

ABC Company

Health Surveillance Group Report

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Executive summary

Health surveillance was conducted between July and November 2008 on 326 ABC Company workers by Corporate Health Professionals. 296 assessments were completed at Venue A, 18 at Venue B and 12 at Venue C.

Health surveillance was primarily targeted at detecting early signs of silica related disease. Currently there are no confirmed cases of silica related disease. Two workers had radiological findings that can be consistent with very early and minor silicosis. However, other conditions can also cause the same radiological appearance. One worker is located at Venue A, the other worker at Venue B. Both workers are asymptomatic and further evaluation is taking place.

Two workers had radiological evidence of asbestos exposure in the form of pleural plaques. Neither worker had significant asbestos related disease such as asbestosis or mesothelioma. For both workers, the asbestos exposure most likely occurred decades ago. There is no known current asbestos exposure at ABC Company.

As expected, no cases of manganese related disease were detected or suspected.

Smoking prevalence at ABC Company is higher than the community smoking prevalence. 30% of Venue A workers, 50% of Venue C workers and 66.7% of Venue B workers smoke compared to 25% of adult males in the community.

As a group, smokers at Venue A reported increased respiratory symptoms (66.3% vs 36.2%) and decreased lung function (92% predicted FEV1 vs 100% predicted FEV1) compared to the non-smokers.

162 workers had lung function measured in both 2001 and 2008. As a group, the median decline in lung function is well within the expected range. Analysis of lung function change by department did not reveal any consistent patterns.

Worker concerns involving respiratory PPE included poor comfort, impracticality, uncertainty regarding use, unavailability in some work areas and lack of knowledge in terms of achieving a good fit and checking for a seal.

Workers were commonly concerned about dust exposure. Concerns could be broken down into: 'Too much (visible) dust and inadequate controls', worry about other dusts such as red oxide, difficulty distinguishing between nuisance and hazardous dusts and distrust of monitoring results and management reassurances.

A small number of workers had further medical review. Referral to their own medical practitioner was made when appropriate. 5 workers were referred to a respiratory specialist – Dr 'Smith'. A small number of workers will require further follow-up over the next 6-12 months.

Overall, the risk of developing significant silica or asbestos related disease for workers at ABC Company is low. The risk of developing significant manganese related disease is minimal.

Introduction

Health surveillance was conducted between July and November 2008 on 326 ABC Company workers by Corporate Health Professionals. Previous health surveillance had been conducted by 'XYZMedCo' in 2001. The results of the previous health surveillance were only retrieved after the majority of assessments had been completed.

Please refer to the previous reports titled *ABC Company health surveillance protocol* and *Worksite assessment- ABC Company* for details of the worksite assessment, review of airborne dust monitoring results, risk assessment, discussion of dust related disease and surveillance protocols.

In summary, the overall risk of developing silica related disease was assessed as low and the risk of manganese related disease assessed as negligible. Workers in the highest exposure category (Consumables shed and Whatsit machine workers) were assessed to have a reasonable probability of developing silica related disease if exposed over a working lifetime (45 years). Silica health surveillance was recommended for the highest exposure group. Health surveillance was considered optional for all other exposure groups.

The results of the current and previous health surveillance can guide conduct of future health surveillance.

Assessments conducted

Assessment Type	Number completed
Venue A	
Silica	296
Manganese	44
Asbestos	18
Venue B	
Silica	18
Venue C	
Silica	12

Table 1: Assessments conducted by site

Table 1 summarises the assessments conducted across the ABC Company sites. 296 Venue A workers, 18 Venue B workers and 12 Venue C workers completed health surveillance. All workers assessed with the exception of one female were male.

The majority of assessments were conducted over 3 weeks in July/August. Further assessments were conducted intermittently to November to cover different sites and workers unable to attend for the initial assessments. A small undetermined number of workers did not attend for health surveillance.

Summary results

Venue A

	Number	% of total assessed
Current smoker	89	30.1 %
Respiratory symptoms	134	45.3%
Lung function abnormal	21	7.1%
Chest x-ray completed	153	51.7%
Chest x-ray abnormal	18	6.1%
CT scan completed	8	2.7%
CT scan abnormal	7	2.4%
Further review	26	8.8%

Table 2: Venue A results summary

Note: For comparison, adult male smoking prevalence in 2001 (Australia) is 25%.

