

**Clinical evaluations of patients with
(toxigenic) fungal exposure –
what are the research deficits**

**Eckardt Johanning, M.D., M.Sc.
Manfred Gareis, DVM (BAFF-Kulmbach, FRG)
Wayne Gordon (MSMC, New York, USA)
Raymond Luhrman MA
Occupational and Environmental Life Science
Fungal Research Group Foundation, Albany, N.Y.**

**International Workshop
Fungi in Indoor environments;
towards strategies for living in healthy buildings**

Database

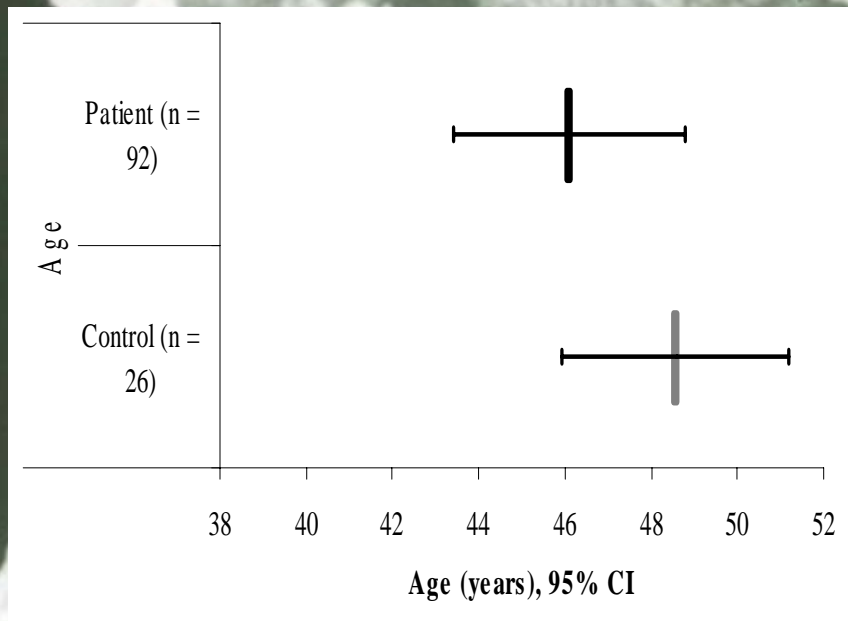
Patients evaluated in occupational and environmental health clinic from **December 1999 to February, 2005**

- * Adult patients (Patients \geq 18 years at time of visit, exposure duration \sim 2y)
- * Advanced environmental testing (including airborne cytotoxicity study MTT)
- * Completed self-administered health questionnaire.

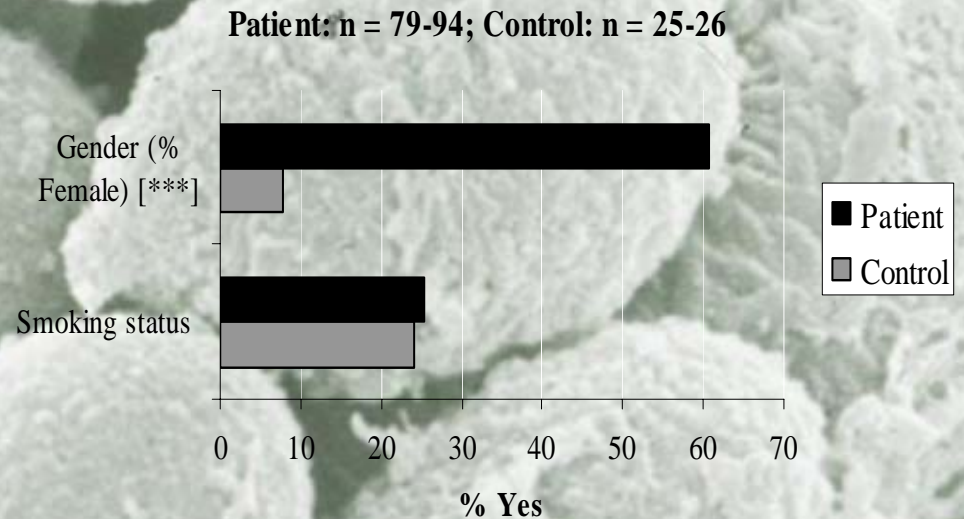
Compared to adult clinic patients (controls) without self-reported exposure to dampness/mold at home or at work.

