U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
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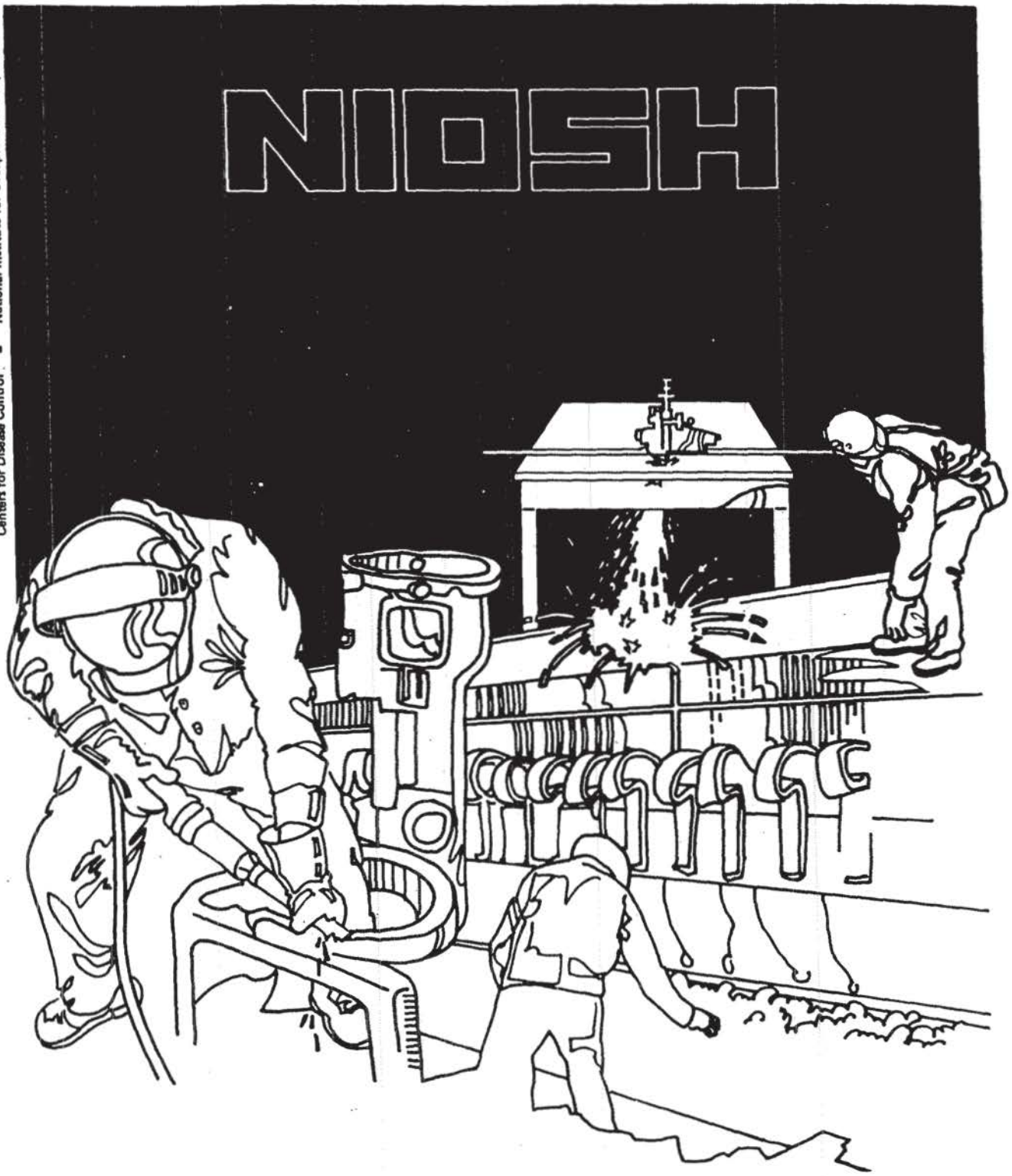
NIOSH



Health Hazard Evaluation Report

HETA 82-002-1312
METABOLISM AND RADIATION
RESEARCH LABORATORY (MRRL)
FARGO, NORTH DAKOTA

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 82-002-1312
MAY 1983
METABOLISM AND RADIATION RESEARCH
LABORATORY (MRRL)
FARGO, NORTH DAKOTA

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I. SUMMARY

In September 1981, a survey of employees at the USDA Metabolism and Radiation Research Laboratory (MRRL) was conducted using mailed self-administered questionnaires. Follow-up medical interviews and an industrial hygiene survey were conducted from November 2 to November 5 at the MRRL. The purpose of this evaluation was to evaluate the causes and prevalence of occupational allergies at this research facility where insects are raised under controlled conditions for entomological research.

Fifteen of 80 (19%) employees reported by questionnaire that they experienced some type of allergy related to insect exposure at work. The most prevalent symptoms included eye irritation (87%), sneezing or running nose (47%), chest tightness (47%), and skin irritation or skin rash (47%). Medical records were reviewed in detail for nine employees who had seen local physicians for evaluation of occupationally related health problems.