Venue B

	Number	% of total assessed
Current smoker	12	66.7%
Respiratory symptoms	4	22%
Lung function abnormal	0	0
Chest x-ray completed	2	11.1%
Chest x-ray abnormal	1	5.6%
CT scan completed	1	5.6%
CT scan abnormal	1	5.6%
Further review	3	16.7%

Table 3: Venue B results summary

Venue C

	Number	% of total assessed
Current smoker	6	50%
Respiratory symptoms	3	25%
Lung function abnormal	0	0
Chest x-ray completed	0	0
Further review	0	0

Table 4: Venue C results summary

Respiratory symptoms

Venue A

			Respiratory Symptoms		Total
			no	yes	
DEPT	C	Count	1	4	5
		% within DEPT	20.0%	80.0%	100.0%
	D	Count	18	9	27
		% within DEPT	66.7%	33.3%	100.0%
	EI	Count	9	5	14
		% within DEPT	64.3%	35.7%	100.0%
	En	Count	4		4
		% within DEPT	100.0%		100.0%
	L	Count	6		6
		% within DEPT	100.0%		100.0%
	M	Count	36	21	57
		% within DEPT	63.2%	36.8%	100.0%
	P	Count	2	3	5
		% within DEPT	40.0%	60.0%	100.0%
	PI	Count	3	1	4
		% within DEPT	75.0%	25.0%	100.0%
	Plant~	Count	7	5	12
		% within DEPT	58.3%	41.7%	100.0%
	Plant #&*	Count	15	6	21
		% within DEPT	71.4%	28.6%	100.0%
	Plant ) & (	Count	9	10	19
		% within DEPT	47.4%	52.6%	100.0%
	Plant N&T	Count	22	11	33
		% within DEPT	66.7%	33.3%	100.0%
Total		Count	132	75	207
		% within DEPT	63.8%	36.2%	100.0%

Table 5: Prevalence of respiratory symptoms by department (non-smokers)

			Respiratory Symptoms		Total
			no	yes	
DEPT	C	Count	1	2	3
		% within DEPT	33.3%	66.7%	100.0%
	D	Count	6	13	19
		% within DEPT	31.6%	68.4%	100.0%
	EI	Count		4	4
		% within DEPT		100.0%	100.0%
	En	Count	1		1
		% within DEPT	100.0%		100.0%
	L	Count	1		1
		% within DEPT	100.0%		100.0%
	M	Count	9	6	15
		% within DEPT	60.0%	40.0%	100.0%
	OHS	Count		1	1
		% within DEPT		100.0%	100.0%
	P	Count		2	2
		% within DEPT		100.0%	100.0%
	Plant ~	Count	2	4	6
		% within DEPT	33.3%	66.7%	100.0%
	Plant *#5	Count	4	7	11
		% within DEPT	36.4%	63.6%	100.0%
	Plant )&(	Count	3	13	16
		% within DEPT	18.8%	81.3%	100.0%
	Plant N&T	Count	3	7	10
		% within DEPT	30.0%	70.0%	100.0%
Total		Count	30	59	89
		% within DEPT	33.7%	66.3%	100.0%

Table 6: Prevalence of respiratory symptoms by department (smokers)

Respiratory symptoms were measured using the respiratory questionnaire from the Department of Consumer & Employee Protection mine workers health surveillance. A ‘yes’ was scored for respiratory symptoms if either of cough, wheeze, phlegm or shortness of breath was present.

As expected, smokers reported increased respiratory symptoms compared to non-smokers across most departments. In total, 66.3% of smokers reported symptoms compared to 36.2% of non-smokers.

Differences between departments must be interpreted with caution because of:

- Small numbers
- No measurement of exposure time eg. a worker could have spent 15 years in Plant 4&5 but moved to Plant 11 one week before the assessment.
- No differentiation between different jobs within departments (eg. Whatsit machine operator vs Cooker operator)
- No differentiation between minor and significant respiratory symptoms

Venue B

4 workers reported respiratory symptoms. 3 of these workers smoked.

