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ORIGINAL COMMUNICATION

Respiratory symptoms among forensic identification workers

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There has been relatively little recent study of potential health hazards to police officers performing forensic identification duties. Such information as there is does not demonstrate any apparent major health hazards resulting from occupational exposure to chemical compounds.[1 2]

Police officers doing fingerprint work frequently use cyanoacrylate to uncover latent prints. This technique has been in worldwide use for many years. Recently, however, the Health and Safety Commission in the UK listed cyanoacrylate as a respiratory sensitiser.[3] This resulted from numerous reports of sensitization in other **industries**[4–7] and caused concern that police staff may become sensitized to this compound. Some studies have suggested a significant increase in the prevalence of skin and visual symptoms, but not respiratory symptoms, among police officers involved in fingerprint work.[2] The current study surveyed members of a large Canadian police force who were employed in the forensic identification service to determine the prevalence of respiratory symptoms. A matched control group of police officers not employed in forensic identification services was also surveyed and the results of the surveys compared. The questionnaire used in the survey was also administered to 100 consecutive patients undergoing methacholine challenge testing to determine any relationship between specific questions asked in the survey and the presence of non specific bronchial hyperreactivity (NSBH).

METHODS

All 277 members of the police force currently employed in the forensic identification services were mailed a questionnaire (Fig. 1). Questions on the occurrence of respiratory symptoms (shortness of breath, wheezing and coughing) under various circumstances were asked, namely: with exercise; at night; in cold air and at work. Additional demographic and medical history data were collected. A follow-up questionnaire was sent if there was no response after 3 months. A control group of police officers from the force, but not employed in forensic identification services, was identified for comparison purposes. This was achieved in the following manner. All members of the police force are issued a regimental number at the time of recruitment and these

1. Do you work with cyanoacrylate? (superglue, crazy glue, locktite, hard evidence, and others)
2. What respiratory protection do you use to prevent breathing of the fumes?
3. Where do you work?
4. Did you have asthma or any other lung problem before you started working for IDENT?
5. Do you now experience any of the following symptoms?
   a) Shortness of breath or difficulty breathing:
      (i) With exercise? yes no
      (ii) At night? yes no
      (iii) On exposure to cold air? yes no
      (iv) At work? yes no
   b) Wheezing:
      (i) With exercise? yes no
      (ii) At night? yes no
      (iii) On exposure to cold air? yes no
      (iv) At work? yes no
   c) cough:
      (i) With exercise? yes no
      (ii) At night? yes no
      (iii) On exposure to cold air? yes no
      (iv) At work? yes no
6. Do you have hay fever? yes no
7. Do you get throat congestion? yes no
8. Do you get lung congestion? yes no
9. Do you smoke cigarettes? yes no
10. Have you ever smoked?
    Amount smoked _____

Thank you for your help with this project. The results will be communicated back to the membership.

Fig. 1 -Questionnaire completed by members of the forensic identification services.

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numbers are issued sequentially. Thus by adding and subtracting the number '1' to each regimental number of the members identified in the forensic identification group, it was possible to access a population that joined the police force at about the same time and so would be similar in terms of police experience and possibly age. The regimental numbers both before and after that of the study regimental number were selected in order to increase the potential population size. The resultant control group of regular members consisted of 339 officers. These individuals were mailed a similar questionnaire (Fig. 2) as the study group and a similar survey methodology was followed.

The central section of the questionnaire dealing with respiratory symptoms was also administered to 100 sequential outpatients who were undergoing methacholine challenge testing, for possible asthma, at Ottawa General Hospital. The methacholine tests were performed according to the method recommended by the Canadian Thoracic Society' and the resultant PC_{20} (airway responsiveness expressed as that concentration of agent that will provoke a fall in FEV_1 of 20%) was assessed against each question to determine whether any relationship existed between NSBH and specific symptoms described in the questionnaire. This challenge group was not compared to either study or control group with respect to demographic and medical variables.

For each dichotomous respiratory response variable, point and confidence interval estimates for the odds ratio were calculated to describe the presence and absence of the symptom with respect to study and control group membership. Chi-square test procedures were used to assess the significance of this relationship. For the methacholine challenge, the mean and standard error of $PC_{,,}$ was calculated for each response to the respiratory symptoms and Students f-tests were used to compare the PC, levels between the presence and absence of each symptom.

