PREVALENCE OF BYSSINOSIS IN COTTON GINS IN LOWER RIO-GRANDE VALLEY OF TEXAS AND MESSILLA VALLEY OF NEW MEXICO

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16. Abstract (Limit: 200 words)

The respiratory health status of cotton production workers at cotton gins in the Lower Rio Grande Valley of Texas and New Mexico was investigated. The study population included 203 ginners and 260 comparisons. Three cotton gins were randomly selected in each study areas. A questionnaire was administered by an interviewer, spirometric measurements were recorded, and chest X-ray examinations were conducted. Chronic respiratory disease (CRD) was found in 30 percent of the ginners and 39 percent of the comparison group. No unusual opacities were found in the ginners, and spirometric tests identified abnormalities in 13 percent of both groups. Mean forced expiratory volume and forced vital capacity were within 92 percent of the expected values. Non-smoking ginners and comparison subjects had almost identical respiratory capacity. The overall mean cotton dust concentration in environmental samples was 0.93 milligrams per cubic meter. No specific differences were found for different types of gins, although climate appeared to have some effect. The concentrations of dust appeared to be unrelated to CRD or respiratory function, however, prolonged exposure and smoking enhanced CRD.

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I. Background Problem

Byssinosis, a pulmonary dysfunction peculiar to those who work with vegetable fibers, is of paramount interest to all concerned with the cotton industry. Even the problem of defining this entity has beleaguered many investigators, with definitions ranging from dyspnea on Mondays[1] to "chest tightness starting on return from the annual holiday and continuing for at least three consecutive days".[2] One of Bouhuy's more recent definitions has encompassed the symptoms of chest tightness, dyspnea and cough,[3] all experienced within hours after returning to work following a period (days to months) of absence. During the course of a working day, significant obstructive-type changes in pulmonary function, notably a decrement in FEV_1, must accompany these symptoms before Byssinosis can be diagnosed.[4] To our knowledge, no authority has so far postulated that this diagnosis can be made strictly on a laboratory basis, i.e., a decrease in FEV_1 during the first work day in a patient without symptoms, although such subjects have been labeled "reactors".[5]

Multiple prevalence studies, in the majority indicating that a problem of significant proportions exists, have been conducted in the flax, hemp and cotton industries within the past fifteen years, with special emphasis on the cotton mills in Great Britain.[6-10] The Netherlands[1,8,11,12] Sweden,[4] Belgin,[13] Spain,[14,15] Ireland,[16] Austrailia,[17] Egypt,[18] India,[19] and even the United States of America[3,20,21] in recent years have all been cited as locations of textile mills staffed by Byssinosis subjects. However, no one to-date had attempted to quantify the magnitude and severity of this problem among the cotton

gin workers in the United States, although Egyptian and Sudanese gin workers have demonstrated a comparable prevalence rate to textile mill employees.[2,18] It is both interesting and puzzling that Byssinosis was not detected in Greek gins (a limited study of only 70 subjects); however, an increased incidence of chronic obstructive lung disease was noted.[22] There is every reason to suspect the gin worker to be quite as vulnerable to Byssinosis, inasmuch as the causative agent is apparently present in the cotton bracts[23] (the plant leaves at the base of the cotton boll), and exposure to this waste product would seem to be as great in the ginning process, the step that separates the seeds and contaminants from the lint with a consequent production of strikingly high dust concentrations,[24] as in any later procedures handled at the mills. This offending agent in the cotton dust causes symptoms in an exposed and susceptible subject by a reversible bronchoconstriction that is allegedly secondary to a non-allergenic release of histamine from the lungs.[25] (n.b., other etiopathological mechanisms have been propounded.)

The documentation of a relationship between many years of continued heavy exposure to this pulmonary stress and the development of chronic, respiratory disease (CRD) has been a subject of much debate. Recent opinion would favor not only the development of acute reactions among the byssinotic, but also an increased abount of CRD.[15] However, the question as to whether or not the intermittent exposure (3 months out of the year) of the gin workers creates permanent lung damage remains unanswered, in addition to the more basic problem of determining the prevalence and incidence of this disorder among American gin employees. The purpose of this project was to attempt to resolve this delemma and to accurately assess the scope of the Byssinosis syndrome among cotton gin workers in the United States of America.

II. Objectives

An Ad-Hoc Committee of experts in the field of Byssinosis and Pulmonary Disease met in Atlanta, Georgia during the April 1971 Meeting of the American Industrial Health Conference (See Appendix 2).

The study protocol was presented and discussed and the following objectives were approved.

a. To determine the prevalence of Byssinosis among the employees of all cotton gins studied.

b. To determine the incidence of Byssinosis among the employees of all cotton gins studied.

c. To determine the prevalence of Chronic Respiratory Disease among the employees of all cotton gins studied.

d. To determine the relationship between environmental dust concentrations and the Byssinosis incidence and prevalence rates.

III. Survey Location

Of the several, large cotton-producing areas in the United States, at least seven distinct regions were identified: California; Arizona; New Mexico; Texas High Plains; Lower Rio-Grande Valley; Mississippi Valley and the South East states. The choice of study locations was dictated by practicality (initial contacts in the area, local cooperation, right of entry and growing season) since the 1970 Occupational Safety and Health Act was not yet in effect. In light of these factors the Lower Rio-Grande Valley of Texas and the New Mexico (Las Cruces - El Paso) areas were selected for study. Strong efforts were made to include the Texas High Plains area, important because of the high crop density,

and the dirty grade of cotton harvested, but extremely high resistance was encountered from management in this region, forcing a shift of emphasis to the New Mexico area.

IV. Population

A. Test Group

The purpose of this study was to determine the incidence and prevalence of a symptom complex (positive responses to respiratory symptom questionnaire) and/or a reduction of certain component parameters of the Forced Expiratory Spriogram in the cotton gin workers.

The sampling plan used permitted pre-exposure data to be gathered on a cohort of gin workers. The controlling factor on the size of the sample was based on logistics involved within the study. It was anticipated that the maximum number of examinees that could be examined would be approximately 200 per region. In actuality, 286 ginners and 442 controls were obtained in the Lower Rio-Grande Valley and New Mexico area.

In order to answer the question "how frequently" are gin workers affected by this phenomenon throughout the ginning season, and to what degree, a longitudinal study component was included in the study design encompassing 57% of the ginning population. The testing schedule called for the periodic reexamination of these subjects throughout the season at varying times after exposure to cotton dust.

Several of the gin operations worked as groups called "Cooperatives." Most of these cooperatives had a permanent body of workers who were employed all year around in other activities within the cooperative when ginning was not in

season. It was these groups of ginners that permitted a definable pre-exposure group to be accumulated. Recognizing the possibility of a potential bias from using only those gins who chose to participate in the study, six gins were randomly selected, three in each geographical area, and environmental sampling was performed. This technique permitted comparisons to be made of dust concentrations in cooperating and non-cooperating gins and assess whether or not the gins that chose to cooperate were in fact representative of the actual ginning conditions within a region.

B. Control Population

Eighty-five percent of the ginners tested were Mexican-American. No data are currently available in the literature regarding normal values for FEV_1, FVC, and prevalence of chronic respiratory disease for this ethnic group. Approximately two controls for each ginner were examined to permit ginners to be matched on race, age and smoking histories. Controls were obtained from high schools, universities, National Guard (consisting of workers from a variety of industries) and Civil Service personnel. These data were used to assess ambient level of CRD, and FEV_1 and FVC changes in the normal (control) population as well as examine if Caucasion predicted values were valid for this population.

V. Testing Methods

A. Questionnaire:

The questionnaire used in this study was a modified version of the Duke University textile mill questionnaire. This questionnaire was used by Merchant and Associates[26] for their work in the cotton textile industry and was selected

for this survey to promote compatibility of data acquisition. Only minor alterations were made to the questionnaire to reflect the change of target population (gin workers as opposed to textile workers). A copy of the questionnaire and its Spanish translation is located in Appendix 1. The Spanish translation was recommended since a high percentage of the ginners were Spanish speaking. The questionnaire was interviewer administered rather than self administered since many in the population were illiterate and non-sophisticated.

B. Spirometric Measurements

The pulmonary test of choice was the Forced Expiratory Spirogram from which the FEV_1 and FVC measurements were made. The number of trials given was limited to five for each person to control for the learning and fatigue effect. Observed values were compared with predicted values using the Dischер-Palmer equations.[27]

C. Spirometric Instrumentation

An Ohio 800 electronic spirometer, modified to include a panel of motivation lights, was interfaced with a digital computer controller. (Biologics, PMA3). The system consisted of a mini digital computer, an alpha numeric key board input, and A/D converter and multiplexer, spirometer controller interface, a storage cathode ray tube for display of flow and volume signals in the form of a loop along with its computed data, and a digital tape recorder for data storage.

The Computer Control System served as an aid to the technician to achieve quality control of the test data, i.e., to alert the technician should unacceptable data be recorded. In addition, it compared successive Spirometry trials, computed, interpreted and stored the best flow-volume

loop on the digital tape. The system also called for pneumatic and electronic calibrations at regular intervals and for adjustments if limits of equipment reliability were exceeded.[27]

Temperature control in the spirometry room was maintained through the trailer air-conditioning system. Temperature ranged from 20°C. to 26°C. during the survey.

A permanent spirometric record of the analog Flow and Volume signal was made for each subject as a backup to the computer tape. This recorder also served as a secondary recording device when the primary system became inoperative (22% of total data). These records were processed using a digitizing technique which permitted the data to be processed by the same MASS IV pulmonary program that anlayzed the taped data.

A portable Jones Spirometer was also carried as a backup to the electronic systems and to provide a flexibility to collect data remotely from the trailer unit as need dictated (18% of total data). The tracings generated by this unit were processed using the same digitizing program as used on the backup tracings. Since no flow signal is generated by the Jones Spirometer, the computed data did not include the instantaneous flow rates.

D. Calibration Procedures

The Ohio 800 Spirometer came equipped with a pneumatic Flow and Volume calibrator. The calibrator device permitted known flows and volumes to be entered into the spirometer which in turn permitted the accuracy of the electronic Flow and Volume signals to be assessed and corrected if necessary. Before each testing session, or once every 20 subjects, whichever came first, a pneumatic calibration procedure was completed and this was compared to the

electronic calibration signal. (The electronic signals were used as scaling factors by this computer program. An error in excess of 0.7% on either the flow or volume channel was cause to adjust the system electronics.)

Comparisons between the Jones Spirometer and Ohio 800 were made by entering known Volumes from the pneumatic calibrator system into the Jones Spirometer and computing a BTPS adjusted Volume. The Jones Spirometer was found to overread the FEV_1 value by 1.8%, this data was subsequently adjusted.

The data processing hardware (computer) was also monitored throughout the study. As part of the calibration CRT display, two sets of numbers were displayed, one representing the Flow factor and the other, the Volume factor. These numbers represented the pneumatic value given to each bit of data going through the system. Once a limit of $\pm$ 10% was exceeded, this indicated an electronic problem either within the system or within the Spirometer electronics, since a change in voltage per unit volume in the spirometer; i.e., excessive electronic noise within the spirometer or computer, or component decay caused these values to change. These tolerances were not exceeded at any time during the study.

E. X-ray Equipment

A posterior anterior chest X-ray was taken on each examinee to rule out chest pathology. The X-ray equipment consisted of a portable GE 200 ma unit. The adjacent dark room permitted the changing of film cassettes and the storage films. Each day exposed films were transferred to a carry cassette, and transported in an air-conditioned car to a pre-arranged location for processing by an automatic processor. Only one location was used in each area to permit control of processing quality standards.

F. Environmental Sampling

The environmental sampling effort was to determine, in the gins under consideration, concentrations by weight, of airborne particulates in the respirable range. It was anticipated that such concentrations could be correlated to the results of the epidemiological effort of the study.

Personal monitors were placed on all gin employees predominantly confined to the immediate gin environment, and operated for a complete working shift. A maximum of five area samplers were operated at selected sites such as areas of congregation, frequently used passages, operator stations, and areas along the gin stands and other equipment locations. Because of design differences it was necessary to simultaneously operate personal monitors at each of these sites to correlate the results obtained from the two types of samplers. One high volume sampler, equipped with a glass fiber filter, was strategically located to collect a large sample for possible future analysis of a specific agent.

