



December 20, 2005

TLV Committee
Attention: Ms. Jean A. Staubach
Science Coordinator
ACGIH
1330 Kemper Meadow Drive
Cincinnati, OH 45240-2020

Re: Significant New Dose-Response Study on Wood Dust

Dear Members of the TLV Committee:

We are pleased to report that Tulane University has completed its six-year study examining the respiratory health of workers in the wood processing industry. The study collected dust measurements (including contemporaneous measurements of inhalable, extrathoracic, tracheobronchial and respirable size fractions), and conducted serial pulmonary function testing on workers. We enclose a copy of the study report.

As we have previously reported, this major research was sponsored by the Inter-Industry Wood Dust Coordinating Committee (IWDC) in order to provide dose-response data from which an exposure limit could be scientifically derived. We summarize below key features of the study's methods and dust measurement innovations, and the findings that are highly relevant for establishing a scientifically sound TLV for wood dust. We therefore urge ACGIH to revise the current TLV for wood dust, which is currently "under study", using the data from the Tulane study.

Study Design Features

The study was the largest, and to our knowledge the only longitudinal study examining the pulmonary health of workers in the wood processing industry.

- The cohort included 3,140 participants from 10 facilities (4 furniture plants, 3 facilities producing cabinets or cabinet parts, 1 milled product facility producing architectural moldings and similar products, 1 plywood facility, and 1 integrated sawmill-planer-plywood facility).
- The study's 10 plants provide a set of diverse operations with a range of dust levels for examination of dose-response relations. The plants were selected after a feasibility survey of 480 facilities, because these 10 facilities had complete historical records for current employees (start and stop dates and work areas) and had sufficient numbers of

workers in areas associated with both hardwood and softwood dust exposures to provide an adequate number of participants for the study.

- This is the first health study of wood workers to employ the Respicon sampler, which provides simultaneous measurements of three particle size fractions – respirable, tracheobronchial and extrathoracic (the sum of these three size fractions equals inhalable dust). Tulane’s validation of the Respicon for dust measurements in the wood processing industry has been published.¹
- This is the first health study of wood workers to quantitate wood solids content of gravimetric dust samples. A new analytical technique using fourier-transform infrared spectroscopy was developed and published by the Tulane researchers.² The authors thus were able to distinguish between wood dust and other dust present in the workplace, and to conduct separate dose-response analyses by wood solids content, and by the residual (i.e. non-wood) particulate matter.
- Over the 6-year study, the Tulane team collected 3,488 sets of samples (over 10,000 individual filters) for particulate analysis. After subtracting blanks, area samples, and samples with collection problems, almost 2,400 personal dust samples were available for the exposure assessment.
- Over the 6-year study, the Tulane team collected over 10,130 spirometric tests on exposed workers.
- Over 1,100 workers participated in at least three spirometric tests over a minimum of 2.5 years and thus were included in the longitudinal analysis.
- Tulane developed a comprehensive job-exposure matrix for use in dose-response analysis.
- Tulane performed multiple regression analysis, controlling for age, baseline pulmonary function, sex, percent of body-weight change over participant’s study duration, smoking amount, wood type (green vs dry and hard vs soft) and other potential exposures.

Summary Findings

A. Exposure Assessment.

- Geometric mean values of personal inhalable dust samples ranged from 0.82 mg/m³ to 2.51 mg/m³ across the 10 plants, with geometric standard deviations ranging from 2.1 to 2.8.
- For respirable dust, geometric means ranged from 0.10 mg/m³ to 0.23 mg/m³ with geometric standard deviations in the range 2.0 to 3.5.

¹ Rando R, Poovey H, Mokadam D, Brisolara J, Glindmeyer H: Field performance of the Respicon for size-selective sampling of industrial wood processing dust. *J. Occup. Environ. Hyg* 2005; 2:219-226.

