The public health impact of infection control, sterilization and regulation in tattooing.

by

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Abstract

Background: The purpose of this study was to look at infection control and sterilization procedures in relation to invasive services performed at Personal Service Establishments (PSEs) in British Columbia. The objective was to collect data on the opinions of regulation and infection control practices of persons currently working in the industries of: tattooing, micro-blading and permanent make-up.

Method: Data was collected from a survey that was created and distributed online through *Survey Monkey*. A list of 261 personal service establishments throughout Vancouver Costal Health and Fraser Health were called and/or e-mailed and asked to participate in the online survey.

Results and Analyses: Among the 261 PSEs contacted, 30 agreed to participate. They were asked about the regulation of their profession and their standard practices for infection control and sterilization. 3% of the respondent's primary service was permanent make-up, 7% micro-blading, 7% piercing and 80% was tattooing. The majority of opinions on regulation were divided where 50% felt the industry was under regulated and 40% felt it was adequately regulated. 90% of the respondents agreed that formal training should be required before being allowed to tattoo and 43% of the respondents also agreed that the use of an autoclave should require certification. For infection control/sterilization procedures 100% of shops use one-time use (disposable) needles and ink caps, 80% use disposable tubes, 93% use cord and machine covers and 90% use disposable razors. 63% of the respondents do not use autoclaves because they use disposable items and therefore do not need to clean and sterilize re-usable equipment. The data compared in chi-squared analysis, age and formal training had a p-value of 0.01460 which indicates that there is an association between age and the belief that formal training should be required for those who practice tattooing. Those under 40 were more likely to indicate that formal training should be required.

Conclusion: With a low response rate for micro-blading and permanent make-up it is not feasible to compare or contrast opinions and/or practices between the three services. The tattooing industry had the highest response rate and can be looked at in more detail. The information collected on tattooing could be used to develop a course to improve the safety of PSE's. EHO knowledge in inspecting food service establishments is very high as a system has been put into place that ensures effective inspections. As well, the FOODSAFE program teaches safe practices to those who work in the kitchen. The growing popularity of PSEs now gives EHOs the opportunity to focus on creating safe work environments through the implementation of a training course and possibly altering the way inspections of each different PSE are conducted. Results of this study, along with other Canadian published data, should be considered when developing standardized training and education in the industry where invasive procedures are used.

Keywords: Tattoo, tattooing, tattoos, sterilization, infection control, regulations.

Introduction

Although tattooing has historically been linked to viral and bacterial diseases the industry has gone through many changes over the decades. Single-use disposable items are becoming the industry standard which decreases the risk of transmitting any blood borne pathogen from client to client. A reason that the current population views the risk of getting tattooed differently is because the process of acquiring a tattoo before the arrival of single use items put a recipient more at risk of incurring an associated infection. Cleaning and sterilizing (re-processing) re-usable items such as needles, tubes, ink caps and razors increased the probability that infected blood could be transferred between clients. Even though there are new methods and tools that may lower the risks of infection there are no rules or regulations that enforce the use of these new systems. K. Shaw reported "The requirement of certain business operators to have a minimum level of education to reduce the spread of communicable disease is a measure that has been adopted by other Alberta regulations, particularly for food and swimming pool operations. "These risks [of contracting infection] can be diminished if proper sterilizing procedures and equipment are in place."[7] Specific regulations made for invasive beauty procedures may help shift public opinion on the risks associated with tattooing.

One shift that has taken place is the demographic of those who are getting tattooed. Previously tattooing was more popular with sub-populations of people who were more at risk of having blood borne diseases such as Hepatitis C and HIV. The popularity and general acceptance of having a tattoo was not as great as it is today and being tattooed is becoming increasingly popular. Even though the popularity of tattoos in Canada is increasing, there is still little published research on prevalence and/or incident rates of diseases contracted from getting a tattoo at a commercial shop. The studies that are available show a shift from viral or blood borne diseases to bacterial infections caused by inks or non-sterile water sources such as tap water.

K. Shaw[14] states "There is currently no published data on the total costs associated with infection and injury from personal service establishments (PSEs)" There is also no published data on how Canadian provinces Best Practices or Guidelines have impacted infection control and sterilization procedures in commercial tattooing. With limited data on infections acquired from the tattooing process within PSEs, there is sparse evidence to establish what the risk of getting tattooed actually is.