The personal sampler consisted of a battery-powered pump, a Gelman Type VM-1 polyvinylchloride membrane filter in a suitable holder, and an aluminum tube vertical elutriator, operating at a flow rate of 1.7 liters per minute, the particle cutoff being 30 μm. Battery operation limited the sampling time to no longer than eight hours.

The equipment of choice for area sampling was vertical elutriator cotton dust sampler used by the National Institute for Occupational Safety and Health. This line-powered sampler uses the Type VM-1 filter preceded by a vertical elutriator. At a flow rate of about 7 liters per minute, the cutoff is 15 μm.

To alleviate problems associated with varying relative humidity, filters were to be equilibrated in a dessicator for 24 hours prior to being weighed. A Chan Cram Electrobalance was used for the weight measurements. A radioactive ionizing unit minimized electrostatic attraction.

It was suggested that the relatively large amount of dust associated with stripped cotton might significantly alter the mineral fraction of an airborne dust sample taken in a gin in comparison to a similar sample taken in a cotton mill. It was thought that an increase of and/or a large variation of the mineral fraction would perhaps materially mask any correlation of particulate concentrations to the prevalence of Byssinosis.

VI. Testing Procedure

A. As each subject entered the examination trailer he was greeted by the coordinator, who measured his height (in.) and weight (lb.) He was then asked to sit in one of the desk chairs provided and complete a consent form and the name, sex, age, height, occupation and social security number portion of a questionnaire. More frequently, a Spanish speaking staff member was assigned to help the subject fill in these forms--and in the case of illiteracy, complete them for him. The coordinator then assigned a study number to each subject and completed a "record card" before directing the examinee to the next test station. The card not only documented the subject identification data, but also recorded the type of visit. (See Appendix 3).

Usually, three or more examinees were in the trailer at any one time. Each examinee then underwent one phase of the medical examination. A technician took one of the examinees and his record file and proceeded with the X-ray protion of the study. The second technician proceeded with spirometry examination and the 2nd subject. The demographic data necessary

for entry into the Spirometry Computer System were obtained from the subject's record card. The Forced Expiratory Spirogram Pulmonary test was performed 5 times by each examinee in an effort to obtain reliable data. All five trials were recorded. The third examinee had the Byssinosis questionnaire administered in total by the coordinator.

Those subjects who participated in repeated testing throughout the study underwent an abbreviated test routine consisting of a shortened questionnaire and spirometry only. (This shortened questionnaire is in tabular format and consists of questions 46-54). The time required to complete this test routine approximated 5-6 minutes. Any subject requiring a retake on his X-ray had it done at that time. Those examinees not scheduled for re-examination, yet requiring a retake of their X-ray, were contacted for a new appointment at some later date during the study.

VII. A. Notification and Follow-up Procedures

Certain tests results have fairly well-documented correlations with known disease processes. Although not necessarily related to the main purpose of the Survey, the following conditions were felt to be serious and/or distinctive enough to warrant further follow-up in a continuing health care program:

(1) Questionnaire: Positive responses to major respiratory symptoms: Chronic Respiratory Disease (CRD).

(2) Spirometry: FVC and/or FEV_1 greater than 2.326 standard deviations below predicted for age, sex, and height: Restrictive Lung Disease

and/or

Obstructive Lung Disease

(3) Chest X-ray: Depending on the nature of the lesion, one or more of the following diagnoses were anticipated:

Suspected lung neoplasm*

Tuberculosis, probably active*

Tuberculosis, activity undetermined*

Suspected mycosis

Suspected pneumoconiosis

Other non-tuberculous infiltrate

Lymphadenopathy

Bullous emphysema

Cardiomegaly or other cardiovascular abnormality

Pleural effusion

Other significant abnormality

Routine follow-up of incidental positives were accomplished via appropriate letters directed to the subject and his physician within four months of the termination of the survey. It was originally planned to develop the computer notification routines concurrently with the ongoing survey; however, the data processing contract was not effected until the survey was completed. The time required to develop these program and initiate the notification letters resulted in the above delay. With these programs now functioning, notification can be effected within four to six weeks following data collection. Those subjects in need of immediate physician referral received the same via their appropriate county health department representative, who were notified by mail within four weeks after the termination of the survey in

*Indicated need for immediate physican referral. All other diagnoses above were termed "Routine follow-up of incidental positives".

a particular geographic area. These departmental representatives had already been contacted in all areas selected for the survey, and had pledged their vigorous support and cooperation in these efforts. They worked in conjunction with the Texas State Tuberculosis Eradication Program and the area TB and RD Association in carrying out these responsibilities. Such a program for follow-up of all positives (immediate and routine) had already been sanctioned by the Texas State Department of Health and the appropriate county medical societies. The details of immediate physician referral involved the following procedures:

(a) All chest films were developed the same week they were taken; this function was accomplished by the X-ray technician member of the survey team through the use of the automatic RP film processing facilities at the Harlingen State Tuberculosis Hospital (or the Memoral General Hospital in the Las Cruces area).

(b) All chest films were reviewed by a physician team member and/or by a board certified chest physician within ten days of film development, with the singular purpose of screening for tuberculosis and/or neoplasm of the lung.

(c) Any subjects with chest films suggestive of tuberculosis and/or neoplasm of the lung were notified and entered into a continuing health care program by their county health department representative. The latter received appropriate notification from us by telephone when possible and always by certified mail, via a form letter addressed by a survey clerk and signed by an M.D. within 48 hours of the film readings.

B. Survey Test Criteria for Notification of Results

(1) Questionnaire: The following questions were designated as indicating borderline or abnormal questionnaires, if answered "yes". (Over 2 years or over 50 times where applicable.)

(a) Chronic Respiratory Disease:

Borderline	Abnormal	Pre-Screened
18	(20,21)	74
19	(24,25)	79 and/or a,b,c,d,e
22	32	
23	34	
26	37	
29	42	
31		
33		
36		
41		

(b) Byssinosis: All Abnormal:

52a
52b
59a
59b

Clinical Grading (Highest grade assigned if more than one of these combinations is complete.)

F-1/2: 52a and 53b; 59a and 60b.
F1 : 52a and 53a; 59a and 60a.
F2 : 52a and 52b; 59a and 59b.
F3 : 52a, 52b, and 34 or 38; 59a, 59b, and 34 or 38.

We considered all other responses as irrelevant for notification purposes.

(2) Forced Expiratory Spirogram

(a) Criteria for Chronic Respiratory Disease:

(Obstructive and/or Restrictive)

1. Normal: Within 1.645 standard deviations (S.D.) of predicted for both FVC and FEV_1.

2. Borderline: Between 1.645 and 2.326 S.D. below predicted for either or both values (FVC and FEV_1),

and within 2.326 S.D. of predicted for both values.

3. Abnormal: More than 2.326 S.D. below predicted for either FVC or FEV_1 (or for both).

(b) Criteria for Byssinosis (functional grading recommended by Dr. Bouhuys and Schilling).[28]

Functional Severity	$FEV_{1.0}$*‡ (%of Predicted)	$FEV_{1.0}$†† (%)	Interpretation of $FEV_{1.0}$	Recommendations for Employment
F_0	>80 (no evidence of chronic ventilatory impairment)	-4 to 0; or +	Minimal or no acute effect of dust on ventilatory capacity	No change; annual $FEV_{1.0}$
		-9 to -5	Moderate acute effect of dust on ventilatory capacity	No change; 6-mo $FEV_{1.0}$
		-10+	Definite and marked acute effect of dust on ventilatory capacity	Move to lower risk area; 6-mo $FEV_{1.0}$
F_1	60-79 (evidence of slight to moderate irreversible impairment of ventilatory capacity)	-4 to 0; or +	As above	No change; 6-mo $FEV_{1.0}$
		-5+	As above	Move to lower risk area; 6-mo $FEV_{1.0}$
F_2	<60 (evidence of moderate to severe irreversible impairment of ventilatory capacity)			Work requiring no cotton dust exposure; detailed pulmonary examination

*$FEV_{1.0}$ in the absence of dust exposure (two days or longer).

‡See Appendix 4 for special FEV_1 Reliability Criteria.

††Difference between $FEV_{1.0}$ before and after six or more hours of cotton dust exposure on a first working day.

(3) Chest X-ray: Suggested abnormal readings were limited to those eleven categories delinieated under "Follow-up of Incidental...Positives", namely:

Suspected lung neoplasm

Tuberculosis, probably active

Tuberculosis, activity undetermined

Suspected mycosis

Suspected pneumoconiosis

Other non-tuberculous infiltrate

Lymphadenopathy

Bullous emphysema

Cardiomegaly or other cardiovascular abnormality

Pleural effusion

Other significant abnormality

All other X-ray interpretations were included under the statement: "No significant abnormality".

(4) Subject and Physician Notification: Based on the preceding criteria, one of four basic letters were sent.

(a) Letter to the subject indicating all tests were normal.

(b) Letter to the subject indicating there may be a problem and that during his next routine visit to his physician he should show the letter.

(c) Letter to the subject indicating abnormalities were found and urging him to see his physician immediately.

(d) Letter to the physician documenting the abnormal data found in the examinee receiving the (c) letter.

VIII. Survey Logistics

The Field Operations Supervisor (FOS) provided the main interface between management and examination team. He was responsible for the setting up of testing schedules and arranging for each examinee to have the necessary time off to participate in the survey. Cotton ginning is seasonal work, running some 8-12 weeks, beginning in the summer months and running through late fall, depending on the geographical area. The function of the FOS was to keep close watch on the schedule of the ginning industry and to inform the survey team as to which gin within the sample was now hiring and when they expected to begin ginning. This daily contact continued throughout the season to permit various exposure categories to be assessed. This technique permitted the survey trailer to locate at the particular gin and obtain the necessary data. This required that daily contact by telephone or personal visit be kept with all gin operators, and that he notify that gin managers of our planned testing schedule. The testing schedule called for relocating as many as three to four times per day to permit pre- and post-shift testing on a significant number of workers. In order to obtain baseline studies before exposure to cotton dust, initial testing was done prior to the beginning of the season on those ginners already working around the gin (preparing the equipment for the ginning season). Typically, the ginning season began with intermittent ginning, requiring only enough workers to man one twelve hour shift. Itinerant workers routinely turned up at the gin on a daily basis in hopes of being hired, and they usually were as the volume of ginning increased. By the third week of the season, ginning

was at its peak, requiring around the clock operations (12 hour shifts, seven days a week). The only exception to this routihe was when rain prevented the harvesting of cotton so reducing or precluding the supply of cotton. Such rain breaks were followed closely during the survey since it permitted a 24-36 hour "out of dust" measurement to be obtained on those ginners who had been hired on the spot after the season had begun and who consequently had no baseline data.

Since it was not possible to test gin workers on a Monday following a week end off work, (ginners work 12 hour shifts 7 days per week throughout the season) a modified testing routine was developed to permit prevalence to be assessed in a manner as close as possible to that described in prevalence surveys conducted in the textile industry, i.e.: measurements of the $FEV_{1.0}$ 6 hours into a workshift following two or more days off. The revised model required that a reliable baseline $FEV_{1.0}$ measurement be made whenever ginning circumstances permitted. Three types of tests were accepted as baseline values. An "A" test represented data obtained on an examinee prior to the start of the ginning season. There were relatively few in number since most ginners were hired without advance notice from a labor pool on a daily basis and in increasing number as the volume of ginning increased. A "B" test was obtained on a worker before reporting for work, after he had worked the previous day; consequently he experienced only 12 hours of "out of dust." Few "B" tests were used. A "D" test was a pre-shift measurement obtained after a 24-36 hour break. These tests were relatively scarce also, since they could only be obtained when inclement weather forced a temporary halt to the ginning schedule.