There are no established industrial hygiene methods and standards to guide evaluation of airborne material in insect rearing facilities, but an attempt was made to begin to characterize the work place exposures of insectary employees using a variety of industrial hygiene sampling methods.

On the basis of this evaluation, NIOSH has determined that some employees at the MRRL report having experienced symptoms consistent with occupational allergy related to exposures inherent to working with insects. Recommendations for reducing exposures to allergenic particulates at this arthropod research facility and for medical surveillance of the workers are contained in the report.

Key Words: (SIC 8922 Non-commercial Educational, Scientific, and Research Organizations) laboratories, allergies

II. INTRODUCTION AND BACKGROUND

Under Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), the National Institute for Occupational Safety and Health (NIOSH) has been delegated responsibility for evaluating, upon written request, the potential hazard of any substance in the concentrations normally used or found in the workplace.

In August, 1981, the Division of Respiratory Disease Studies, NIOSH received a request for technical assistance from the United States Department of Agriculture, Science and Education Administration (SEA) to investigate a problem of allergic respiratory symptoms in laboratory workers at the Metabolism and Radiation Research Laboratory (MRRL) in Fargo, North Dakota. A mailed, self-administered questionnaire survey was conducted during September 1981. A follow-up visit by NIOSH investigators was conducted from November 2 to November 5 at the MRRL. Medical records from workers who had seen physicians for their symptoms were reviewed. The purposes of the study were to (1) evaluate the prevalence of occupational allergic complaints at the MRRL; (2) define the types of allergic symptoms experienced by workers at the MRRL; (3) determine whether qualitative or quantitative differences in fungal and/or bacterial contamination of air might be related to occupational allergies; (4) evaluate work practices and current ventilation control measures as they relate to occupational allergies; and (5) develop recommendations regarding medical surveillance of workers at insect rearing facilities.

As an adjunct to the initial request, NIOSH also was asked to evaluate MRRL's program for the control and use of cancer-suspect chemicals. An industrial hygiene study was made of the program and the lab where such chemicals are handled.

MRRL was built in 1964 and now houses about 100 full-time employees including about 35 senior scientists. Several scientists at the MRRL conduct research which requires working with various species of insects. The facility utilizes several insect rearing areas to provide insects for experimentation. In the past, insects were reared throughout MRRL's Building Number 1. In recent years an effort has been made to centralize insect rearing, and it is currently generally, but not entirely, confined to the "Insectary" which consists of Buildings 5 and 6. Building 6 is a recent structure specifically designed for the rearing of insects. The facilities in Building 5 are largely of a temporary nature and should no longer be needed once an additional insect rearing structure, now under construction, is completed. A variety of environmental control measures are utilized where insects are reared or studied. These include engineering controls such as the "room in a room" concept (where several walk-in chambers are isolated in a room), local exhaust ventilation, and high efficiency filtering units, as well as personal protective equipment such as lab coats, gloves, and respirators.

In November 1979 an industrial hygiene and health survey of the MRRL was conducted by an SEA industrial hygienist. Management and employees had both expressed concern that certain workers at the facility had apparently developed allergies to insects or their components. Recommendations for control of airborne particulate matter and for respiratory protection were made. An in-house health survey of laboratory employees was conducted by the MRRL in October 1980 which demonstrated that 40% of 100 employees were experiencing, or had experienced sometime in the past, symptoms which they felt were allergic in nature. At the written request of the American Federation of Government Employees Local 3748, an OSHA inspection was made from January 19-23, 1981 and from March 3-4, 1981. As a result of this inspection a "Notice of Unsafe or Unhealthy Working Conditions" was issued in June 1981 (see Appendix A).

III. METHODS AND MATERIALS

Environmental

Environmental evaluation methods consisted of interviews with employees, observance of work practices, qualitative testing of local exhaust ventilation with smoke tubes, and limited air and surface sampling. Air sampling consisted of both viable and nonviable sampling.

Nonviable samples included impinger samples and Marple cascade impactor samples for microscopic examination, and Andersen cascade impactor samples for particle sizing. Viable samples included swab samples of surfaces, Andersen cascade impactor samples, and settling plates containing culture media held within the air handling system perpendicular to the air flow. All viable samples were collected on Tryptocase Soy Agar (TSA) and/or Rose Bengal-Streptomycin (RBS), and incubated for four to five days at 30 ^{o}C before the number of colonies on each plate was counted. A limited effort was made to identify the genus of predominant microbes.

To evaluate the handling of cancer-suspect chemicals, Room 173, where cancer-suspect chemicals are stored and dispensed, was inspected, ventilation readings were taken, and procedures were reviewed. A USDA-SEA draft manual entitled "Detailed Requirements for the Laboratory Use of Chemical Substances of Potential Carcinogenic Risk" was reviewed.