1. Do you work with animals?
2. Do you work with chemicals on a daily basis?
3. Do you work in a city or town of more than 15 000 people?
4. Did you have asthma or any other lung problem before you joined the force?
5. Do you now experience any of the following symptoms?
   a) Shortness of breath or difficulty breathing:
      (i) With exercise? yes no
      At night? yes no
      On exposure to cold air? yes no
      At work? yes no
   b) Wheezing:
      (i) With exercise? yes no
      (ii) At night? **yes** no
      (iii) On exposure to cold air? **yes** no
      (iv) At work? yes no
   c) Cough:
      (i) With exercise? yes no
      (ii) At night? yes no
      (iii) On exposure to cold air? yes no
      (iv) At work? yes no
6. Do you have hay fever?
7. Do you get throat congestion?
8. Do you get lung congestion?
9. Do you smoke cigarettes?
10. Have you ever smoked?
    Amount smoked _____

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Fig. 2-Questionnaire completed by the sample of regular members of the police force.

RESULTS

Responses from 253 members of the forensic identification group were received (a response rate of 91%). All were male. 94% of those that responded worked with cyanoacrylate. The response rate for the control group was lower (60%) with 202 members responding (98.5% male). The study and control groups were comparable by demographic, medical and smokingrelated characte:r-istics (Table 1). The average ages were similar (41.5 (SD 4.3) years and 40.1 (SD 5.4)) for the forensic identification and control group respectively. The only characteristic different between the groups was the more frequent occurrence of hay fever in the control group.

Respiratory symptoms were more common in tlhe forensic identification group (Table 2). In particular, all symptoms occurred significantly more often at work for the forensic identification group. Coughing under all circumstances was more frequent in this group. Other respiratory symptoms showed no difference in frequency between the two groups. The estimated odds ratio and the 95% confidence interval for each respiratory condition are shown in Figure 3. In each of the four

Table 1. Baseline characteristics of the forensic identification and regular member groups

Variable		Control group (n = 202)	Forensic identification group (n=253)
Asthma or lung problem prior to joining force	(% yes)	3.0 (n=202)	**2.8 (n=249)**
Hay fever	(% yes)	26.0 (n=200)	15.6 (n=243)
Smoke cigarettes	(% yes)	13.9 (n=202)	10.5 (n=248)
Ever smoked	(% yes)	54.5 (n-202)	55.6 (n=248)
Number of pack years smoked for, ever smoked, subgroup	(mean)	10.1 (n=97)	11.5 (n=120)

Table 2. % experiencing the respiratory symptoms in the forensic identification and regular member groups

	Control group (n=202)	Forensic identification group (n=253)	*P*-value
Shortness of breath			
With exercise	24.0%	30.0%	0.16
At night	6.5%	8.5%	0.43
In cold air	9.9%	9.7%	0.95
At work	6.0%	10.9%	0.0658
Wheezing			
With exercise	10.5%	14.3%	0.22
At night	6.0%	9.0%	0.23
In cold air	7.0%	7.4%	0.86
At work	2.5%	6.9%	0.0317
Cough			
With exercise	12.0%	21.6%	0.0075
At night	4.5%	11.5%	0.0078
In cold air	6.0%	14.3%	0.0042
At work	4.0%	16.0%	0.0004

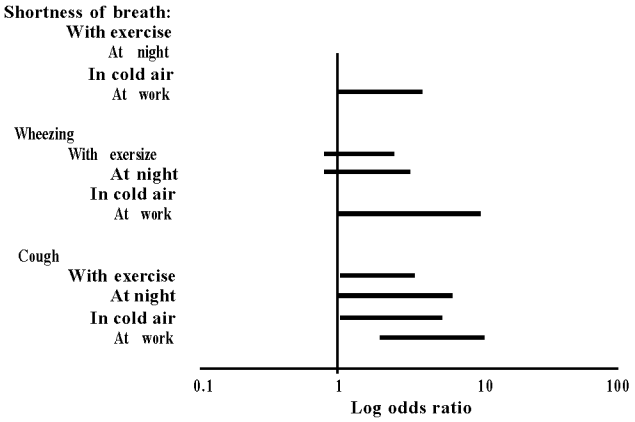

Fig.3 - Odds ratios and 95% confidence interval of the respiratory symptoms by forensic identification and regular member groups.

circumstances, coughing is more than twice as likely to occur in the forensic identification group than the control group (odds ratio: 2.0 with exercise; 2.8 at night; 2.6 with exposure to cold air and 4.6 at work). The odds ratio for the occurrence at work of each of the three respiratory symptoms were: 1.9 for shortness of breath or difficulty breathing; 2.9 for wheezing and 4.6 for coughing.