Description of the database : demographics

Age

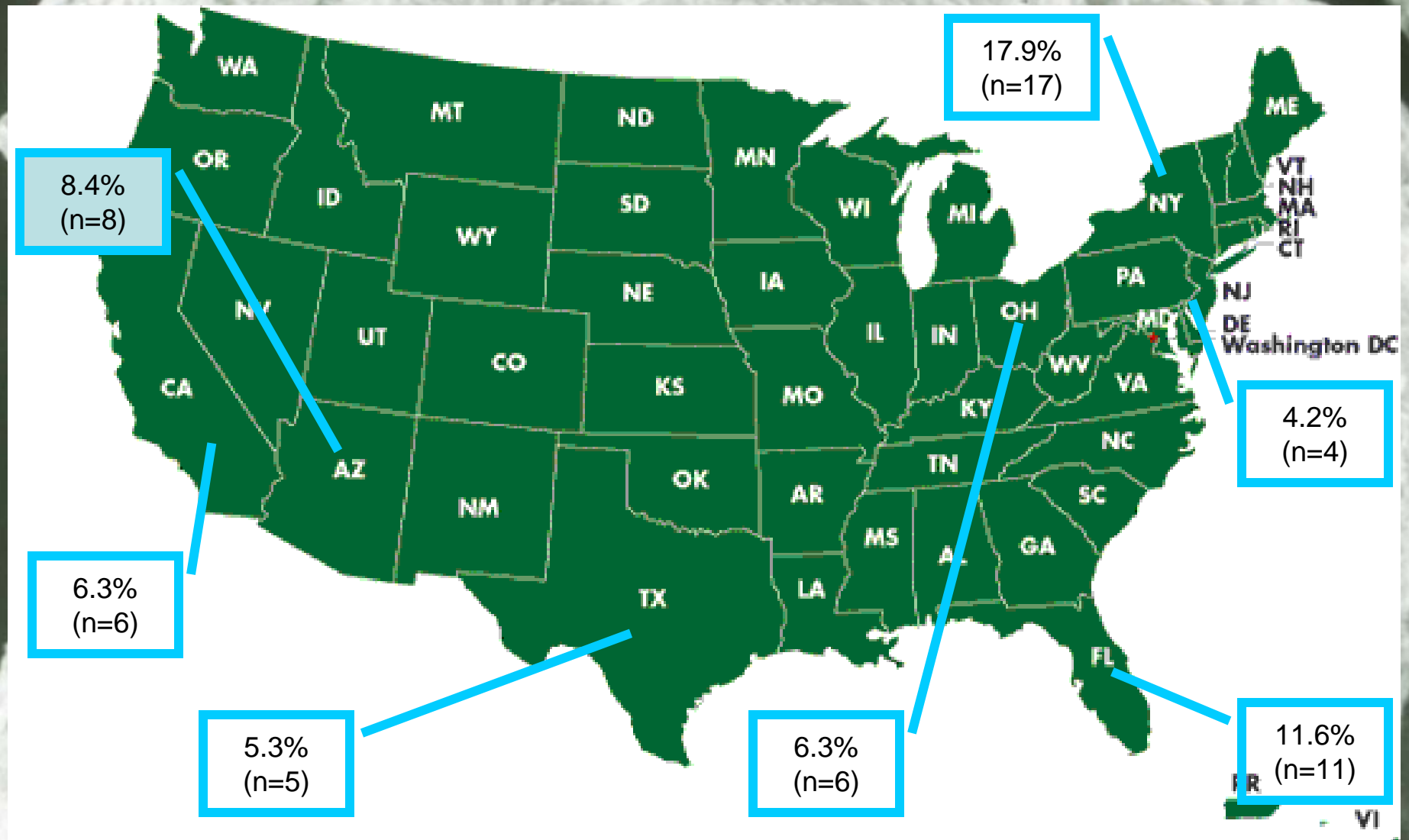


Gender - Smoker

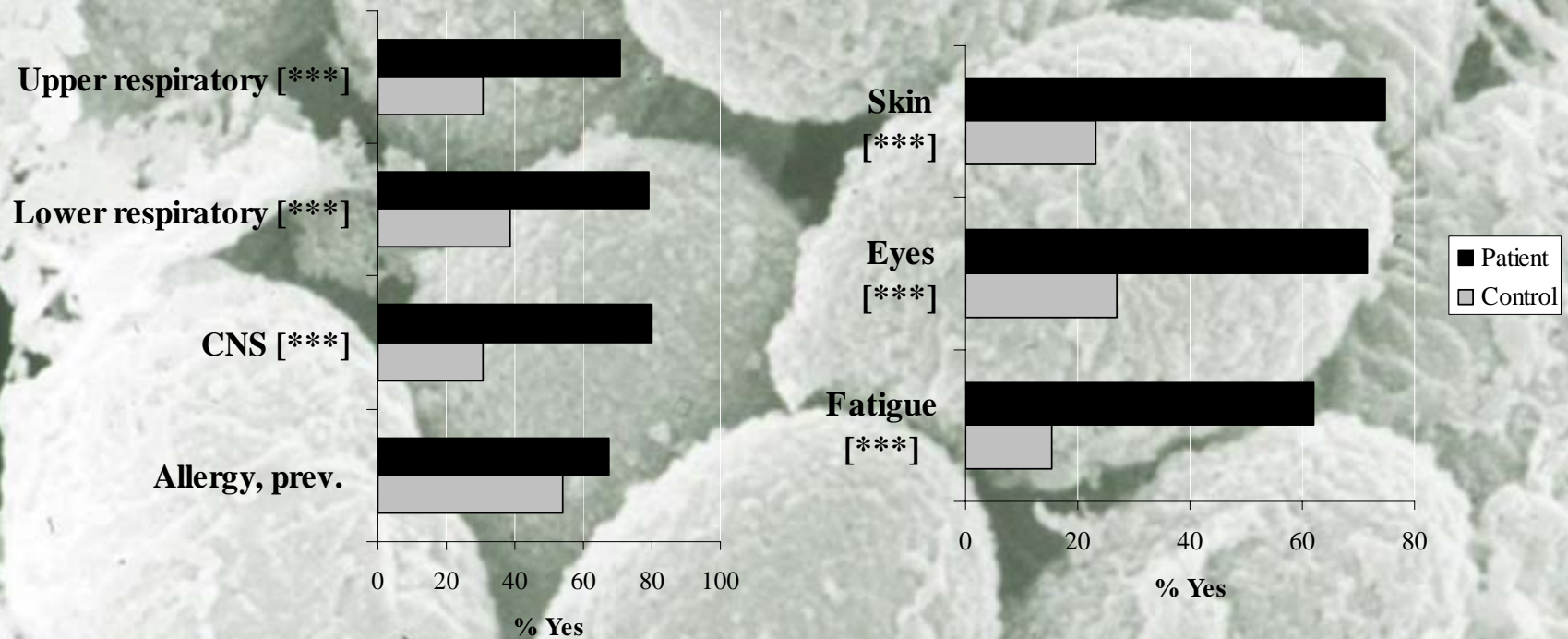


*** = $p < 0.001$

Geographical origin (exposed)