Medical

A medical evaluation of current workers at the MRRL consisted of a self administered health questionnaire given to all employees and a review of all outside medical records supplied by symptomatic individuals.

In September 1981, a medical questionnaire (Appendix B) was distributed to all employees at the Fargo MRRL. Information obtained from this

"Insect Allergy Questionnaire" included basic demographic data, a brief occupational history, and smoking history. The prevalence of alleged allergy to insect(s) at work (affirmative response to Question 13) was ascertained.

Further information was obtained for those with alleged insect allergy, including types of allergic symptoms, their temporal relationship to insect exposure at the worksite, the alleged method of contact with allergens, whether or not a physician had been seen and/or medication had been prescribed, and whether it had been necessary to stop work or be transferred to another work area or job because of health problems related to insect exposure. Also, information relating to the types of protective equipment used at the worksite was obtained from all respondents.

IV. EVALUATION CRITERIA:

Medical

Employees who had seen private physicians for alleged occupationally related illness were requested to authorize release of their private medical records. Copies of released medical records were reviewed for objective documentation of illnesses and their relationship to exposures at work.

Environmental

There are no environmental standards for occupational exposure to particulate insect matter or airborne microorganisms.

Guidance for handling cancer-suspect chemicals was derived from several sources:

(1) NIOSH Publication No. 77-206, Working with Carcinogens
(2) NIOSH Publication No. 75-188, Suspected Carcinogens - A subfile of the NIOSH Toxic Substances List.
(3) 29 CFR 1910 OSHA Safety and Health Standards: General Industry Sections 1910.1003 to .1028
(4) NIOSH Current Intelligence Bulletin 34 (April 15, 1981): Formaldehyde, Evidence of Carcinogenicity.
(5) Halperin, W.E. et al "Nasal cancer in a worker exposed to formaldehyde", J Am Med Assoc, 1983, 249: 510-12.

V. RESULTS

Medical

The questionnaire (Appendix B) was distributed to 95 federal government employees at the MRRL. This self-administered questionnaire was

completed and returned by 80 employees (84% response rate). For respondents, the average duration of employment at an insect rearing facility (current job assignment plus any prior job experience) was 10.4 years.

Fifteen employees had alleged allergies related to insect exposure at work. Fourteen (93%) were entomologists and laboratory technicians who work directly with insects in experimentation or rearing. (Table 1) Table 2 lists various symptoms of these fifteen workers. The most prevalent symptoms were eye irritation (87%), sneezing or running nose (47%), chest tightness (47%), and skin irritation or skin rash (47%).

Eight (53%) of these 15 employees stated that symptoms began within 1/2 hour after the start of exposure at work. Nine (60%) felt that symptoms improved when going home after work, eleven (73%) felt that symptoms improved or went away on weekends, and twelve (80%) stated that symptoms improved or went away on vacations. Ten (67%) saw a physician for their symptoms, and nine had treatment prescribed. Eight (53%) found it necessary to stop work with the insect causing their problem or be transferred to another work area or job.

Twelve (75%) of these workers thought that airborne insect material caused their problems. The most frequently implicated insects were those in the Lepidoptera order (moths and butterflies). (Table 3) For entomologists and laboratory technicians who worked directly with insects, ninety-three percent (13/14) of those with alleged insect allergy problems used protective equipment to minimize exposure, compared to seventy-five percent (12/16) of unaffected workers in the same job categories. Disposable respirators ("face masks"), ventilation hoods, and gloves were most frequently used.

Private medical records were obtained and reviewed for nine of the ten employees who indicated that they had seen physicians. These are summarized below:

Employee A had began working extensively with insects approximately five years ago. Approximately two years later this employee had onset of conjunctival inflammation, as well as nasal and sinus congestion, associated with exposure to various moth species. These symptoms would typically begin about one hour after exposure and would last up to one day after exposure ceased. Symptoms would not occur if and when the employee used a battery-powered, air purifying respirator. Serologic testing for antibodies to Aspergillus as well as other standard fungal extracts was negative. Allergy skin testing gave negative results to house dust, house dust mite, a series of molds, moth scales, and adult and larval stages of the screwworm fly. A positive (2+) skin reaction occurred to an extract of the larval stage of the Heliothis moth. After the employee stopped working with Heliothis species, there was no recurrence of symptoms.

Employee B worked with both Musca domestica (housefly) and Cochliomyia homonivorax (screwworm) species and developed nasal irritation and congestion, cough, and episodes of shortness of breath with chest tightness. Serum IgE level was markedly elevated. A complete blood count revealed a normal differential with an eosinophil count of 4%. Prior eosinophil counts during employment at a different insect rearing facility (1974) were noted to be in the range of 10-15%. A recent chest x-ray (June 1981) was normal. Allergy skin testing was positive for housefly and moth extracts, as well as for extracts made from the adult stage and larval stage of the screwworm fly. A transfer from all insect-related work duties effected a resolution of symptoms.
Employee C had health problems related to Musca domestica (housefly) exposure. If, during dissection of the housefly, this employee was inadvertently pricked with a needle or scalpel, a local hive developed almost immediately. Intermittent urticaria occurred about twice a month and was associated with handling all stages of this insect. RAST testing was negative for ragweed, Penicillium, Cladosporium, Alternaria and Plantain. Skin tests to the adult and larval stages of the screwworm fly, to housefly, and to moths were all negative. The employee had no further recurrence after instituting the use of protective gloves while doing insect work.

