Asthma, Wheezing, and Allergies in Russian Schoolchildren in Relation to New Surface Materials in the Home

Jouni J. K. Jaakkola, MD, DSc, PhD, Helen Parise, PhD, Victor Kislitsin, MSc, Natalia I. Lebedeva, MD, DSc, and John D. Spengler, PhD

In a cross-sectional study of 5951 Russian 8–12-year-old schoolchildren, risks of current asthma, wheezing, and allergy were related to recent renovation and the installation of materials with potential chemical emissions. New linoleum flooring, synthetic carpeting, particleboard, wall coverings, and furniture and recent painting were determinants of 1 or several of these 3 health outcomes. These findings warrant further attention to the type of materials used in interior design. (*Am J Public Health*. 2004;94:560–562)

The Soviet era has been followed by increased activity in construction and renovation of housing in the Russian Federation, as well as an introduction of new building technology and new materials used in interior design, furniture, and textiles. Two recent studies indicated that exposure to plastic flooring and wall materials may increase the risk of respiratory conditions in children.[1,2] As part of a cross-sectional study of air pollution and respiratory health in Russia in 1996 to 1997,[3,4] we tested a hypothesis that the risks of children's asthma and allergic diseases are related to recent renovation, especially newly installed synthetic surface materials, furniture, and painting.

METHODS

The study population included 5951 children in second to fifth grade (8–12 years old) in 8 Russian cities in the Sverdlovsk Oblast region and the city of Cherepovets in the Upper Volga Oblast.[3] The participation rate in schools varied from 96% to 98%. The questionnaire, modified from previous European and North American questionnaires for the Russian conditions,[5,6] inquired about the child's personal characteristics, health information, and socioeconomic factors. Local elementary schoolteachers were trained to conduct the interviews, and parents and guardians were invited to meetings after the school day was finished. After signing an informed consent form, a parent completed the questionnaire.

The current study focused on asthma, wheezing, and allergy. *Current asthma* was defined as a history of doctor-diagnosed asthma and symptoms, signs, or medication of asthma during the past 12 months. *Current wheezing* was defined as wheezing during the past 12 months. *Any allergy* was defined as any history of doctor-diagnosed allergy or parental-reported hay fever or pollinosis.

Exposure assessment was based on the following question: "Have you conducted any of the following renovations in your home within the past 12 months or earlier?" The choices were installation of linoleum floor, painting, particleboard, new furniture, synthetic carpet, wall covering, and suspended ceiling.

We used the odds ratio (OR) as a measure of effect and logistic regression analysis to adjust for age, gender, preterm birth, low birthweight, parental atopy, maternal smoking during pregnancy, exposure to environmental tobacco smoke at home (at ages 0–1 years, ages 2–6 years, and currently), and mother's and father's education.

RESULTS

Of the children, 1.5% had current asthma, 13.4% had current wheezing, and 33.2% had an allergy. Table 1 shows the occurrence of the potential sources of emissions.

The risks of current wheezing (adjusted OR=1.36; 95% confidence interval [CI]=1.00, 1.86) and allergy (adjusted OR=1.31; 95% CI=1.05, 1.65) were significantly related to the installation of linoleum flooring during the past 12 months (Table 2). The corresponding risk estimates were slightly lower when focusing on exposure earlier than 12 months ago. There was a general pattern of positive as-

TABLE 1—New Surface Materials, Furniture, and Recent Painting in Russian Homes

Emission Source	Past 12 Mo, %	Earlier, %
New linoleum flooring	9.9	34.0
New synthetic carpet	6.5	22.0
New wall covering	35.9	38.2
Recent painting	32.9	39.9
New particleboard	4.7	20.7
New furniture	12.9	39.3

sociation between installation of synthetic carpet during the past 12 months and the 3 outcomes (adjusted ORs from 1.39 to 1.84), although for asthma, the association was not statistically significant. The effect estimates for the past 12 months were greater than those for earlier installation. The adjusted odds ratios for new wall covering during the past 12 months (from 1.20 to 1.25) and earlier (from 1.12 to 1.22) were lower. The odds ratios for recent painting were elevated for current wheezing and allergy. The odds ratios for new particleboard were substantially elevated for all the studied relations except for recent installation of particleboard and the risk of current asthma. The adjusted odds ratios for current asthma (1.33; 95% CI=0.57, 3.06), current wheezing (1.32; 95% CI=0.99, 1.77), and any allergy (1.43; 95% CI=1.16, 1.75) were increased in relation to new furniture during the past 12 months but weaker in relation to new furniture installed earlier.

DISCUSSION

Consistent with our hypothesis, the risks of current asthma and wheezing and allergic diseases were related to installation of materials with potential chemical emissions.

Two previous studies provided evidence of the role of polyvinyl chlorides and other plastic surface materials.[1,2] We asked about installation of linoleum flooring to identify polyvinyl chloride materials. In line with the Norwegian study, the risks of asthma and wheezing in the current study were related to installation of linoleum floors. Linoleum in colloquial Russian represents a large heterogeneous group of synthetic floor materials with an unknown proportion of polyvinyl chlorides; therefore, the exposure parameter was rather nonspecific.

Substantial evidence indicates that in the working-age population (13–65 y), painters have an increased risk for developing asthma and asthma-related and other respiratory symptoms.[7–9] Paints used in home renovation are likely to emit similar chemical substances as the paints used by professional painters, although exposure levels in occupational settings are much higher than in the home environments after renovation. In the homes, the exposure levels are the highest during and shortly after painting, but low levels of exposure may remain for several months. Wooden furniture and also painted or varnished and new furniture are likely to emit chemical substances. Also, synthetic carpets, furniture, painting, and wall covering used as exposure indicators constitute a heterogeneous group of potential emitting materials.

