

Occupational health and safety management of chemicals in small businesses in three industries in New Zealand

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Abstract

Seventy-five owner-managers of small businesses (36 hairdressers, 25 printers and 14 apple growers) in New Zealand were interviewed about their attitude, knowledge and management of hazardous chemicals. The majority of the owners were not concerned about dealing with chemicals used in the industry but 75% of them considered substitution of the most hazardous chemicals. In general their knowledge about health and safety related to hazardous chemicals was poor but they

were unaware of this. The apple growers stood out as having the best management of hazardous chemicals in practice. Their yearly audit developed with industry involvement and on the basis of market demand included management of hazardous chemicals. This seemed to be related to better management of hazardous chemicals. There seemed to be a relation between poor practice amongst the hairdressers and that 64% of hairdressers had experienced or witnessed an accident or injury involving chemicals.

Key words

Small enterprises, hazardous chemicals, OHS knowledge and perception, owner-manager

Introduction

In 2004 it was estimated that 700 to 1,000 New Zealanders die from occupational diseases each year and that a substantial proportion of these deaths are related to exposure to hazardous chemicals (Driscoll et al., 2004; Pearce et al., 2005). There is growing evidence that people who work in small businesses are more likely to be exposed to hazardous situations and suffer more work-related injuries and illnesses in New Zealand (Lamm & Tipples, 2005; O'Connell, Firth, & McBride, 2001) and internationally (Hasle & Limborg, 2006; Walters, 2006). Some researchers indicate that the higher exposure to hazard is related to the fact that the industries dominated by small business are high risk industries (Antonsson, 2002; Lentz, 2001). Occupational Health and Safety (OHS) statistics in New Zealand are not analysed by business size so it is difficult to make conclusive statements about accidents and injuries in small businesses in New Zealand (Legg et al., 2009). However there is some evidence that small businesses have poor management of health and safety (Hasle & Limborg, 2006) and hazardous chemicals (Antonsson, 2007; Pratt, 2006; Sørensen, Hasle, & Bach, 2007) and a higher proportion of their employees are more often exposed to chemicals

(Walters, 2006). This is the background for the present study which focuses on the management of hazardous chemicals in small businesses in New Zealand.

The owner, who is most commonly also the manager, is the key person in small businesses. It is their values that determine the business' approach to OHS management (Antonsson, 2007; Biggs, 2000; Hasle & Limborg, 2006; Lamm, 2002; Vickers, 2003). Thus the owner-manager's knowledge perception and attitude towards health and safety and hazardous chemicals are important factors to analyse and influence when wanting to improve OHS in general and more specifically the management of and exposures to hazardous chemicals. Many owner-managers do not consider hazardous chemicals or OHS as separate problems or management areas. These areas are commonly integrated into the daily management of the business and are considered when problems or issues arise (Laird, Olsen, Harris, Legg, & Perry, 2009a).

There are many different ways of trying to influence small businesses' management of OHS and hazardous chemicals including development of OHS systems and assessments, training and education, health promotion, engineering and industrial hygiene interventions and behavioural interventions (Laird et al., 2009a). Hasle and Limborg (2006) found that the most common preventative approaches were different types of checklists and implementation of OHS management systems and other programmes. They suggest that the most successful methods are action-oriented, low cost approaches that combine OHS with other management goals. When trying to influence management of OHS and management of hazardous chemicals it is important to use intermediaries that have a regular contact with the small business and can integrate the OHS intervention into other services or business matters of interest to the small business like - suppliers, customers and industry auditing organisations (Antonsson, 2007; P. Hasle, 2000; P. Hasle, and Wissing, P., 2000; Hasle & Limborg, 2006; Lamm, 1997; Pratt, 2006).

On this background the Accident Compensation Corporation (ACC) in New Zealand funded a research project in 2007- 8 with the aim of assessing small business owner-managers' attitudes and perceptions, knowledge and management of hazardous chemicals and to identify possible influencers as a baseline survey for future interventions to reduce exposure to hazardous chemicals. It was intended that the effect of any further interventions would originate from findings of this baseline study.