Employee D has been working with various moth species since 1967. Since the early 1970's this employee has had problems with eyelids swelling, conjunctival injection, nasal congestion, sneezing, and occasional cough and wheezing associated with moth exposure. Precipitating antibodies against the adult and pupal stages, as well as the scales and frass of Heliothis species, were all negative. Allergy skin tests were reactive to commercially available moth extract with a 3+ wheal and flare reaction. Treatment consisted of antihistamines and avoidance.

Employee E was evaluated for the occurrence of generalized urticaria associated with exposure to scales and debris from the cockroach. The worker experienced hives with swelling on the face, arms and legs occurring within minutes after exposure. Skin tests to extracts of house dust, various molds, housefly insect, and a cockroach extract were all negative. A transfer to a new worksite with no cockroach exposure resulted in complete resolution of the problem.

Of the four other employees for whom records were reviewed, one had nasal congestion and conjunctivitis associated with screwworm fly exposure, one had skin irritation and conjunctivitis associated with cockroach exposure, one worker had allergic rhinitis and severe bronchitis secondary to moth exposure, and one had problems with recurrent sore throats and swallowing difficulties which were thought to be possibly related to chemical exposure.

Environmental

Insectary

Impinger samples and Marple cascade impactor samples collected for microscopic examination revealed intact and fragmented moth scales within a background of unrecognizable particulate matter. Intact scales were 150-250 microns in length, and the length was more than three times the width.

The major portion of the viable sampling performed was Andersen viable sampling. (Table 4) For comparison, sampling was also done in two areas outside the Insectary. One location was an office within MRRL, but outside the Insectary, on a separate ventilation system. The second location, Sudro Hall College of Pharmacy, was a separate building. Moisture condensation and spreading of colonies rendered some plates uncountable. The highest counts were obtained in the Screwworm Adult Holding Room. The lowest were in MRRL Administration Room 198 and in Sudro Hall. More than 50% of the samples were collected on Stages 3 and 4, which capture particles of aerodynamic size range 2.1 to 4.7 microns.

Table 5 lists the results of swab samples taken at various locations. The only zero count obtained in any of the viable sampling occurred on fungal media, in a sample from an area where hypochlorite solution (Clorox) is used routinely for cleaning.

Table 6 lists the results of a modified settling/impaction plate sampling method used within the air handling system on each side of the air filter. Bacterial and fungal counts were higher on the plates exposed after the filter compared to those exposed before the filter. Counts were lower in Room 211 compared to Room 187.

Total dust and quantitative particle-sizing samples were taken with the Andersen Ambient Sampler. In a six-hour total dust sample taken in the Diet Preparation Room with the Andersen Ambient Sampler, particulate accumulated was insufficient to yield valid gravimetric results. The results of a total dust and quantitative particle-sizing Andersen ambient sample in Incubator #9 are presented in Table 7. Forty-eight percent of the sample was collected on stages 4 through 7, which correspond with aerodynamic size range 0.4 to 3.3 microns.

Cancer-Suspect Chemicals

The draft manual entitled "Detailed Requirements for the Laboratory Use of Chemical Substances of Potential Carcinogenic Risk" provides a comprehensive program for the use of chemical carcinogens, except that formaldehyde is not included on the list of suspected carcinogens. This program had not yet been fully implemented at the time of the survey.

Carcinogens and suspected carcinogens are stored in either a locked refrigerator or in a locked, vented cabinet within Room 173. There was a sign-out procedure for using chemicals stored in the refrigerator, but not for using chemicals stored in the cabinet. Signs on the door of Room 173 appropriately prohibited unauthorized entry and warned that radioactive materials were present. However, no sign warned specifically that chemical carcinogens were present.

Ventilation tests were performed on the chemical fume hood used to dispense the cancer-suspect chemicals. Air velocity measurements (average velocities of 130 linear feet per minute at the corners of the hood opening and 150 linear feet per minute at the center) and smoke tubes indicated that the hood was quite effective and that the storage cabinet was appropriately under negative pressure and vented through the chemical fume hood.

VI. DISCUSSION

Medical

The United States Department of Agriculture (USDA) performs and funds much of the agricultural research in the United States. There are over one hundred U.S.D.A. entomological research facilities that purposefully rear insects in confined environments. In addition, many academic and commercial institutions are involved with research requiring insects for experimentation. Work activities may result in employee exposure to various airborne particulates such as insect parts or excrement, culture medium components, and airborne bacterial and/or fungal contaminants. Repeated exposures may result in immunologic sensitization and subsequent allergic symptoms in some workers.