Although 286 ginworkers were examined using questionnaire and pulmonary function tests, only those 203 ginworkers exhibiting at least on "reliable" A, B, or D pulmonary function test were retained for these analyses. "Reliability" of the lung function tests was deemed to have been met in a given test sequence of five trials when the best trial, as chosen by a ten parameter Best Trial Score, satisfied both of the following criteria:

1. The FVC was within 5%* of at least one other FVC in that sequence.

2. The $FEV_{1.0}$ was within 5%* of the FEV_1 of at least on trial that met criteria number 1.

A baseline $FEV_{1.0}$ and FVC value was calculated for each examinee by averaging the values of the best trials of all reliable A, B & D tests. The average baseline FVC and $FEV_{1.0}$ values were then converted into percent of predicted.[27] These mean values were used in determination of a person's chronic respiratory disease level as diagnosed by pulmonary function test and F-grade, but not in determination of his 48-hour reactor category.

When looking at FEV_1 decrements to identify reactors an "out-of-dust" measurement was compared with an "in-dust" measurement. Two test types (Appendix 3) were used as "out-of-dust" tests, A and D; while C and E tests were used as "in-dust" tests. To further assure comparability, an "out-of-dust" "in-dust" test pair was used only if both measurements were made on the same piece of equipment.

For the purposes of classifying gin workers by the area worked in, three classifications were used. Ginners were those who looked after the

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*5% if largest FVC >3000 ml and 10% if largest FVC <3000 ml.

ginning machines and thier helpers, i.e., ginners and ginner helpers. Pressmen were those who managed the baling presses and load the bales, i.e., pressmen and baleman. The "other" classification contained a variety of job categories such as scalemen, yardmen, suctionmen, seedmen, trackmen and lint fly men. Each of these people frequently moved in and out of these job categories and consequently their long term exposure to cotton dust was not measureable.

IX. Results

The original group consisted of 442 controls and 286 ginworkers. Only 78% (346) of the control group and 71% (203) of the ginworkers had at least one "reliable" pulmonary function test. The lower percentage in the ginworkers was partly due to a number of persons who completed the questionnaire then could not attempt the pulmonary function test due to survey logistics problems. Of the 78% (n = 346) of the controls with "reliable" pulmonary function tests, further data was discarded by stratifying the group by age, race and smoking history and then randomly removing examinees from each strata until parity had been obtained to that of the equivalent strata of ginners. The resulting control population of 260 will be referred to as the "modified control group." The modified control group and ginworkers are compared in Table 1. They are very similar with respect to percent of whites, 14.2% vs. 12.3%; percent of smokers, 52.3% vs. 49.3%; percent of previous smokers, 19.2% vs. 18.7%; and mean age, 36.1 years vs. 36.3 years. Pack years experienced by the smokers and previous smokers are also very similar for the two groups. Obviously the one main variable that is different between the two groups is the ginworkers average 8.8 years exposure to cotton dust on the job.

Determination of the prevalence of chronic respiratory disease (CRD) was a major goal in this study. CRD was measured in a number of ways; x-ray readings, respiratory symptom questionnaire, and spirometric tests. Radiographic readings showed no unusual small opacity profusions in the ginworkers. In the spirometric tests FEV_1 and FVC as percents of predicted (using age-height adjusted equations) were the variables analyzed. Chronic respiratory disease as diagnosed by the questionnaire (see criteria page 9) was more prevalent in the controls 39%, than in the gin workers 30%, (statistically significant at .05) and approximately 6% of each group was classfied prescreened abnormal by the questionnaire. The amount of CRD diagnosed by spirometric test (see critieria page 10) was idential (13%) when the abnormal and borderline categories were included together. When the Bouhuys F-Grade was calculated (see page 11), no significant difference was discernible between the groups. Both groups had a mean FEV_1 percent of predicted of about 92 percent. Their mean FEV_1/FVC's were .82 for controls and .81 for gin workers.

Of primary concern was the possibility that the spirometric prediction equations used were not applicable to a Mexican-American population, and that Mexican-Americans might react differently to cotton dust than whites. To resolve these questions, nonsmoking white controls were compared with non-smoking nonwhite controls. The whites had a 92.5 mean percent of predicted FEV_1 vs. 96.3 for the non-whites; and both had a mean .83 FEV_1/FVC. The non-whites had 15% with abnormal or borderline CRD as diagnosed by pulmonary function test vs. 10% in the whites and 23% and 24% respectively with CRD as diagnosed by the modified BMRC questionnaire. None of these differences were significant statistically at the .05 level. Since the pulmonary function parameters were expressed as percents of predicted they were age and height

adjusted. Thus, the seven year age disparity of the two groups was unimportant. This was a strong indication that the predicted FEV_1 and FVC equations used were not inappropriate for either race, even though they were based on an all-white non-smoking population. The differences in mean FEV_1/FVC, and percent with CRD as diagnosed by questionnaire and pulmonary function test between the whites and non-whites for the smokers and previous smokers are not statistically significant excepting one case (Table 2) which is probably due to the large pack year differences between the two groups.

A review of the smoking history by race (Table 3) reveals that 44% of the white ginworkers were smokers as opposed to 50% of the non-whites, yet the whites exhibited 3 times the mean pack year value of the non-whites (34.4:11.4). This indicates that a larger number of non-whites smoke, but have smoked for significantly less time than their white counterparts. Because of these confounding differences, the small number of white ginners, and the fact that the prediction equations seemed to be race independent, no further analysis by race was attempted; consequently, data from both races were merged. The merge was further justified after examination of prevalence of FEV_1 reactors between the two races showed no significant differences ($P = .05$).

The controls were than compared with the ginworkers by smoking (Tables 4 and 5) category separately. Non-smoking ginworkers and controls had almost identical FEV_1%, FVC% and FEV_1/FVC% means. Even the proportion of each group diagnosed by pulmonary function test as having CRD was similar, 16% vs. 13%. However, although both groups had roughly the same age distribution, the controls had 23% with CRD and diagnosed by questionnaire compared to the ginworkers 15%.

Previous smoking ginworkers had a higher (35% vs. 26%) prevalence of CRD diagnosed by questionnaire than the corresponding controls but a lower prevalence of CRD diagnosed by pulmonary function test (11% vs. 16%). In this case the pack years were very similar between the two groups; 7.5 and 9.1 respectively. Both groups had similar FEV_1%, FVC%, and FEV_1/FVC means. The smoking ginworkers had much less CRD as diagnosed by questionnaire than the smoking controls, 38% vs. 52%, (statistically significant at .05). Both groups had 12% with CRD diagnosed by pulmonary function test, and both groups had similar FEV_1%, FVC%, and FEV_1/FVC means. Pack years experienced by both groups were similar.

The environmental air sampling technique had to be revised so that no high volume or ashed samples were taken. The environmental respirable dust samples taken with a USPHS cotton dust large vertical ellutriator (LVE) showed the overall mean to be .93 mg/m^3 (Table 6). In new Mexico the gin stand samples were consistently at least twice as high as the baling press and other samples; however, in Texas the concentrations were very similar throughout the gin. This same result also appeared in small vertical ellutriator and personal samples (Tables 7 and 8). While only saw gins were used in Texas, there were substanial numbers of saw and roller gins in New Mexico. There was no noticeable difference in dust levels between these two types of gins. Spindle pickers were used almost exclusively in both states so the cotton was predominately long fiber, i.e., Stoneville and Acala, however, a significant proportion of New Mexico cotton was extra long fiber Pima. One of the major factors that could account for differences in dust levels was the prevailaing weather in each area, since gins are barn like structures essentially open to the elements. Texas had a very high humidity with very little wind, while by contrast New Mexico was very dry and windy.

A group of gins in Texas was uncooperative and resisted medical testing of their employees. To check for any possible bias in the group of gins were we performed medical testing, dust samples were taken and compared to dust samples from gins whose employees had not participated in the medical testing. No significant difference was found between the gins. Since the environmental samples varied so widely even within a job area at one gin and it was not always possible to accurately assess a ginworkers total exposure, a number of medical-environmental relationships were investigated.

The first of these was a comparison of the ginworkers in the three job areas; ginners, pressmen, and others (Table 9). Although smoking patterns were not statistically different among the three groups at .05, there was a very noticeable abundance of non-smokers in the "other" jobs category. The hypothesis was forwarded that non-smokers became aware first and to a greater degree of any broncho constriction due to byssinosis or reactor type symptoms and self-selected out of the dusty ginner and pressmen jobs. This selection phenomena was actually observed in a few instances during the survey. The ginners averaged almost twice as many years worked in cotton ginning as the other two groups (13.1 vs 7.2 and 7.9); however, in spite of this longer exposure in higher dust levels, particularly in New Mexico anyway, the ginners had only 6.4% diagnosed with borderline or abnormal CRD by pulmonary function test as opposed to 19% of the pressmen. This was not statistically significant at .05. This same trend was found when using the Bouhuys F-Grade classification and is felt to be partially due to the different smoking characteristics of the group.

Next a comparison of mean FEV_1% by smoking category for those with short term, medium term, and long term exposure was made (Table 10). Smokers exhibited an almost linear drop in FEV_1% of predicted between the 0-1 year, 2-5 year and $\geq$ 6 years exposure groups. A similar effect was found when all ginworkers regardless of smoking history were combined. Non-smokers, on the other hand, exhibited a drop only in the $\geq$ 6 years exposure group.

This relationship was further investigated by generating a correlation matrix separately for smokers and non-smokers using pack years, FEV_1%, FEV_1/FVC, and years worked as variables. For the non-smokers, years worked had a correlation coefficient of -.10 with FEV_1% and -.09 with FEV_1/FVC. For the smokers, years-worked had a correlation coefficient of +.41 with pack years, -.37 with FEV_1%, and -.43 with FEV_1/FVC. Meanwhile, pack years had a correlation coefficient of -.26 with FEV_1%, and -.45 with FEV_1/FVC. In order to separate between the cotton dust exposure and smoking effects on pulmonary function, a stepwise linear regression was performed. The resulting regression equation was:

$$FEV_1\% = 100 - .131 \text{ (pack years)} - .564 \text{ (years worked)}.$$

The years-worked coefficient was statistically signficiant at less than .01 as being non-zero.

Table 11 reflects the relationship between the overall mean respirable dust level measured in each gin by area samples and three separate measurements of the chronic respiratory disease of the ginworkers. Parametric regression and non-parametric correlation showed individual gin dust levels to be unrelated to the level of chronic respiratory disease in that gin. In addition, personal sample dust levels had almost no correlation with FEV_1% ($R = .05$) and with FEV_1/FVC ($R = .0001$) as was expected due to the frequent job changing and highly variable dust levels over years of cotton gin operation.

Classically, byssinosis is defined by positive responses to questions on chest tightness and breathlessness several hours into a workshift after being off for one or more shifts. Schillings grading system provides for the following classifications of byssinosis:[28]

Grade 0	No evidence of Monday chest tightness or breathing difficulty
Grade 1/2	Occasional chest tightness on first day of the working week
Grade 1	Chest tightness on every first day of the working week
Grade 2	Chest tightness every first and other days of the working week
Grade 3	Grade 2 symptoms accompanied by evidence of permanent incapacity from diminished effort intolerance and/or reduced ventilatory capacity.

Responses to the Byssinosis questions were consistently answered negatively by each ginworker in the sample, resulting in a clinical prevalence rate of zero. Likewise when the questions were re-asked later in the season there were no positive responses. Thus the incidence was zero. However, when the functional grading system recommended by Bouhuys[28] for classification and management of exposed workers (page 11) was used to classify the Forced Expiratory Flow Spirometry data, a prevalence of 18.2% was found in categories needing further medical surveillance and transfer to a lower risk area (Table 12). This data is based on "out-of-dust" to "in-dust" decrements in FEV_1. The "in-dust" measurement for each worker was usually obtained within 48 hours of his

"out-of-dust" value, with no intermediate missed shifts, at least four hours into the shift. The prevalence rate of FEV_1 decrements (ΔFEV_1) based on this model is referred to as 48-hour prevalence. Total prevalence is computed by looking for changes in the $FEV_{1.0}$ from the "out-of-dust" measurement to the "in-dust" measurement that occurred regardless of the elapsed time since the "out-of-dust" value was obtained. This then permits reactors to be identified who are sensitized more slowly and would not be picked up in the 48-hour measurement. Not all ginworkers had 48-hour or total "out-of-dust" to "in-dust" data. Table 13 presents the distribution of 48-hour prevalence rates by smoking category and degree of reaction. An overall prevalence of 34% was demonstrated. Moderate reactors contributed 25%, and severe reactors 8.7%. When stratified by smoking habits, x-smokers and non-smokers show the lowest prevalence of reaction (28% and 20%). Light smokers (<10 pack years) have a prevalence of 52% whereas heavy smokers (>10 pack years) have a prevalence of 34%.

