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Evaluation Of Respiratory Health Indicators Among Farmers / Farm Workers Exposed To The Organic Dust A Cross Sectional Study From Punjab.

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Abstract
Exposure to grain dust and diesel exhaust accentuated respiratory disorders with declines in lung function. Personal exposure to high level to respirable dust increased the risk of lung function deterioration chronic exposure to alcohol and / or cigaratte smoke significantly impairs normal lung defense against inhaled Environmental toxins and pollutants. The immunological consequences of organic dust exposures in Agriculture workers microbial motifs indust can elicit differing immune receptors signaling pathways results in the robust inflammatory response and repetitive dust exposures modulate immunity. Early recognition of this damage provides an important clue to insure good health. Spirometery is an invaluable screening test to identify the patient with airflow obstruction. In this study 150 male farmers / farm workers of 20-50 years of age who were exposed to organic dust (cases) and 150 farmers/ farm workers who were not exposed to organic dust (controls) were Selected and pulmonary function tests performed and detailed history of exposure was studied . The value of PEFR, FEV_1 and FVC showed statistically highly significant (P<0.001)) Value as compared to controls.

Keywords: *Organic dust, PEFR, FEV_1, FVC, Agricultural, Workers, Lung Functions.*

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I. Introduction

In a Study Bronchial responsiveness to methacholine was measured in 14 subjects who had persistent cough and sputum and concluded that peat moss workers showed no evidence of extrinsic allergic alveolitis; However, chronic exposure to organic dust leads to chronic cough and sputum production which is not associate with significant lung impairment nor increase in nonspecific airway responsiveness.[1]

The range of environmental conditions in commercial pig houses and the potential for workers to be exposed to large concentration of dust, mostly organic in origin, and bacteria. The majority of workers had work - related upper respiratory tract symptoms, mainly nasal irritation, however , the presence of specific IgE in some workers with wheeze suggested the possibility of them having an allergic response .[2]

Exposure to aerosol of organic dusts such as coffee, tea, spices, soy fur, and animal food in an occupational setting can affect the respiratory health of industrial workers. Significantly higher prevalences for most chronic respiratory symptoms were found among exposed workers then among control workers. Exposure to organic aerosols in industrial settings particularly in conjunction with smoking may be associated with the development of chronic obstructive lung disease .[3]

Exposure to dust and gases from diesel exhaust blasting , drilling and rock transport in tunnel work enhances the risk for accelerated decline in FEV, respiratory symptoms and CopD in tunnel workers compared with other heavy construction workers .[4]

Restrictive lung defect in the Tobacco Farm workers (TFWs) and may be attributed to long term exposure to flue curing and stacking of tobacco leaves. The results also suggest the importance of the duration of exposure in the aetiology of lung impairment in this environment .[5]

Exposure to spice dust in the spice factories leads to an increased prevalence of respiratory symptoms and impaired lung functions. [6]

Cross shift changes in the Spirometric variables were associated with smoking status, age , presence of airway obstruction and history of chronic respiratory symptoms but not with dust or endotoxin exposure. Peak expiratory flow rate was found to decrease over the workshift in a manner similar to that experienced by cotton workers.[7]

The most important diseases are not rhinitis and asthma , which although common, are not usually total. Some non-allergic conditions e.g. asthma like syndrome and organic toxic dust syndrome are not yet fully understood, but appear to be common among farm workers. The most serious respiratory diseases are hypersensitivity pneumonitis and respiratony infection, but these are rare. Most importantly, respiratory diseases are preventable by controlling harmful exposures to organic dust, toxic gases and chemicals on farms, through , improvements in animal rearing techniques , ventilation of animal accommodation careful drying and storage of animal feed - stuffs ,crops and other products and use of personal protective equipment.[8]

Dust related dose response decrements in lung function among coal miners have been reported in several studies, with varying magnitudes across population few studies have compared differences between current and former coal miners .[9]

Exposure to organic dusts is unlikely to be major risk factors of respiratory cancer. Even exposure to wood dust which is a major exposure in finland seen to have minor effects for nasal cancer. The authors found suggestive evidence that exposure to grain dust may increase the risk of laryngeal cancer, and some support to the hypothesis that exposure to textile dust (agricultural dusts) may decrease the risk of lung cancer.[10]

