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**ANNUAL SURVEILLANCE REPORT**

**OCCUPATIONAL RESPIRATORY  
ALLERGY**

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## GLOSSARY

<b>Allergens</b>	A substance capable of triggering a response that starts in the human immune system and results in sensitisation or an allergic reaction
<b>Occupational allergy</b>	Occupational allergies such as asthma, rhinitis, conjunctivitis, urticaria and contact dermatitis is the result of exposure to allergens or chemicals while “on the job”
<b>Skin prick test</b>	A skin prick test, also called a scratch test, checks for immediate allergic reactions to allergens and is usually done on the forearm
<b>Type of sample</b>	Blood, serum or bulk sample (samples from the workplace that is suspected as the causative agent)
<b>Patient</b>	All workers or persons referred internal or external to the NIOH for allergy testing
<b>Industry</b>	The industry where the samples were taken was grouped into categories according the Standard Industrial Classification of all economic activities (7th Edition).
<b>Job</b>	The activity that the patient does while on duty

## SUMMARY

In 2016, a total of 112 patients from various occupational industries were tested for occupational respiratory allergies at the NIOH. The mining and quarry industry accounted for the highest number of patients (30.36%; N= 34), followed by human health and social work (27.68%; N= 31). Of the 112 patients, blacks accounted for 79% (N= 89) and males were the predominant sex, accounting for 57% (N= 64) of the patients tested for occupational respiratory allergies. The mean age of the patients was 42.9; with a minimum age of 23 years and a maximum age of 75 years.

The aeroallergens panel was the most performed skin prick test amongst patients with occupational respiratory allergies. Aeroallergens accounted for 69.6% (N= 78/112) of the tests performed in 2016. Within the aeroallergen panel, house dust mite was the most tested allergen. Amongst the most tested aeroallergens, zea maize and cockroaches had the highest number of positive results, both accounting for 34% (32/94) of the total number of tests done respectively.

Of the 112 patients tested for respiratory allergens, 101 patients were assessed for atopy. A total of 31 (30.7%) patients were identified as being atopic (tested positive to three or more aeroallergens). Most patients identified as being atopic, had tested positive for four aeroallergens (29%; N= 9/31).

In 2016, a total of 242 patients from three occupational settings (platinum mining, platinum and nickel research laboratory and food manufacturing) were screened for occupational allergies, using the skin prick test. The highest number of screened patients were from the food manufacturing sector, accounting for 52.9% (N= 128) of the total number of screened patients. Males were the predominant sex, accounting for 65.7% (N= 159) of the total number of patients screened for occupational allergies. Blacks were the most commonly screened race (79.3%; N = 192); and black males were the most screened group across two of the three occupational settings (excluding platinum mining). Overall, the number of positive skin prick tests within these occupational settings was low, with a 0.82% test positives collectively.

## BACKGROUND

Industrialisation in general has caused a significant increase in occupational allergies. Occupational allergies can lead to serious health problems and hence are compensable under the South African Compensation for Occupational Injuries and Disease Act, of 1993 (Act 130, 1993). In certain industries where allergens are prominent, pre-employment screening is essential in preventing allergies as a result of workplace exposure. This pre-employment screening is particularly important for atopic individuals, who have a genetic predisposition to allergies. Numerous studies have described the strong association between atopic individuals and their likelihood to develop allergies as a result of exposure at work.

Occupational allergens are substances used or handled in the work environment that are capable of triggering a response; that starts in the human immune system and results in sensitisation or an allergic reaction. These agents are diverse and in many instances are complex and as such proving causation of disease can be challenging. In addition, only a few occupational allergens are commercially available; and biological allergens may differ by species and region and may not be relevant to South Africa or specific provinces. The Occupational Allergy Unit (OAU) of the Immunology & Microbiology Section at the NIOH has been maintaining a database of occupational allergies since 2005. The information in this database is paramount for our understanding of occupational allergies and surveillance of occupational allergies in South Africa. Through the database common allergens and industries are identified which can inform preventative measures to reduce exposure in the workplace. Furthermore, the data in the database is an important resource for research purposes.

The OAU focuses on both respiratory [Immunoglobulin E (IgE) mediated or Type I hypersensitivity] and skin (Type IV hypersensitivity reactions or delayed reactions) allergies in occupational settings. This report focuses on respiratory allergies which were tested using the skin prick test (SPT). The SPT involves applying allergen solutions onto the patient's skin, and introducing them into the skin by pricking the patients skin. The SPT is desirable since results are available within 15 minutes. However, for patients with potentially life-threatening anaphylactic

shock reactions, and those on medication which cannot be stopped, SPT is not recommended. For such cases, the ImmunoCAP specific IgE test is considered for identification of the specific IgE against the suspected allergen. The OAU specialises in testing non-commercial allergens. This function is valuable since some allergens are specific to certain occupational sectors, which are found in few countries or regions (e.g. certain metal allergies such as potassium dichromate). Laboratory preparation of allergens ensures that the cause of rare or less common allergies can be identified. The laboratory maintains an extensive occupational allergen bank and a list of allergens can be made available upon request.