The current findings warrant further attention to the type of materials used in interior design. ■

About the Authors

Jouni J.K. Jaakkola is with the Institute of Occupational Health, The University of Birmingham, Edgbaston, Birmingham, UK, and the Department of Public Health, University of Helsinki, Helsinki, Finland. Helen Parise is with the Department of Mathematics and Statistics, Boston University, Boston, Mass. Victor Kislitsin and Natalia I. Lebedeva are with the Center for the Preparation and Implementation of International Technical Assistance Projects, Moscow, Russian Federation. John D. Spengler is

TABLE 2—Adjusted Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for Current Asthma, Current Wheezing, and Presence of Any Allergy According to Recent Installation of Surface Materials and Furniture

	Current Asthma		Current Wheezing		Any Allergy	
	Crude OR	Adjusted OR[a] (95% CI)	Crude OR	Adjusted OR[a] (95% CI)	Crude OR	Adjusted OR[a] (95% CI)
New linoleum flooring						
No	1.00	1.00	1.00	1.00	1.00	1.00
Yes, past 12 mo	1.44	1.13 (0.44, 2.04)	1.36	1.36 (1.00, 1.86)	1.47	1.31 (1.05, 1.65)
Yes, earlier	1.64	1.39 (0.69, 2.77)	1.31	1.25 (0.99, 1.59)	1.41	1.22 (1.04, 1.45)
New synthetic carpet						
No	1.00	1.00	1.00	1.00	1.00	1.00
Yes, past 12 mo	2.70	1.84 (0.73, 4.65)	1.81	1.70 (1.21, 2.40)	1.56	1.39 (1.07, 1.80)
Yes, earlier	1.60	1.26 (0.58, 2.72)	1.29	1.24 (0.96, 1.61)	1.44	1.22 (1.02, 1.46)
New wall covering						
No	1.00	1.00	1.00	1.00	1.00	1.00
Yes, past 12 mo	1.60	1.25 (0.63, 2.51)	1.28	1.20 (0.95, 1.52)	1.40	1.25 (1.06, 1.48)
Yes, earlier	1.61	1.22 (0.62, 2.43)	1.19	1.12 (0.88, 1.41)	1.32	1.16 (0.99, 1.37
Recent painting						
No	1.00	1.00	1.00	1.00	1.00	1.00
Yes, past 12 mo	1.45	1.09 (0.53, 2.22)	1.34	1.25 (0.99, 1.58)	1.40	1.25 (1.05, 1.47)
Yes, earlier	1.58	1.29 (0.65, 2.53)	1.19	1.11 (0.88, 1.40)	1.29	1.16 (0.99, 1.37)
New particleboard						
No	1.00	1.00	1.00	1.00	1.00	1.00
Yes, past 12 mo	1.10	0.60 (0.13, 2.77)	1.44	1.33 (0.89, 2.00)	1.72	1.49 (1.12, 2.00)
Yes, earlier	1.78	1.38 (0.65, 2.94)	1.50	1.39 (1.07, 1.80)	1.48	1.28 (1.07, 1.54)
New furniture						
No	1.00	1.00	1.00	1.00	1.00	1.00
Yes, past 12 mo	1.65	1.33 (0.57, 3.06)	1.32	1.32 (0.99, 1.77)	1.59	1.43 (1.16, 1.75)
Yes, earlier	1.57	1.27 (0.64, 2.51)	1.22	1.16 (0.92, 1.47)	1.39	1.24 (1.05, 1.46)

[a]From logistic regression, adjusted for age, gender, preterm birth, low birthweight, parental atopy, maternal smoking during pregnancy, exposure to environmental tobacco smoke at home (at ages 0–1 years, ages 2–6 years, and currently), and mother's and father's education.

with the Environmental Science and Engineering Program, Harvard School of Public Health, Boston, Mass.

Requests for reprints should be sent to Jouni J.K. Jaakkola, MD, DSc, PhD, Institute of Occupational Health, The University of Birmingham, Edgbaston, Birmingham B15 2TT, United Kingdom (e-mail: j.jaakkola@bham.ac.uk).

This brief was accepted April 8, 2003.

Contributors

J.J.K. Jaakkola conceived the hypothesis, participated in the planning of the study and statistical analyses and in the interpretation of the results, and wrote the brief. H. Parise conducted the statistical analyses and contributed to the interpretation of the results. V. Kislitsin and N.I. Lebedeva participated in the planning of the study and contributed to the writing of the brief. J.D. Spengler participated in planning of the study and statistical analyses and in the interpretation of the results and provided input on the writing of the brief.

Acknowledgments

This study was supported by a World Bank loan to the Russian Federation and administered under the Environmental Epidemiology Component, the Center for Preparation and Implementation of International Technical Assistance Projects.

We are indebted to our colleagues in the Ural Region Environmental Epidemiology Center who, under the direction of Dr Sergey Kuzmin, conducted a successful comprehensive study of air pollution and children's health in 9 Russian cities.

Human Participant Protection

Parents were informed that participation was voluntary. Questionnaires were completed by parents and returned in sealed envelopes. No personal identifiers were used in our data files and all questionnaires have been destroyed. Data were not collected from children.

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