Great Britain has designated occupational asthma associated with insects in laboratories as compensable under workmen's compensation. (1) A recent bibliography documents over 300 reports of allergic reactions where exposure to allergens occurs or probably occurs through the inhalation of insect derived materials. (2) Most of these are case reports of individual allergic responses to various individual insect species. There are few epidemiologic studies of large populations of workers with insect exposure.

An awareness of a significant prevalence of respiratory allergies among insect workers has led to the recent formation of a national "Insect Allergy Committee" by the Entomological Society of America. A pilot mail survey was recently conducted at 136 educational, government and private institutions rearing insects in the United States. (3) The total number of workers surveyed was not reported, but fifty (60%) of the 84 respondent institutions had at least one individual with an allergy related to occupational exposure to an arthropod, host animal, or diet. Allergic conditions were reported by 115 individuals. Lepidoptera were the prominent source of allergic responses, 67% of the

115 attributing their symptoms to moths and/or butterflies. Twelve percent of respondents reported allergic reactions to cockroach and locust species. Types of allergic symptoms reported included sneezing and running nose (67%), skin irritation (62%), eye irritation (61%) and "breathing difficulty" (33%).

The MRRL symptoms are consistent with that nationwide survey, and also with other reports in the medical literature indicating that eye irritation, respiratory symptoms (sneezing, cough, chest tightness), and skin irritation or skin rash are the major symptoms in those with complaints of insect allergy. (4) The frequency of Lepidoptera-related allergic symptoms at MRRL is also consistent with the Entomological Society of America survey results.

The occurrence of allergic manifestions appeared to be clearly related to job exposures at MRRL. Forty seven percent (14/30) of entomologists and laboratory technicians working with insects had alleged insect allergy, accounting for 93% (14/15) of the total. A problem with the NIOSH questionnaire is the potential for biased conclusions resulting from the highly subjective assessment of symptoms and their cause by the respondents. However, the questionnaire proved useful as a screening tool, and medical records revealed evidence for classical allergic symptoms in many of those who sought medical care for their problems.

Inhalation of airborne material, the mechanism most frequently alleged to be responsible for allergic symptoms at MRRL, may involve proteinaceous material from fragments of insects (e.g., scales) and/or their exuviae or feces. Other alternatives include fungal or bacterial contaminants, plant pollen, animal dander, Dermatophagoides species (house dust mite), insect diet components, and volatile chemicals (formaldehyde). (5) Combinations of these, cross-reactions between antigens from different insect species, and potential interactions with humidity, temperature, and non-work related antigens should be considered. (6-9)

The occurrence of respiratory symptoms within 1/2 hour in the majority of individuals would be consistent with a Type I (immediate, IgE-mediated) immunologic response. (10) Also in support of an IgE-mediated immune mechanism, several individuals had positive immediate skin tests to crude insect-derived extracts. However, other symptomatic individuals were noted to have negative skin tests, and based upon the results of several other studies, caution is needed in interpretation of skin test results. (11-20)

Some workers at MRRL are experiencing symptoms of asthma (chest tightness and wheezing) which are typically associated with acute impairment of respiratory function. Whether chronic impairment of lung function may result from work with insects is not known. At an insect rearing facility in Great Britain, mean FEV_1 was slightly (but not significantly) lower in 13 workers with occupational asthma compared to 10 workers with rhinitis and 91 unaffected workers. (4)

TABLE 1

RESPONSES TO INSECT ALLERGY QUESTIONNAIRE
IN RELATION TO JOB CODES

Job Description	Job Code	Total Respondents #	Respondents Alleging Insect Allergy *
Clerical workers: i.e. secretarial staff, administrators	01	11	0(0%)
Research entomologists whose work at MRRL entails some contact with insects in experimentation and/or rearing	02	18	6(33%)
Research entomologists who perform insect-related research but who have no direct contact with insects and/or rearing	03	3	0(0%)
Laboratory technicians: who work directly with insect experimentation and/or rearing	04	12	8(67%)
Laboratory technicians assisting in insect related research projects, but having no direct contact with insects and/or rearing	05	12	0(0%)
Researcher: plant research projects	06	11	0(0%)
Researcher: animal research projects	07	3	0(0%)
Laboratory technicians: working or assisting in projects with no direct contact with insects in non-entomological areas. i.e. plant or animal physiology	08	0	0(0%)
Maintenance, custodial staff including machinists, engineers	09	5	1(20%)
Researchers: all others, i.e. chemists, microbiologists	10	5	0(0%)
Totals		80	15(19%)

*Fifteen employees gave a positive response to the question "Do you feel that you have allergies related to insect exposure at work?" Tables 1 - 3 are based on these fifteen workers. However, interviews suggested that several employees may have had work-related insect allergy, but gave a negative response to the above question.