What is the risk of getting tattooed nowadays in a commercial tattoo shop? With the introduction of disposable equipment, the trend to move away from autoclaves, the change in the demographic of those getting tattooed and a general awareness of the customers to cross contamination it may have declined significantly.

The purpose of this study was to extract information on (a) reprocessing (cleaning and sterilization) of tattoo equipment and (b) opinions on regulations for tattooing.

Evidence Review

Published Documents on Reprocessing Tattoo Equipment

In Canada there are documents published federally and provincially with instructions on how to clean, disinfect and properly sterilize tattooing equipment and work areas. Some examples are; Infection Control Guidelines from Health Canada[2], Guidelines for PSEs from British Columbia[3] and Manitoba[8], Standards and Guidelines for Tattooing from Alberta[9], Best Management Practices from Saskatchewan[13] and Infection Prevention and Control Best Practices for PSE's from Ontario[4] and Cleaning, Disinfection and Sterilization at PSE's[1] from NCCEH (National Collaborating Centre for Environmental Health).

K. Rideout[12] from NCCEH published *Comparison of Guidelines and Regulatory Frameworks for Personal Services Establishments* where she states that "There are a lot of gaps and conflicting information regarding public health issues associated with PSEs. Guidelines and regulations are often vague or impractical." These publications are intended to be a replacement for training technicians to reprocess "sterile" medical devices. The number of pages that include instruction on cleaning and sterilizing in the federal and provincial publications vary in number; BC's include four, Alberta's provide two, Saskatchewan has six, Manitoba includes one, Ontario has nine and Health Canada includes seven. If these are looked at in comparison to the training involved in medical device reprocessing the extent of information for PSE's reprocessing appears small. In BC, Alberta and Ontario medical device reprocessing training programs last from 16 weeks to 1 year at an accredited school where certification is received at completion of the program. All reprocessors must have certification to clean instruments in hospitals, doctor's offices, dentists and other offices where invasive tools are used.

McGuire[7] in *Effectiveness of Autoclaves in Tattoo and Body Piercing Establishments in British Columbia* quoted a study by Hogg and Morrison (2005) that looked at the practice of re-sterilization of dental tools. The study concluded that re-sterilization of instruments, thought cost-effective, showed evidence that the sterilization process may not be entirely effective. Further adding that, "The sterilization process is complex and that if strict adherence to an effective protocol is not followed, contamination of instruments may result." To further bolster these findings a study reported in Health Canada's Infection Control Guidelines for PSE's[2] highlights the ease in which BBP's are spread. "For devices that hold sharps, in at least three separate situations, patients developed hepatitis B from pathogens on a lancet holder. This spring-loaded device holds a lancet, used to pierce a finger so the blood sugar level can be tested. Even though a new sterile lancet was used for each person, it is believed the lancet holder was splattered with blood containing HBV, and the virus was then spread to other patients who later developed the disease. This example emphasizes the importance of cleaning and disinfecting or sterilizing any items that hold sterile sharp objects that pierce the skin." This story highlights the fact that "Blood does not have to be visible on a device to transmit infection. Similarly, it is possible that blood from an infected client that has contaminated a tattoo machine…exposes other clients to a risk of infection unless it has been appropriately cleaned and disinfected."[2]

All of the policies, procedures, guidelines and best practice manuals are meant to be a source of information on proper practices for use and maintenance of equipment for skin puncturing procedures. The 1999 Health Canada publication summarizes the intent behind the Canadian documents by saying that "The guidelines are based on an assessment of potential or documented evidence of infection risk posed by skin piercing procedures and the principles of infection control to manage the risk. The frame work of the Harm Reduction Model is used which, if followed, will reduce infection control risks."[2]

The knowledge gap seen here is that there is no required certification for training. As well, there are no methods of assessing if proper reprocessing techniques are being implemented and followed within PSEs that are reprocessing tools and using autoclaves.