The research project focused on three industry sectors: hairdressers, apple growers and printers based on specific selection criteria. These three industries operate under very different market conditions. The hairdressers are in the service industry, serve the local market where their costumers are private people who can assess the quality of the product immediately. The hygiene (related to costumer health) of the hairdressing salon is controlled by local city councils who conduct an inspection of all salons every year. The printing industry serves mainly the local and national market, has both companies and private people as customers and production is based on technology. It has been in the national authorities' focus during the last decade and has an active industry organisation. The apple industry exports the main part of its production and is highly influenced by the international market resulting in full adoption of integrated or organic fruit production programmes (IFP) to suit the demands of the end costumer in 2001 (ABARE & New Zealand Ministry of Agriculture and Forestry, 2006). The rapid implementation of IFP was largely attributable to the industry's reliance on the legislated single export seller operating at the time and a high participation of growers in its adjustment to New Zealand conditions. The implementations of IFP led to reduction of the use of hazardous chemicals e.g. a 95% reduction in the use of organophosphate insecticides and implementation of an audit scheme (Wiltshire, 2003).

Approach and methods

A researcher administered questionnaire survey was conducted via telephone or by face to face interview with a total of 75 small business owner-managers: 36 hairdressers; 25 printers and 14 apple growers over the months of March to May 2008.

Selection of industry sectors

The criteria for selecting the industry sectors were: 1) industries with a high percentage of small businesses with less than 20 employees (measured as Employee Count (EC), 2) industries with high usages and exposure to hazardous chemicals, based on an analysis from Environmental Risk Management Authority (ERMA), Ministry for the Environment (MfE) and Department of Labour (DoL) (ERMA, MfE, & DoL, 2005), 3) a representative distribution of businesses by size in the central North Island of New Zealand compared with the national distribution (for ease of access).

Selection of businesses

Only businesses with 20 employees or less participated in the study. The businesses within the three industry sectors were selected using several methods. The hairdressers were selected via contacts from the New Zealand Association of Registered Hairdressers regional meeting, through snowballing and by using the yellow pages. The printers were selected through the Yellow Pages and the industry organisation's; Print NZ's database. The apple growers were selected via the ACC's database. Eighty-one hairdressers were contacted in their salons and invited to participate whereafter an appointment for the interview was made. An information letter was sent to 94 printers and 46 apple grower. Thereafter all of the printers and 40 apple growers were contacted by telephone to make an appointment or to directly conduct the survey.

The questionnaire

A generic questionnaire was developed using several studies as inspiration (Biggs, 2000; Champoux & Brun, 2003; Larsson, 1998; Perry & Layde, 2003; Pratt, 2006; Vickers, 2003). The questionnaire contained 5 sections: 1) demographic questions, 2) questions about management of health and safety in general, 3) management of chemicals in general, 4) management of the chemical used in the business that the interviewee (the owner) perceived the most hazardous to human health and 5) sources of information in general and in relation to OHS and hazardous chemicals. Some of the questions were then adjusted to the specific industry through discussions with the particular industry association. The sections on OHS management, management of chemicals and management of the perceived most hazardous chemicals contained questions about the owner-managers knowledge, perception, and practice. Their knowledge about the health effects and of the protective measures used was assessed in relation to the chemical they perceived the most hazardous to human health. The answers were then compared to the health effects and the protective measures mentioned on the Material Safety Data Sheet (MSDS) for that particular chemical. We assumed that the owner would know most about the chemicals he/she perceived the most hazardous and use the recommended protective measures. The owners' perception of the business' compliance with health and safety legislation and their knowledge about the health effects of the perceived most hazardous chemical were rated on a scale from one to 10. The questionnaire contained both open ended and closed questions.

Conducting the survey

The survey was first conducted with the hairdressers. Two researchers conducted the survey; one asked the questions the other wrote the answers down. The survey was conducted by one of the researchers in the apple industry and the other researcher in the printing industry where most of the interviews were carried out by telephone and the researcher both asked the questions and noted the answers.

Analyses of the data

Most of the answers to the open-ended questions were categorised after the interviews. For example, the answers to the question “Could you tell me what the main health and safety issues for your business are?” were categorised in the following categories: chemicals, slips, trips and falls, posture and movements, cuts, mechanical, others. The answer to the question about the chemical the owner-manager considered the most hazardous: “What procedure do you have to ensure that staff are using the product safely?” were categorised into the following categories: observation/supervision, training and education, staff meetings; rely on staff to act responsibly, assess staff knowledge of the product, others. All data was entered into an excel spread sheet and a comparative analysis using the percentages of owners that responded in a particular way was carried out for all three industries and for each industry.