Table 15 again demonstrates the relationship between severity of reaction and smoking history, this time with total prevalence. Smokers had the least number of non-reactors and the most moderate and severe reactors 50%, 29% and 21% respectively. Non-smokers showed the highest number of non-reactors, 64% and the lowest number of moderate and severe reactors, 26% and 12% respectively. Previous smokers fell in between these two categories in each classification of reactor. All three smoking categories showed that with an increasing severity of reaction, the percentage of people reacting became smaller.

Table 14 shows a total reactor prevalence of 44%. When examined by severity of reaction, moderate reactors ($\Delta FEV_{1.0}$ -5% to -10%) made up 27%, and severe reactors ($\Delta FEV_{1.0}$ -10%) 17%. When these figures are stratified into job areas, the highest prevalence is seen to occur in "Pressmen" with 52% being reactors (moderate 39% and severe 13%). "Ginners" are the second highest with 44% (moderate 28% and severe 15%). The lowest prevalence was demonstrated in the "other" group. They showed a total prevalence of 42% (moderate 21%, severe 21%). However, the differences between job areas were not statistically significant.

Tables 16 and 17 show the number and percent of ginworkers reacting at each gin along with the gin's overall average area dust level as measured by the LVE. No statistical correlation was found to exist between these variables. In addition, when each ginworker's personal sampler dust level was compared with his ΔFEV_1 on 56 persons a non-significant correlation coefficient was found.

Tables 18 and 19 were computed to locate any self selection out of the ginworkers population among smokers or FEV_1 reactors. The longer term employees consist of a higher percentage of smokers, lower percentage of nonsmokers, similar percentage of previous smokers, and lower percentage of reactors than the short term employees. However, none of these differences were statistically significant at the .05 level.

X. Discussion

Although extensive planning went into the sampling design, a combination of circumstances relegated this survey to the rank of an investigation. Generally, management in each of the cotton gins sampled was uncooperative. This fact along with the absence of the authority of PL 91-596 prevented a geographically representative sample of ginners being taken. Therefore, the results presented in this report represent only a "group at hand" and cannot be generalized outside of the immediate population.

Perhaps the most serious confounding circumstance was the high percentage of Mexican Americans, 82%. Many were illegal aliens from Mexico and were extremely reluctant to participate in a Federal survey. When persuaded to participate, these ginworkers demonstrated much anxiety about their job since management occassionally had tried to discourage participation of workers by threatening to fire those who did. Finally, a language-culture barrier was frequently encountered, which was manifested by common words having different meanings, and questions not being fully understood. This situation was the result of subtle language differences between Mexican nationals and Mexican Americans. This fact, therefore, coupled with illiteracy often defied resolution in spite of Spanish speaking interviewers and technicians, and a Spanish translated questionnaire. The responses on the questionnaire reflected most of these problems. A similar problem was experienced by Gilson in his study of cotton mills and gins in Kenya.[24] The total absence of Byssinosis symptoms was due either to a reluctance to admit to a problem because of fear of job loss and subsequent deportation, or a total misunderstanding of the questions. It was observed in some cases that symptoms of wheezing were present but questions pertinent to this condition were answered negatively. For these reasons, the questionnaire data was not considered reliable.

The pulmonary function testing generally met with a higher degree of success. A new "Motivational spirometer" was used which permitted the examinee to engage in a game to blow as many lights on in the shortest period of time.[27] They related well to this technique and enthusiastically engaged in the competition of who could do it the best. Out of 286 ginners tested, 203 had reliable baseline pulmonary function tests, and of those 140 demonstrated

reliable $FEV_{1.0}$ & FVC values for both "in-dust" and "out-of-dust" measurements. Thus the fact that no excess chronic respiratory disease was found in the ginworkers was most likely not due to data quality.[29] The chronic respiratory disease that was found by pulmonary function tests was attributable to some degree to the amount of exposure of the ginworkers as measured by years worked for smokers only. This effect was in addition to the smoking factor. However, the chronic respiratory disease was not relatable to any current personal or area dust exposure level. This was probably due to the large variation in duties of the ginworker over the years, the large variation in dust levels at one location over time, the unknown content of the dust and, in some cases the sporadic, yet often improper use of respirators.

The prevalence of FEV_1 decrements found in the ginworkers was higher than that found in the cotton textile industry. Thus, although there were no controls for this part of the study nor any reliable questionnaire findings to corroborate with, it seemed the same response pattern to cotton dust found in textile workers also was occurring in ginworkers. These FEV_1 decrement reactions were more prevalent and severe in smokers. This concurs with findings by others.[3,20,26,30] However, there seemed to be no relationship between the prevalence of FEV_1 reactors and job area, dust level, or years experienced. Although pressmen had a higher prevalence of chronic respiratory disease and FEV_1 reactors, the numbers were too small to be statistically significant. Even if they had been statistically significant, the meaning would not be clear since dust levels did not correlate with any pulmonary function data and the men in the three job areas, ginners, pressmen, and other all had similar smoking histories.

There exists a group of people in this ginworking population, 18%, who according to Bouhuys' F-Grade classification scheme need to be moved to a lower risk area and given semi-annual pulmonary function tests. However, due possibly to the irregular exposure to cotton each year these ginworkers did not develop an excess prevalence of chronic respiratory disease.

Since the ginworkers, especially the pressmen and other workers, were highly mobile and there was no excess chronic respiratory disease, self selection naturally became a point of concern in this study. However, the fact that there was no significant difference in percent of smokers, or percent of reactors between those ginworkers employed less than two years and those employed more than five years tended to refute the hypothesis of self selection.

Table 1

Ginworker and Control Groups Description

	All Ginworkers	Modified Control Group
Total persons in group:	203	260
Total number of whites:	25	37
Percentage white:	12.3%	14.2%
Total number non-white:	178	223
Percentage non-white:	87.7%	85.8%
Mean age:	36.3	36.1
Mean height:	67.2	68.2
Mean years ginned:	8.8	
Mean FLVI (%of pred):	92.4%	92.7%
Mean PVC (% of pred):	95.4%	95.5%
Mean FLVI - over FVC:	.81	.82
Smokers (percent):	49.3%	52.3%
Prev smokers (percent):	18.7%	19.2%
Non smokers (percent):	32.0%	28.5%
Smoker mean pack-years:	14.0	11.4
Prev smoker mean pack-yr:	7.5	9.1
Questionnaire CRD		
Percent normal	63.5%	55%
Percent borderline	23.6%	32%
Percent abnormal	6.4%	7%
Percent prescreened abnormal	6.4%	6%
Pulmonary Function CRD	87.2%	87%
Percent normal	8.4%	8%
Percent borderline	4.4%	5%
Percent abnormal		
Percent with pulmonary F-Grade = 0:	82.3%	81%
Percent with pulmonary F-Grade = 1:	13.3%	16%
Percent with pulmonary F-Grade = 2:	4.4%	3%

Table 2

MODIFIED CONTROL GROUP SPIROMETRY AND QUESTIONNAIRE RESULTS BY RACE AND SMOKING CATEGORY

		n	Mean Pack Years	Mean Age	Mean FEV 1% of Predicted	Mean FVC % of Predicted	Mean FEV 1/FVC	% with CRD Diagnosed by Questionnaire	% with CRD Diagnosed by Pulmonary Test
Non-white	Non-smokers	53		32	94.3	96.3	.83	24%	15%
White	Non-smokers	21		39	92.5	93.1	.83	23%	10%
Non-white	Previous smokers	45	7	42	89.9	93.5	.80	24%	16%
White	Previous smokers	5	27	54	85.8	95.6	.73	40%	20%
Non-white	Smokers	125	9.5	33	93.5	95.7	.83	51%	10% *
White	Smokers	11	31.9	52	91.8	102.5	.72	54%	36%

* Significant at .05

Ginworkers Description by Race

Table 3

	Whites		Non-Whites	
	Ginworkers	Modified Control Group	Ginworkers	Modified Control Group
Total Persons in group:	25	37	178	223
Total number of whites:	25	37	00	00
Percentage white:	100.0	100.0%	00.0	00.0
Total number non-white:	00	00	178	223
Percentage non-white:	0.0%	00.0%	100.0%	100.0%
Mean Age:	41.48	44.7	35.6	34.7
Mean Height:	69.48	69.4	66.1	67.9
Mean Years Ginned:				
Mean FEVI (% of pred):	93.6%	91.4%	92.2%	92.9%
Mean FVC (% of pred):	~100.8%	96.2%	94.7%	95.4%
Mean FEVI-over FVC:	0.78	.78	.82	.82
Smokers (percent):	44%	29.7%	50.0%	56.1%
Prev smokers (percent):	16%	13.5%	19.1%	20.2%
Non-smokers (percent):	40%	56.8%	30.9%	23.8%
Smoker mean pack-years:	34.4	31.9	11.4	9.5
Prev smoker mean pack-yr:	11.50	27.00	7.1	7.1
Questionnaire CRD				
Percent Normal	48%	49%	66%	56%
Percent Borderline	20%	32%	24%	31%
Percent Abnormal	12%	3%	6%	8%
Percent Prescreened Abnormal	20%	16%	4%	4%
Pulmonary Function CRD				
Percent Normal	92%	81%	87%	88%
Percent Borderline	8%	14%	8%	8%
Percent Abnormal	0%	5%	5%	4%
Percent with				
pulmonary F-Grade = 0:	84%	68%	82%	83%
pulmonary F-Grade = 1:	16%	27%	13%	14%
pulmonary F-grade = 2:	0%	5%	5%	3%

Table 4

Ginworkers Description by Smoking Classification

	Smokers	Previous Smokers	Non-Smokers
Total persons in group:	100	38	65
Total number of whites:	11	4	10
Percentage white:	11.0%	10.5%	15.4%
Total number non-white:	89	34	55
Percentage non-white:	89.0%	89.5%	84.6%
Mean Age:	38.26	37.44	32.55
Mean Height:	67.70	68.28	68.56
Mean Years Ginned:			
Mean FEVI (% of pred):	90.8%	94.8%	93.3%
Mean FVC (% of pred):	95.4%	96.0%	95.2%
Mean FEVI-over FVC:	.80	.83	.83
Smokers (percent)	100%	00,0%	00.0%
Prev smokers (percent):	00.0%	100%	00.0%
Non-smokers (percent):	00.0%	00.0%	100%
Smoker mean pack-years:	13.98	00	00.0
Prev smoker mean pack-yr:	00.0	7.54	00.0
Questionnaire CRD			
Percent Normal	58%	55%	77%
Percent Borderline	28%	32%	12%
Percent Abnormal	10%	3%	3%
Percent Prescreened Abnormal	4%	11%	8%
Pulmonary Function			
Percent Normal	88%	89%	85%
Percent Borderline	7%	8%	11%
Percent Abnormal	5%	3%	5%
Percent with			
pulmonary F-Grade = 0:	83%	84%	80%
pulmonary F-Grade = 1:	12%	13%	15%
pulmonary F-Grade = 2:	5%	3%	5%