The incidence of suspected and definite pneumoconioses were very low and the results of some PFT such as those for FVC and FEV_1 %, in the exposed group were better than those in the non-exposed group, although a gradual decline in the performance in PFT was observed with age and work duration. There was a Higher prevalence of restrictive impairment among the exposed group and a higher prevalence of obstructive impairment in the non-exposed group Possible reasons for these include (i) undetectable conc. of free silica in the stone dust in the work environment of the exposed workers and (ii) factors as climate in the work environment of the nonexposed agricultural workers that could cause pulmonary impairment .[11]

Exposure to organic dust at workplaces of composting facilities is associated with adverse acute and chronic respiratory health effects, including MMI, chronic bronchitis and an accelerated decline of FVC%. The pattern of health effects differs from those at other work places with exposures to organic dust possibly done to high concentration of thermo tolerant/ thermo philic actinomycetes and filamentous fungi at composting plants .[12]

Studies indicate a reduced forced vital capacity (FVC) or forced expiratory volume in 1s (FEV_1,) and a higher prevalence of chronic respiratory symptoms and chronic obstructive pulmonary disease (COPD) in cement workers. The thoracic fraction was chosen because it was considered to be the most relevant health related aerosol fraction with regards to bronchial exposure. This fraction estimates the particles that deposit in the bronchi.[13]

Dairy and nondairy agricultural workers showed an increased risk for usual morning phlegm. An increased decline in FEV_1, for all agricultural workers was associated with animal feed handling An increased risk of chronic bronclutis has been demonstrated in various agricultural groups. An accelerated decline in lung function has been suggested in swine confinement workers and grain handlers. we found an accelerated decline in Forced Vital Capacity (FVC) and Forced Expiratory Volume in 1s (FEV_1) in dairy farmers .[14]

The immunological consequences of organic dust exposure in the farming industry are likely explained by the diversity of microbial motifs in dust that can elicit differing innate immune receptor signaling pathways. Whereas initial activation results in a robust inflammatory response, repetitive dust exposures modulate immunity. This can result in Low grade, chronic inflamation and / or protection against disease.[15]

Flour mill worker like grain workers elsewhere, were at an increased risk of developing pulmonary symptoms, a strong association exists between exposure to flour dust and the prevalence of respiratory symptoms, a strong association exists between exposure to flour dust and the prevalence of respiratory symptoms and functional impairments of the lungs. The result has implication for improved dust control measures in the grain industry in Egypt.[16]

A statistically significant reduction in FVC , FEV_1, PEFR, $FEF_{(25\%-75\%)}$ and FEF 200-1200 and this impairment was increased with duration of exposure to dust in sweepers. A positive relationship between the extent of exposure to street dust and decreasing lung function. It is suggested that protective measures such as long brooms and appropriate respiratory protective equipment, should be provided to workers engaged in sweeping , the workers should undergo periodic spirometry test .[17]

Majority of the workers are exposed to higher level of respiratory dust as compared to the PEL (Permissible Exposure Limit). Thus immediate reduction of dust exposure among the workers is necessary for preventing respiratory system impairment .[18]

The agricultural industry, occupational exposures to organic and inorganic aerosol leads to increased risk for lung diseases amongst workers. Increased awareness of respiratory risks and improved monitoring of agricultural environments are necessary to limit pulmonary health risk to exposed populations.[19]

Critical exposure groups i.e. those exposed to high levels endo toxin such as card room workers and weavers. The number of farmers has progressively decreased over the last three decades. People leaving dairy farming have taken employment in industries and services in which the exposure level to organic dust is low. To guide prevention and adjudicate compensation, The time effect relation should be considerd at the same time as the exposure effect relationship, Otherwise, the critical functions of epidemiology .[20]

Chronic exposure to alcohol and / or cigarette smoke significantly impairs normal lung defences against inhaled environmental toxins and pollutants. The long term goal is to understand why some people exposed to confined-animal dusts have more severe diseases of the lung and to examine the impact of combination exposures in the work place when dust exposed workers both smoke and drink alcohol.[21]

Agricultural workers who are exposed to pesticides suffer from variety of diseases that pose a serious risk to public health, mainly on the lung disease (mainly restrictive lung disease.) [22]

Smoking potentiates the effects of cotton dust exposure on the respiratory function of spinners by indicating the prevalence of enhanced lung symptom as well as byssinosis . [23]

Inhalation exposures during parlor tasks which were lower than previously reported and were not associated with cross shift measures of pulmonary health among dairy workers.[24]

Hatchary workers were at increased risk of compromised respiratory health due to dust exposure, particularly those who work in sorting rooms. Asthma and rhinitis were in excess of workers. Through clinical examination of these workers should be performed and all exposures assessed.[25]