Research Papers on Infection Control in Tattooing

There have been research papers published in other countries on the knowledge of infection control in the tattooing industry yet there seems to be a noticeable gap of research publications in Canada. "Tattooing [is one of many] popular personal service procedures currently offered to the public… Unfortunately, implementation of proper infection and injury control practices in personal service establishments does not always

occur."[14] In Canada there is no system to monitor if the knowledge translation into guidelines, regulations and best practice manuals is effective in reducing risks and increasing safe operational infection control procedures. "In Alberta, …regulation…does not currently require a minimum level of education or competence for personal service practitioners."[14] Across Canada there is no minimum level or standard way to measure the proficiency in sterilization at any of the PSE services. Monitoring of knowledge and adherence to the complex process of reprocessing is a crucial part in the assessment of the burden to public health. As reported by K. Shaw "Infection and injury from personal service procedures is likely placing an unnecessary burden on the health care system."[14] Without research and data there is no tangible evidence to confirm or deny the efficacy of the published guidelines. There is also no research to see if publications are increasing compliance or if they are a useful tool in the tattooing industry. This opinion is represented in the United States in research done by M. Raymond, L. Halcon, P. Pirie in *Regulation of Tattooing in Minneapolis and St. Paul, Minnesota: Tattooists' Attitudes and Relationship Between Regulation and Practice* "There is no literature on the impact of tattooing regulation on the infection control practices of tattooists…An understanding of the current status of infection control in tattooing is needed to evaluate the effectiveness of existing legislation, plan future legislation, and educate the public."[10] Also, M. Raymond, L Poroe, L. Halcón in *Infection Control amoung Professional Tattooists in Minneapolis and St. Paul, MN* say "Little is known, however, about tattooists' understanding or utilization of blood borne pathogen precautions."[11] Furthermore, as of 2001 "Only one study of tattooists' infection control practices had been published in the English-language literature. Goudey and Thompson surveyed registered tattoo artists in Victoria, Australia, inspected tattoo studios, and observed tattooing practices."[11] E. Lehman, J. Huy, E. Levy, S. Viet, A. Mobley, T. McCleery in 2010 maintain that "…tattooing is a difficult occupation to study, because no reliable national statistics about body art exist…"[5] M. Raymond et. al [11] found in their results that the percentage of [tattooist who used the] recommended procedures was negatively associated with years of tattooing experience and concluded that interventions should focus on … cleaning prior to sterilization and that tattooists with >10 years of experience are most in need of intervention. They also found that that "There was a limited understanding of the difference between cleaning and disinfection and interventions should also focus on… teaching the differences between cleaning, disinfection, and sterilization."[11] McGuire[7] also quoted Hogg and Morrison (2006) saying "Other than single use devices (SUDS), effective sterilization and disinfection of equipment and needles is the main preventative action against transmission of pathogens from one client to another

Methods

For this study two lists of tattoo shops that perform 'invasive' procedures in Vancouver Coastal Health and Fraser Health were collected. After the lists had been compiled and the contact information was added a survey was created using Survey Monkey. Preliminary questions were included to gather demographic information on the individuals. (These questions served to measure associations between collected information.) Quantitative questions were broken down into four sections: 1. Services provided (5 questions), 2. Training and Public health interactions (12 questions), 3. Assessing knowledge (14 questions) and 4. Equipment (5 questions).

Each shop on the list was called and asked if they would be interested in participating in the survey. If they consented the respondent was asked if they would like to have the survey filled out for them or if they would prefer to put in their own answers. Each of the prompts of the survey were followed and recorded by Survey Monkey. At the end of the Survey time frame (February 30, 2017), the on-line survey was closed and no more responses were accepted. The data collected was downloaded onto excel spreadsheets and analysed using NCSSII.

Statistical analyses were conducted for associations on age, opinions on regulation of the industry, opinions on formal training and use of autoclaves versus single use items.

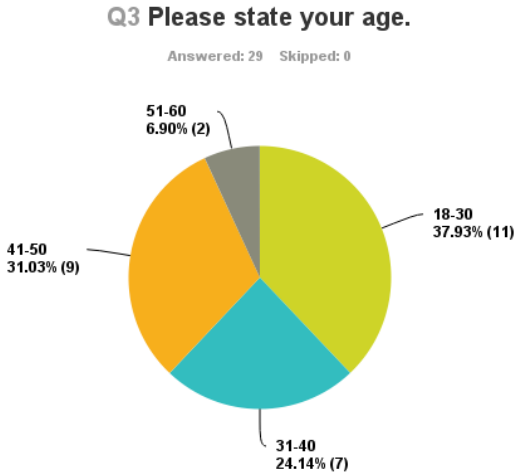
Results

Descriptive Statistics

30 of the 261 contacted participated in this study. 106 of the tattoo parlours in Vancouver coastal health region were approached and 14 completed the survey which was 13% response rate. 155 of the tattoo or invasive parlours in Fraser health were contacted and 7 completed the survey which was a 5% response rate. The overall the response rate was 11%. The 14 respondents from Vancouver Coastal Health (VCH) represented 47% and the 7 respondents were from Fraser Health (FH) represented 23%. The 9 that preferred not to specify their health authority represented 30%. The preference not to specify may have been because the health authorities were not spelled out by name but indicated as the acronym and there was confusion over VCH (Vancouver Coastal Health) versus the name Coastal Health which seemed to be the name used by most practitioners.