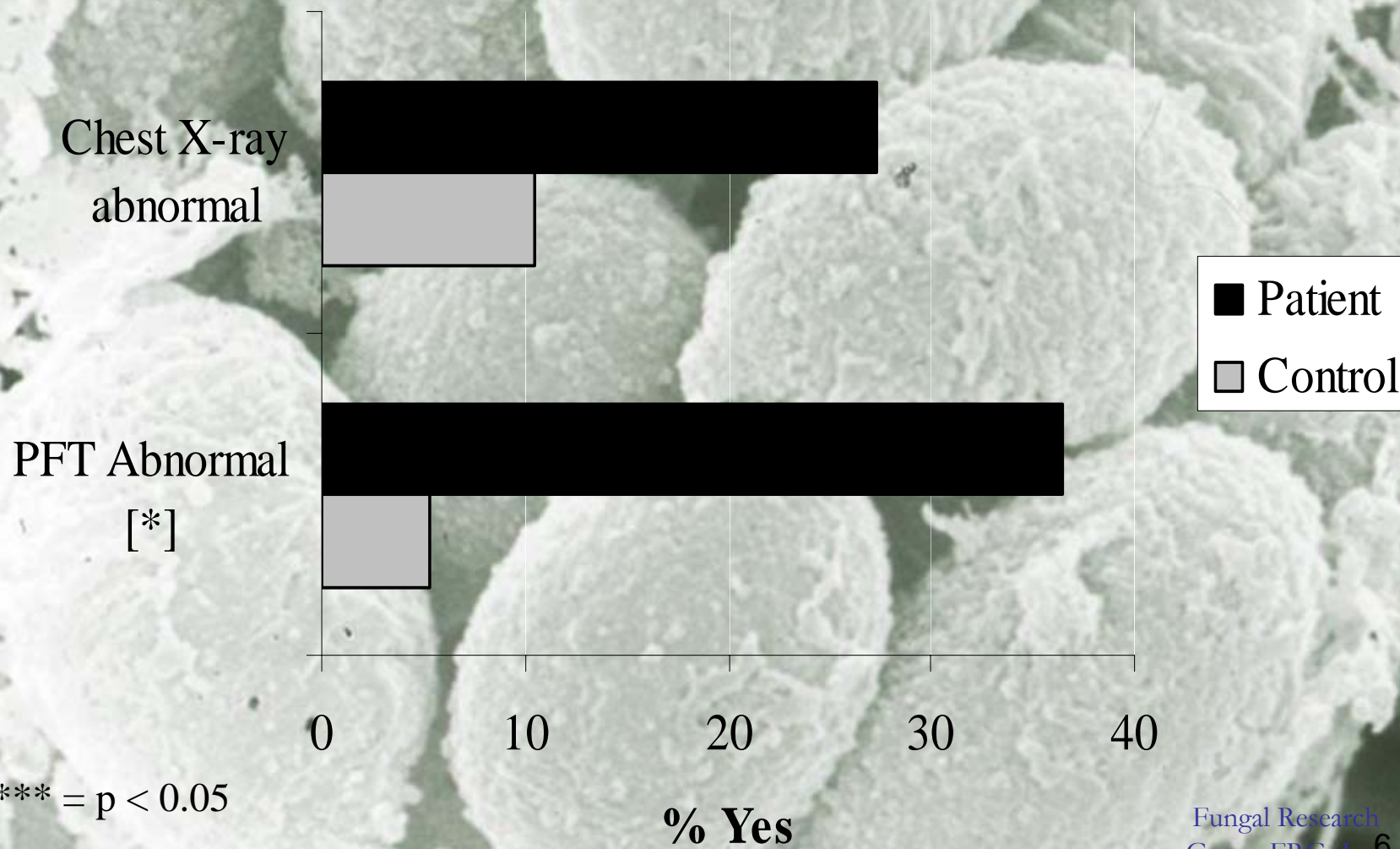
Symptom complex



Patient: n = 95; Control: n = 26

Testing: PFT & Chest X-Ray

Patient: n = 33-55; Control: n = 19

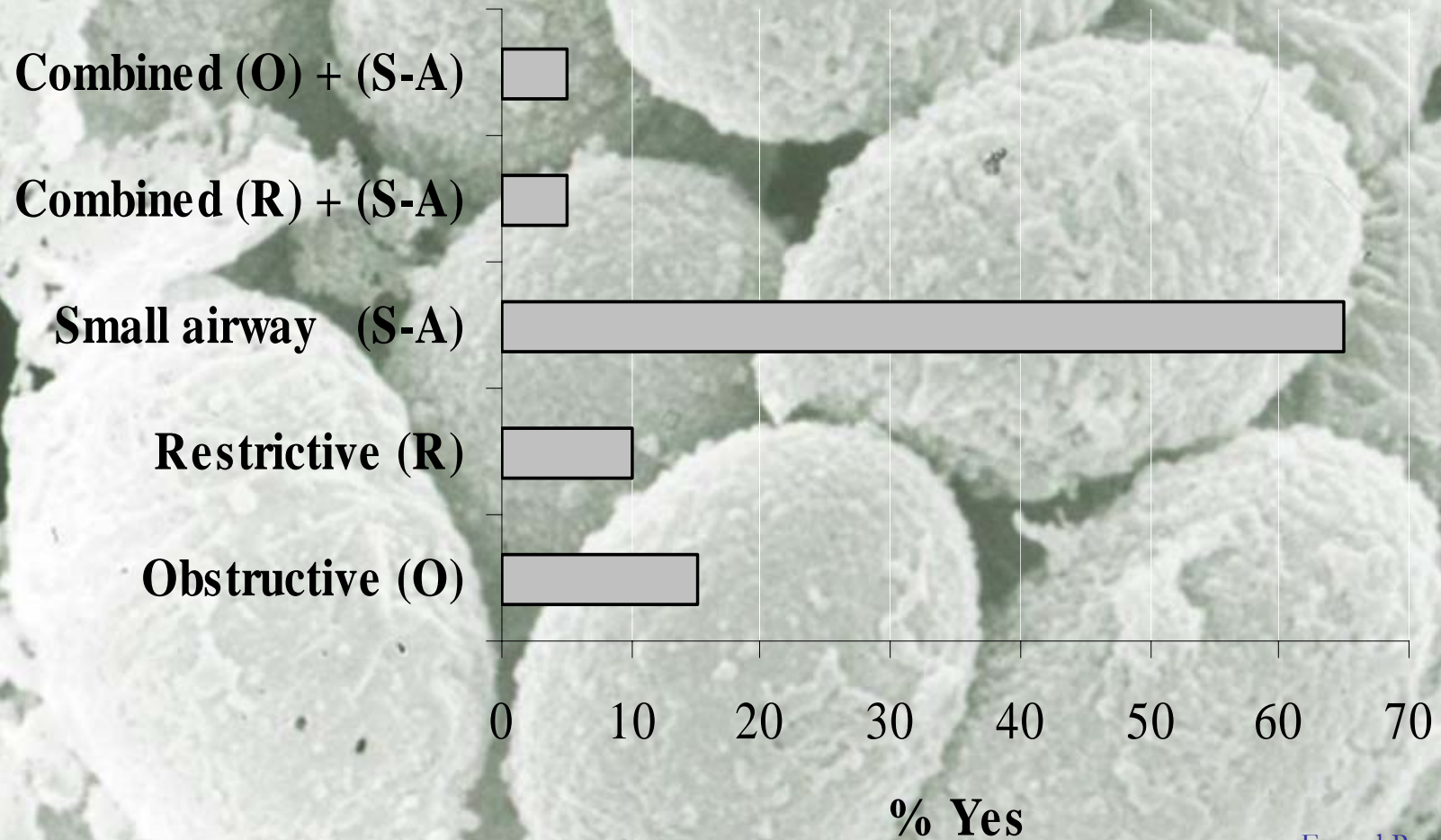


*** = $p < 0.05$

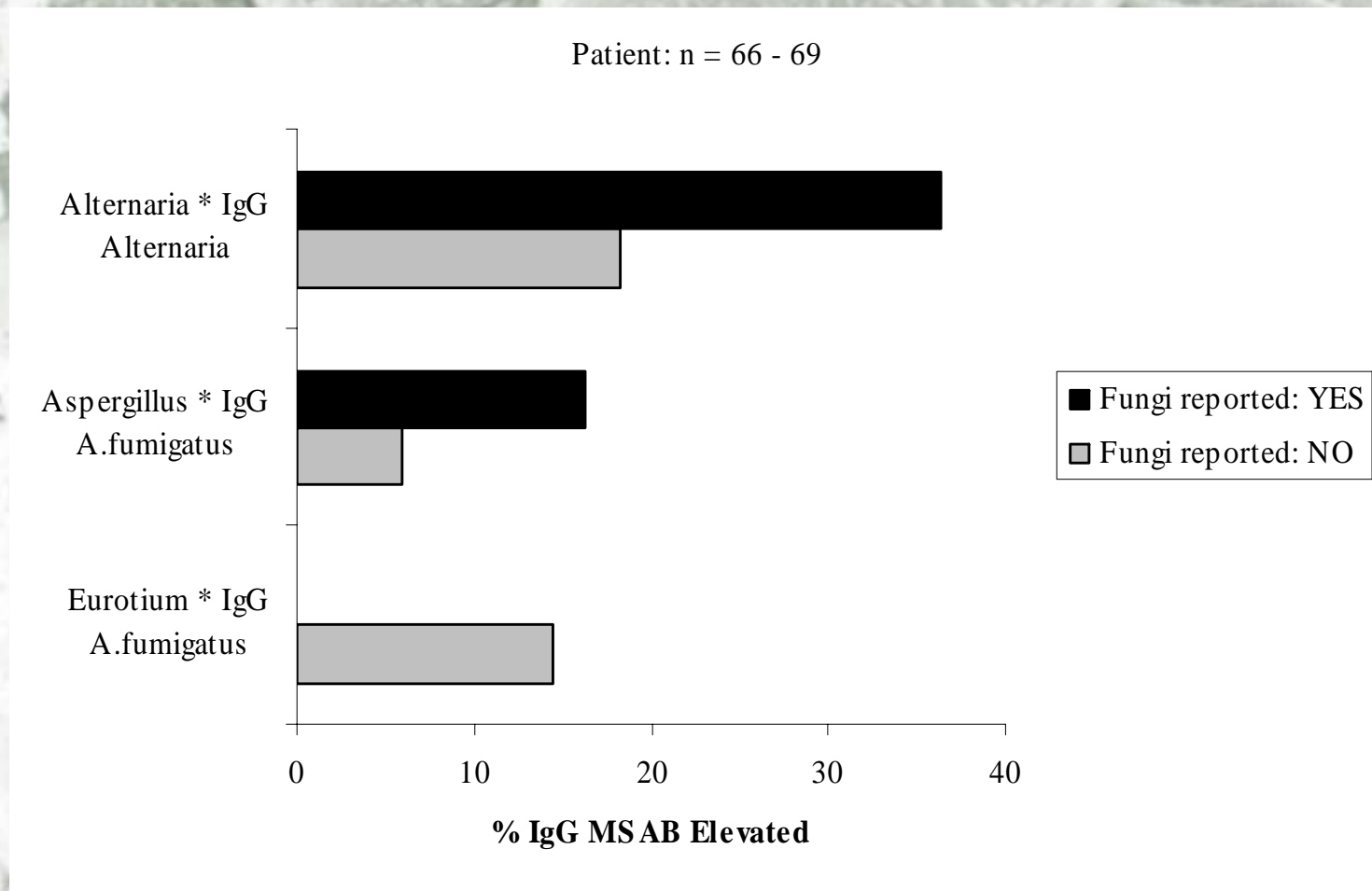