² Rando R, RJ, Gibson, RA, Kwon, C-W, Poovey, HG, and Glindmeyer, HW, On-filter determination of collected wood dust by diffuse reflectance infrared Fourier-transform spectroscopy (DRIFTS). *J. Environ. Monit.* 2005, 7, 675-680 (2005).

- The wood solids content of dust samples varied, with an average of 5-70% wood solids present in the inhalable dust depending on the plant. (The plywood facility had only 5.5% wood solids, and the sawmill-planing-plywood facility only 8.2% wood solids, present in the inhalable particulates. The average for the other 8 facilities was about 50% wood solids in the inhalable particulates.)

The following table presents the inhalable dust results of 2,363 personal samples from the 10 facilities:

Personal Dust Monitoring Results from 10 Plants
(from Table 5A of Tulane report)

Plant Type	N	Inhalable Dust (mg/m ³)	
		Geometric Mean	Geom. Std. Dev.
Furniture	271	1.96	2.7
Furniture	198	2.10	2.4
Furniture	220	1.32	2.8
Furniture	288	1.86	2.3
Cabinet	290	1.61	2.4
Cabinet	244	2.51	2.3
Cabinet	205	1.23	2.1
Plywood	254	0.77	2.2
Milling	180	1.07	2.3
Saw-Plan-Ply	213	.82	2.2
Overall	2,363	1.45	2.7

B. Exposure-Response Analysis

- **Exposure-response analysis showed no statistically significant adverse respiratory effects to any wood solids fraction. This is a main finding for consideration of a revised TLV for wood dust.**
- The only statistically significant effects were associated with the respirable residual (non-wood) particulate matter in the milling and in the sawmill-planing-plywood facilities.³

³ At the single sawmill-planing-plywood facility in the study, the researchers hypothesize that the reported pulmonary function decline may be associated with airborne fungi or bacteria. Effects reported at the single millwork facility are suspected to be the result of a masked smoking effect due to possible under reporting of smoking at this facility following a change in health insurance premiums for smokers.

Relevance of Findings for Modifying the TLV for Wood Dust

The results of the Tulane study provide important new information to be considered in setting a more scientifically-based TLV for wood dust. As noted by the authors, the study addresses limitations in the scope and design of previous studies, many of which have included small populations, single process exposures, variable and often sparse environment sampling, diverse response variables (sometimes only symptoms), external controls of questionable comparability, and inadequate assessment of lung function involving little or no follow-up.

Indeed, since beginning its reconsideration of the TLVs for wood dust in the mid 1990s, ACGIH has appeared to struggle with interpretation of the available data. In progressing from its initial proposed revision of 5 mg/m³ inhalable, then to a proposed value of 2mg/m³ inhalable, and lastly to 1 mg/m³ inhalable without significant new data justifying the changes, ACGIH's information base would seem to benefit significantly from this new study. The new data from Tulane present the opportunity to develop a standard based on a large, scientifically rigorous human study designed specifically to provide dose-response data related to respiratory health, including corresponding data for inhalable dust.

We therefore urge ACGIH to seriously consider this new information and revise its TLV for wood dust as the Tulane study clearly demonstrates the lack of lung function changes from wood dust exposure over the range of exposures encountered in this study. Furthermore, ACGIH should also evaluate the Tulane study with respect to size-selection method currently indicated by the inhalable dust TLV as the Tulane data does not support pulmonary effects from inhalable wood dust exposure.

We appreciate that ACGIH has appropriately maintained wood dust on its "Under Study" list due to ongoing scientific and measurement issues, leaving the door open for consideration of this important new data. If the TLV Committee would like to speak with the researchers, we would be happy to arrange for them to present their results directly to the Committee.

The IWDC looks forward to future opportunities to provide scientific input and comment on the TLV for wood dust.

Please feel free to contact me if you have any questions.

Sincerely,



John L. Festa, Ph.D.
Senior Scientist
Secretary, IWDC

Enclosure