Cigarette smoking and lung cancer – risk estimates for the major histological types from a pooled analysis of European case-control studies

Benjamin Kendzia1, Per Gustavsson2, Hermann Pohlabeln3, Wolfgang Ahrens4, Karl-Heinz Jöckel4, Georg Johnen1, Ann Olsson5, Isabelle Mercedes Gross1, Irene Brüske6, Heinz-Erich Wichmann6, Franco Merletti7, Dario Mirabelli7, Lorenzo Richardi7, David Zaridze8, Adrian Cassidy9, Neonila Szeszenia-Dabrowska10,11, Jolanta Lissowska12, Isabelle Stücker13, Eleonora Fabianova14, Rodica Stanescu Dumitru15, Vladimir Bencko16, Lenka Foretova17, Vladimir Janout18, Paolo Boffetta19,20, Kurt Straif5, Thomas Brüning1 and Beate Pesch1

1 Institute for Prevention and Occupational Medicine of the German Social Accident Insurance – Institute of the Ruhr-Universität Bochum (IPA), Germany
2 Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden
3 Bremen Institute for Prevention Research and Social Medicine, University of Bremen, Germany
4 Institute for Medical Informatics, Biometry and Epidemiology, University Hospital of Essen, Germany
5 International Agency for Research on Cancer (IARC), Lyon, France
6 Helmholtz Zentrum München, Institute of epidemiology, German Research Center for Environmental Health, Munich, Germany
7 Cancer Epidemiology Unit, CPO-Piemonte and University of Turin, Italy
8 Russian Cancer Research Centre, Moscow, Russia
9 Roy Castle Lung Cancer Research Programme, Cancer Research Centre, University of Liverpool, UK
10 The Nofer Institute of Occupational Medicine, Lodz, Poland
11 National Institute of Environment Health, Budapest, Hungary
12 The M Sklodowska-Curie Cancer Center and Institute of Oncology, Warsaw, Poland
13 INSERM U 754 - IFR69, Villejuif, France
14 Regional Authority of Public Health, Banska Bystrica, Slovakia
15 National Institute of Public Health, Bucharest, Romania
16 Institute of Hygiene and Epidemiology, 1st Faculty of Medicine, Charles University, Prague, Czech Republic
17 Masaryk Memorial Cancer Institute, Brno, Czech Republic
18 Palacky University, Faculty of Medicine, Olomouc, Czech Republic
19 The Tisch Cancer Institute, Mount Sinai School of Medicine, New York, USA
20 The International Prevention Research Institute, Lyon, France

Introduction
Smoking is a strong risk factor for lung cancer. As part of a series of supplemental analyses of the project SYNERGY that has been designed as a pooled analysis of lung cancer studies on the interaction of occupational carcinogens the risk of smoking was estimated for histological subtypes.

Materials and Methods
This dataset comprised 10,050 cases (8,403 males, 1,647 females) and 12,388 controls (10,246 males, 2,142 females) from 11 European countries. Odds ratios (ORs) and 95% confidence intervals (CIs) of smoking cigarettes for squamous cell carcinoma (SqCC), small cell lung carcinoma (SCLC), and adenocarcinoma (AdCa) were estimated with logistic regression models in men and women, conditional on study center, adjusted for smoking of any other type of tobacco (yes/no) and age (in five-year classes).

Results
Only 2% males and 29% females were never smokers, with AdCa as leading subtype. In current smokers, 54% men and 35% women had a diagnosis of SqCC. Current smoking of cigarettes was associated with an OR of 45.3 (95% CI 33.3-61.6) for SqCC, 43.0 (95% CI 27.5-67.3) for SCLC, and 9.2 (95% CI 7.2-11.7) for AdCa among men. The corresponding risk estimates in women were 12.4 (95% CI 9.2-16.5) for SqCC, 17.7 (95% CI 12.4-25.3) for SCLC, and 3.2 (95% CI 2.5-4.0) for AdCa. High risks of current smoking of > 30 cigarettes/day were observed for SqCC (OR 94.1; 95% CI 64.2-130.6) and SCLC (OR 84.5; 95% CI 51.2-139.6) in men and for SqCC (OR 46.9; 95% CI 17.3-127.1) and SCLC (OR 77.4; 95% CI 22.7-263.8) in women.

Conclusion
Cigarette smoking in our study was associated with a considerably higher risk both for SqCC and SCLC than for AdCa. These observations corroborate findings from experimental and former epidemiological studies.