Exposure or organic dust is associated with compromised pulmonary functions and there is a need of formulation of safety guidelines.[26]

Occupational exposure and unhealthy working conditions are the most likely causes of mild obstructive disease and pulmonary function parameter changes. Providing street sweepers with the appropriate respiratory protection equipment as well as periodic spirometry for the early diagnosis of pulmonary dysfunction could be effective for preventing many types of pulmonary damage .[27]

Farmers appear to experience elevated risk for several cancers like non-Hodgkin's Lymphoma, Leukemia, multiple myeloma, soft tissue sarcoma and cancers of the brain stomach , prostrate skin and Lip. Agricultural workers are at risk of developing hematologic malignancies due to factors like zoonotic viruses responsible for human carcinogenicity in veterinaians, abattoir workers and meat inspectors, agricultural chemicals. Agricultural workers, farmers or farm workers and their families may be exposed to potential carcinogens including pesticides, sensitizing agents and solar radiation experiencing higher rates of cancer.[28]

People who work in agriculture and other related industries are persistently exposed to many containinants and suffer from respiratory diseases and other conditions. Among the occupational contaminants, persistent exposure to organic dust is central to negative health effects of work- related exposures, Organic dust is a complex mixture of particulate matter of varying sizes, microbes and micrbial products.

Workers from concentrated animal feeding operation involved in swine, dairy and poultry production including duck hatcheries as well as other industries (sewage handlers , waste handlers and bakery workers) are persistently exposed to organic dust.[29]

Exposure to grain dust and diesel exhaust accentuated respiratory disorders with declines in lung functions amongst grain millers. Improved milling practices and engaging cleaner milling facilities should be adopted to minimize Exposure and related hazards.[30]

The association between ambient pm exposure and lung function was evaluated by linear regression modeling, with adjustments for age ,sex, height, weight, educational attainment, presence of asthma or chronic obstructive pulmonary disease, smoking status , season and co. pollutants.[31]

Personal exposure to high level of respirable dust increased the risk of lung function deterioration. Future measures show focus on the overall reduction of LPS (Lipopolysaccharide) sources in addition to the improvement of the balance of inhaled bacterial EVs (Extracellular vesicles) in the indoor environment to minimize pulmonary disease risk.[33]

Occupational exposure to soft paper dust is associated with lung function impairment and increased prevalence of obstructive lung function impairment.[34]

Air borne occupational exposures are associated with lower lung function level but not with a faster lung function decline. These negative effects are more pronounced among males and smokers.35 Prevalence of chronic respiratory symptoms to be higher among flour mill workers as compared to soft drinks factory workers. Lower education level, mixing department, increased work experience and longer working hours were identified factors . The flour mill dust exposed workers lung function parameters were highly reduced.[36]

The low volume sampler was applied to measure dust concentration and the questionnaire was used to assess the individual characteristics. Bivariate analysis of the variables is the working environment dust and

gender are significant. The result of multivariate analysis of dust is the most significant to the lung vital capacity. Dust concentration is classified above the threshold limit value (TLV) so for the company to control the source of dust exposure for the workers, they need to have a health examination and for companies, they should provide N95 type masks as personal protective equipment (PPE)[37]. Restrictive Lung diseases are characterized by reduced lung volumes either because of an alteration in lung parenchyma or because of a disease of the pleura, chestwall or neuromuscular apparatus.

The first is intrinsic lung diseases or diseases of lung parenchyma. The diseases cause inflammation or scarring of the lung tissue (interstitial lung disease) or result in filling of the air spaces with exudate and debris (pneumonitis). These diseases can be characterized according to etiological factors. They include idiopathic fibrotic diseases, connective-tissue diseases, drug – induced lung diseases in environmental exposures (inorganic and organic dusts), and primary diseases of the lungs (including sarcoidosis).