Results

The results from the study are presented in tables 1 to 4. The tables show the percentage of the owner-managers that have given the answer shown in the left column except for the three first rows in table 1, which give the average of the answers and the last row in tables 2 and 4 which show the average scores for all industries and for each of the three industries.

Demographics of respondents

Table 1 shows the demographics of the respondents; the average size of the business, how long the owner-manager had been in the industry and had owned the business, the percentage of the owners that had industry training and if they were members of an industry organisation.

Demographics	All industries	Hairdressers	Printers	Apple
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				growers
Average numbers of permanent employees in the business	4.5 employee	5.8 employee	4.8 employee	0.6 employee
Average years the owner had been in the industry	21.1 years	20.5 years	20.7 years	23.6 years
Average years the owner had owned the business	11 years	9.3 years	9.3 years	18 years
Percentage and (number) of owners that had owned the business for 5 years or less	40% (30)	47% (17)	42% (11)	14% (2)
Percentage and (number) of owners with industry specific training and education	75% (56)	89% (32)	60% (15)	64% (9)
Percentage and (number) of owners that are members of an industry association	70% (53)	83% (30)	64% (13)	71% (10)

Table 1 Demographic of the respondents listed for all three industries and for each of the industries

On average the owners in all three industries had owned the business for a substantial number of years. However this hides the observation that a large proportion (40%) had only owned the business for five years or less. The apple growers deviate from the rest by in general having owned their business for a longer period. Most of the owners were quite experienced in their industry. Most of the businesses were very small businesses. Particularly the apple growers were small. Only two apple growers employed permanent staff but all employed casual staff in the picking season but they did not use chemicals. Most owners had an industry specific training and education and were member of an industry organisation.

Attitude and knowledge about hazardous chemicals

The results about the owners' attitude, perception and knowledge about hazardous chemicals, the management of them and the legal requirements are presented in table 2.

	All industries	Hairdressers	Printers	Apple growers
Percentage and (number) of owners attitude and perception related to hazardous chemicals				
Owners mentioning Chemicals as the main OHS issue	40% (30)	33% (12)	52% (13)	38% (5)
owners concerned about dealing with hazardous chemicals	32% (24)	31% (11)	32% (8)	36% (5)
Owners that considered the health effect before taking the chemical they considered the most hazardous in use	33% (23)	17% (6)	48% (10)	54% (7)
owners aware of alternatives to the chemical they identified as the most hazardous	43% (36)	42% (14)	36% (8)	54% (7)
Owners that had considered substitution of the chemical they identified as the most hazardous	75%(39)	60% (15)	100% (21)	62% (8)
Owners that had used an alternative to the chemical they identified as the most hazardous	65% (26)	67% (12)	100% (8)	43% (6)
Percentage and (number) of owners' knowledge about management of chemicals and legislation				
Owners identifying them self as the responsible for staff safety. ^â	70% (52)	56% (20)	72% (18)	100%(14)
Owners that thought they knew the main health and safety legislation.	80% (60)	86% (31)	68% (17)	86% (12)
Owners that could mention the main health and safety legislation or the authority responsible. ^â	23% (17)	8% (3)	36% (9)	36% (5)
owners that knew what a material safety data sheet was ^â	33% (25)	0% (0)	72% (18)	50% (7)
Owners that knew more than one health effects of the chemical they considered the most hazardous ^â	31% (21)	43% (15)	30% (6)	0% (0)
Owners scoring on a scale from one to 10 of their knowledge about health and safety of the chemical they perceived as the most hazardous they used				

Average score	6.8	7	6.5	6.3
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Table 2 Attitude, perception and knowledge related to hazardous chemicals and health and safety legislation.

The results in table 2 shows that only 40% of the owners felt that chemicals were one of their main OHS issues and less than 1/3 was actually concerned about dealing with them. The concerns that the owners had were concentrated around the health effects resulting from exposure and an uncertainty about the health effects. The owners that did not have concerns mentioned that “chemicals today are less hazardous than the chemicals they used ten years ago”, that they received good information and training from the suppliers and furthermore the apple growers mentioned that they used personal protective equipment which should keep them safe.