TABLE 2

REPORTED ALLERGIC SYMPTOMS AT MRRL
(Multiple Responses from 15 Respondents)

	Number of Responses	
Eye irritation	13	(87%)
Sneezing or running nose	7	(47%)
Chest tightness	7	(47%)
Skin irritation or skin rash	7	(47%)
Cough	6	(40%)
Shortness of breath	2	(13%)
Wheezing	2	(13%)
Anaphylactic shock	0	

TABLE 3

AGENT CAUSING ALLERGIC RESPONSES
(Current and Past)

(Multiple Responses from 15 Respondents)

Agents		Number of Responses
Arthropods:	*Heliothis virescens*	5
	Leucophaea maderae	4
	Heliothis subflexa	3
	Musca domestica	3
	Cochliomyia hominovorax	2
	Heliothis zea	2
	Trichoplusia ni	2
	Manduca sexta	2
	Pectinophora gossypiella	1
	Oncopeltus fasciatus	1
	Anthonomus grandis	1
	Anagasta kuehniella	1
	Unspecified	1
Animals:	Rabbits	2
Diet:	Formaldehyde	3
	"Mold" on insect diet: *Penicillium*, *Aspergillus*	3
Other:	Dirty house fly cages	1
	Chemical exposure (ether), (beefblood formalin)	1
	Plant material (dust, pollens)	2

TABLE 4

ANDERSEN VIABLE SAMPLING RESULTS

Sample Location	Time	Media (1)	Stage (2)	Colonies/Stage as of 11/9/81	% Total Sample	Total Concentration (3 & 5)	Predominant Genera & Remarks
Incubator #9	1:15 to 1:35 pm 11/4/81	fungi	1	18	18%		Aspergillus flavus
			2	19	19%		Sample started while eggs &
			3	42	43%	173	adults were being collected.
			4	17	17%		Collecting stopped at 1:21.
			5	2	2%		Sampling continued til 1:35.
Screwworm Adult Holding Room #2	2:49 to 3:09 pm 11/4/81	bacteria	1	spreading	(4)	(4)	Penicillium, bacteria, yeast
			2	33			Room estimated to contain
			3	38			about one-third the usual
			4	spreading			compliment of flies.
			5	38			
			6	7			
	3:30 to 3:50 pm 11/4/81	fungi	1	114	16%		Penicillium
			2	91	13%		
			3	150	21%	1265	
			4	320	45%		
			5	40	6%		
			6	1	0%		
				716	101%		
Tobacco Hornworm	4:12 to 4:32 pm 11/4/81	fungi	1	8	7%		Cladosporium
			2	43	35%		
			3	48	39%	216	
			4	23	19%		
			5	0	0%		
			6	0	0%		
				122	100%		

TABLE 4 (cont'd)

ANDERSEN VIABLE SAMPLING RESULTS

Sample Location	Time	Media (1)	Stage (2)	Colonies/Stage as of 11/9/81	% Total Sample	Total Concentration (3 & 5)	Predominant Genera & Remarks
	4:42 to 5:02 pm 11/4/81	bacteria	1	29	19%		Cladosporium & Penicillium
			2	42	28%		
			3	42	28%	267	
			4	34	23%		
			5	3	2%		
			6	1	1%		
				151	101%		
Sudro Hall College of Pharmacy (control)	8:30 to 8:50 am 11/5/81	fungi	1	5	13%		Aspergillus niger, Penicillium Cladosporium
			2	5	13%		
			3	14	35%	71	
			4	14	35%		
			5	2	5%		
			6	0	0%		
				40	101%		
	9:01 to 9:21 am 11/5/81	bacteria	1	spreading	(4)	(4)	
			2	134			
			3	spreading			
			4	spreading			
			5	160			
			6	spreading			

TABLE 4 (cont'd)

ANDERSEN VIABLE SAMPLING RESULTS

ample ocation	Time	Media (1)	Stage (2)	Colonies/Stage as of 11/9/81	% Total Sample	Total Concentration (3 & 5)	Predominant Genera & Remarks
RRL dministration oom 198	10:10 - 10:30am	bacteria	1		(4)	(4)	Moisture problems make it impossible to count plates
			2				
			3				
			4				
			5				
			6				
	10:40 - 11:00am 11/5/81	fungi	1	4	7%		Cladosporium, Penicillium
			2	17	30%		
			3	11	19%	101	
			4	24	42%		
			5	1	2%		
			6	0	0%		
				57	100%		

. The medium used for fungi was Rose Bengal-Streptomycin (RBS). The medium for bacteria was Tryptocase Soy Agar (TSA).
. See Table 8 for the area of probable deposition corresponding to each stage number.
. Concentrations are expressed in "colony forming units per cubic meter of sampled air." (cfu/m^3)
. When any stage cannot be counted, it becomes impossible to determine the "Percentage of Total Sample" and the "Total oncentration".
. There are no environmental standards for airborne microorganisms.
No health implications can be derived from the data in this table.