When PC_{20} was evaluated for each respiratory symptom in order to determine whether an afiirmative reply was related to an increased level of NSBH, a positive reply to seven of the 12 symptoms was significantly related to a low PC_{20} (Table 3). In particular, for the occurrence of shortness of breath and wheezing, the PC_{20} was significantly different under all circumstances except 'at work'. For coughing, this relationship was only significant 'with exercise'. Such relationships indicate a high degree of airways reactivity and, presumably, intrinsic asthma.

Table 3. Mean and standard deviation of PC_{20} by respiratory symptoms experienced in the methacoline challenge testing group

Respiratory symptom	Symptom absent	Symptom present	P-value
Shortness of breath			
With exercise	7.7±0.81 (n=72)	12.4±1.18 (n=25)	0.002
At night	5.5±0.96 (n=40)	11.1±0.89 (n=55)	0.0001
In cold air	7.4±0.97 (n=53)	10.5±0.96 (n=45)	0.02
At work	7.4±1.27 (n=31)	9.7±0.93 (n=55)	0.15
Wheezing			
With exercise	6.2±0.99 (n=45)	11.0±0.90 (n=52)	0.0001
At night	5.3±1.00 (n=35)	10.6±0.89 (n=58)	0.0001
In cold air	6.2±1.22 (n=34)	10.2±0.82 (n=63)	0.009
At work	6.9±1.49 (n=19)	9.4±0.84 (n=70)	0.15
Cough			
With exercise	7.7±0.84 (n=66)	11.2±1.17 (n=32)	0.02
At night	8.7±0.91 (n=53)	9.0±1.09 (n=45)	0.86
In cold air	8.6±0.92 (n=56)	9.1±1.0 (n=42)	0.73
At work	8.6±1.16 (n=35)	9.1±1.00 (n=52)	0.74

DISCUSSION

The response rate was substantially higher for the forensic identification group, members of which would be more exposed to chemicals and powders. Since it is to the financial advantage of responders to be able to show that their symptoms are work related, it seems more likely that the non-responders would be asymptomatic than symptomatic.

These data demonstrate that there is a significant difference in the prevalence of respiratory symptoms among police officers doing forensic identification work when compared to a matched control group of police officers. Given that these officers work with cyanoacrylate, and that this compound is considered a respiratory sensitizer capable of causing occupational asthma, these data are consistent with the hypothesis that occupational asthma occurs among police officers using this compound in fingerprint work.

The questions to which an affirmative response was related to increased bronchial hyperreactivity were not the same questions that were answered affirmatively by forensic identification workers. Indeed, the pattern of answers from the asthmatics was almost the opposite of the forensic identification workers. This would not be supportive of the hypothesis that intrinsic asthma is more common among the forensic identification workers.

It must be remembered that these officers also work with a wide variety of other chemicals and powders, most notably with fingerprint powder. It has been shown

that a variety of non-specific irritants can cause respiratory symptoms.[10] These data are also consistent with non-specific irritation of the airways. They may also result from sensitization by some substance other than cyanoacrylate which is also used in the work place.

The police force has responded to this information by emphasizing the need for respiratory protection among members of the force working in forensic identification, by introducing a new occupationally oriented periodic health assessment for members engaged in this type of work. The assessment includes spirometry and chest X-ray. The police force has alerted the regional health services officers and the forensic identification personnel to the issue. A review of all forensic identification services across the force has been initiated in order to ensure optimal work place respiratory protection. Nevertheless, it is clear that if an individual has been sensitized, then reliance must not be placed on respiratory protection. The member must be transferred to other duties which do not involve contact with the sensitizing agent.

Some respiratory sensitizers, particularly those whose action is characterized by a late asthmatic reaction, may result in continued symptoms in spite of removal from the work environment.[9] It has been suggested that as many as 60% of individuals, after removal from contact with the sensitizer, retain some degree of non-specific bronchial hyperreactivity.[11] Fortunately these data do not support the contention that this work exposure is associated with an increased risk of non-specific bronchial hyperreactivity, or intrinsic asthma. Respiratory precautions and periodic monitoring of respiratory function is warranted. This population will be followed wit'h spirometry. After removal of sensitized workers from exposure continued medical surveillance is, nevertheless, prudent, to ensure that non-specific bronchial hyperreactivity has not developed.

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