Venue C

3 workers reported respiratory symptoms. All of these workers smoked.

Current lung function

Venue A

SMOKER		N	Minimum	Maximum	Mean	Std. Deviation
no	FEV1 % Predicted	206	51	151	100.09	14.932
	FVC % Predicted	206	72	155	100.14	14.414
yes	FEV1 % Predicted	89	28	121	92.25	15.116
	FVC % Predicted	89	30	131	94.98	14.463

Table 7: Comparison of lung function in smokers vs non-smokers

Lung function was measured by spirometry. Two parameters were measured. FEV1 is the volume of air forcefully exhaled after 1 second. FVC is the total volume of air forcefully exhaled. The measured parameters are then compared to predicted lung function to assess normality. This is expressed as a percentage of the predicted value. Eg. FEV1% = 94 means that the value for FEV1 is 94% of the predicted value.

For the 206 non-smokers measured, the average measured lung function is the same as predicted for healthy adults (100%). For the 89 smokers, the average lung function is significantly reduced compared to the non-smokers.

DEPT		N	Minimum	Maximum	Mean	Std. Deviation
C	FEV1 % Predicted	5	62	110	95.20	19.357
	FVC % Predicted	5	74	106	97.80	13.535
D	FEV1 % Predicted	27	74	120	99.11	12.135
	FVC % Predicted	27	72	122	98.11	12.248
Ei	FEV1 % Predicted	14	73	134	98.64	17.570
	FVC % Predicted	14	72	140	98.07	18.833
En	FEV1 % Predicted	4	79	101	90.00	9.018
	FVC % Predicted	4	85	104	93.25	8.884
L	FEV1 % Predicted	6	90	115	98.00	8.786
	FVC % Predicted	6	91	120	101.00	10.373
M	FEV1 % Predicted	57	51	151	102.00	17.287
	FVC % Predicted	57	76	155	101.58	15.806
P	FEV1 % Predicted	4	89	131	102.00	19.900
	FVC % Predicted	4	88	125	98.25	17.877
PI	FEV1 % Predicted	4	76	112	101.25	17.154
	FVC % Predicted	4	77	114	102.00	16.912
Plant ~	FEV1 % Predicted	12	87	124	105.92	11.461
	FVC % Predicted	12	82	149	106.33	16.093
Plant *&#	FEV1 % Predicted	21	76	124	98.48	12.548
	FVC % Predicted	21	81	128	97.38	12.412
Plant 7&8	FEV1 % Predicted	19	75	132	101.79	16.735
	FVC % Predicted	19	75	137	103.68	16.623
Plant N&T	FEV1 % Predicted	33	66	119	98.09	13.475
	FVC % Predicted	33	75	116	98.67	11.714

Table 8: Lung function by department (non-smokers) – ANOVA p-value > 0.8

DEPT		N	Minimum	Maximum	Mean	Std. Deviation
C	FEV1 % Predicted	3	76	115	89.67	21.962
	FVC % Predicted	3	76	131	97.67	29.297
D	FEV1 % Predicted	19	69	118	94.37	13.594
	FVC % Predicted	19	71	123	95.21	13.665
EI	FEV1 % Predicted	4	87	108	96.75	8.655
	FVC % Predicted	4	86	103	95.00	7.071
En	FEV1 % Predicted	1	81	81	81.00	.
	FVC % Predicted	1	93	93	93.00	.
L	FEV1 % Predicted	1	100	100	100.00	.
	FVC % Predicted	1	98	98	98.00	.
M	FEV1 % Predicted	15	42	108	87.07	16.555
	FVC % Predicted	15	57	114	92.27	15.031
OHS	FEV1 % Predicted	1	86	86	86.00	.
	FVC % Predicted	1	81	81	81.00	.
PK	FEV1 % Predicted	2	88	108	98.00	14.142
	FVC % Predicted	2	83	107	95.00	16.971
Plant ~	FEV1 % Predicted	6	73	109	93.50	11.862
	FVC % Predicted	6	68	109	92.50	15.162
Plant *&#	FEV1 % Predicted	11	71	113	91.09	10.793
	FVC % Predicted	11	88	114	95.45	7.738
Plant )&(	FEV1 % Predicted	16	28	121	92.38	22.250
	FVC % Predicted	16	30	120	95.94	21.337
Plant N&T0	FEV1 % Predicted	10	77	116	95.10	11.902
	FVC % Predicted	10	80	110	98.50	8.383