The second is extrinsic disordes or extrapulmonary diseases. The chest wall, pleura and respiratory muscles are the compenents of the respiratory pump and they need to function normally for effective ventilation. Diseases of these structures result in lung restriction, impaired ventilator function and respiratory failure (e.g. non muscular diseases of the chest wall, neuromuscular disorders). The Mnemonic "PAINT" has been used to divide the causes of the restrictive lung disease into pleural, alveolar, interstitial, neuromuscular and thoracic cage abnormalities .[38]

Dust concentration might be attributable to the lung function decline among exposed workers especially sawmill workers. [39]

The current working department, service duration, respiratory symptoms and exposure to respirable dust were predictors of lung function in textile workers. An adequate ventilation good work practices, hygienic work place safety and health training regarding potential health effects, and periodical assessment of lung functions are the critical elements for control of respirable dust exposure and reduction of occupational lung diseases. [40]

Even in the absence of radio graphic evidence of silicosis, exposure to high level of silica dust is associated with reduction in pulmonary function in the absence of radiological evidence of silicosis, progressive deterioration of FEV_1, over time most likely indicates sub radiological silicosis. The effects were associated with severity and duration of exposure. Expousre to sub-TLV levels of silica dust may not affect pulmonary functions. Smoking appears to have a synergistic effect in relatively high silica exposures.[41]

Pulmonary damage risk is associated with raising Livestock animals due to organic dust exposure. Once the lung is damaged by organic dusts, regeneration of lungs to normal state is almost impossible.

Exposure to Organic dust and its health effects among workers has been investigated in numerous epidemiological and exposure assessment studies during the last three decades. Multiple components within the dust such as endotoxins, LPS and peptidoglycans bind to a wide variety of innate immune receptors but we still have no clear definition of the potential determinants of personal exposures in livestock farming environments.

Livestock farmers are exposed to high levels of dust and endotoxins consistent with an increased risk of developing respiratory symptoms and diseases.[42]

There are three types of lung function disorders, obstructive, restrictive and combination. Impaired lung function can occur due to various types of particulates or dust exposure. Fibrogenic or cancinogenic dust or particulates can cause pulmonary fibrosis or cancer.[43]

Organic dusts are complex bioaerosol mixture, Comprised of dust and particulate matter of organic origin. These include components from bacteria, fungi, pollen and viruses to fragments of animals and plants commonplace to several environmental / occupational settings encompassing agriculture / farming, Grain processing, waste / recycling, textile, cotton, woodworking , birdbreeding and more. Organic dust exposures are linked to development of chronic bronchtis, chronic obstructive pulmonary disease, asthma, asthmalike syndrome, byssinosis, hypersensitivity pneumonitis and idiopathic pulmonary fibrosis. Risk factors of disease development include cumulative dust exposure, smoking , atopy, timing/duration and nutritional factors .[44]

Immuno pathogenesis predominantly involves toll-like receptor signaling cascade, $T\text{-}helper_{1A}$/ $T\text{-}Helper_{17,}$ lymphocyte responses, neutrophil influx and potentiation of manifestations associated with allergy. The true prevalence of airway disease directly attributed to organic dust, especially in a workplace setting.[45]

II. Material And Methods

It was a cross sectional exploratory/observational study 150 apparantly healthy male farmers/farm workers(between age group 20-50 years) were selected who were exposed to the organic dust from long time i.e. more than 5-7 year as cases and same number of age and sex matched controls with the same exclusion criteria were recruited from farmers and farm workers, Not exposed to any kind of organic dust. Farmer/farmworkers were selected from Patiala, Fatehgarh sahib and Sangrur road villages. Approximately 30-40 villages covered.

Judged to be healthy for the criterion of no exertional dyspnoea/general debility, H/o current or past cardiopulmonary disorder or frequent cold, obvious sign of malnutrition , no obesity, H/o smoking and detailed physical examination was carried out and Hb. Concentration was done. The lung function tests suggested by Gandevia and hugh jones and cotes. The procedure was quite simple for patients points of view. Only two maneuvers were required to accumulate all test data i.e. a forced vital capacity and maximum voluntary ventilation. All gas volumes are corrected to B.T.P.S (body temperature ambient. Pressure and saturated with water vapour) automatically by the instrument. Pulmonary function tests were carried out in standing position, Height was measured in centimeters, weight was measured in kilograms. Body surface area was read from 'Nomogram' Dobous and Dobous

In the procedure of lung function test a nose clip was attached to the subject and a clean piece was inserted into the breathing tube. Two maneuvers were performed:-

1 **Forced vital capacipy Test** – subjects were instructed to take maximum inspiration and then place mouth piece firmily in mouth and performed maximum expiration.

2 **Maximum voluntary ventilation test procedure**:- After rest of five minutes the subject was asked to breathe as rapidly and as deep as possible in and out from mouth piece, MVV test was run for 12 seconds. Results were taken on the built in printer containing all the patients information and calculated values of all the 14 parameters.

Statistical Analysis.

The various statistical consideration used were mean, standard deviation, correlation coefficient and regression equations was evaluated by ANOVA table.