Table 5

Modified Control Group Description by Smoking Classification

	Smokers	Previous Smokers	Non-Smokers
Total persons in group:	136	50	74
Total number of whites:	11	5	21
Percentage of whites:	8.1%	10.0%	28.4%
Total number non-whites:	125	45	53
Percentage non-white:	91.9%	90.0%	71.6%
Mean Age:	34.46	43.60	34.20
Mean Height:	68.27	67.90	68.16
Mean Years Ginned:			
Mean FEVI (% of pred):	93.4%	89.4%	93.8%
Mean FVC (% of pred):	96.2%	93.7%	95.4%
Mean FEVI-over FVC:	.82	.80	.83
Smokers (percent):	100%	00.0%	00.0%
Prev smokers (percent):	00.0%	100%	00.0%
Non-smokers (percent):	00.0%	00.0%	100%
Smoker mean pack-years:	11.35	00.0	00.0
Prev smoker mean pack-yr:	00.0	9.10	00.0
Questionnaire CRD			
Percent Normal	40%	70%	72%
Percent Borderline	40%	22%	23%
Percent Abnormal	12%	4%	1%
Percent Prescreened Abnormal	8%	4%	4%
Pulmonary Function CRD			
Percent Normal	88%	84%	86%
Percent Borderline	7%	12%	9%
Percent Abnormal	5%	4%	4%
Percent with			
pulmonary F-Grade = 0:	81%	78%	82%
pulmonary F-Grade = 1:	15%	20%	15%
pulmonary F-Grade = 2:	4%	2%	3%

Table 6

Dust Concentrations by Work Area and by State

Gin	# of Gins	Area	LVE* Samples	LVE* Mean	LVE* High	LVE* Low	LVE* Median
Texas Gin Totals	13	Gin Stand	16	0.83	2.09	0.12	0.40
		Baling Press	23	0.90	2.70	0.08	0.64
		Other	7	0.79	1.99	0.29	0.48
		Overall	46	0.86	2.70	0.08	0.48
New Mexico Gin Totals	16	Gin Stand	28	1.52	4.98	0.19	1.23
		Baling Press	29	0.63	1.67	0.14	0.46
		Other	7	0.72	1.08	0.51	0.71
		Overall	64	1.03	4.98	0.14	0.73
Combined Texas & New Mexico Gins	29	Gin Stand	44	1.25	4.98	0.12	1.08
		Baling Press	52	0.71	2.70	0.08	0.48
		Other	14	0.76	1.99	0.29	0.59
		Overall	110	0.93	4.98	0.08	0.67

LVE* - USPHS Cotton Dust Vertical Elutriator. - Particle size cutoff approximately 15 microns.

Table 7

Dust Concentrations by Gin

Gin No.	Gin	# of Gins	Area	LARGE VERTICAL ELUTRIATOR					SMALL VERTICAL ELUTRIATOR					PERSONAL				
				# Spl	$\bar{X}$	High	Low	Median	# Spl	$\bar{X}$	High	Low	Median	# Spl	$\bar{X}$	High	Low	Median
1	McAllen Fruit & Vegetable Gin Co.	1	Overall	14	0.35	1.99	0.08	0.24	18	0.70	2.56	0.21	0.41	22	0.81	3.36	0.32	0.55
2	Hidalgo Gin Co.	1	Overall	0					2	1.53	2.07	0.99	1.53	0				
3	Farmers Gin Coop Assn. (San Juan)	2	Overall	11	1.28	2.40	0.37	1.20	15	2.05	4.08	0.45	2.34	0				
5	La Feria Coop Gin	1	Overall	2	0.74	1.16	0.33	0.74	3	1.19	1.86	0.60	1.12	0				
6	Farmers Gin of Los Fresnos	1	Overall	4	1.12	2.56	0.34	0.80	4	1.67	3.02	0.32	1.68	6	0.54	1.01	0.24	0.39
7	Sebastion Farmers Gin	1	Overall	3	0.49	0.60	0.40	0.46	6	0.66	0.84	0.54	0.65	11	1.66	4.29	0.28	0.86
8	Martin Cotton & Grain Co.	1	Overall	1	0.26				2	1.17	1.19	1.15	1.17	0				
9	J. P. Bowlin Gin	1	Overall	4	1.18	2.70	0.37	0.82	7	1.94	4.70	0.68	1.39	0				
10	Borderland Farmers Coop Assn.	2	Overall	7	1.38	2.97	0.14	1.45	8	2.34	3.89	0.23	2.70	14	1.91	3.40	0.57	1.68
11	White Gin Assn.	2	Overall	9	0.65	1.06	0.38	0.59	9	1.13	1.71	0.71	1.12	9	2.00	3.03	1.22	1.74
12	La Mesa Coop Gin Assn.	1	Overall	8	0.78	1.33	0.32	0.68	9	1.52	2.55	0.55	1.88	20	1.26	2.39	0.21	1.15
13	Santo Tomas Coop Gin	2	Overall	10	1.52	4.98	0.21	0.67	9	1.82	5.06	0.34	0.98	11	1.28	2.64	0.35	1.11
14	Mesilla Coop Gin Assn.	2	Overall	12	1.17	2.34	0.30	0.80	13	2.05	6.34	0.47	1.72	14	2.19	4.61	0.61	1.80
15	Dona Ana Coop Gin	2	Overall	5	0.59	1.60	0.19	0.37	4	0.67	1.82	0.14	0.36	7	1.24	1.84	0.92	1.09
16	Luna Cotton Coop	2	Overall	7	0.63	1.44	0.21	0.46	8	0.77	2.25	0.22	0.64	12	2.57	4.00	0.80	2.44
18	B. E. Harvey Gin Co.	1	Overall	1	0.93				2	1.28	1.61	0.96	1.28	0				
--	Anthony Gin Co.	1	Overall	2	0.88	1.27	0.49	0.88	2	1.51	2.15	0.87	1.51	0				
20	Joe Christmas Gin Co.	1	Overall	1	1.05				1	4.36				0				

Dust Concentrations by Gin

Table 8

Gin No.	Gin	# of Gins	Area	LVE # Spl	LVE $\bar{X}$	LVE High	LVE Low	LVE Median	SVE # Spl	SVE $\bar{X}$	SVE High	SVE Low	SVE Median	PERSONAL # Spl	PERSONAL $\bar{X}$	PERSONAL High	PERSONAL Low	PERSONAL Median
21	Edinburg Coop Gin Co.	1	Overall	2	0.71	1.11	0.31	0.71	2	0.86	1.08	0.65	0.86	0				
2	Valley Growers Gin & Supply Co.	1	Overall	2	1.77	1.92	1.62	1.77	2	3.19	3.85	2.53	3.19	0				
3	Mission Gin Co.	1	Overall	2	1.02	1.15	0.90	1.02	2	1.54	1.84	1.23	1.54	0				
4	Berino Coop Gin	1	Overall	2	0.88	1.25	0.53	0.88	2	1.70	2.52	0.88	1.70	0				
	Texas Gin Totals	13	Gin Stand	15	0.83	2.09	0.12	0.40	27	1.53	4.36	0.32	1.16	5	0.67	0.93	0.49	0.53
			Baling Press	23	0.90	2.70	0.08	0.64	25	1.42	4.70	0.21	0.99	15	0.69	1.38	0.24	0.79
			Other	7	0.79	1.99	0.29	0.48	12	1.28	2.66	0.45	1.07	19	1.36	4.79	0.28	0.69
			Overall	46	0.86	2.70	0.08	0.48	64	1.44	4.70	0.21	1.10	39	1.01	4.79	0.24	0.69
	New Mexico Gin Totals	16	Gin Stand	28	1.52	4.98	0.19	1.23	30	2.21	6.34	0.27	1.80	23	2.45	4.43	0.57	2.41
			Baling Press	29	0.63	1.67	0.14	0.46	30	0.99	2.85	0.14	0.85	33	1.51	3.59	0.36	1.22
			Other	7	0.72	1.08	0.51	0.71	6	1.45	2.55	0.81	1.25	31	1.55	4.61	0.21	1.52
			Overall	64	1.03	4.98	0.14	0.73	66	1.58	6.34	0.14	1.12	87	1.77	4.61	0.21	1.59
	Combined Texas & New Mexico Gins	29	Gin Stand	44	1.25	4.98	0.12	1.08	57	1.89	6.34	0.27	1.61	28	2.11	4.43	0.49	2.29
			Baling Press	52	0.71	2.70	0.08	0.48	55	1.18	4.70	0.14	0.87	48	1.25	3.59	0.24	1.08
			Other	14	0.76	1.99	0.29	0.59	18	1.34	2.66	0.45	0.78	50	1.48	4.79	0.21	1.39
			Overall	110	0.93	4.98	0.08	0.67	130	1.51	6.34	0.14	1.12	126	1.53	4.79	0.21	1.26

LVE = USPHS Cotton Dust Vertical Elutriator. - Particle size cutoff approximately 15 microns.

SVE = Unico Micronair with 37mm filter holder and vertical elutriator used as area sampler. - Particle size cutoff approximately 30 microns.

PERSONAL = Unico Micronair used as personal sampler. - Particle size cutoff approximately 30 microns.

Ginworkers Description by Job Category

	Ginners	Pressmen	Others
Total persons in group:	47	42	112
Total number of whites:	3	1	20
Percentage white:	6.4%	2.4%	17.9%
Total number non-white:	44	41	92
Percentage non-white:	93.6%	97.6%	82.1%
Mean Age:	39.7	33.8	35.4
Mean Height:	67.9	69.2	67.9
Mean Years Ginned:	13.1	7.2	7.9
Mean FEVI (% of pred):	93.15%	87.1%	93.9%
Mean FVC (% of pred):	97.44%	90.1%	96.7%
Mean FEVI-over FVC:	.81	.82	.82
Smokers (percent):	51.1%	57.1%	45.5%
Prev smokers (percent):	25.5%	19.1%	15.1%
Non smokers (percent):	23.4%	23.8%	39.4%
Smoker mean pack-years:	16.0%	7.3	15.3
Prev smoker mean pack-year:	9.6	4.1	8.0
Questionnaire CRD			
Percent Normal:	63.8%	69%	61.6%
Percent Borderline:	25.5%	21.4%	24.1%
Percent Abnormal:	6.4%	4.8%	7.1%
Percent Prescreened Abnormal:	4.3%	4.8%	7.1%
Pulmonary Function CRD			
Percent Normal:	93.6%	81%	86.6%
Percent Borderline:	2.1%	11.9%	9.8%
Percent Abnormal:	4.3%	7.1%	3.6%
Percent with			
pulmonary F-Grade = 0:	91.5%	69.1%	88.4%
pulmonary F-Grade = 1:	4.3%	23.8%	13.4%
pulmonary F-Grade = 2:	4.3%	7.1%	3.6%

Table 10

GINWORKERS MEAN FEV1% PREDICTED

	COTTON DUST EXPOSURE		
	Short 0-1 years	Medium 2-5 years	Long 6+ years
ALL GIN WORKERS (n=181)	99.6	96.4	93.0
NON-SMOKERS (n=53)	99.9	100.4	94.8
SMOKERS (n=92)	98.2	94.7	90.1

GIN DUST LEVEL versus PARAMETERS OF CHRONIC RESPIRATORY DISEASE

GIN	DUST	WORKERS WITH QUESTIONNAIRE CRD	WORKERS WITH PULMONARY CRD	WORKERS MEAN FEV1% PREDICTED
1	.35	21%	13%	89.2
7	.49	44%	0%	97.4
8	.26	0%	25%	87
9	1.18	67%	0%	100.2
10	1.38	24%	14%	94.1
11	.65	17	17%	94.8
12	.78	50%	0%	93.8
13	1.52	33%	17%	96.3
14	1.17	43%	0%	100.1
15	.58	30%	20%	111.8
16	.63	54%	23%	86.5

Table 12

BOUHUYS F-GRADE PREVALENCE

	FEV1%	48 hr ΔFEV1%	NUMBER OF PERSONS
F_o	(80%)	a) -4 to 0; or +	47
		b) -9 to -5	15
		c) -10+	7 *
F_1	(60-79)	a) -4 to 0; or +	5
		b) -5+	4 *
F_2	(<60)		4 *

* 18.2% of the population fell into categories recommended by Bouhuys as needing further medical surveillance and transfer to lower risk area.