TABLE 5

SWAB SAMPLES

Location	Media for[1]	Results[2]	Predominant Strains
Room 133 Work Station Where Pupae Handled	Fungi	14	Aspergillus niger, (1 colony Mucor)
	Bacteria	52	Aspergillus niger, some bacteria[3]
Room 102 Work Station In Portable Incubator #19	Fungi	0	Area where Clorox is routinely used
	Bacteria	125	
Room 126 Swab of Rack In Incubator #13	Fungi	53	Mucor, Aspergillus niger, Penicillium Cladosporium
	Bacteria	Spreading	bacteria and fungi cover 3/4 plate
Room 126 Swab of Screen At Top of Cockroachcage In Incubator #13	Fungi	43	Mucor
	Bacteria	Spreading	bacteria and fungi cover 3/4 plate

(1) Medium used for fungi - Rose Bengal Streptomycin.
Medium used for bacteria - Tryptocase Soy Agar.

(2) Results in units of colony forming units per plate.
There are no environmental standards for swab samples.
No health implications can be derived from the data in this table.

(3) Some fungi can grow on a bacterial medium.

TABLE 6

MODIFIED SETTLING/IMPACTION PLATE SAMPLING

LOCATION	MEDIA FOR(1)	RESULTS(2)	DESCRIPTION
Room 187			
Before air filter	Fungi	10	5 or more varieties.
After air filter	Fungi	41	
Before air filter	Bacteria	13	Also, fungi & yeast.
After air filter	Bacteria	34	
Room 211			
Before air filter	Fungi	1	
After air filter	Fungi	2	
Before air filter	Bacteria	3	
After air filter	Bacteria	10	

(1) Fungal media - Rose Bengal-Streptomycin
Bacteria media - Tryptocase Soy Agar

(2) Results expressed in colony forming units per plate
There are no environmental standards for airborne microorganisms.
No health implications can be derived from the data in this table.

TABLE 7

ANDERSEN AMBIENT SAMPLER RESULTS

Location & Duration	Stage	Milligrams per stage	Percent in size range
Incubator #9	Preseparator	0.3	13%
	0	0.4	17
	1	0.5	22
	2	0.0	0
	3	0.0	0
	4	0.3	13
	5	0.2	9
	6	0.2	9
	7	0.3	13
	Final	0.1	4
		2.3 Total*	100%

*Corresponds to 0.2 mg/m^3 overall concentration.

U. S. Department of Agriculture, Metabolism
& Radiation Research Lab
State University Station
Fargo, North Dakota 58105

29 CFR Part 1960 requir
copy of this Notice be pr
prominent place at or
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posted until the unsafe or unhealthful working conditions have been corrected, or for 3 working days wh
longer. This Notice describes violations of Federal Regulations. You must correct the violation(s) by the dat
below, or in accordance with an established abatement plan.

ITEM NUMBER STANDARD, REGULATION, OR SECTION OF THE ACT OR EXECUTIVE ORDER VIOLATED; DESCRIPTION	DATE VIOLA BE C

The violations described in this notice are alleged to have occurred on or about the day the inspection was made unless otherwise indicated within the description given below.

1. 12/

Section 5(a)(1) of the Occupational Safety and Health Act of 1970: The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that:

a) Insect rearing areas, being used outside of the "insectory", were not constructed to utilize the most technologically feasible method of containing and filtering insect particulate matter to prevent employee exposure.

b) Air filtering systems presently in use were not routinely inspected and properly maintained to insure optimum efficiency in filtering insect particulate matter.

c) Employees are exposed to contaminated air which is being directed into the breathing zone by the laminar flow hoods. This hazard was originally documented by USDA Industrial Hygienist in report dated 11/19-21/79.

d) Insect debris and/or mold retaining materials, i.e. carpeting or fabric covered partitions, were in use or planned to be used in or in proximity to insect handling or insect rearing areas.

e) The OSHA expanded standards for the following seven carcinogens--benzene, methyl chloromethyl ether, beta-Naphthylamine, benzidine, ethyleneimine, beta-Propiolactone, and 4-Dimethylaminoazobenzene--are not being implemented or followed despite the use, handling, and storage of these chemicals at the MRRL. Specific examples include:

1) Room 173 (Hot Lab) where methyl chloromethyl ether, beta-Naphthylamine, benzidine, ethyleneimine, beta-Propiolactone, and p-N, N-Dimethylaminoazobenzene are stored and handled.
2) McDonald Room 5B (Building 5) where benzidine is stored and handled.

Appendix B
Insect Allergy Questionnaire

(Please Print)

SUBJECT IDENTIFICATION

LAST NAME _

FIRST NAME _ _ _ _ _ _ _ _ _ _ _ _ _ MIDDLE INITIAL _

ADDRESS _

CITY _ STATE _ _

ZIP CODE _ _ _ _ _ TELEPHONE _ _ _ _ _ _ _ _ _ _ _ _
Area Code

PERSONAL DATA

SEX: Male ___ Female ___ DATE OF BIRTH _ _ _ _ _ _
Mo Day Yr

What was your age on your last birthday? _ _ yrs.