III. Results

Anthropometric parameters in cases and controls are shown in table 1 showing mean standard deviation 't' value 'P' and significance. The value of PEFR, FEV_1, and FVC shows statistical significant difference between cases and controls FVC Table. 2 show mean 'SD' and 't' value significance in cases and controls and show that it is statistically highly significance FEV_1 Table 3 show mean 'SD' and 't' value significance in the cases and controls and show That it is statistically Highly significant. PEFR table 4 Showsmean 'SD' and 't' Value Significance in the cases and controls and shows , that it is statistically highly significant.

Table-1 Comparison of Anthropometric parameter in Farmer/Farm workers Exposed to Organic dust (cases) the farmers and farm workers who were not exposed (controls).

Parameters	Mean + SD (cases)	Meant + SD Control	'T' Value	'P' Value	Significance
Age	31.57+4.876	30.61+4.415	1.459	>0.05	NS
Height	166.54+7.754	159+7.871	0.778	>0.05	NS
Weight	60.63+8.896	60+9.386	0.4871	>0.05	NS
FVC	2.0124+0.6030	3.1207+0.4028	15.2819	<0.001	**HS**
FEV 0.5.	1.91+0.58	1.98+0.57	1.28	>0.05	NS
FEV_1	3.149+0.482	5.77 +1.88	9.876	<0.001	**HS**
FEV3	3.11+0.68	2.616+0.479	1.34	>0.05	NS
PEFR	9.377+6.052	7.670+3.976	2.778	<0.001	**HS**
FEV25-75	3.19+13.17	3.18+1.14	0.11	>0.05	NS
FEF0.2-1.2	2.66+0.53	2.73+0.61	1.40	>0.05	NS
FEF25%	2.87+0.43	2.35+1.41	1.68	>0.05	NS
FEF50%	3.74+1.37	3.83+1.40	0.61	>0.05	NS
FEF75%	1.66+0.89	1.77+0.96	1.23	>0.05	NS
FEF0.5/FVC	0.61+0.51	0.61+0.74	0.21	>0.05	NS
FEF1/FVC	0.85+0.09	0.85+0.10	0.39	>0.05	NS
FEV3/FVC	99.40+2.41	99.28+2.83	0.83	>0.05	NS
MVV	108.34+337.87	113.54+31.483	0.80	>0.05	NS

NS- Non-Significant
HS- Highly Significant

Table -2 Mean+ SD,'T' Value and Significance of FVC

Case	Mean +SD	'T' Value	Significance
	2.0124+0.6030	15.2819.	<0.001
Control	3.120>0.4028		HS

Table -3 Mean + SD, 'T' Value and Significance of FEV_1

Case	Mean +SD	'T' Value	Significance
	3.149+0.482	9.876	<0.001

			HS
Control	5.77+1.88		

Table -4 Mean + SD, 'T' Value and "Significance of PEFR

Case	Mean +SD	'T' Value	Significance
	9.3777+6.052	2.778	<0.001
Control	7.670+3.976		HS

IV. Discussion

This study was done with an aim to collect more data on the farmers and farm workers exposed to organic dust for long time and the farmers and farm workers not exposed to organic dust in the Punjab and to bridge the gap in our knowledge.[1]

With the exposure to organic dust in large concentration and bacteria there is work related upper respiratory tract symptoms mainly nasal irritation however the prevalence of specific IgE in some workers with wheeze suggested the possibility of them having allergic response.[2]

Exposure to organic aerosols in industry settings particularly in conjunction with smoking may be associated with the development of chronic obstructive lung disease.[3]

Exposure to dust and gases from diesel exhaust, blasting, drilling and rock transport in tunnel work enhances the risk far accelerated decline in the FEV, respiratory symptoms and COPD.4 Results also suggest the importance of duration of exposure in the aetiology of lung impairment.5 Peak expiratory flow Rate was found to decrease over the work shift in a manner similar to that experienced by cotton workers.7 Authors found suggestive evidence that exposure to grain dust may increase the risk of lasyngeal cancer and some support to hypothesis that exposure to textile dust (agriculture dusts) may decrease the risk of lung cancer. [10]

A gradual decline in performance in PFT was observed with age and work duration.11 The pattern of health effects differs from those at other work places with exposure to organic dust possibly due to higher concentration of thermotolerant / thermophilic actinomycites cates and filamentous fungi at composting plants.[12]