Table 13

PREVALENCE OF 48-HOUR ΔFEV1 REACTION

	SMOKING CATEGORY				
	Non Smokers	Previous Smokers	Light Smokers	Heavy Smokers	Total
Non Reactors	80%	72%	48%	66%	66.3%
Moderate Reactors	20%	21%	39%	17%	25%
Severe Reactors	0%	7%	13%	17%	8.7%

N = 80

Table 14

Distribution of Dust Levels and Pulmonary Reactors by Job Area

	Average (Δ FEVI)	Number of Non-Reactors (Δ FEVI >-5%)	Number of Moderate Reactors (-5% ≥ Δ FEVI >-10%)	Number of Severe Reactors (Δ FEVI < -10%)	Total	% of Population Reacting	Dust Levels
Texas	-2.3	26	17	6	49	47%	.86
Ginners	-2.9	6	2	1	9	33%	.83
Pressmen	-2.9	5	6	4	15	67%	.90
All Others	-2.2	13	9	1	23	43%	.79
Unclassified		2	0	0	2	0%	
New Mexico	-4.2	51	20	18	89	43%	1.03
Ginners	-3.1	16	9	5	30	47%	1.52
Pressmen	-2.0	10	6	0	16	38%	.63
All Others	-5.9	25	5	13	43	42%	.72
Total	-3.6	77	37	24	138	44%	.93
Ginners		22	11	6	39	44%	1.25
Pressmen		15	12	4	31	52%	.71
All Others		38	14	14	66	42%	.76
Unclassified		2	0	0	2	0%	

TOTAL* PREVALENCE OF ΔFEV1 REACTION

	SMOKING CATEGORY			
	Non Smokers	Previous Smokers	Smokers	Total
Non Reactors	64%	58%	50%	56%
Moderate Reactors	24%	27%	29%	27%
Severe Reactors	12%	15%	21%	17%

N = 138

* Includes test pairs over and under 48 hours.

Table 16

Distribution of Dust Levels* and Pulmonary Reactors by Gin - Texas

Gin	Average (Δ FEVI)	Number of Non-Reactors (Δ FEVI >-5%)	Number of Moderate Reactors (-5% ≥ Δ FEVI >-10%)	Number of Severe Reactors (Δ FEVI < -10%)	Total	% of Population Reacting	Mean Dust Level
1	-1.5%	14	9	1	24	42%	.35
2	-10.5%	2	1	1	4	50%	ND**
4	-7.7%	0	4	1	5	100%	ND**
7	-4.3%	5	2	2	9	44%	.49
8	+5.9%	4	0	0	4	0%	.26
9	-9.4%	1	1	1	3	67%	1.18
Total Texas Gins	-2.3%	26	17	6	49	42%	.86

** No data.

* Total Respirable Dust measured by Large Vertical Elutriator.

Table 17

Distribution of Dust Levels* and Pulmonary Reactors by Gin - New Mexico

Gin	Average (Δ FEVI)	Number of Non-Reactors (Δ FEVI >-5%)	Number of Moderate Reactors (-5% ≥ Δ FEVI >-10%)	Number of Severe Reactors (Δ FEVI < -10%)	Total	% of Population Reacting	Dust Levels
10	-.8%	18	2	1	21	14%	1.38
11	-1.4%	5	1	0	6	17%	.65
12	-7.5%	4	4	2	10	60%	.78
13	- 8.5%	3	1	2	6	50%	1.52
14	+.9%	6	1	0	7	14%	1.17
15	-4.0%	4	3	3	10	60%	.58
16	-8.8%	2	5	6	13	85%	.63
17	-5.7%	9	3	4	89	44%	ND
Total N.M. Gins	-4.2%	51	20	18	89	43%	1.03

** No Data.

* Total Respirable Dust measured by Large Vertical Ellutriator.

Table 18

SMOKING MAKEUP BY EXPOSURE GROUP

	YEARS WORKED		
	0-1	2-5	>6
Smokers	43%	42%	56%
Previous Smokers	17%	24%	22%
Non Smokers	40%	34%	22%
Total	100%	100%	100%

Table 19

48-HOUR REACTORS BY EXPOSURE GROUP

	YEARS WORKED		
	0-1	2-5	>6
Non Reactors	55%	65%	73%
Moderate Reactors	40%	23%	17%
Severe Reactors	5%	12%	10%
Total	100%	100%	100%

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Form approved
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DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION
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COTTON GIN STUDY
MEDICAL QUESTIONNAIRE

ASSURANCE OF CONFIDENTIALITY

The U.S. Public Health Service hereby gives its assurance that your identity and your relationship to any information obtained by reason of your participation in the Cotton Gin Study will be kept confidential in accordance with PHS regulations (42 CFR 1.103(a)) and will not otherwise be disclosed except as specifically authorized below. A copy of this regulation will be made available to you upon request.

Marcus M. Key, M.D.
Assistant Surgeon General
Director, National Institute
for Occupational Safety and Health

CONSENT

I hereby voluntarily agree to participate in the Cotton Gin Study which will be conducted by the U.S. Public Health Service. I understand that in addition to my answering the questionnaire I will receive a chest X-ray and breathing tests will be made to determine the resistance in my air passages and to measure the passage of gases between the air in my lungs and my blood. I understand that these tests are established medical procedures. I am aware that I may withdraw from this study at any time should I so desire.

Signature_____
Date

AUTHORIZATION TO RELEASE MEDICAL INFORMATION

I hereby request the U.S. Public Health Service to inform my personal physician should there be any significant medical findings from this study.

Dr._____

Street

City State Zip Code

Signature Date

1. Observe: Does the subject have signs of a cold or acute respiratory symptoms? ☐ Yes ☐ No (1)

2. Case No. _____ (2-6)

A. IDENTIFICATION DATA

3. Gin: _____ (7-11)

4. Name: _____ (Surname)
_____ (First Name)

5. Address: _____
_____ (City)

6. Interviewer: 1 2 3 4 5 6 7 8 (12-13)

7. Work Shift: 1st___ 2nd___ (14)

8. Present Work Area: (15)
a. Scale man
b. Yard man
c. Suction man
d. Ginner
e. Ginner's helper
f. Pressman
g. Seed man
h. Trash man
i. Lint fly man
j. Bale man
k. Other

9. Social Security No.
___-___-___ (16-24)

10. Date of Interview:
Month Day Year
___/___/___ (25-30)

11. Time _____ A.M. P.M.

12. Date of Birth:
Month Day Year
___/___/___

13. Age: _____ (31-32)

14. Sex: M___ F___ (33)

15. Race: W___ B___ M___ O___ (34)

16. Measured Height: ___ (Inches) (35-37)

17. Measured Weight: ___ (lbs) (38-40)

RESPIRATORY SYMPTOMS

USE ACTUAL WORDING OF EACH QUESTION. PUT "X" IN APPROPRIATE SQUARE AFTER EACH QUESTION. WHEN IN DOUBT, RECORD "NO." WHEN NO SQUARE, CIRCLE APPROPRIATE ANSWER.

PREAMBLE: I AM GOING TO ASK YOU SOME QUESTIONS, MAINLY ABOUT YOUR CHEST. I WOULD LIKE YOU TO ANSWER "YES" OR "NO" WHENEVER POSSIBLE.

B. COUGH

18. Do you usually cough first thing on getting up? ☐ Yes ☐ No (41)

19. Do you usually cough during the day or at night? ☐ Yes ☐ No (42)

20. If "Yes" to 18 or 19 ask: Have you coughed like this on most days for as much as 3 months during the past year? ☐ Yes ☐ No ☐ NA (43)

21. If "Yes" to 20 ask: How many years have you coughed like this? Years _____ Under 2 years ☐ Over 2 years ☐ NA (44-45)

C. PHLEGM (or alternative word to suit local custom):

22. Do you usually bring up any phlegm from your chest first thing on getting up? (Count phlegm with the first smoke or on first going out of doors. Exclude phlegm from the nose. Count swallowed phlegm) ☐ Yes ☐ No (46)

23. Do you usually bring up any phlegm from your chest during the day or at night? (Accept twice or more) ☐ Yes ☐ No (47)

24. If "Yes" to either question 22 or 23, have you brought up phlegm like this on most days for as much as 3 months during the past year? ☐ Yes ☐ No ☐ NA (48)

25. If "Yes" to question 24, for how many years have you brought up phlegm like this? Years _____

Under 2 years	Over 2 years	NA	
_____	_____	___	(49-50)

D. CHEST ILLNESSES

26. In the past three years, have you had a period of (increased) + cough and phlegm lasting for 3 weeks or more?

+ For subjects who usually have phlegm

☐ No
☐ Yes, only one period
☐ Yes, two or more periods (51)

27. During the past three years have you had any chest illness which has kept you off work, indoors, at home or in bed for as long as one week? (e.g., flu?) ☐ Yes ☐ No (52)

28. If "yes" to 27 ask: Did you bring up (more) + phlegm (than usual) in any of these illnesses? ☐ Yes ☐ No ☐ NA (53)

29. If "Yes" to 28 ask: During the past three years have you had:

Only one such illness with increased phlegm? _____
More than one such illness? _____ (54)
Not applicable _____

30. Br. Grade
0_____(0)
1_____(1)
2_____(2) (55)
3_____(3)

31. Do you ever have wheezing or whistling noises in your chest? ☐ Yes ☐ No (56)

32. If "Yes" to 31 ask: How many times does this happen in a year? Times_____

Under 50	Over 50	NA	
_____	_____	_____	(57-58)

E. BREATHLESSNESS

33. Do you have attacks of shortness of breath which are not related to any physical exertion? ☐ Yes ☐ No (59)

34. If "Yes" to 33 ask: How many such attacks have you had during the past year? Attacks _____ Under 50 / Over 50 / NA (60-61)

35. If disabled from walking by any condition other than heart or lung disease put "X" here and specify reason: _____ _____ (62)

36. Are you troubled by shortness of breath when hurrying on level ground or walking up a slight hill? ☐ Yes ☐ No (63)

(If "No" grade is 1. If "Yes" proceed to next question)

37. Do you get short of breath walking with other people of your own age at an ordinary pace on level ground? ☐ Yes ☐ No ☐ NA (64)

(If "No" grade is 2. If "Yes" proceed to next question)

38. Do you have to stop for breath when walking at your own pace on level ground? ☐ Yes ☐ No ☐ NA (65)

(If "No" grade is 3. If "Yes" proceed to next question)

39. Are you short of breath on washing or dressing? ☐ Yes ☐ No ☐ NA (66)

(If "No" grade is 4. If "Yes" grade is 5)

40. Dyspnea Grd. _____ (67)

Preamble for Questions 41 through 44:

ON THE FIRST DAY BACK TO WORK AFTER YOUR DAY(s) OFF:

41. Are you troubled by shortness of breath when hurrying on level ground or walking up a slight hill? ☐ Yes ☐ No (68)

(If "No" grade is 1. If "Yes" proceed to next question)

42. Do you get short of breath walking with other people of your own age at an ordinary pace on level ground? ☐ Yes ☐ No ☐ NA (69)

(If "No" grade is 2. If "Yes" proceed to next question)

43. Do you have to stop for breath when walking at your own pace on level ground? ☐ Yes ☐ No ☐ NA (70)

(If "No" grade is 3. If "Yes" proceed to next question)

44. Are you short of breath on washing or dressing? ☐ Yes ☐ No ☐ NA (71)

(If "No" grade is 4. If "Yes" grade is 5)

45. B. Grd. 0_____(0)
1/2_____(1)
1_____(2) (72)
2_____(3)
3_____(4)

46. During the past week, have you coughed more often than usual?

Date											(73)
Yes											
No											

47. During the past week, have you brought up phlegm from your chest during the day or night?

Yes											(74)
No											

48. During the past week, have you had a "chest cold"?

Date											(75)
Yes											
No											

F. TIGHTNESS

49. Does your chest ever feel tight or your breathing become difficult?

Yes											(76)
No											

50. Is your chest tight or your breathing difficult on any particular day of the week?

Yes											(77)
No											

51. If "Yes" to 50 ask: Which Day?

S										(78-85)
M										
T										
W										
T										
F										
S										
Always										
Sometimes										
NA										

52. Does your chest feel tight or your breathing become difficult:

a. On the first day back to work after one or more days off
b. On the second day back to work after one or more days off
c. On the last day of work before day(s) off
d. None of the above

Date											(86-89)

53. If "Yes" to 52 ask: Is your chest tight or your breathing difficult:

    a. On every such occasion
    b. Only sometimes
    c. Not applicable

Date | | | | | | | | | | (90-92)

54. If "Yes" to 50 or 52 ask: At what time of the day(s) indicated does your chest feel tight or your breathing difficult:

    a. Before entering the gin
    b. After entering the gin
    c. After leaving the gin
    d. Not applicable

Date | | | | | | | | | | (93-96)

55. If after entering or after leaving the gin (Question 54) ask: How many hours after beginning a shift does this begin?