% Yes

Pulmonary function test abnormalities

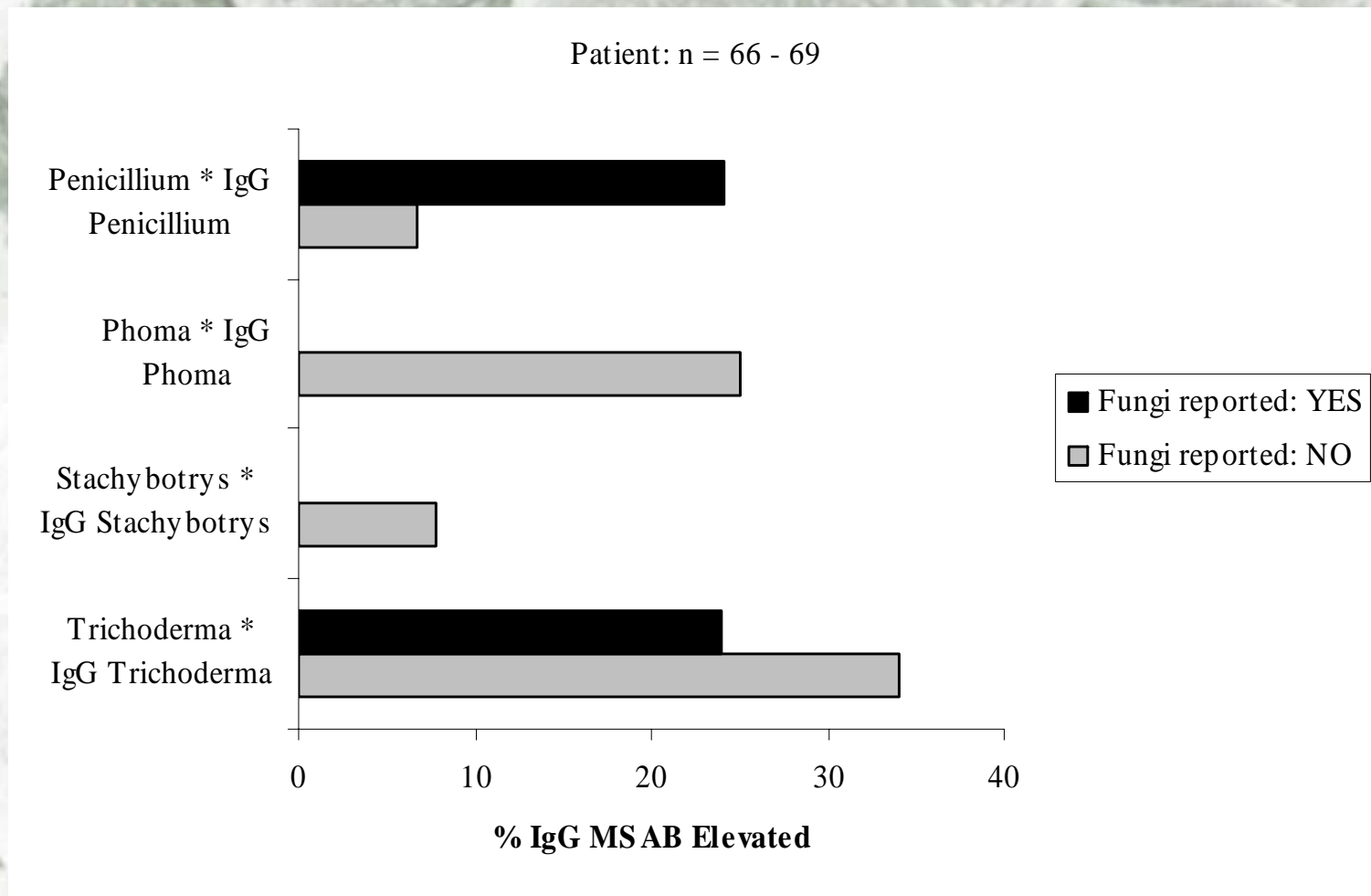
Patient: n = 20



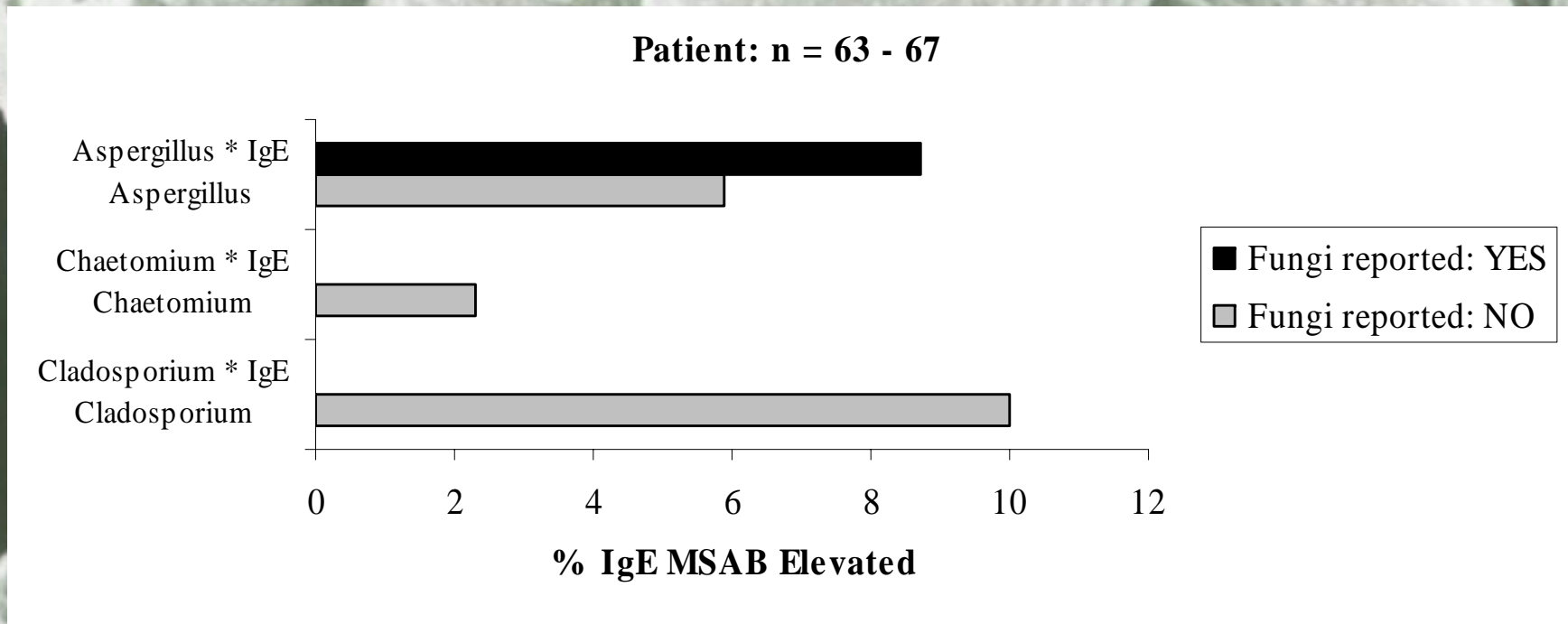
Patient's IgG Antibody response and comparison with environmental sampling identification