There were 16 female respondents which represented 53% and 14 males that represented 47%. 19 respondents under 40 years of age represented 63% and 11 respondents 40 and over represented 37%. (**Figure 1**) Years in the industry were a minimum of under 1 year, maximum of >15.

Figure 1: Age of participants

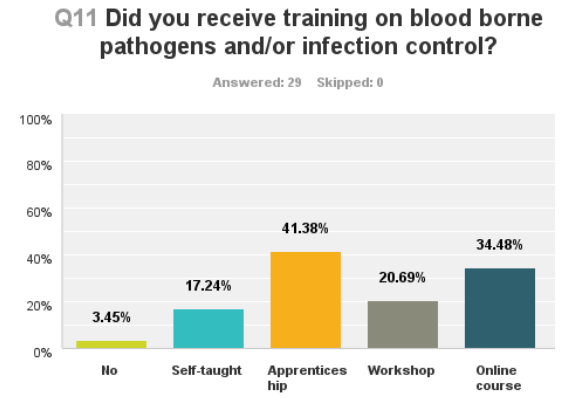


80% of the respondents indicated that tattooing was the primary service they performed, 7% selected micro-blading, 3% selected permanent makeup, 7% selected piercing and 3% selected sterilization as the primary service. Training for their profession included the following: (**Figure 2**) 17% were self-taught, 73% had completed apprenticeships, 7% trained at Biotouch Canada, 3% at the American Institute of intradermal cosmetics, 3% received an App Certification and 3% trained under Dave Shore. Training on blood borne pathogens and infection control included: (**Figure 3**)

41% completed apprentices, 34% took online courses, 21% attended workshops and 17% were self-taught. Only 3% respondent indicated that they had received no training on blood-borne pathogens and/or infection control standards. 6 people indicated that they were a part of a professional organization (20%) but of the 6 none indicated they were a part of a tattoo specific professional organization.

Figure 2: Training on profession

Figure 3: Training on infection control and blood borne pathogens



Key Results

When the 30 respondents were asked about the regulation of their profession 50% felt the industry was under regulated, 40% felt it was adequately regulated, 3% thought it was over regulated, 3% believe the regulation is excellent and 3% was unsure (**Figure 4**). When asked if they believe there should be formal training required to be allowed to perform tattooing 90% agreed. 43% respondents also agreed that the use of an autoclave should require certification where 17% disagreed. (**Figure 5**) For infection control/sterilization procedures 100% of shops use one-time use (disposable) needles and ink caps, 80% use disposable tubes, 93% use cord and machine covers and 90% use disposable razors. 63% of the respondents do not use autoclaves because they use disposable items and therefore do not need to clean and sterilize re-usable equipment.

Figure 4: Opinion of tattoo professionals about the regulation of their industry

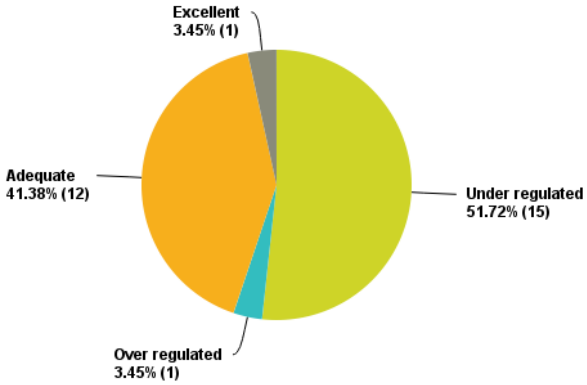


Figure 5: Belief of tattoo professionals that everyone in the industry should require formal training in infection control

Strongly Agree	Agree	Neither
55.17% 16	**34.48%** 10	**3.45%** 1

Disagree	Strongly Disagree	N/A
6.90% 2	**0.00%** 0	**0.00%** 0

Inferential Statistics

The data collected in the survey was nominal and Chi-square test was used for statistical analyses. The data compared in the table was: age and formal training. The p-value of 0.01460 indicates that there is an association between age and the belief that formal training should be required for those who practice tattooing. Therefore, we reject H_0 and conclude that there is an association between the age of the tattoo artist and the belief that formal training should be required for those who practice tattooing. The low p-value supports the idea that persons under 40 are more likely to think that there should be

requirements for formal training. Because the p-value falls between 0.01 and 0.05 it could be subject to alpha errors although the percentage of the alpha error is quite low so Ho should still be rejected. However, because of the low response rate, beta error may contribute to the weakness of the study so it would be highly recommended to have a larger sample size.