The data presented in this report summarises the occupational allergy test data obtained in 2016, of patients presenting with suspecting occupational respiratory allergies. This data was exported into, and analysed using STATA version 9.2. Some of the percentage data indicated in this document must be viewed with caution, due to small sample size and may give higher percentages (e.g. rye allergen in Table 1.4, with 36.4% positive tests; which were 4 positives out of 11 patients). The report does not include data on testing done for research. **This report can be accessed at: <http://niohweb.nhls.ac.za/>**

## SECTION 1: PATIENTS TESTED FOR OCCUPATIONAL RESPIRATORY ALLERGIES

### Section 1.1. Occupational industry of patients tested for occupational respiratory allergies

A total of 112 patients were tested for occupational respiratory allergies in 2016. The highest number of patients were from the mining and quarrying industry (N= 34 patients) accounting for 30.36% of the total number of patients tested. The second highest number of patients were from human health and social work activities industry (27.68%; N= 31). During the testing period, four patients had been let go from their employment (unemployed). Furthermore, the occupational industries for five patients (4.46%) were unknown (Table 1.1).

**Table 1.1.** Number of patients tested for occupational respiratory allergies per occupational industry

Occupational Industry	N	Percentage (%)
Administrative and support services	2	1,79
Currently unemployed	4	3,57
Electricity, gas, steam and air condition supply	3	2,68
Human health and social work activities	31	27,68
Manufacture of basic metals	1	0,89
Manufacture of coal and refined petroleum	1	0,89
Manufacture of fabricated metal products	2	1,79
Manufacture of glass and glass products	1	0,89
Manufacture of machinery and equipment	4	3,57
Manufacture of motor vehicles and trailers	3	2,68
Manufacture of pharmaceutical products	1	0,89
Manufacturing of food products	9	8,04
Mining and quarrying	34	30,36
Other manufacturing	2	1,79
Scientific research and development	1	0,89
Supplier and support services	2	1,79
Transportation and storage	2	1,79
Unknown	5	4,46
Water supply, sewerage, waste management	2	1,79
Wholesale and retail trade; repair of motor vehicles	2	1,79
<b>Total</b>	<b>112</b>	

N - Number of patients

### Section 1.2. Demographic data of patients tested for occupational respiratory allergies

The demographic distribution (race and sex) of patients that were tested for occupational allergies in the year 2016 is depicted in Table 1.2. Blacks accounted for the highest number of patients (79%; N=89). Males were the predominant sex overall, accounting for 57% (N= 64) of the total number of patients tested (Table 1.2). Furthermore, the mean age of the patients was 42.95; with a minimum age of 23 years and maximum age of 75 years (data not shown).

**Table 1.2.** Demographic data (race and sex) of patients tested for occupational allergies in 2016.

Race	Sex		Total per race group
	Female	Male	
Black	37	52	89
Coloured	1	0	1
Asian	0	2	2
White	8	10	18
Unknown	0	2	2
<b>Total per gender</b>	<b>45</b>	<b>64</b>	<b>112</b>

### Section 1.3. Occupational allergen tests performed on patients

The most commonly requested commercially available test was the aeroallergens test panel. The test was performed on 69.6% (N=78) of the patients that were tested for occupational allergies. The second most commonly performed test was the aeroallergens and platinum test (7.1%; N=8). The non-commercially available allergens that were prepared in the laboratory, were face mask material supplied by the patient (Table 1.3).



**Table 1.3.** Allergen tests performed on patients with suspected occupational respiratory allergies.

Allergen Tests	N	Percentage (%)
Aeroallergens	78	69,6
Aeroallergens and flours	6	5,3
Aeroallergens and potassium dichromate	2	1,8
Aeroallergens and potassium dichromate + nickel	2	1,8
Aeroallergens and other metals	2	1,8
Aeroallergens and nickel	1	0,9
Aeroallergens and platinum	8	7,1
Aeroallergens, platinum and nickel	1	0,9
Aeroallergens and soya	1	0,9
Potassium dichromate	3	2,7
Potassium dichromate and nickel	1	0,9
Platinum	4	3,5
Rhodium	1	0,9
Laboratory prepared allergens (face mask sample)	2	1,8
<b>Total</b>	<b>112</b>	