Chronic Exposure to alcohol and / or cigarette smoke singficantly impairs normal lung diseases against inhaled environmental toxins and pollutants.[21] Farmers appear to experience elevated risk for several concerns like non-hadgkins lymphoma, leukemia, multiple myeloma, soft tissue sarcoma and cancers of the brain, stomach, prostrate, skin and lip. Agricultural workers are at risk of developing hematologic malignancies due to factors like zoonotic viruses responsible for human carncinogenicity in veterinarians, abattoir workers and meat impactors, agricultural chemicals.[28]

Organic dust is a complex mixture of particulate matter varying sizes, microbes, and microbial product workers from concentrated animal feeding operation involved in swine, dairy and poultry production including duck hatcheries as well as other industries (sewage handlers and bakery workers) are persistently exposed to organic dust.[29] Exposure to grain dust and diesel exhaust accentuated respiratory disorder with decline in lung functioning amongst grain millers.[30] Personal exposure to high level of respirable dust increased the risk of lung function deterioration.[32]

Restrictive lung diseases are characterized by reduced lung volumes either because of an alteration in lung parenchyma or because of a disease of the plasma, chest wall or neuromuscular apparatus38 multiple components in the dust such as endotoxins , LPS and peptidoglycans bind to a wide variety of innate immune receptors. Live stock famers are exposed to higher levels of dust and endotoxin consistent with an increased risk of developing respiratory symptoms and diseases.[42]

There are 3 types of lung function disorders- obstructive, Restrictive and combination. Impaired lung function can occur due to various types of particulates or dust exposure. Fibrogenic or carcinogenic dust particulates can cause pulmonary fibrosis or cancer.[43]

Organic dusts are complex bio aerosol mixture comprised of dust and particulate matter of organic origin. There include components from bacteria, fungi, pollen and viruses to fragments of animals and plants. common place to several environmental/Occupational settings encompassing agriculture / farming, grain processing, waste/ recycling, Textile cotton wood grain processing , waste/ recycling, Textile cotton, wood working, bird breeding and more organic dust exposures are linked to development of chronic bronchits, chronic obstructive pulmonary disease, asthma, asthma like syndrome, byshinosis , hypersensitivity, Pneumonitis and idiopathic pulmonary fibrosis. Risk factors of disease development include cuummulative dust exposure , smoking atopy, timing/duration and nutrition factors.[44]

Immunopathogenesis Predominently involves Toll-like receptor for signaling cascade, T-helper1/ T-helper 17 Lymphocytes responses, neutrophil influnx, and potentiation of manifestation associated with allergy. The true prevalence of airway disease directly attributed to organic dust especially in a workplace setting .[45]

V. Conclusion

The Study of lung functions conducted in 150 male farmers/farm workers between 20-50 years of age group who were exposed to organic dust for longer durations (cases) and the controls of the same age group who were not exposed to organic dust.

Organic dusts are complex bioaerosal mixture composed of dust and particulate matter of organic origin. There are components of bacteria fungi, pollen and viruses to fragment of animals and plants. When the farmers /farm workers are exposed to the organic dusts, there is development of chronic bronchitis, chronic obstructive pulmonary diseases, Asthma, asthma like syndrome, byssinosis, hypersensitivity pneumonitis and idiopathic pulmonary fibrosis.

Immunopathogenesis predominantly involves toll like receptors signaling cascade, T-helper1 /T-helper17 lymphocyte responses, neutrophil influx and potentiation of manifestation associated with allergy. The true prevalence of airway disease directly attribute organic dust the above mentioned organic dust has varying PM sizes and accordingly penetrate/reach the respiratory passage. Varying from PM 10 to less than PM 2.5.

Consumption of alcohol, cigarette smoking and diesel exhaust emissions/vapors from the diesel motors in agriculture cause more serious lung function deterioration.

It is observed that the chronic exposure to organic dust along with alcohol consumption, smoking and diesel exhaust vapors may cause Laryngeal cancer among the farmers /workers along with the cancer of lungs. So it is concluded that the long term exposure to all the above factors decrease the lung functions and also it is most potential cause of laryngeal cancer and lung cancer in the farmers / farm workers. of Punjab.

Prevention: The following Measures are suggestive for prevention from long term exposure to organic dust:-
1> Frequent/ periodic spirometery tests of exposed workers.
2>Do not smoke
3> Do not consume alcohol.
4> Keep distance from the diesel exhaust of machines/Agricultural transport etc.
5>use of masks/ N-95 preferably while engaged in exposure to organic dust/ machines etc.

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