Table 9: Lung function by department (smokers) – ANOVA p-value > 0.9

Differences between departments must be interpreted with caution because of:

- Small numbers
- No measurement of exposure time eg. a worker could have spent 15 years in Plant #&* but moved to Plant ~ one week before the assessment.
- No differentiation between different jobs within departments (eg. Whatsit machine operator vs Cooker operator)

There is no significant statistical difference in lung function between departments regardless of smoking status. One way ANOVA was used to perform the statistical analysis.

Venue B

SMOKER		N	Minimum	Maximum	Mean	Std. Deviation
no	FEV1 % Predicted	6	88	121	98.33	12.675
	FVC % Predicted	6	83	123	100.33	13.018
yes	FEV1 % Predicted	11	83	123	99.55	12.226
	FVC % Predicted	11	85	120	99.27	10.546

Table 10: Comparison of lung function smokers vs non-smokers (Venue B)

Venue C

SMOKER		N	Minimum	Maximum	Mean	Std. Deviation
no	FEV1 % Predicted	6	94	126	107.67	10.838
	FVC % Predicted	6	94	138	107.67	15.616
yes	FEV1 % Predicted	6	83	171	109.67	34.268
	FVC % Predicted	6	88	163	111.33	29.911

Table 11: Comparison of lung function smokers vs non-smokers (Venue C)

Lung function comparison 2001-2008

Comparison of lung function can be used to detect workers with significant decline in lung function who otherwise would have been missed because their current lung function remains within the normal predicted range.

Spirometry is a complex procedure and accuracy depends on:

- subject cooperation and technique
- equipment used and calibration
- examiner training

The use of different providers for 2001 and 2008 is likely to introduce additional variability into the comparisons.

162 workers at ABC Company had spirometric lung function testing in both 2001 and 2008.

Ever smoked			Decline in lung function (L)
No	FEV1 comparison	Median	.0700
	FVC comparison	Median	.3050
Yes	FEV1 comparison	Median	.1100
	FVC comparison	Median	.3650

Table 12: Average decline in lung function from 2001-2008 non-smokers versus ever smoked

Table 12 shows that the average decline in lung function in smokers and non-smokers is within the range expected for age related decline. As expected, workers who have ever smoked demonstrate a greater rate of decline in lung function on average.

Venue A

DEPT		N	Minimum	Maximum	Mean	Std. Deviation
C	FEV1 comparison	5	-1.15	.81	-.0720	.71918
	FVC comparison	5	-1.58	1.42	.1920	1.09081
D	FEV1 comparison	14	-.09	1.51	.4421	.45204
	FVC comparison	14	-.09	2.16	.9336	.61475
EI	FEV1 comparison	8	-.55	.87	.0788	.43982
	FVC comparison	8	-.91	1.22	.2238	.64491
En	FEV1 comparison	1	.24	.24	.2400	.
	FVC comparison	1	.78	.78	.7800	.
L	FEV1 comparison	1	-.51	-.51	-.5100	.
	FVC comparison	1	-.31	-.31	-.3100	.
M	FEV1 comparison	36	-1.15	1.01	.0983	.35607
	FVC comparison	36	-1.46	1.54	.3694	.48525
P	FEV1 comparison	2	-.02	.22	.1000	.16971
	FVC comparison	2	.02	.62	.3200	.42426
PI	FEV1 comparison	3	-.41	.01	-.2167	.21197
	FVC comparison	3	-.26	.07	-.1300	.17578
Plant ~	FEV1 comparison	6	-.25	.76	.2817	.33193
	FVC comparison	6	-.93	1.23	.2117	.72610
Plant *&#	FEV1 comparison	13	-.87	.62	-.0662	.41450
	FVC comparison	13	-.84	1.33	.3123	.55586
Plant )&(	FEV1 comparison	8	-.14	.57	.2375	.22814
	FVC comparison	8	.14	.92	.4787	.29381
Plant N&T	FEV1 comparison	17	-.49	1.99	.2065	.59420
	FVC comparison	17	-.23	3.33	.5476	.88726