N- Number of patients

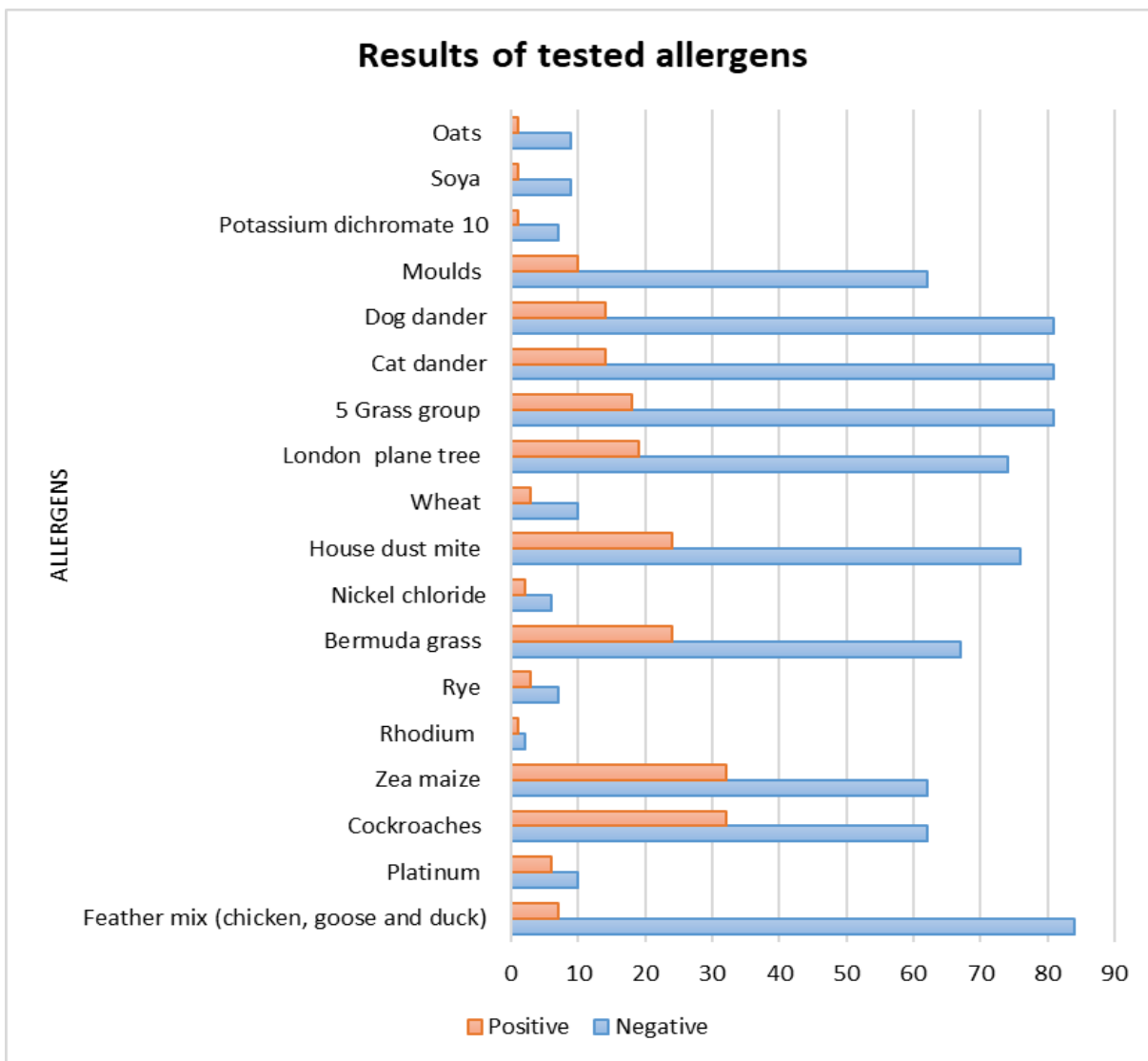
#### Section 1.4. Test results for patients tested for occupational allergies

Some of the most common allergens tested included 5 grass group (N=99), followed by house dust mite (N=97), dog dander (N=96), cat dander (N=95), cockroaches (N=94), zea maize (N= 94), London plane tree (N=93), feather mix (N=91) and Bermuda grass (N= 91). Platinum had the highest number of positive tests (6/16; 37.5%). Amongst the most performed allergen tests, zea maize and cockroaches had the highest positive results, both accounting for 34% (N= 32/94) of the total number of tests done respectively (Table 1.4 and Figure 1.3)

**Table 1.4.** Number of tests performed per allergen and the result (negative or positive) of the tests

Allergens	# tests performed (N)	Negative	Positive	% positive
House dust mite	97	76	24	24.7
Cockroaches	94	62	32	34.0
Cat dander	95	81	14	14.7
Dog dander	96	81	14	14.5
Feather mix <sup>a</sup>	91	84	7	7.7
5 Grass group	99	81	18	18.1
Bermuda grass	91	67	24	26.3
London plane tree	93	74	19	20.4
Zea maize	94	62	32	34.0
Moulds	72	62	10	13.9
Soya	10	9	1	10.0
Oats	10	9	1	10.0
Wheat	13	10	3	23.0
Rye	10	7	3	30.0
Platinum	16	10	6	37.5
Nickel chloride	8	6	2	25.0
Rhodium	3	2	1	33.3
Potassium dichromate 10	8	7	1	12.5