Patient's IgG Antibody response and comparison with environmental sampling identification

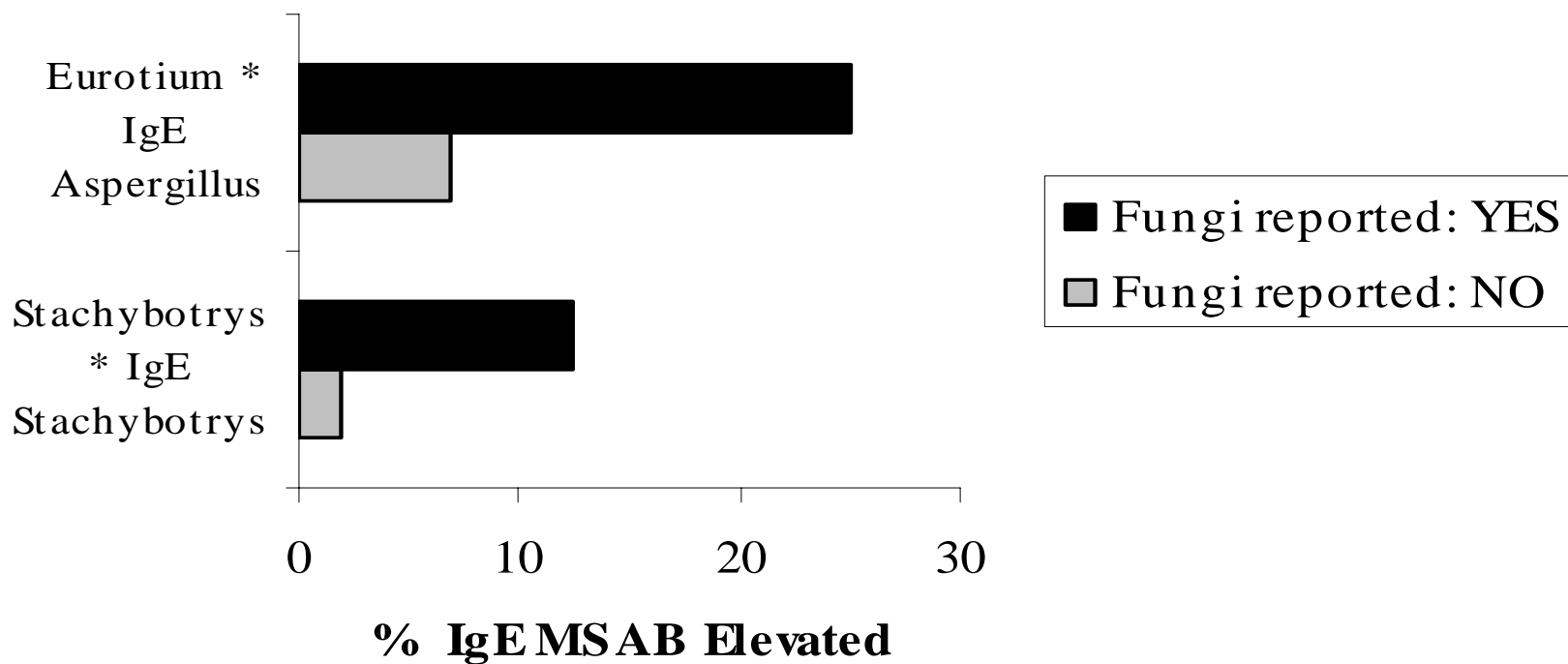


Patient's IgE Antibody response and comparison with environmental sampling identification



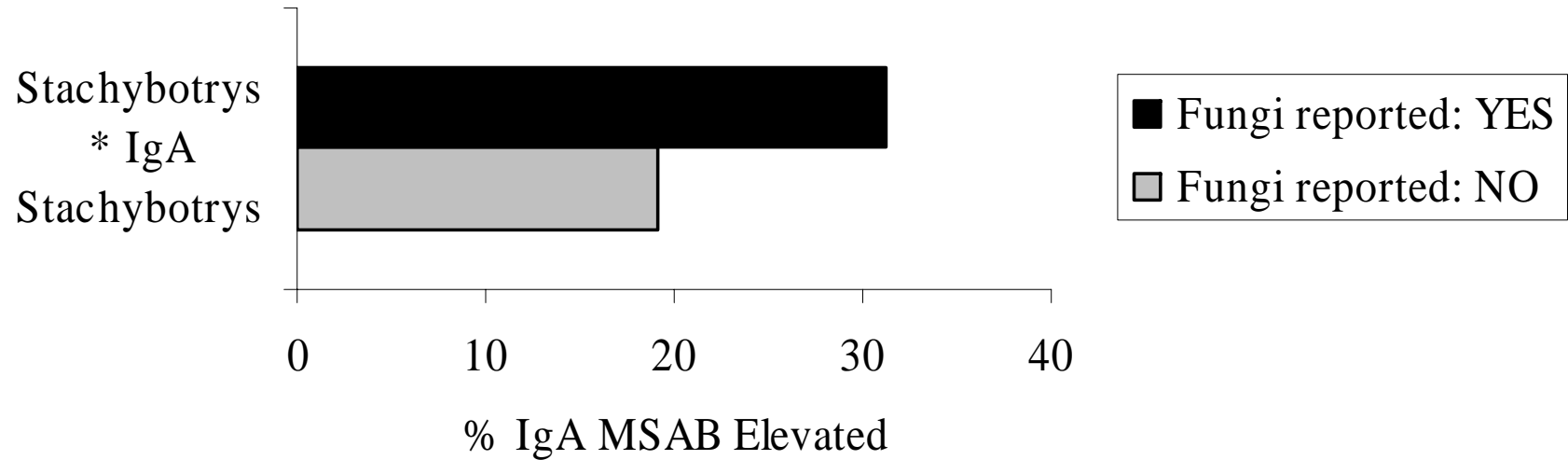
IgE Mold Specific Antibodies & Environmental Exposure

Patient: n = 63 - 67



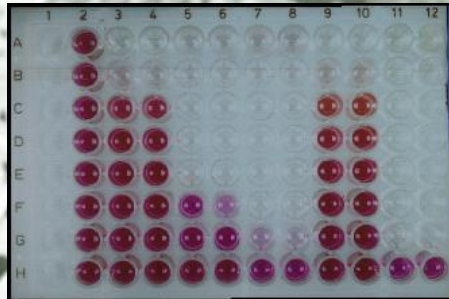
IgA Mold Specific Antibodies & *Stachybotrys chartarum* exposure

Patient: n = 68



Airborne fungal toxicity assessment of patient cases

(M. Gareis, BAFF, Kulmbach)