Hours _____
Not Applicable _____ (97-98)

56. If after entering or after leaving the gin (Question 54) ask: How long does this tightness or breathing difficulty last?

Hours _____
Not Applicable _____ (99-100)

57. (Ask only if "No" to 50) In the past, has your chest ever been tight or your breathing difficult on any particular day of the week?

☐ Yes ☐ No ☐ NA (101)

58. If "Yes" to 57 ask: Which day?

S_____
M_____
T_____
W_____
T_____
F_____
S_____

(102)

Always ____
Sometimes ____
NA___

59. (Ask only if "No" to 52) In the past, has your chest ever been tight or your breathing difficult:

    a. On the first day back to work after one or more days off — a_____
    b. On the second day back to work after one or more days off — b_____
    c. On the last day of work before day(s) off — c_____
    d. None of the above — d_____
    e. Not Applicable — e_____

(103)

60. If "Yes" to 59 ask: Was your chest tight or your brea hing difficult:

    a. On every (or nearly so) occasion — a_____
    b. Only sometimes — b_____
    c. Not Applicable — c_____

(104)

61. If "Yes" to 50,52,57, or 59 ask: For how many years have you had chest tightness or breathing difficulty?

Years_____ NA_____ (105-106)

G. OCCUPATIONAL HISTORY

62. What jobs do you do when not ginning cotton? (Specify) _____ (107)
_____
_____

Preamble for Questions 63 through 69: Have you ever worked in:

63. A foundry (as long as one year?) ☐ Yes ☐ No (108)

64. Stone or mineral mining, quarrying or processing (as long as one year?) ☐ Yes ☐ No (109)

65. Asbestos milling or processing (ever?) ☐ Yes ☐ No (110)

66. Cotton textile mill, cotton blend mill, or cotton seed oil mill? ☐ Yes ☐ No (111)

67. Cotton or grain harvesting? ☐ Yes ☐ No (112)

68. Cotton gin (For controls only?) ☐ Yes ☐ No (113)

69. Other dusts, fumes or smoke? If yes, specify ☐ Yes ☐ No (114)
Type of exposure _____
Length of exposure _____

70. At what age did you first go to work in a cotton gin? (115-116)
(Write in specific age)_____

71. How many years have you worked in a cotton gin? (117-118)
(Write in total number of years) _____

72. How many months per year do you usually work in a cotton gin? _____ (119-120)
(No. of months)

73. In what other areas of the state or country have you worked (ginning cotton)? _____ (121-122)
_____
_____

H. OTHER ILLNESSES

74. Do you have a heart condition for which you are under a doctor's care? ☐ Yes ☐ No (123)

75. If "Yes" to 74, specify condition _____
and
drug therapy: _____
_____
Not Applicable: _____

76. Have you ever had asthma? ☐ Yes ☐ No (124)

77. If "Yes" to 76 did it begin:
___ Before age 30
___ After age 30
___ Not Applicable

78. If "Yes" to 76 did you have asthma before ever going to work in a cotton gin? (125)
☐ Yes ☐ No ☐ NA

79. Have you ever been told by a doctor that you had any of the following:

a. Chronic Bronchitis	☐ Yes ☐ No	(126)
b. Emphysema	☐ Yes ☐ No	(127)
c. Fungus infestation of the lungs	☐ Yes ☐ No	(128)
d. Tuberculosis (TB)	☐ Yes ☐ No	(129)
e. Any chronic lung condition	☐ Yes ☐ No	(130)

If "Yes" specify _____

_____

_____

I. TOBACCO SMOKING

80. Have you ever smoked cigarettes?	☐ Yes ☐ No	(131)
(If "Yes" to 80, ask 81. If "No", skip to 88.)		
81. Do you smoke cigarettes now?	☐ Yes ☐ No	(132)
(If "Yes" to 81, ask 82 through 84. If "No", ask 85 through 87.)		
82. About how many cigarettes a day do you usually smoke?	Number___ ☐ NA	(133-134)
83. Do you inhale - - I mean draw the smoke into your chest?	☐ Yes ☐ No ☐ NA	(135)
84. For about how many years have you smoked cigarettes?	Years_____ ☐ NA	(136-137)
(Skip to 88.)		
85. When you used to smoke, about how many cigarettes a day did you usually smoke?	Number_____ ☐ NA	(138-139)
86. Did you inhale - - I mean draw the smoke into your chest?	☐ Yes ☐ No ☐ NA	(140)
87. For about how many years did you smoke cigarettes?	Years_____ ☐ NA	(141-142)
88. Have you ever smoked cigars?	☐ Yes ☐ No ☐ NA	(143)
89. Do you smoke cigars now? (If "Yes" to 89, ask 90 and 91. If "No", skip to 92.)	☐ Yes ☐ No ☐ NA	(144)
90. About how many cigars a day do you usually smoke?	Number _____ ☐ NA	(145-146)
91. For about how many years have you smoked cigars?	Years _____ ☐ NA	(147-148)

92. Have you ever smoked a pipe? (If "Yes" to 92, ask 93 through 95. If "No", end interview.) ☐ Yes ☐ No ☐ NA (149)

93. Do you smoke a pipe now? (If "Yes" to 93, ask 94 and 95. If "No", end interview.) ☐ Yes ☐ No ☐ NA (150)

94. About how many pipefuls of tobacco do you usually smoke a day? Number_____ ☐ NA (151-152)

95. For about how many years have you smoked a pipe? Years_____ ☐ NA (153-154)

☆ U.S. GOVERNMENT PRINTING OFFICE: 1973— 759-577/1431

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DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION
INSTITUTO NACIONAL DE SEGURIDAD Y SALUD RELATIVAS AL EMPLEO
P.O. Box 8137
Salt Lake City, Utah 84108

ESTUDIO RESPECTO A LA DESMOTADORA DE ALGODÓN
CUESTIONARIO MÉDICO

GARANTÍA DE CONFIANSA

Por medio de la presente, el Servicio de Salud Pública de los Estades Unidos le asegura a Ud. que su identidad y su relación con la información obtenida mediante su participación en el Estudio Respecto a la Desmotadora de Algodón serán guardadas en confiansa de acuerdo con la regla del Servicio de Salud Pública (42 CFR 1.103(a)) y no serán reveladas excepto según se autoriza en la siguiente. Se le dará una copia de esta regla si se la pide.

Marcus M. Key, M.D.
Assistant Surgeon General
Director, Instituto Nacional
de Seguridad y Salud Relativas al Empleo

PERMISO

Por medio de la presente, yo voluntariamente consiento participar en el Estudio respecto al desmotadora de algodón que será dirigida por el Servicio de Salud Pública de los EE. UU. Entiendo que además de contestar las preguntas del cuestionario, recibiré una radiografía del pecho y una examinación del respirar. Estoy consciente de que puedo retirarme de eso a cualquier momento.

Firma_____
Fecha

AUTORIZACION PARA LA CESION DE DATOS MEDICOS

Por medio de la presente, yo ruego que el Servicio de Salud Publica le informe a mi médico personal de las conclusiones médicas significantes de este estudio si las hay.

Dr._____

_____
Calle

_____
Ciudad

_____
Firma Fecha

1. Nótese: ¿Muestra el sujeto señales de resfraido o síntomas de grave infección respiratoria? ☐ Sí ☐ No (1)

2. Caso núm. _____ (2-6)

A. DATOS DE IDENTIFICACION

3. Desmotadora: _____ (7-11)

4. Nombre: _____ (Apellido)

_____ (Nombre de pila)

5. Dirección: _____

_____ (Ciudad)

6. Entrevistador: 1 2 3 4 5 6 7 8 (12-13)

7. Turno de Trabajo: 1 ____ 2 ____ (14)

8. Sitio de Trabajo Actual: (15)
   a. Balancero
   b. Corralero
   c. Succionero
   d. Desmotador
   e. Ayudante de desmotador
   f. Comprimidor
   g. Desemillador
   h. Basurero
   i. Quitahilachas
   j. Embalador

9. Número de Seguro Social

   ___-___-___ (16-24)

10. Fecha de Entrevista:
    Mes Día Año
    ___/ ___/ ___/ (25-30)
    de la mañana

11. Hora: _____ de la tarde

12. Fecha de Nacimiento:
    Mes Día Año
    ___/ ___/ ___/

13. Edad: _____ (31-32)

14. Sexo: Varón___ Hembra ___ (33)

15. Raza: B___N___M___O___ (34)

16. Altura Medida:____(Pulgadas) (35-37)

17. Peso Medido:_____(Libras) (38-40)

SINTOMAS RESPIRATORIAS

EMPLÉENSE LAS PALABRAS EXACTAS DE CADA PREGUNTA. PÓNGASE UNA "X" EN LA CASILLA QUE SIGUE CADA PREGUNTA. EN CASO DE DUDA, PÓNGASE "NO". DONDE NO HAY CASILLA, PÓNGASE UN CÍRCULO ALREDEDOR DE LA RESPUESTA APROPIADA.

INTRODUCCIÓN: LE VOY A HACER UNAS PREGUNTAS, POR LA MAYOR PARTE ACERCA DE LOS PULMONES. QUIERO QUE CONTESTE CON "SÍ" O "NO" CUANDO SEA POSIBLE.

B. LA TOS

18. ¿Tose Ud. ordinariamente al levantarse por la mañana? ☐ Sí ☐ No (41)

19. ¿Tose Ud. ordinariamente de día o de noche? ☐ Sí ☐ No (42)

20. Si se contesta "Sí" a la pregunta 18 o 19, pregúntese: ¿Ha tosido así la mayoría de los días por un periodo de 3 meses durante el año pasado? ☐ Sí ☐ No ☐ NR (43)

21. Si se contesta "Sí" a 20, pregúntese: ¿Cuántos años hace que tose de esta manera?

Menos de 2 años	Más de 2 años	NR	
_____	_____	__	(44-45)

C. LA FLEMA (u otra palabra de uso local):

22. ¿Se arranca Ud. flema del pecho ordinariamente al levantarse? (Tenga en cuenta la flema arrancada al fumar o al salir de la casa por primera vez. No tenga en cuenta los mucos nasales. Tenga en cuenta la flema que se traga.)

☐ Sí ☐ No (46)

23. ¿Se arranca Ud. alguna flema del pecho ordinariamente de día o de noche? (Nótense sólo 2 veces o más)

☐ Sí ☐ No (47)

24. Si se contesta "Sí" a la pregunta 22 o 23, pregúntese: ¿Se ha arrancado flemas la mayoría de los días por un periodo de 3 meses durante el año pasado?

☐ Sí ☐ No ☐ NR (48)

25. Si se contesta "Sí" a 24, pregúntese: ¿Cuántos años hace que se arranca flemas así? _____Años

Menos de 2 años | Mas de 2 años | NR
_____ | _____ | ____ (49-50)

D. ENFERMEDADES PULMONARIAS

26. ¿Durante los tres años pasados, ha pasado algún periodo de tos* (aumentada) y flemas que duró 3 semanas o más?

☐ No
☐ Sí, uno solo
☐ Sí, dos o más (51)

* Sujetos que ordinariamente se arrancan flemas

27. ¿Ha tenido Ud. durante los 3 años pasados alguna enfermedad del pecho que le haya impedido a trabajar o le haya obligado a permanecer en casa, en cama por tanto como una semana? (Por ejemplo: ¿la gripe?)