Table 13: Decline in lung function between 2001-2008 by department (non-smokers)

DEPT		N	Minimum	Maximum	Mean	Std. Deviation
C	FEV1 comparison	3	.06	.40	.2267	.17010
	FVC comparison	3	-.03	.73	.4633	.42771
D	FEV1 comparison	7	-.37	.31	-.0386	.24389
	FVC comparison	7	-.39	.73	.1114	.39376
EI	FEV1 comparison	2	.14	.80	.4700	.46669
	FVC comparison	2	-.16	1.15	.4950	.92631
L	FEV1 comparison	1	.62	.62	.6200	.
	FVC comparison	1	1.11	1.11	1.1100	.
M	FEV1 comparison	5	.01	.71	.3480	.28883
	FVC comparison	5	.09	1.10	.5060	.37233
P	FEV1 comparison	2	-1.39	-.46	-.9250	.65761
	FVC comparison	2	-1.53	-.51	-1.0200	.72125
Plant ~	FEV1 comparison	1	-.45	-.45	-.4500	.
	FVC comparison	1	-.05	-.05	-.0500	.
Plant *&#	FEV1 comparison	3	-.03	.15	.0767	.09452
	FVC comparison	3	-.33	.31	.0833	.35852
Plant )&(	FEV1 comparison	6	.00	.36	.1150	.13065
	FVC comparison	6	-.06	.53	.2933	.20481
Plant N&T	FEV1 comparison	4	-.23	.26	.0375	.20581
	FVC comparison	4	.21	.46	.2950	.11210

Table 14: Decline in lung function between 2001-2008 by department (smokers)

Notes: The comparisons are calculated as 2001 lung function minus 2008 lung function (litres). A positive value represents a decline in lung function. A negative value represents an increase in lung function.

Tables 13&14 do not reveal a consistent pattern of lung function decline associated with any particular department.

Venue B

6 workers at Venue B had lung function comparisons (2001-2008). All comparisons were within the normal expected range.

Venue C

8 workers at Venue C had lung function comparisons (2001-2008). One worker had greater than average decline in lung function.

Follow-up

Across all sites, 11 workers had measured decline in lung function great enough to warrant repeat lung function testing in 6-12 months time. Repeat testing will help to determine whether the decline in lung function is significant or due to variation in test performance.

Imaging

Venue A

153 chest x-rays were completed. 18 chest x-rays had some abnormality present. Of the 18 workers with abnormal chest x-rays, 9 required further evaluation by CT scan.

The most common abnormality requiring further evaluation was the presence of lung nodules. No chest x-rays were reported as having evidence of silicosis. Asbestos pleural plaques (evidence of asbestos exposure) were present on one chest x-ray.

7 CT scans were abnormal. The abnormal CT scans were distributed amongst the following departments: electrical, maintenance, plant ~, plant # & *, plant) & (.

The presence of single or multiple small lung nodules was the most common abnormality on CT scan of the chest (5 CT scans). Evidence of asbestos exposure was present on 2 CT scans. 2 CT scans had findings that were difficult to interpret.

Venue B

Two workers had chest x-rays. One chest x-ray result was abnormal. This was further evaluated by CT scan. The CT scan result was abnormal.

Venue C

No chest x-rays were completed.

Specialist referral

After further review by CHP's Occupational Physician, 5 workers were referred to Dr 'Smith', respiratory specialist, for further evaluation of clinical and imaging findings.

Silica

Venue A

There are no confirmed cases of silica related disease. No chest x-rays were reported as having signs of silicosis.

The appearance of two CT scans may be consistent with very mild silicosis though the findings may have other possible causes. These workers have been referred to Dr 'Smith' for further evaluation. It is unlikely that a definitive diagnosis can be made at this time. It is likely that these workers will require ongoing monitoring with further imaging. A supplementary report will be issued when the outcome of specialist evaluation is received.