Under federal law, people participating in our surveys DO NOT have to tell us their social security number. However, it is very useful and helps us in follow-up studies. May we have your social security number?

SOCIAL SECURITY NUMBER _ _ _ _ _ _ _ _ _

Current U.S.D.A. Work Location: _____

How long have you been working at an insect rearing facility? _____ Years

What is your job title? _____

Briefly describe your work duties: (with special emphasis on those duties that bring you into contact with insects)

_____

_____

_____

_____

Please answer the following questions yes or no whenever possible:

COUGH		COMMENTS
1. Do you usually cough first thing in the morning in the winter?	_____ Yes _____ No	Count a cough with first smoke or on first going out of doors.

		COMMENTS
2. Do you usually cough during the rest of the day in the winter?	____ Yes ____ No	"Usually" means 5 or more days per week.

If Yes to either of the above:

3. Do you cough like this on most days for as much as three months during the year?	___ Yes ___ No	Exclude clearing throat or a single cough.
4. How many years have you coughed like this?	___ Yrs.	Ignore an occasional cough.

PHLEGM

5. Do you usually bring up phlegm from your chest first thing in the morning in the winter?	___ Yes ___ No	Count phlegm with first smoke, or on first going out of doors.
6. Do you usually bring up phlegm during the rest of the day in the winter?	___ Yes ___ No	Count phlegm produced twice or more per day.

If Yes to either of the above:

7. Do you bring up phlegm like this for as much as 3 months during the year?	___ Yes ___ No	Count swallowed phlegm. Exclude phlegm from nose.
8. How many years have you brought up phlegm like this?	___ Yrs	"Usually" means 5 or more days per week.

WHEEZING

9. Does your chest ever sound wheezing or whistling?	___ Yes ___ No	

If Yes:

10. Do you get this on most days?	___ Yes	___ No
11. Do you get this on most nights?	___ Yes	___ No

ALLERGY HISTORY

12. OUTSIDE OF THE WORKPLACE, have you ever had: (check appropriate items)

___ Hayfever
___ Asthma
___ Hives
___ Eczema
___ Food Allergies
___ Allergies to Medicines
___ Allergy to Animals
_____Other (Specify)

ALLERGY HISTORY: AT THE WORKSITE

13. Do you feel that you have allergies related to insect exposure at work?

___ Yes ___ No

If Yes, please answer the following questions: If No, please go directly to Question 23.

14. How many species of insects are you exposed to at work? _____

15. What do you think causes your occupational allergy?

Arthropod: Names: Genus _____ Species _____

Genus _____ Species _____

Genus _____ Species _____

Host Animal: Names _____

Diet: Names _____

Other: _____

16. What kind of symptoms do you experience? (Check appropriate items)

___ Sneezing or running nose
___ Skin irritation or skin rash
___ Headache
___ Eye Irritation
___ Cough
___ Chest tightness
___ Shortness of breath
___ Wheezing
___ Nausea
___ Anaphylactic Shock
Other _____

17. How long after start of your exposure at work do symptoms begin?

___ Within 1/2 hour
___ Between 1/2 - 4 hours
___ Between 4 - 8 hours
___ Other (specify) : _____

18. Do your symptoms improve when you go home after work? ___ Yes ___ No

19. Do your symptoms improve or go away or weekends? ___ Yes ___ No

20. Do your symptoms improve or go away or vacations? ___ Yes ___ No

21. What method of contact seems to cause your allergy? (Check all that apply)

___ Airborne material
___ Direct contact with an insect or insect part. Specify: _____
___ Bite
___ Sting
Other _____

22. Have you had to see a physician concerning work related allergies or other work related health problems? ___ Yes ___ No

If Yes, did this require medication or medical treatment? ___ Yes ___ No

Briefly describe: _____

_____

23. Do you use protective equipment when working? ___ Yes ___ No

If Yes, which of the following is used: (Check all that apply)

___ Face mask
___ Hood (laminar flow/exhaust)
___ Gloves
___ Head net
Other _____

24. Has it been necessary for you to stop work or to be transferred to another work area or job or take aother action (explain) because of health problems related to insect exposure?

___ No ___ Yes (explain) _____

25. Are you a cigarette smoker? ___ Yes ___ No ___ Exsmoker

26. Any further comments regarding health aspects of working at an insect rearing facility would be greatly appreciated:

_____

_____

_____

THANK YOU FOR FILLING OUT THIS QUESTIONNAIRE. Please return it by mail in the enclosed addressed envelope. If you have any questions about the project or related matters, please contact the Project Officer, Dr. Michael A. Bauer, by phone (FTS 923-7755) or commercial no. 304-599-7755) or by mail (NIOSH-CIB, 944 Chestnut Ridge Road, Morgantown, West Virginia 26505).