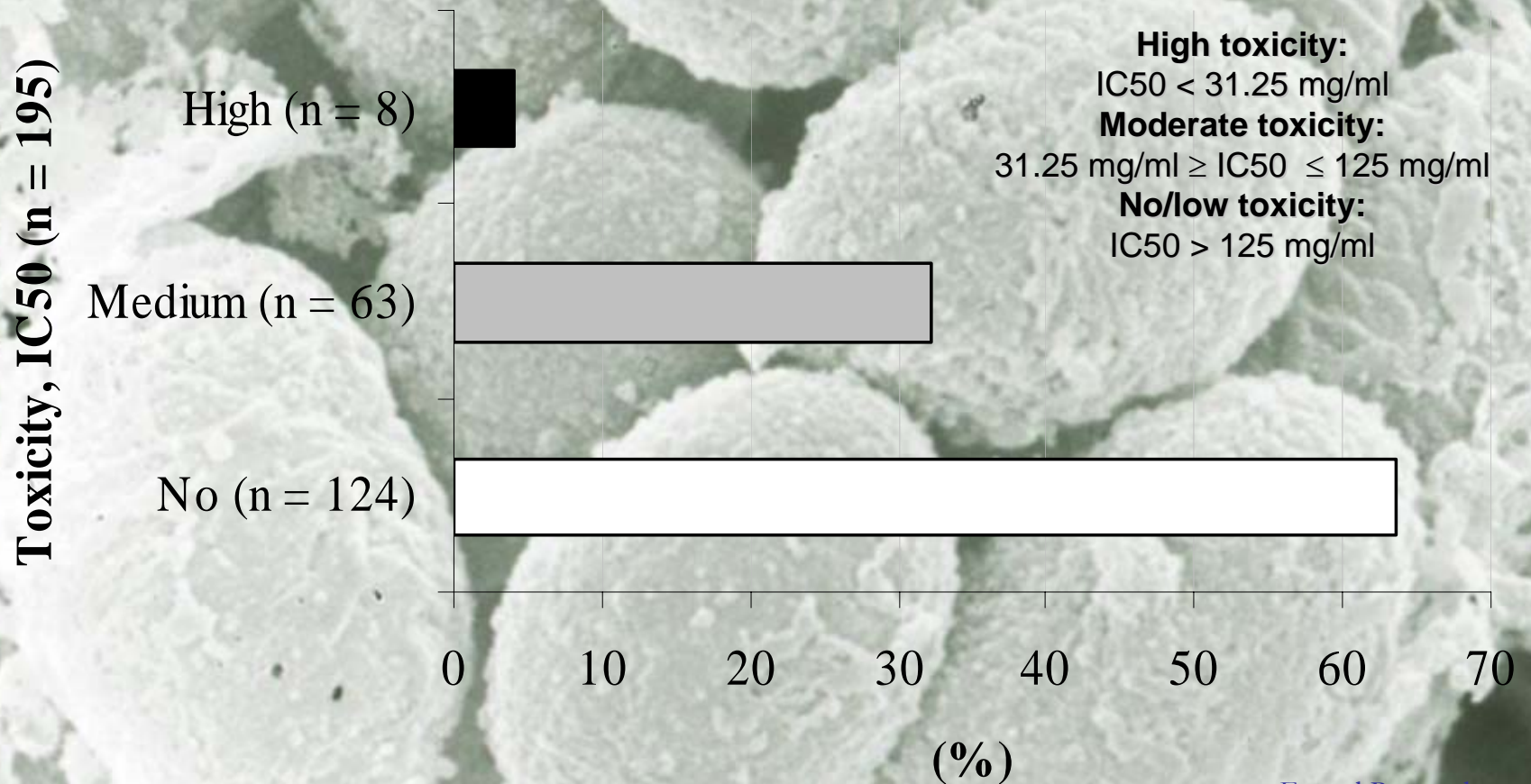
**Sampling period:
1999 – 2004**

**Cases:
79 homes, schools, and
workplaces**

**High Vol. Air samples:
n = 195**



Airborne Toxicity – results of field studies



Fungal toxicity and neurocognitive dysfunction

(W. Gordon, PhD et al)

Applied Neuropsychology
2004, Vol. 11, No. 2, 65-74

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ARTICLES

Cognitive Impairment Associated With Toxigenic Fungal Exposure: A Replication and Extension of Previous Findings

Wayne A. Gordon and Joshua B. Cantor

*Department of Rehabilitation Medicine, Mount Sinai School of Medicine,
New York, New York, USA*

Eckardt Johanning

*Department of Community and Preventative Medicine, Mount Sinai School of Medicine,
New York, New York, USA*

**Heather J. Charatz, Teresa A. Ashman, Janis L. Breeze, Lisa Haddad, and Steven
Abramowitz**

*Department of Rehabilitation Medicine, Mount Sinai School of Medicine,
New York, New York, USA*

- 22 neurocognitive cases selected that included indoor air toxicity assessments

Brain Injury Screening Questionnaire (BISQ) Results:

Gorden et.al., Applied Neuropsychology 2004, Vol. 11, No.2, 65-74

Table 2. *BISQ Symptom Report: Means and Standard Deviations and Results of ANOVAs Comparing Mean Numbers of BISQ Symptoms Between Groups*

Type of Symptoms	Groups								df	F	p
	Mold ^a		Mild TBI ^b		Moderate TBI ^c		No Disability ^d				
	M	SD	M	SD	M	SD	M	SD			
Physical	6.07	3.73	7.11	4.88	9.12	4.78	1.87	2.67	3	21.74	<.001
Cognitive	18.67	11.06	21.25	14.59	25.65	14.34	2.66	5.47	3	29.48	<.001
Behavioral	8.13	6.82	11.89	8.20	13.00	7.98	4.19	5.76	3	12.84	<.001
All	32.87	19.37	40.25	26.17	47.77	24.65	8.72	12.37	3	25.78	<.001
25 S&S ^b	10.10	6.23	8.72	6.38	11.27	6.85	1.02	2.53	3	25.43	<.001