Table 1: Summary of belief in formal training by age group

Age	**Believes Formal Training course should be required.**			**Total**
	Strongly Agree	Agree	Disagree	
40 and over	7	1	3	11
Under 40	9	9	0	18
Total	**16**	**10**	**3**	**29**

Discussion

Where Raymond et. al [10] found in their results that "The percentage of [tattooist who used the] recommended procedures was negatively associated with years of tattooing experience", this study's findings could be construed as similar in that age was negatively associated with a desire for the profession to be more regulated. 100% of people under 40 stated that they would like to see more regulation in the tattooing industry. Shaw identified that "In Alberta, …regulation…does not currently require a minimum level of education or competence for personal service practitioners."[14] This is true in BC that there is no minimum level or standard method to measure the proficiency in any of the PSEs.

"The lack of mandatory regulations leaves room for error by workers in PSEs. In comparison, The Food Premise Regulations has a lengthy list of enforceable regulations that allows EHOs to have a standardized framework to base an inspection on (Public Health Act, 2008)". [6]

Also, BC does not have a system to monitor whether guidelines and regulations are effective in reducing risks and increasing safe operational infection control procedures. As K. Rideout[12] from NCCEH stated in *Comparison of Guidelines and Regulatory Frameworks for Personal Services Establishments* "There are a lot of gaps and conflicting information regarding public health issues associated with PSEs. Guidelines and regulations are often vague or impractical." "The only regulations regarding PSEs fall under the Regulated Activities Regulations" [6] "When compared with the Food Premise Regulations, used in restaurant inspections, the legislation for personal service establishments are minimal (Public Health Act, 2008)". [6]

Even though there are no minimum requirements it was found that most of the respondents of this survey were knowledgeable about the minimum standards of tattooing in a sanitary manner. Only one respondent indicated that they had not received training on blood-borne pathogens and infection control and two did not receive training on sterilization. As well, only two people indicated that their training did not prepare them for the health risks associated with their profession.

While these finding are interesting, this data may not accurately represent the entire population of PSE employees as individuals who are more knowledgeable in procedures may be over-represented in these survey results. Looking at the different styles of tattooing such as commercial tattooing, micro blading and permanent make-up, the commercial tattooing industry was much more willing to enter into a conversation about what was going on in the

industry. Most establishments offering micro blading and permanent make-up declined to participate in the survey; their response being that they were very busy and did not have time. A more representative study would help illuminate where the risks lie and indicate if safe practices were being followed on a regular basis.

Another study from the United States has indicated the need for more research when it comes to tattooing. Raymond et.al indicated "An understanding of the current status of infection control in tattooing is needed to evaluate the effectiveness of existing legislation, plan future legislation, and educate the public."[10] Also, "Little is known, however, about tattooists' understanding or utilization of blood borne pathogen precautions."[10] This lack of information points to the need for more research to be conducted in the tattooing industry as it evolves and increases in prevalence in our culture.

Limitations

The limitations of the study include: time frame, small funding, and lack of participation in the surveys. Of 261 people contacted only 30 participated in the survey which is a response rate of 11%. The survey was not very specific and only collected very general information. A more in-depth survey would have provided more detailed information of the procedures happening in the industry. A longer survey, however may have produced a lower response rate as most of the people in the industry indicated they are very busy. People practicing micro blading and permanent make-up were more likely to decline to talk about infection control and sterilization. Also, with the low response rate, it could be that the responses are biased toward wanting more regulation.

Knowledge Translation

The data collected from the survey suggests that there is an interest in the industry for more regulations to be made for PSEs. Other research would be advantageous to investigate whether regulations or a standardized training would be practical. It might be that a program similar to FOODSAFE could be developed, and would be required for tattooists to complete in order to work safely in the industry.

More single use (disposable) items are in use because this is a more effective to protect against the transmission of blood borne pathogens. If PSEs were to use all disposable items it would reduce or even remove the risk of transmitting blood borne pathogens.