Around half of the printers and apple growers actually considered the health affects before they took the chemical they considered the most hazardous in use. Few hairdressers did so. In comparison with the owners’ knowledge about the health effects of the same chemicals it is clear that more hairdressers knew about the health effects than the printers and apple growers. This is surprising at first glance. When we looked more deeply into the chemicals identified as the most hazardous we found that most hairdressers mentioned hydrogen peroxide and bleach powder. Both of these chemicals have acute health effects. This contrasts with the printers and apple growers who identified chemicals with long term health effects. This could be an explanation for this difference and seems to have little relation to whether they consider health effects before they use chemicals in practice.

More than half of all the owners had actually considered substitution of the chemical they perceived as the most hazardous. This was more than were aware of an alternative. A third had actually tried an

alternative. The owners gave several reasons for still using the most hazardous chemical amongst which better quality and results were the most common. Interestingly, only 12% mentioned cost as a factor. Many of the hairdressers mentioned that the product they used was supplied by their preferred supplier. This indicates that they chose a preferred supplier and then stuck to the products supplied by them.

It is clear that the owners assessed their knowledge about these hazardous chemicals higher than it actually was. There was no relation between the owners ranking of his/her knowledge and the actual knowledge about the chemicals health effects and the protective measures (see table 4) that they were supposed to use. Only a high percentage of the apple growers used the correct protective measures when using the chemicals.

Only a third of all the owners knew what a MSDS was but that figure does not give a real picture. A quite high proportion of the printers knew what a MSDS was. Half of the apple growers knew but none of the hairdressers did.

A high percentage (70%) of owners identified themselves as having the main responsibility for staff health and safety. Fewer hairdressers indentified themselves as responsible. Around a third of the hairdressers mentioned a shared responsibility for staff safety between staff and the owner.

Few owners (23%) could mention the main health and safety legislation or the authority responsible for the legislation. This is in line with another study of small business owners' awareness of health and safety legislation and targeted programmes in New Zealand (Legg et al., 2009) Again fewest amongst the hairdressers (8%) could do so. In contrast, a high percentage of the owners said they were aware of the health and safety legislation. Most of the owners (particularly amongst the

hairdressers and the apple growers) mentioned the organisation that inspected or audited their business. The hairdressers mentioned the city council that each year inspected the hairdressing salons to assess compliance with the Health (Hairdressers) Regulation Act. 1980. The apple growers mentioned Euro/Global GAP. Both are certification schemes that include a yearly audit. The printers mentioned that they had to comply with the legislation their industry organisation informed them about. This picture reflects the sources the owners used to keep themselves informed about legislation (see Table 3). A very small percentage used the authorities responsible for the legislation. The hairdressers used the city council and the industry organisation. Around half of the printers used the industry organisation. Half of the apple growers used the certifying body.

Sources of information/ knowledge	All industries	Hairdressers	Printers	Apple growers
The percentage of owner/managers that seek information about health and safety legislation from these sources (the exact number of respondents is shown in brackets).				
City/Regional council	26% (19)	49 % (17)	8 % (2)	0 % (0)
Industry Association	39% (29)	40 % (14)	48 % (12)	21 % (3)
National regulatory body	3 % (2)	0 % (0)	8 % (2)	0 % (0)
Certifying body	9% (7)	0% (0)	0% (0)	50% (7)
others	41% (30)	26 % (9)	36 % (9)	36 % (5)

Table 3 sources the owners used to gain information about health and safety legislation

Management of hazardous chemicals

Table 4 presents the results about the owners' management and practice in relation to hazardous chemicals.

