCLEAR WEAPONS FACILITY

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Introduction: In the mid-1940s, the United States built numerous facilities for the production of atomic weapons. A project is underway to evaluate historical radioactive and non-radioactive use and environmental releases at one large facility to ultimately reconstruct doses received by surrounding communities. While radioactive monitoring began in the late-1940s, uses of non-radioactive materials were poorly tracked and documented until the 1970s. The purpose of this paper is to describe methods used to prioritize radioactive and non-radioactive materials based upon their potential to pose a health risk to the public.
Methods: Estimates of historical uses and releases were based on an extensive review of available records. Radioactive and non-radioactive materials were evaluated separately.
Both airborne and liquid-borne radionuclide releases were considered. Each airborne radionuclide was ranked by calculating a priority index (PI) based on the air volume required to dilute the annual activity released to be equal to the worst-case non-occupational Maximum Permissible Concentration (MPC). Six groups of radionuclides were evaluated: plutonium, uranium, tritium, radioactive lanthanum, mixed fission products, and mixed activation products (MAP). For liquid-borne releases, PIs (based on water volumes required to reach MPCs) were calculated for total plutonium, ^{238}Pu, ^{239}Pu, ^{89}Sr, ^{90}Sr, tritium, gross alpha, and gross beta radioactivity.
Non-radioactive materials identified as being present onsite in large quantities were ranked based upon highest annual usage and USEPA toxicity factors. Ranking was based on annual usage multiplied by either the non-cancer reference dose or the inverse of the cancer potency slope factor. If both were available, the more conservative toxicity factor was used.
Results: Airborne releases of plutonium and uranium were of primary concern until the early 1980s, after which MAPs were the most significant. Application of the PI approach to beryllium indicated that airborne releases of the metal also warrant high priority. Plutonium was of highest concern among liquid-borne radionuclides. Historical releases of explosives and volatile organic chemicals appear to have the greatest potential for producing off-site health effects, with methylene chloride, TNT (2,4,6-trinitrotoluene), tetrachloroethylene, chlorodifluoromethane, and trichloroethylene ranking highest.
Discussion and Conclusions: Prioritization methods were used to indicate which radioactive and non-radioactive materials used in facility operations warranted highest priority in retrospective studies of public exposures. Additional data will be sought for these materials to support detailed dose reconstruction. These methods can be applied to other sites where multiple hazards are present.

P-773 FIVE APPROACHES TO PM2.5 EXPOSURE REDUCTION IN A NORTHERN METROPOLITAN AREA

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Introduction. Atmospheric particles are associated with 347 900 premature chronic deaths in EU countries (EU25). The European Community Thematic Strategy on air pollution aims by 2020 to cut the annual number of premature deaths from air pollution-related diseases by almost 40% from the 2000 level, which implies a corresponding reduction in population exposures. The current work compares a number of studies have been conducted for estimating the exposure reduction potential of various scenarios and policies in Helsinki metropolitan area.
Methods. Three different modelling studies have been conducted in estimating development of PM exposures from various traffic sectors, including a business-as-usual study for 2025; a study for replacing busses in public transportation by ones using compressed natural gas engines; and a study modelling the private car transportation and looking at a hypothetical large-scale demand-responsive public composite traffic system. One study looked at the exposure reduction potential of modern building ventilation systems using particle filters.
Results. Largest exposure reductions (Table 1) were achieved by improving particle filtration in ventilation systems (20% reduction in $PM_{2.5}$ exposures). Replacement of private car traffic with the composition traffic reduced exposures, depending on the utilization rate (in parentheses), by 6% (100%), by 3.3% (75%), or by 1.4% (50%). Replacement of all busses with gas ones reduced exposures by 2.8%, but comparable reductions were achieved also by modern diesel engines and diesel engines with particle traps (1.6% and 2.4% reductions, respectively). The business as usual scenario in the Helsinki metropolitan area transportation system plan for 2025 estimated 6.5% reductions in the exposures. These reduction scenarios are not competing and they may be implemented independently of each other. The tailpipe exposure reductions in the HEAT scenario, however, include also business as usual development of bus and car emissions, which were studied in more detail in the respective studies; therefore these reductions cannot be directly summed for an overall estimate.

Table 1. Exposure reductions in different scenarios.

Scenario	Baseline exposure		Scenario reduction		
	$\mu g\ m^{-3}$	%[1]	$\mu g\ m^{-3}$	%	%[1]
Traffic system plan (HEAT) 2000-25	1.0	10.8	-0.6	-60.0	-6.5
Natural Gas Buses 2000-20	0.3	3.2	-0.26	-85.6	-2.8
Composite traffic 100%	1.5	16.5	-0.6	-35.8	-5.9
Building ventilation filtration	6.9	74.2	-1.9	-27.5	-20.4

[1] Relative to the estimated total population exposure (9,3 $\mu g\ m^{-3}$)

Discussion and conclusions. All modelled exposure reductions were significantly smaller than the European Commission policy goals. Exposure analysis has shown that the role of long-range transportation is remarkable in Helsinki area, exceeding 50% contribution to the population exposures. Therefore significant reductions in population exposures need to be supported by favorable development of international emissions. Development and utilization of ventilation technology seems to provide the largest potential for PM exposure reduction.
Table 1. Exposure reductions in different scenarios.