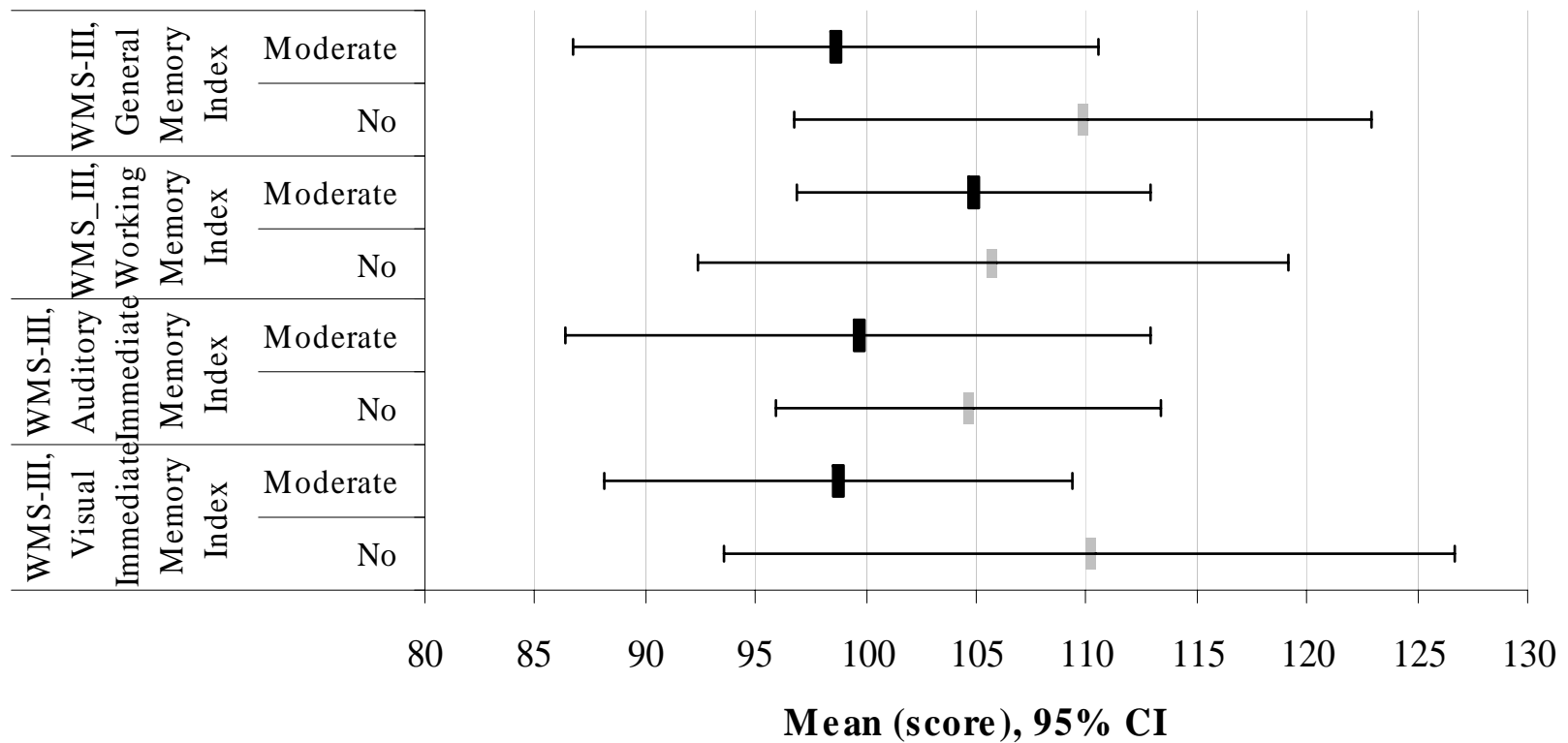
Note. BISQ = Brain Injury Screening Questionnaire; ANOVA = Analyses of Variance; TBI = traumatic brain injury.
^an = 30. ^bn = 65. ^cn = 26. ^dn = 47. ^eS&S = symptoms sensitive and specific to TBI (Gordon et al., 2000).

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Patients with (toxigenic) indoor mold exposure history and traumatic brain injury report similar symptoms and problems

Neurocognitive Testing Results, WMS III, Airborne Toxicity Findings

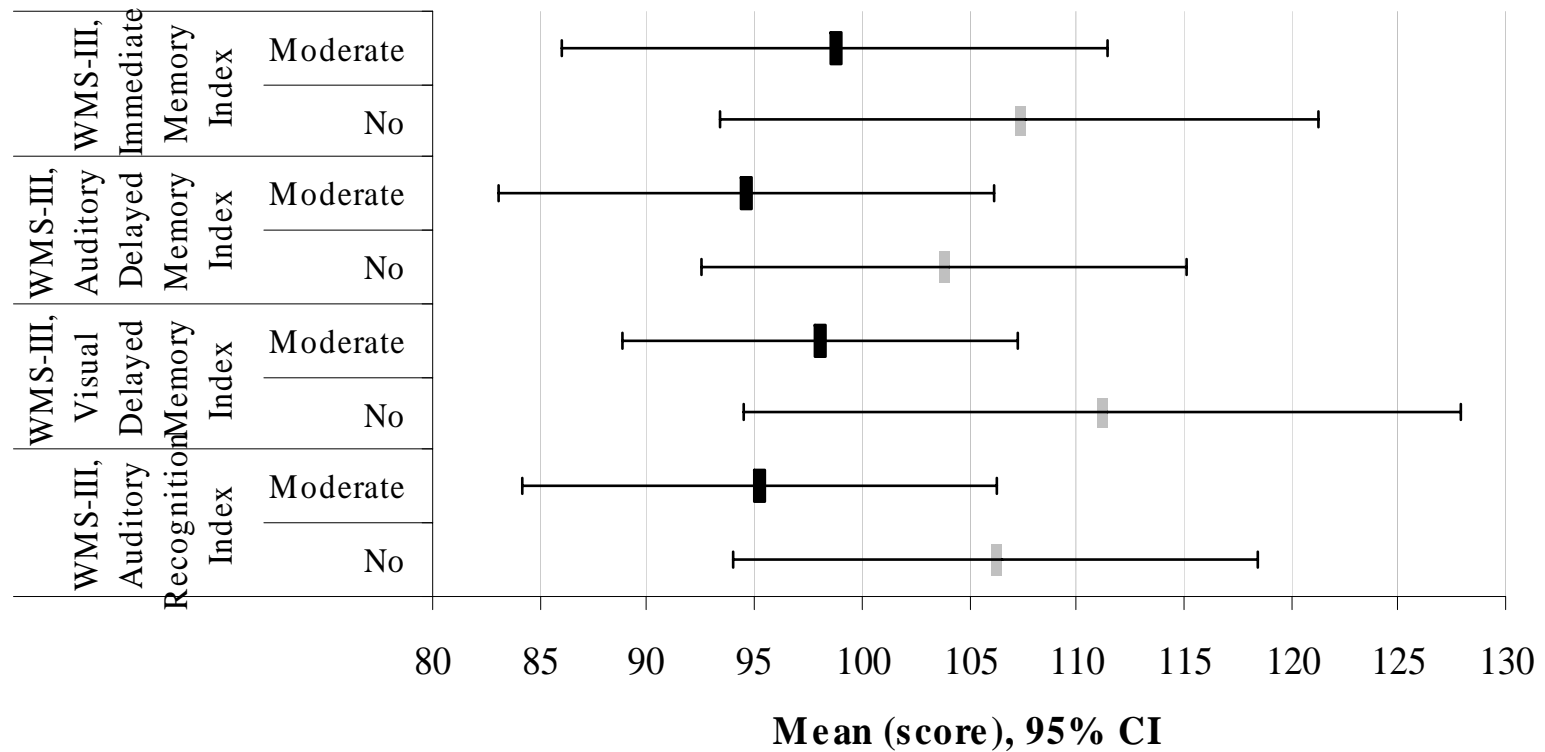
Moderate-high, n = 11; No, n = 8



Of 22 neurocognitive cases selected that included indoor air toxicity assessments

