

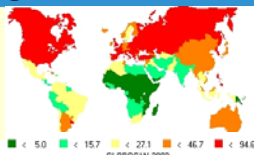
Diesel motor exhaust and lung cancer risk in a pooled analysis from studies in Europe and Canada

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BACKGROUND

Lung cancer is the most common cancer in the world and one of the most fatal cancer types. The areas with the highest incidence and mortality rates are Europe (especially Eastern Europe) and North America [1].



Diesel motor exhaust (DME) was classified as probably carcinogenic to humans (group 2A) by the International Agency for Research on Cancer (IARC) in 1989 [2].

Our objective was to investigate the risk of lung cancer following occupational exposure to DME, while controlling for smoking and other occupational exposures.

METHODS

DATA: The results are based on data from the "SYNERGY project" – *Pooled Analyses of Case-control Studies on the Joint Effects of Occupational Carcinogens in the Development of Lung Cancer*, which started in 2007.

EXPOSURE ASSESSMENT: The Institute for Risk Assessment Sciences at Utrecht University developed a job exposure matrix based on ISCO-68 job codes to determine level of exposure to occupational DME. Out of 1840 jobs, 202 (11%) e.g. drivers, engineers, and farmers were assigned low DME levels and 27 (1.5%) e.g. miners, mechanics for agricultural machinery and diesel engines, railway and road vehicle loaders were assigned high levels of DME exposure.

STATISTICAL ANALYSES: Odds ratios (OR) for lung cancer and 95% confidence intervals (CI) were estimated using unconditional logistic regression; OR1 adjusted for age, sex, study, and ever employment in a "Group A" job, i.e. occupations with established lung cancer risk [3], and OR2 in addition adjusted for smoking pack-years and time since quitting smoking. A cumulative exposure index was built and divided into quartiles based on the distribution among the exposed controls.

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RESULTS

- The response rate was 82% among cases and 66% among controls.
- Cumulative DME exposure was associated with an increased lung cancer risk; highest quartile vs. unexposed OR 1.31 (95% CI 1.20-1.44).
- Corresponding effect estimates for high cumulative exposure were similar in never smokers and in workers never employed in "Group A" jobs, and higher, but less precise in women.

Studies included in the SYNERGY project in April 2010

Study acronym	Country	Cases	Controls	Data collection	Source
AUT	Germany	3180	3249	1990-1995	Population
EAGLE	Italy	1921	2090	2002-2005	Population
HdA	Germany	1004	1002	1988-1993	Population
INCO_Cz.Rep	Czech Republic	304	452	1998-2002	Hospital
INCO_Hungary	Hungary	391	305	1998-2001	Hospital
INCO_Poland	Poland	793	835	1999-2002	Hosp.& Pop.
INCO_Romania	Romania	179	225	1998-2001	Hospital
INCO_Russia	Russia	599	580	1998-2000	Hospital
INCO_Slovakia	Slovakia	345	285	1998-2002	Hospital
INCO_UK	United Kingdom	442	917	1998-2005	Population
LUCA	France	294	292	1989-1992	Hospital
LUCAS	Sweden	1014	2307	1985-1990	Population
MONTREAL	Canada	1176	1505	1996-2002	Population
MORGEN*	Netherlands	64	187	1993-1997	Population
PARIS	France	169	227	1988-1992	Hospital
ROME	Italy	329	324	1993-1996	Hospital
TURIN	Italy	1100	1501	1990-1994	Population

* Nested case-control study

Lung cancer risk associated with cumulative DME exposure

All subjects	Cases	%	Controls	%	OR1	95% CI	OR2	95% CI
Never	7676	57.7	10320	63.4	1.00	Reference	1.00	Reference
Q1	1269	9.5	1513	9.3	1.04	0.96 – 1.13	0.98	0.90 – 1.08
Q2	1325	10.0	1497	9.2	1.14	1.05 – 1.23	1.05	0.96 – 1.15
Q3	1440	10.8	1503	9.2	1.23	1.14 – 1.34	1.07	0.97 – 1.17
Q4	1594	12.0	1450	8.9	1.43	1.32 – 1.55	1.31	1.20 – 1.44

Test for trend, p-value <0.001

Trend among exposed, p-value <0.001

OR1 is adjusted for age, sex, study, ever employment in a "List A" job
OR2 is in addition adjusted for smoking pack years, time-since-quitting smoking



Lung cancer risk associated with cumulative DME exposure

Never smokers	Cases	%	Controls	%	OR1	95% CI
Never	614	76.7	3486	73.0	1.00	Reference
Q1	44	5.5	334	7.0	0.74	0.53 – 1.05
Q2	63	7.9	328	6.9	1.23	0.91 – 1.67
Q3	33	4.1	306	6.4	0.86	0.58 – 1.27
Q4	47	5.9	320	6.7	1.27	0.90 – 1.79

Test for trend, p-value 0.261

Trend among exposed, p-value 0.150

Never "List A"	Cases	%	Controls	%	OR2	95% CI
Never	7040	59.0	9829	64.7	1.00	Reference
Q1	1060	8.9	1340	8.8	0.98	0.89 – 1.08
Q2	1133	9.5	1334	8.8	1.09	0.99 – 1.20
Q3	1256	10.5	1354	8.9	1.10	1.00 – 1.21
Q4	1449	12.1	1337	8.8	1.35	1.23 – 1.48

Test for trend, p-value <0.001

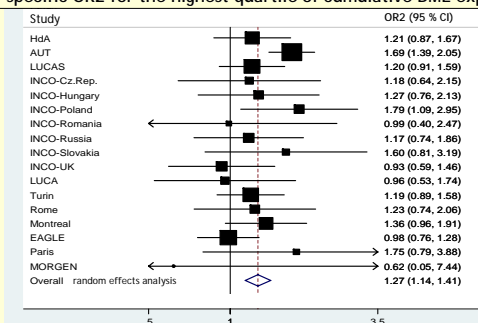
Trend among exposed, p-value <0.001

Women	Cases	%	Controls	%	OR2	95% CI
Never	2144	86.0	2810	86.4	1.00	Reference
Q1	146	5.9	198	6.1	0.83	0.64 – 1.08
Q2	116	4.7	127	3.9	1.28	0.95 – 1.73
Q3	51	2.0	71	2.2	0.95	0.63 – 1.44
Q4	35	1.4	45	1.4	1.57	0.96 – 2.58

Test for trend, p-value 0.163

Trend among exposed, p-value 0.188

Study specific OR2 for the highest quartile of cumulative DME exposure



CONCLUSION

Our results indicate that occupational exposure to DME is associated with an increased risk of lung cancer.