☐ Sí ☐ No (52)

28. Si se contesta "Sí" a 27, pregúntese: ¿se arrancó Ud. más flemas que lo general durante alguno de estos ataques?

☐ Sí ☐ No ☐ NR (53)

29. Si se contesta "Sí" a 28, pregúntese: ¿Ha tenido durante los tres anos pasados:

Sólo un tal ataque con aumento de flemas? ____
Más de uno? ____
No cabe ____ (54)

30. Br. Grade
0_____(0)
1_____(1)
2_____(2)
3_____(3) (55)

31. ¿Resuella ruidosamente o tiene silbidos alguna vez en el pecho?

☐ Sí ☐ No (56)

32. Si se contesta "Sí" a 31, pregúntese: ¿Cuántas veces por año pasa eso? _____Veces

Menos de 50 | Más de 50 | NR
_____ | _____ | ____ (57-58)

E. LA DISPNEA (desaliento)

33. Sufre Ud. ataques de desaliento que no se relacionan con ningún esfuerzo físico? ☐ Sí ☐ No (59)

34. Si se contesta "Sí" a 33, pregúntese: Cuántos de tales ataques ha sufrido durante el año pasado? _____Ataques

Menos de 50	Mas de 50	NR	
_____	_____	__	(60-61)

35. Si se inhabilita de caminar a causa de cualquier condicion que no sea enfermedad del corazón o del pecho, ponga una "X" y especifique: ___ _____ (62)

36. ¿Lo aflige un desaliento al caminar aprisa en terreno llano o al subir una pequeña cuesta? ☐ Sí ☐ No (63)

(Si "No," el grado es 1. Si es "Sí," siga a la pregunta siguiente.)

37. ¿Lo aflige un desaliento al caminar con otros de su propia edad a su paso ordinario en terreno llano? ☐ Sí ☐ No ☐ NR (64)

(Si "No," el grado es 2. Si es "Sí," prosiga)

38. ¿Tiene que detenerse porque se ahoga al caminar a paso ordinario en terreno llano? ☐ Sí ☐ No ☐ NR (65)

(Si "No," el grado es 3. Si es "Sí," prosiga)

39. ¿Se desalienta al lavarse o vestirse? ☐ Sí ☐ No ☐ NR (66)

(Si "No," el grado es 4. Si es "Sí," el grado es 5)

40. Dyspnea Grd._____ (67)

Introducción para las preguntas 40-43:

EL PRIMER DIA DE VUELTA AL TRABAJO DESPUES DE SUS DIAS LIBRES:

41. ¿Lo aflige un desaliento al caminar aprisa en terreno llano o al subir una pequeña cuesta? ☐ Sí ☐ No (68)

(Si "No," el grado es 1. Si es "Sí," siga a la pregunta siguiente.)

42. ¿Lo aflige un desaliento al caminar con otros de su propia edad a su paso ordinario en terreno llano? ☐ Sí ☐ No ☐ NR (69)

(Si "No," el grado es 2. Si es "Sí," prosiga)

43. ¿Tiene que detenerse porque se ahoga al caminar a paso ordinario en terreno llano? ☐ Sí ☐ No ☐ NR (70)

(Si "No," el grado es 3. Si es "Sí," prosiga)

44. ¿Se desalienta al lavarse o vestirse? ☐ Sí ☐ No ☐ NR (71)

(Si "No," el grado es 4. Si es "Sí," el grado es 5)

45. B. Grd. 0_____(0)
1/2_____(1)
1_____(2)
2_____(3)
3_____(4) (72)

46. ¿Ha tosido más que lo usual durante la semana pasada?

Fecha												
Sí												
No												

(73)

47. ¿Se ha arrancado flemas del pecho o de día o de noche durante la semana pasada?

Sí												
No												

(74)

48. ¿Ha tenido un "resfriado del pecho" durante la semana pasada?

Fecha												
Sí												
No												

(75)

F. LA OPRESION EN EL PECHO

49. ¿Tiene Ud. alguna vez opresión en el pecho o dificultad de respirar?

Sí												
No												

(76)

50. ¿Se le oprime el pecho o se le hace difícil respirar algún día de la semana en particular?

Sí												
No												

(77)

51. Si se contesta "Sí" a 50, pregúntese: ¿Cuál dia?

D												
L												
Mar.												
Mier.												
J												
V												
S												
Siempre												
A veces												
NR												

(78-85)

52. ¿Se le oprime el pecho o se le hace difícil respirar:

Fecha												
a. ¿El primer día de vuelta al trabajo después de un día libre o más?												
b. ¿El segundo día de vuelta al trabajo después de un día libre o más?												
c. ¿El último día de trabajo antes de un día libre?												
d. No cabe ninguna de las preguntas de arriba.												

(86-89)

53. Si se contesta "Sí" a 52, pregúntese: ¿ Siente opresión en el pecho o se le hace difícil respirar:

    a. En todas tales ocasiones?
    b. Sólo a veces.
    c. No cabe.

Fecha | | | | | | | | | | | (90-92)

54. Si se contesta "Sí" a la pregunta 50 o 52, pregúntese: ¿ A qué hora del dia indicado siente opresión en el pecho o dificultad de respirar?

    a. Antes de entrar en la desmotadora.
    b. Después de entrar en la desmotadora.
    c. Después de salir de la desmotadora.
    d. No cabe.

Fecha | | | | | | | | | | | (93-96)

55. Si la respuesta a 54 "b" o "c" es afirmativa, preqúntese: ¿ Cuántas horas después de empezar un turno comienza esto?

Horas_____
No cabe_____ (97-98)

56. Si la respuesta a 54 "b" o "c" es afirmativa, pregúntese: ¿ Cuánto tiempo dura esta opresión o dificultad de respirar?

Horas_____
No cabe_____ (99-100)

57. (Pregúntese sólo si se contesta "No" a 50) En el pasado, ha sentido alguna vez opresión en el pecho o dificultad de respirar algún día de la semana en particular?

☐ Sí ☐ No ☐ NR (101)

58. Si se contesta "Sí" a 57, pregúntese: Cuál día?

D_____
L_____
Mar._____
Mier._____
J_____
V_____
S_____ (102)

Siempre___
A veces___
NR_____

59. (Pregúntese sólo si se contesta "No" a 52) ¿ En el pasado, ha sentido alguna vez opresión en el pecho o dificultad de respirar?

    a. El primer día de vuelta al trabajo después de un día libre o más. a._____

    b. El segundo día de vuelta al trabajo después de un día libre o más. b._____

    c. El último día de trabajo antes de un dia libre. c._____ (103)

    d. No cabe nada de lo de arriba. d._____

    e. NR. e._____

60. Si se contesta "Sí" a 59, pregúntese:
¿Sentía Ud. opresión en el pecho o dificultad de respirar?

a. En toda (o casi toda) ocasion a____
b. Sólo a veces b____ (104)
c. No cabe c____

61. Si se contesta "Sí" a 50, 52, 57, 0 59, pregúntese:
¿Cuantos años hace que siente opresión en el pecho o dificultad de respirar? ____ Años☐ NR (105-106)

G. HISTORIA LABORAL

62. ¿Qué clase de trabajo hace Ud. cuando no desmote el algodón (Especifique)? _____
_____ (107)
_____

Introducción para las preguntas 63 a 69: ¿Ha trabajado Ud. alguna vez en:

63. Una fundición (por tanto como un año)? ☐ Sí ☐ No (108)

64. La minería o elaboración de piedra o metales (por tanto como un año)? ☐ Sí ☐ No (109)

65. En una planta de asbesto (alguna vez)? ☐ Sí ☐ No (110)

66. En una fábrica de textil de algodón, de mezclado de algondon o de aceite de semilla de algodón? ☐ Sí ☐ No (111)

67. En el cosecho de algodón o cereales? ☐ Sí ☐ No (112)

68. En una desmotadora de algodón (sólo para el grupo de control)? ☐ Sí ☐ No (113)

69. En proximidad de otros polvos, emanaciones o humos? Si se contesta "Sí," especifíquese: ☐ Sí ☐ No (114)
Clase de contacto_____
Duración de contacto_____

70. ¿Cuántos años tenía cuando empezó a trabajar por primera vez en una desmotadora de algodón? (Escríbase su edad exacta)_____ (115-116)

71. ¿Cuántos años hace que trabaja en una desmotadora de algodón? (Número total de años)_____ (117-118)

72. ¿Cuántos meses por año trabaja ordinariamente en una desmotadora de algodón?_____ (Núm. de meses) (119-120)

73. ¿En qué otras regiones del estado o del país ha trabajado (desmotando el algodón)?_____
_____ (121-122)
_____

H. OTRAS ENFERMEDADES

74. ¿Tiene Ud. una condición del corazón que requiere los servicios de un médico? ☐ Sí ☐ No (123)

75. Si se contesta "Sí" a 74, especifíquense la condición_____

la medicacion:_____

No cabe:_____

76. ¿Ha tenido alguna vez asma? ☐ Sí ☐ No (124)

77. Si se contesta "Si" a 76, pregúntese si empezó: ____Antes de los 30 anos
____Despues de los 30 anos
____NR

78. Si se contesta "Sí" a 76, pregúntese: Tenía asma antes de trabajar en una desmotadora de algodón? ☐ Sí ☐ No ☐ NR (125)

79. ¿Le ha dicho alguna vez un medico que Ud. Tenía alguna de las condiciones que siguen?

a. Bronquitis crónica ☐ Sí ☐ No (126)

b. Enfisema ☐ Sí ☐ No (127)

c. Infección fungoso de los pulmones ☐ Sí ☐ No (128)

d. Tisis (tuberculosis) ☐ Sí ☐ No (129)

e. Cualquier condición crónica de los pulmones ☐ Sí ☐ No (130)

Si se contesta "Sí," especifíquese:_____

_____

_____

1. CONSUMO DE TABACO

80. ¿Ha fumado Ud. alguna vez cigarrillos? ☐ Sí ☐ No (131)

(Si se contesta "Sí" a 80, pregúntese 81. Si "No," omítase lo que no quepa.)

81. ¿Fuma cigarrillos actualmente? ☐ Sí ☐ No ☐ NR (132)

(Si se contesta "Sí" a 81, pregúntese 82 a 84. Si "No," pregúntese 85 a 87.)

82. ¿Aproximadamente cuántos cigarrillos fuma ordinariamente por día? ____ Número ☐ NR (133-134)

83. ¿Inhala (aspira), digo, traga el humo? ☐ Sí ☐ No ☐ NR (135)

84. ¿Cuántos años hace que fuma cigarrillos? ____ Años ☐ NR (136-137)

(Omítase hasta 88)

85. ¿Cuando fumaba, cuántos cigarrillos consumía por día? ____ Número ☐ NR (138-139)

86. ¿Inhalaba (aspiraba), digo, tragaba el humo? ☐ Si ☐ No ☐ NR (140)

87. ¿Aproximadamente cuántos años hacía que fumaba cigarrillos? ____ Años ☐ NR (141-142)

88. ¿Ha fumado alguna vez puros? ☐ Si ☐ No (143)

(Si se contesta "Si" a 88, pregúntese 89 a 91. Si "No," omítase hasta 92.)

89. ¿Fuma puros actualmente? ☐ Si ☐ No ☐ NR (144)

(Si se contests "Si" a 89, pregúntese 90 a 91. Si "No," omítase hasta 92.)

90. ¿Aprximadamente cuántos puros fuma ordinariamente por día? ____ Número ☐ NR (145-146)

91. ¿Aproximadamente cuántos años hace que fuma puros? ____ Años ☐ NR (147-148)

92. ¿Ha fumado alguna vez en pipa? ☐ Si ☐ No (149)

(Si se contesta "Sí" a 92, pregúntese 93 a 95. Si "No," terminese la entrevista.)

93. Fuma en pipa actualmente? ☐ Si ☐ No ☐ NR (150)

(Si se contesta "Sí" a 93, preguntese 94 a 95. Si "No," terminese la entrevista.)

94. ¿Aproximadamente cuántas pipadas de tabaco fuma ordinariamente por día? ____ Número ☐ NR (151-152)

95. ¿Aproximadamente cuántos años hace que fuma en pipa? ____ Años ☐ NR (153-154)