Management of hazardous chemicals	All industries	Hairdresser	Printer	Apple growers
Percentage and (number) of owners that stated they had Material Safety Data Sheet (MSDS) for the hazardous chemicals used	70% (52)	74% (26)	60% (15)	79% (11)
Percentage and (number) of owners that stated they had an inventory of chemicals used	79 % (58)	83% (29)	63% (15)	100% (14)
Percentage and (number) of owners that stated that the person responsible for chemical management was trained	45% (22)	-	36% (9)	93% (13)
Percentage and (numbers) of owners where staff used the most hazardous chemical	64% (46)	86% (31)	59% (13)	14% (2)
Percentage and (numbers) of owners that inform staff specifically about this hazardous product	87% (40)	90% (28)	85% (11)	50% (1)
Percentage and (numbers) of owners that stated that staff that used this hazardous chemical were trained in safe use	84% (38)	100% (30)	46% (6)	100% (2)
Percentage and (number) of owners where wrong or too little protective measures were used when using this hazardous chemical. ^a	74% (48)	77% (27)	94% (16)	38% (5)
Percentage and (number) of owners that had experienced or witnessed an accident	41% (31)	64% (23)	17% (4)	21% (3)
Percentage and (numbers) of owners that changed the way they dealt with chemicals after experiencing or witnessing an accident/injury involving chemicals	80% (24)	73% (16)	100% (4)	100% (3)
Owners scoring of their compliance with health and safety regulations				
Average of owners scoring of their compliance with Health and Safety legislation (scale 1 – 10)	8.4	8.9	7.6	8.8

Table 4 Management of hazardous chemicals.

There is a legal requirement in New Zealand as in other countries, for businesses to provide their employees with easy access to information about hazardous chemicals through access to MSDS and to hold an inventory of the hazardous chemicals (Occupational Safety and Health Service, 1997). From table 4 we can see that around three quarters of the owners stated that they had MSDS for the hazardous chemicals used in their business. We did not check if this was actually correct for all industries but when visiting the hairdressing salons the hairdressers showed us a manufactures instruction when we explained what a MSDS was. No hairdressers were able to show us a MSDS and the suppliers such as L'Oreal Professional and Wella Professional do not provide salons with MSDS, but prefer to visit the salons to inform and train staff about the use of chemicals (Laird et al., 2009a). A high percentage of the owners also stated that they had an inventory of the hazardous chemicals used. We found that the hairdressers perceived their stock sheet to be an inventory. Their stock sheets did not contain any information about the hazards of the products they contained nor about the products and the amount they had in stock. All apple growers had an inventory which was inspected during the yearly audits. We did not have the chance to check the printers' inventory.

Only two apple growers had staff that used chemicals and they were all trained in the safe use of the chemicals. All owners, except one, who were responsible for managing the chemicals were trained as approved handlers of agrichemicals through the industry organised training. Only around a third of the persons in charge of chemicals were trained. The hairdressers were not asked this question.

For most of the hairdressers' staff used the most hazardous chemical. In the cases where they did not, it was because the staff were cleaners or other helpers that did not have a hairdressing education. All of the staff that used the chemicals were trained in the safe use mainly through supplier training. This training did not include the potential health effects but focused on quality and correct use. Staff

in the printers used the most hazardous chemical in just more than 50 % of the cases. Most of these staff were informed about the chemicals. This included reading the MSDS and use of personal protective equipment. Less than half were trained. The approved code of practice for handling chemicals (Occupational Safety and Health Service, 1997) requires a much more comprehensive information and training than was observed in this study.

Insufficient training and information of the employees at the hairdressers and printers about health hazards is of concern when we can conclude that a very high percentage of the owners told us that too little or wrong protective measures were used when using the most hazardous chemical. In all cases the hairdressers did not have sufficient ventilation or local exhaust ventilation. The same was an issue for the printers, where only two printers sought proper ventilation (by using the chemical out door) and one mentioned using a mask. The other printers mentioned that they had an open door or they turned the fan on. All except of two apple growers used masks. None of the apple growers used ventilation.

A high percentage (64%) of the hairdressers had experienced or witnessed an accident caused by chemicals used in hairdressing. The consequences were mainly short term and experienced by clients, but five out of six incidents that affected long-term health were experienced by hairdressers. Most of the hairdressers that had experienced an accident/injury acknowledged that it had influenced the way they dealt with chemicals. Not so many printers or apple growers had experienced an accident/injury involving chemicals. Those that had all changed the way they dealt with chemicals. On one side this shows that a high percentage of the owners react when they experience accidents/injuries. On the other hand, it could also suggest that the owners have reactive instead of proactive OHS management practices in relation to hazardous chemicals. This is

supported by their having insufficient training and information about hazardous chemicals and use of too little or wrong protective measures.

Information and advice about hazardous chemicals

The results about where the owners seek information about hazardous chemicals and how to use them safely are presented in table 5.