<sup>a</sup> - chicken, duck and goose; N - Number of patients; % - Percentage



**Figure 1.3.** Graphic illustration of the test results of allergens tested in 2016.

### Section 1.5. Atopic patients identified during occupational allergy testing

Atopy was assessed in patients who were tested for all allergens in the aeroallergens panel. A total of 101 patients were tested for all aeroallergens and of these, 30.7% (N= 31) of patients were considered atopic (tested positive to three or more aeroallergens) [Table 1.5]. Of the 31 patients identified as being atopic, the largest number of atopic patients were those who had tested positive for four aeroallergens (29%; N= 9), followed by patients whom tested positive for three aeroallergens (25.8%; N= 8). Patients that tested positive for six aeroallergens were also notable (16.1%; N= 5) [Table 1.6].

**Table 1.5.** Patients assessed for atopy using the aeroallergens panel

<b>Atopy</b>	<b>N</b>	<b>Percentage (%)</b>
No	70	69.3
Yes	31	30.7
<b>Total</b>	<b>101</b>	

N- Number of patients

**Table 1.6.** Atopic patients who tested positive to three of more allergens

<b>Number of positive allergens</b>	<b>N</b>	<b>Percentage (%)</b>
3	8	25.8
4	9	29.0
5	3	9.6
6	5	16.1
7	2	6.5
8	3	9.6
9	1	3.2
<b>Total</b>	<b>31</b>	

N- Number of patients

## SECTION 2: WORKERS SCREENED FOR ALLERGIC SENSITIZATION

### Section 2.1. Results of patients screened for sensitization against occupational allergens

A total of 242 patients from three occupational settings were screened for occupational allergies. The food manufacturing sector had the most number of patients screened (N=128) (Table 2.1). This sector accounted for 52.9% of the total number of patients screened. Of the 242 patients tested within the various occupational settings, two patients had positive results; one from the platinum mining sector (3%) and another from the food manufacturing sector (0.78%).

**Table 2.1.** Number of patients screened for sensitization against occupational allergens from various occupational settings

Occupational setting	N	Positive	% positive
Platinum mining	33	1	3.0
Platinum and nickel research laboratory	81	0	0.0
Food manufacturing	128	1	0.78
<b>Total</b>	<b>242</b>	<b>2</b>	<b>0.82</b>

N - Number of patients; % - Percentage

### Section 2.2. Demographic data of patients screened for sensitization against occupational allergens

Overall, male patients accounted for majority of the patients screened per occupational sector (N= 159; 65.7%). Blacks accounted for the highest number of patients screened (79.3%; N = 192), followed by whites (17.3%; N = 42). Black male patients were the most commonly screened within two of the three occupational sectors; there was a slightly higher number of black females that were screened within the platinum mining sector, compared to black males (N = 11 vs N = 10).

**Table 2.2.** The demographic data (sex and race group) of patients screened for occupational allergies within various occupational settings

Occupational setting	Sex	Black	Asian	White	Coloured	Total* (sex)	Total*
Platinum mining	M	10	0	8	0	21	33
	F	11	0	4	0	12	
Platinum and Nickel research laboratory	M	44	0	1	1	46	81
	F	27	3	4	1	35	
Food manufacturing	M	68	1	22	1	92	128
	F	32	1	3	0	36	
<b>Total per race group</b>		<b>192</b>	<b>5</b>	<b>42</b>	<b>3</b>	<b>242</b>	

Total\* (sex) – Total number of male and female patients screened per occupational setting. Total\* - Total number of patients screened per occupational setting. M – male; F – female

## LIMITATIONS

Although the occupational respiratory allergy database contains data from 2005, this is the first annual surveillance report produced. A number of areas have been identified for improvement for future annual reports. One of the key limitations is the referral bias with most patients coming from Gauteng due to the locality of the NIOH clinic and laboratories. Secondly, the laboratory data sheet did not include the race of the patient. We sought this information from the Occupational Medicine clinic at NIOH whom referred patients. Classification by industry was also difficult as we did not verify with the patient the sector where he/ she work. For example, some gave the name of a mining group, but we are not sure if he /she worked in the mine, lab or smelters.

## FUTURE PLANS

1. To address the reporting bias, the plan is to identify other centres providing a similar service and to explore having a centralised database.
2. Amend data collection sheets to include race, classification by industry, province.
3. Future reports to include distribution by age, size of SPT wheal, occupational allergy and distribution of allergy tests by race and sector per year since 2005.
4. Align job categories and industrial sectors in accordance with the standard industrial classification.