Venue B

One worker had an abnormal CT scan of the chest. The radiological appearance may be consistent with very early silicosis but there are insufficient lesions to make a diagnosis. This worker had personal monitoring conducted in October 2008. No crystalline silica was detected in his sample. Further investigation of potential silica exposure continues.

Venue C

No chest x-rays were completed.

Manganese

Venue A

Generally, manganese exposure was infrequent (3-4 times a year). As expected, no cases of manganese associated neurological disease were detected or suspected. Ongoing health surveillance for manganese is not recommended unless use and exposure is greatly increased.

Asbestos

Venue A

There is no known ongoing current exposure to asbestos on any ABC Company site.

Two workers had radiological evidence of past asbestos exposure in the form of asbestos pleural plaques. This was a new finding for one worker. One worker was evaluated by Dr 'Smith'. Neither worker had asbestosis (lung fibrosis caused by asbestos).

One worker's asbestos exposure primarily occurred in previous employment decades ago (worked with asbestos lagging as an apprentice). The other worker probably only had incidental exposure in previous and current employment.

Other further reviews

A number of workers had medical issues that required further review and referral to their general practitioners as appropriate. Cases included:

- 3 workers with possible occupational asthma. They are undergoing further evaluation.
- Probable contact dermatitis
- Neurological symptoms possibly related to using vibrating power tools
- Probable moderate emphysema – worker was unaware that he had a problem.

Other issues raised

Personal protective equipment

Issues concerning PPE were:

1. Not practical to wear respiratory PPE.

This was the most common complaint. Reasons included discomfort, increased work of breathing, short exposure times and fogging of glasses.

2. Not sure when respiratory PPE is required.

Apart from obvious hazardous activities like mixing additives, many workers were unsure when and where to use respiratory PPE. For example, uncertainty about PPE use when performing housekeeping duties.

3. Respiratory PPE unavailable in work area.

A few workers complained about unavailability of respiratory PPE in their work area.

4. Did not know how to check for a good fit and seal.

Most workers interviewed did not know how to check for a good fit and seal when using disposable P2 dust mask PPE.

Concerns about dust exposure

Issues were:

1. 'Too much dust and inadequate controls'

This was the most common concern. Visible dust was often equated with harm. Some workers complained of dust stained nasal discharge and phlegm.

2. Difficulty distinguishing between hazardous and nuisance dusts

Some workers had difficulty distinguishing between hazardous and nuisance dusts. This is linked with the other concerns listed below.

3. Concern about other additives used – particularly 'red oxide'

Some workers were concerned about dusts that were not part of the health surveillance or hygiene monitoring. In particular red oxide (ferric oxide) was singled out as a concern despite its non-hazardous classification on the MSDS.

4. Distrust of monitoring results and management reassurances

5. Newer workers unaware of specific hazardous dusts

Newer workers tended to be unaware of the hazardous nature of the silica additives.

Enclosed forklift cabins

All drivers felt that this was a significant improvement.

Follow-up

A small number of workers are still being evaluated or require further follow-up over the next 6-12 months. Further follow-up will be arranged with the OHS department.

Conclusion

There have been no confirmed cases of significant silica or manganese related disease. There are two workers with radiological evidence of asbestos exposure but no evidence of asbestosis or mesothelioma.

Overall, the risk of developing significant silica related disease for workers at ABC Company is low. This is based on:

- Available monitoring results- the great majority of readings are below the relevant occupational exposure standard.
- Health surveillance has not detected any confirmed cases of silica related disease.
- Health surveillance has included workers in the dustiest jobs and with long work histories at ABC Company.
- No chest x-rays have been reported as showing evidence of silica exposure.
- Two workers have CT scan appearances that can be consistent with silica exposure and early very minor silicosis. However, the findings are insufficiently developed to make a diagnosis and there can be alternative explanations for the CT scan appearance. Both workers are currently undergoing further evaluation.

The risk of manganese related disease is minimal. Past and current exposure is infrequent and intermittent.

The risk of asbestos related disease is low. There is no known current exposure to asbestos. Past exposure has usually been incidental.

Even though the long term health risks are low, workers remain concerned about the degree of visible dust generated by work processes.