Sources of information/ knowledge	All industries	Hairdressers	Printers	Apple growers
The percentage of owner/managers that seek information/advice about chemicals and how to use safely form these sources				
Supplier or manufacturer *(incl. Spray reps.)	91 % (68)	92 % (33)	84 % (21)	100 % (14)*
Industry education/training	8 % (6)	14 % (5)	0 % (0)	7 % (1)
Industry association	3 % (2)	0 (0)	8 % (2)	0
Other	12 % (9)	6 % (2)	4 % (1)	43 % (6)
The percentage of owner/managers get their knowledge about the chemical perceived as the most hazardous form these sources				
Supplier/manufacturer	57 % (41)	67 % (24)	45 % (10)	50 % (7)
Industry education or training	25 % (18)	39 % (14)	9 % (2)	14 % (2)
Experience using Chemical	19 % (14)	22 % (8)	18 % (4)	14 % (2)
Industry peer	8 % (6)	0 % (0)	23 % (5)	7 % (1)
Labels/ instruction on product	22 % (16)	14 % (5)	14 % (3)	57 % (8)
MSDS	6 % (4)	0 % (0)	9 % (2)	14 % (2)
Other	19 % (14)	17 % (6)	18 % (4)	29 % (4)

Table 5 Information sources about hazardous chemicals

Form Table 5 we can see that most of the owners rely on the supplier when they seek information about the chemicals they use in their business. The hairdressers also rely on the training the

apprentices receive during their education. When we asked about where they gained their knowledge about the chemical they perceived as the most hazardous, around 50% across industries mentioned the suppliers. A high proportion of the apple growers gained their knowledge from the labels or instruction that came with the product, whereas the hairdressers used training. The printers used industry peers to gain their knowledge. Not surprisingly only few used MSDS. More surprisingly, 19% said that they gained their knowledge about the chemical through the use of it.

The source from where the owner gets advice in relation to the business in general and that the owner perceives has the most influence on the way work is carried out (percentage and (number) of owners mentioning this source.	All three industries	Hairdressers	Printers	Apple growers
Suppliers	36% (25)	50% (17)	17% (4)	33% (4)
Networking	13% (9)	12% (4)	22% (5)	8% (1)
Consultant	7% (5)	0% (0)	0% (0)	42% (5)
Industry association	9% (6)	9% (3)	13% (3)	0% (0)
Accountant	4% (3)	0% (0)	13% (3)	0% (0)

Table 6 the most influential general business “advisor”

When it comes to identifying the general business advisor that most influenced how work was carried out in the business, the owners identified different sources. Around a third of all owners mentioned the suppliers as the most influential. This is influenced by the fact that half of the hairdressers mentioned the supplier. Just below half of the apple growers mentioned their consultant as the most influential and 22% of the printers mentioned that networking had the greatest influence on the way work was carried out in the business. The industry association and accountants do not

seem to be regarded as having the greatest influence on the way work was carried out in the businesses.

Conclusion

The majority of the owners were not concerned about dealing with the chemicals used in the industry because less hazardous chemicals had been developed and adopted for use in the industries. A high percentage of the owner managers were still concerned about the health effects of the chemicals used. A considerable proportion of the owners considered substitution of the most hazardous chemicals but kept using them mainly because they felt they achieved better results/quality. It is therefore concluded that there was some interest in reducing the use of hazardous chemicals amongst the owners in this study.

In contrast to what other studies have found the majority of owners in the present study knew that they had the main responsibility for staff health and safety. However in line with these studies only few knew the main health and safety legislation. Fewer hairdressers seemed to be aware of the legislation and their legal responsibility. None of the hairdressers knew what a MSDS - the main source of information about hazardous chemicals, whereas the apple growers and the printers were more familiar with these sources. The owners' knowledge about the health effects of, and the control measures for, the most hazardous chemicals was generally poor. In contrast, their self-perceived average score for their own knowledge about health and safety was 6.8 out of 10. This indicates that they were not aware that their knowledge was poor. It is concluded that their knowledge about health and safety related to hazardous chemicals was poor but they were unaware of this. Thus interventions to improve their knowledge would be appropriate.