Also, interest was shown in implementing PSE standard requirements for invasive tattooing procedures. This would protect the public by not allowing people who are unfamiliar with infection control and blood borne pathogen transmission to practice in the industry. This could be stipulated in the regulation process.

Future Research

This current study could be repeated in other provinces and territories to assess if opinions and techniques are consistent throughout Canada. Also, an in-depth survey could be designed to assess infection control knowledge. More detailed information could be collected on how artists are being trained during apprenticeships. Another avenue of research could investigate whether infections are associated with tattoo parlours that do not employ the use of autoclaves but only use single use disposable items. Tattoo ink has not been studied in great detail hence studies testing for bacteria in tattoo ink and testing of carcinogenic tattoo inks. Lastly, studies could investigate the

differences in regulation of autoclaves across Canada.

Conclusions

It's hard to draw parallels between the micro blading/permanent make-up industry and the commercial tattooing industry because there may be different practices, training and beliefs for each specific industry. All of the different PSEs that are tattooing fall under the same umbrella in the health authority but the keenness to discuss the issues seem to be much greater in commercial tattooing. It is not a general rule but results of this study suggested this is so.

The knowledge level of the respondents of the survey was quite high but had split opinions about the regulation of their profession. Although, when asked if they believe there should be formal training required to be allowed to do tattooing, the majority agreed. Another study could be done on the cost versus benefit to see if it would be worthwhile to implement new regulations and standard requirements for tattooing.

Most of the shops that participated in the survey use disposable products and protective covers for equipment which lowers the risk of transferring blood borne infections. 63% of the shops are not using an autoclave which shows an inclination to use fully disposable products while tattooing. This increasing trend could have the potential to move tattooing away from being associated with blood borne diseases especially if it comes with a change in future regulations. Enforcement of the new methods and disposable tools may not only diminish the physical risks but also assist in changing the public's opinion on the perceived risks of infection when getting a tattoo. Further research is needed in the evolving industries on infection control/sterilization practices in PSE's and more information is needed on what regulation or training would be beneficial to implement for shops that offer invasive procedures.

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Competing Interest

The author declares that they have no competing interests.

References

1. Fong D, Barn P. Cleaning, Disinfection and Sterilization at Personal Service Establishments. 2011;(February).
2. Health Canada. Infection Prevention and Control Practices for Personal Services : Tattooing , Ear / Body Piercing , and Electrolysis. 1999;25(July).
3. Health Protection Branch. Guidelines for Personal Service Establishments, British Columbia. 2013;(November).
4. Infection Prevention Unit. Infection Prevention and Control Best Practices for Personal Services Settings, Ontario. 2009;(January). Available from: http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/pssp_2008.pdf
5. Lehman EJ, Huy J, Levy E, Viet SM, Mobley A, McCleery TZ. Bloodborne pathogen risk reduction activities in the body piercing and tattooing industry. Am J Infect Control. 2010;38(2):130–8.
6. Lojpur & Heacock. Survey of the general public to determin perceptions and choosing personal service establishments. 2014. Survey of the general public to

determine perceptions and precautions taken when choosing personal service establishments

7. McGuire E. Effectiveness of Autoclaves in Tattoo and Body Piercing Establishments in British Columbia. Br Columbia Inst Technol. 2006;

8. Public Health Act. Personal Service Facility, Manitoba. 2013;(November).

9. Public Health Act. Personal Services Regulation, Alberta. 2014;

10. Raymond, M J; Halcon, Linda; Pirie P. Regulation of Tattooing in Minneapolis and St . Paul , Minnesota : Tattooists ' Attitudes and Relationship Between Regulation and Practice. Public Heal reports (Washington, DC 2003). 2003;118(April):154–61.

11. Raymond MJ, Pirie PL, Halcón LL. Infection control among professional tattooists in Minneapolis and St. Paul, MN. Public Health Rep [Internet]. 2001;116(3):243–56. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1497318&tool=pmcentrez&rendertype=abstract

12. Rideout K (NCCEH). Comparison of Guidelines and Regulatory Frameworks for Personal Services Establishments. 2010;

13. Saskatchewan G of. Saskatchewan Personal Service Facility Best Management Practices.

2014;2014.

14. Shaw K. Exploring beliefs and attitudes of personal service practitioners towards infection control education, based on the Health Belief Model. Environ Heal Rev [Internet]. 2016;59(1):7–16. Available from: http://pubs.ciphi.ca/doi/10.5864/d2016-003