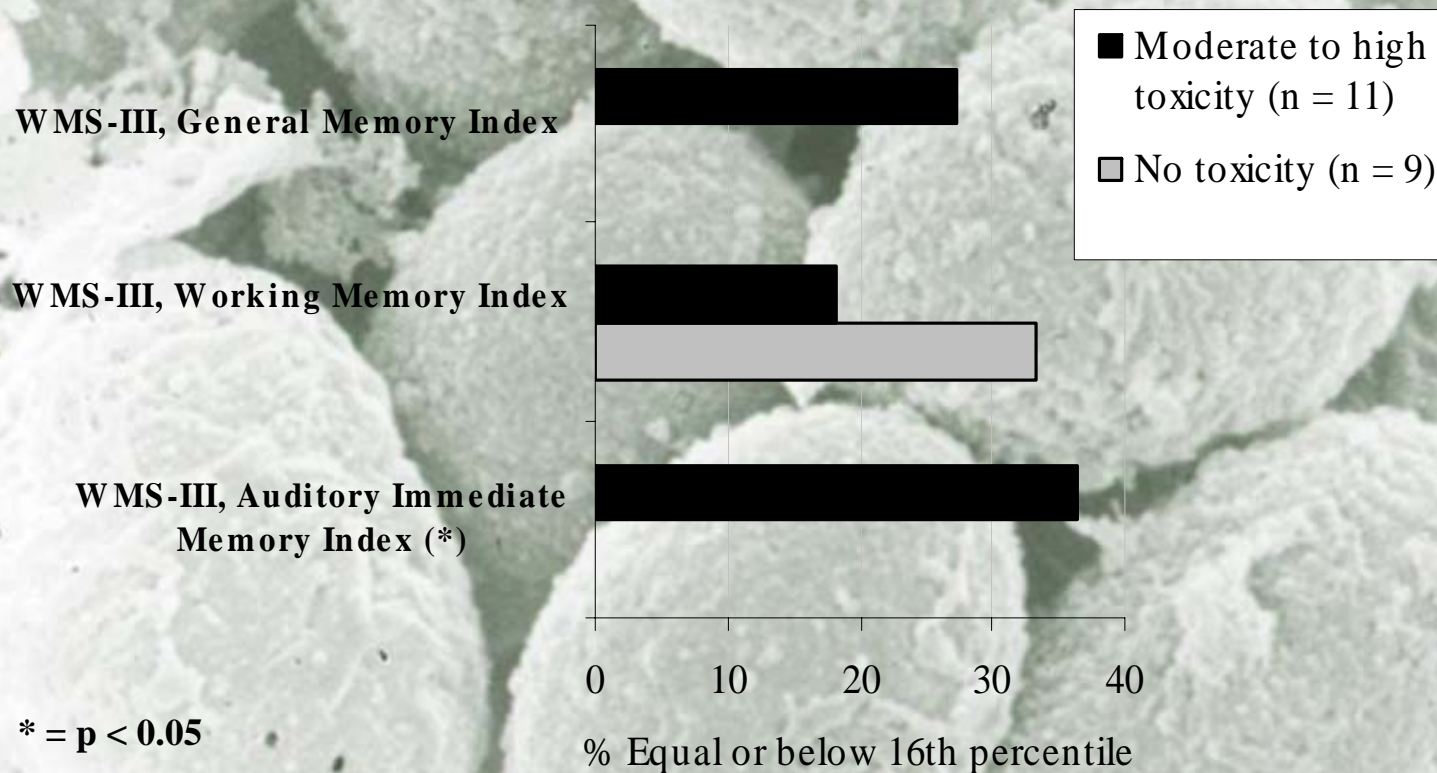
Neurocognitive Testing Results, WMS III, Airborne Toxicity Findings

Moderate-high, n = 11; No, n = 8



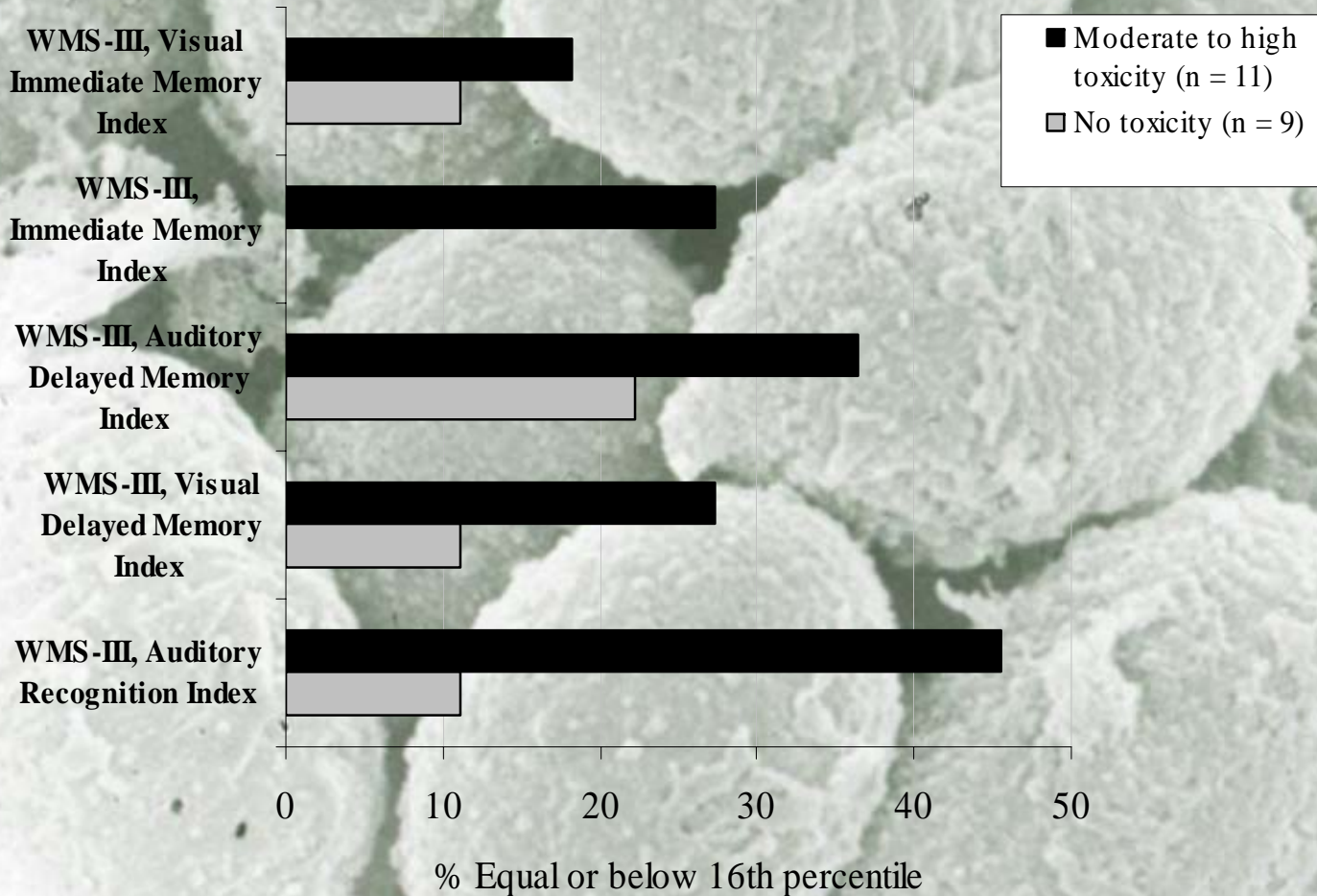
Of 22 neurocognitive cases selected that included indoor air toxicity assessments

Neurocognitive Testing Results, WMS III, Toxicity, % Reduced functioning ($\leq 16^{\text{th}}$ percentile)



Of 22 neurocognitive cases selected that included indoor air toxicity assessments

Neurocognitive Testing Results, WMS III, Toxicity, % Reduced functioning ($\leq 16^{\text{th}}$ percentile)



•22 neurocognitive cases selected that included indoor air toxicity assessments

Conclusions

- Patient IgE and IgG show limited correlation with specific environmental findings (low sensitivity, good specificity)
- Patient show (also) non IgE- or IGG-mediated or associated exposure effects
- New onset of symptoms and abnormalities in non-sensitized patients (new onset Dx)

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Conclusions

- Cognitive impairment symptoms similar to patients with traumatic brain injury (TBI)
- Airborne (fungal) toxicity appear to be correlated with some neurocognitive dysfunction (limited data set)
- Improved, specific exposure data necessary to improve environmental/occupational diagnosis
- Mycotoxin body burden indicator needed to validate study findings

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