The apple growers stood out as having the best management of hazardous chemicals in practice. A higher percentage of the apple growers had MSDS and an inventory of hazardous chemicals. Nearly all the persons responsible for hazardous chemicals and staff using the chemicals were trained in their safe use. Furthermore, a higher percentage of the apple growers used correct protective measures when using the hazardous chemicals. The hairdressers did not have the information sources required by the legislation and many did not use sufficient protective measures. All hairdresser staff were trained in the use of chemicals by the suppliers, but the supplier training was insufficient as regards health and safety. A lower proportion of the printers' employees were trained in safe use of hazardous chemicals but a higher proportion was informed about them. The information supplied to the employees by the owner was the MSDS and information about personal protective equipment. It is hypothesised that there could be a relation between the poor practice amongst the hairdressers and the fact that more hairdressers had experienced or witnessed an accident or injury involving chemicals. Also, fewer of the hairdressers than printers and apple growers that experienced an accident changed the way they dealt with chemicals as a result of the experience.

Organisations that inspect or audit the business in areas related to OSH and management of chemicals seem to be identified as the organisation responsible for regulations and are the most used source for gaining information about legislation. Whether the audit or inspection actually will have an effect on management of hazardous chemicals and OHS seems to depend on whether there is a focus on OHS and the management of chemicals in the audit or inspection. Here there is a contrast between the apple growers and the hairdressers. The apple growers have a yearly audit that includes inspection of inventory of chemicals including MSDS and a physical inspection of storage of chemicals by the industry auditing body. In contrast, the hairdressers are inspected yearly by the city council. This inspection focuses on hygiene, particularly in relation to clients. It does not include

management of hazardous chemicals. One of the possible explanations for the apple growers' higher performance in management of hazardous chemicals could be the requirement for training in management of hazardous chemicals and the yearly audit including inspection of chemical storage and inventory of hazardous chemicals by the IFP. The fact that this scheme was developed through growers' participation and implemented to gain market advantage could be the reason for the high percentage with a high standard for management of hazardous chemicals. Another influencer could be the suppliers of agrichemicals who determine that growers who buy agrichemicals are approved handlers - which means that they are trained in the safe use of the chemicals.

In seeking intermediaries that could be used to implement intervention for better practice and management of hazardous chemicals, the first suggestion that is relevant for all three industries is the suppliers. The owners use the suppliers to obtain information and advice on safe use of chemicals. The hairdressers, in particular, are very dependent on their supplier and many of them tend to build a very close relationship with a particular supplier. Other industry-specific intermediaries for the hairdressers could be city council inspectors and the industry training organisation. The most obvious intermediary for the printers could be the industry association Print NZ. Further consideration of intervention processes developed from the present study are described in another paper by our research group in the proceedings of this conference (Laird, Olsen, Harris, Legg, & Perry, 2009b).

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References

- ABARE, & New Zealand Ministry of Agriculture and Forestry. (2006). *Agriculture in New Zealand; past, present, future*. Wellington, New Zealand: New Zealand Ministry of Agriculture and Forestry.
- Antonsson, A.-B. (2002). *Hållbar tillväxt i små företag - omöjlig utmaning eller möjlig utveckling?* (Research report No. IVF report B1466). Stockholm, Sweden: IVL Swedish Environmental Research Institute Ltd.
- Antonsson, A.-B. (2007). *Strategies for success? Managing chemical risks in small workplaces: a review of Swedish practice* (Draft research report No. B1717). Stockholm, Sweden: Swedish Environmental Research Institute.
- Biggs, D., and Crumie, N. (2000). *Characteristics of People Working with Chemical Products in Small Firms* (No. 278/2000): Health and Safety Executive.
- Champoux, D., & Brun, J. P. (2003). Occupational health and safety management in small size enterprises: an overview of the situation and avenues for intervention and research. *Safety Science*, 41(4), 301-318.
- Driscoll, T., Mannetje, A. T., Dryson, E., Feyer, A.-M., Gander, P., McCracken, D., et al. (2004). *The burden of occupational Disease and injury in New Zealand*. Wellington, New Zealand: National Occupational Health and Safety Advisory Committee.
- ERMA, MfE, & DoL. (2005). *Hazardous substance compliance and enforcement project: Risk landscape and compliance assessment* (Technical internal report). Wellington: Environmental Risk Management Authority, Ministry for the Environment and Department of Labour, New Zealand.

- Hasle, P. (2000). *Health and safety in small enterprises in Denmark and the role of the intermediaries*. Copenhagen, Denmark: Centre for alternative social Analysis.
- Hasle, P., and Wissing, P. (2000). *Workplace Health Promotion in Small Enterprises in Denmark: CASA*.
- Hasle, P., & Limborg, H. J. (2006). A review of the literature on preventive occupational health and safety activities in small enterprises. *Industrial Health*, 44(1), 6-12.
- Laird, I., Olsen, K., Harris, L.-a., Legg, S., & Perry, M. (2009a). *The development of preventive interventions to reduce hazardous chemicals in small business in New Zealand* (Research report): Centre for Ergonomics, Occupational Safety and Health, Massey University.
- Laird, I., Olsen, K., Harris, L.-A., Legg, S., & Perry, M. (2009b). *Utilising the characteristic of small enterprises to assist in managing hazardous substances in the workplace*. Paper presented at the Understanding small enterprises.
- Lamm, F. (1997). Small business and OH&S advisors. *Safety Science*, 25(1-3), 153-161.
- Lamm, F. (2002). Occupational health and safety in small businesses. In M. Lloyd (Ed.), *Occupational health and safety in New Zealand: Contemporary social research* (pp. 93-117). Palmerston North, New Zealand: Dunmore Press.
- Lamm, F., & Tipples, R. (2005). Dealing with employment relations. In C. Massey (Ed.), *Managing small business*. Auckland, New Zealand: Pearson.
- Larsson, T. J. (1998). *Decision making in relation to occupational health and safety among small business: A survey of 100 small business owners/managers in Victoria*. Melbourne
Victorial WorkCover Authority.
- Legg, S., Battisti, M., Harris, L.-A., Laird, I., Lamm, F., Massey, C. & Olsen, K. (2009). *Occupational health and safety in small businesses*. Wellington: National Occupational Health and Safety Committee.

- Legg, S., Olsen, K., Harris, L.-A., Lamm, F., Laird, I., Massey, C., Battsti, M. (2009). *Small business owners' awareness of Health and Safety legislation and targeted programmes*. Paper presented at the Understanding Small Enterprises.
- Lentz, T. J., Sieber, W.K., Jones, J.H., Piacitelli, G.M., Catlett, L.R. (2001). Surveillance of Safety and Health Programs and Needs in Small U.S. Businesses. *Applied Occupational Health & Environmental Hygiene*, 16(11), 1016-1021.
- O'Connell, L., Firth, H. M., & McBride, D.. (2001). Occupational health and safety in small business. *Occupational health and safety - Australia and New Zealand*, 17(5), 5.
- Occupational Safety and Health Service, D. (1997). *Approved code of practice for the management of substances hazardous to health in the place of work*. Wellington, New Zealand: Department of Labour.
- Pearce, N., Dryson, E., Feyer, A.-M., Gander, P., McCracken, S., & Wagstaffe, M. (2005). *Surveillance of occupational disease and injury in New Zealand. Report to minister of labour*. Wellington, New Zealand: National Occupational Health and Safety Advisory Committee.
- Perry, M. J., & Layde, P. M. (2003). Farm pesticides: Outcomes of a randomized controlled intervention to reduce risks. *American Journal of Preventive Medicine*, 24(4), 310-315.
- Pratt, B. (2006). Barriers and enablers to control of hazardous chemicals in small and medium enterprises (SMEs). Retrieved 29 May 2007, from http://www.ascc.gov.au/NR/rdonlyres/DFD837D6-0D02-4018-960F-5A9ED5D65F45/0/ReportBarriersEnablers_July06.pdf
- Sørensen, O. H., Hasle, P., & Bach, E. (2007). Working in small enterprises - Is there a special risk? *Safety Science*, 45(10), 1044-1059.
- Vickers, I., Baldock, R., Smallbone, D., James, P., and Ekanem, I. (2003). *Cultural influences on health and safety attitudes and behaviour in small businesses*: Health and Safety Executive.
- Walters, D. (2006). The efficacy of strategies for chemical risk management in small enterprises in Europe: evidence for success? *Policy and Practice in Health and Safety*, 81-116.

Wiltshire, J. W. (2003). *Integrated fruit production in the New Zealand pipfruit industry* (Technical report): Primary Industry Council.