



National Institute for Occupational
Safety and Health
Robert A. Taft Laboratories
4676 Columbia Parkway
Cincinnati OH 45226-1998

May 16, 2011
HETA 2011-0014

Dear Salon Owner:

This letter is in response to your request for a health hazard evaluation (HHE). The request concerned exposure to formaldehyde when performing hair smoothing treatments using the Brazilian Blowout hair product. The purpose of this letter is to summarize results from our evaluation on December 13, 2010.

We conducted this evaluation on a day when your hair salon was closed to accommodate concerns about conducting an evaluation when clients were present in the salon. One of your hair stylists was planning on receiving the hair smoothing treatment and we used this opportunity to conduct our initial evaluation. Air sampling was conducted in the morning to evaluate the background levels of formaldehyde in the salon when no Brazilian Blowout treatments were being performed. Subsequently, in the afternoon one of your hairstylists performed the Brazilian Blowout treatment on another employee using standard salon procedures. The Brazilian Blowout treatment had six different tasks:

- Hair was washed using the Brazilian Blowout Acai Professional Anti-Residue Shampoo in the hair wash/dry room.
- The hair stylist applied the Brazilian Blowout Acai Professional Smoothing Solution – Formaldehyde Free Smoothing Formula to all parts of the wet hair using a brush in a systematic fashion in the hair treatment room. The hair stylist wore disposable latex gloves only during this stage of the treatment.
- Hair was then brushed and blow dried using an Artizen® 3300 5kV Ionic hair dryer that was set at the highest heat setting.
- A flat iron set at 450°F was used 4–5 times on each section of the hair.
- Brazilian Blowout Acai Deep Conditioning Masque was then applied to the dried hair and rinsed off with water in the hair wash/dry room.
- Hair was again blow dried using the same hair dryer in the hair treatment room.

Assessment

During the visit we met with you, the hair stylist conducting the Brazilian Blowout treatment, and another hair stylist receiving the treatment to discuss the HHE request. We

observed work processes, practices, and workplace conditions, and spoke with employees. We reviewed the material safety data sheet (MSDS) for the Brazilian Blowout Professional Smoothing Solution (revision date 10/26/2010) that you indicated was for the Brazilian Blowout Acai Professional Smoothing Solution – Formaldehyde Free Smoothing Formula and the treatment summary sheet that you provided, and we administered questionnaires to employees to document their health symptoms. MSDSs were not available for the Brazilian Blowout Acai Professional Anti-Residue Shampoo or the Brazilian Blowout Acai Deep Conditioning Masque.

To evaluate the background levels of formaldehyde in the hair salon, we collected general area (GA) air samples for formaldehyde at four locations throughout the hair salon from 0840–1240 hours. No treatments were being conducted during this time. The dispensary room contained various hair products including hair colors, shampoos, and other treatment products that are stored in closed containers. The Brazilian Blowout Acai Professional Smoothing Solution – Formaldehyde Free Smoothing Formula needed for immediate use is dispensed into a small container in this room.

During the treatment, we collected personal breathing zone (PBZ) and GA air samples for formaldehyde using the media specified in NIOSH Method 2016 [NIOSH 2011] and analyzed these air samples using Environmental Protection Agency (EPA) Method TO-11 [EPA 2011]. We collected PBZ air samples on the hairstylist who performed the Brazilian Blowout treatment during each of the six tasks of the treatment as well as short-term samples during specific time periods within each of the six tasks. We also collected a PBZ air sample for formaldehyde on the other hair stylist working in the salon.

We also collected bulk samples of the Brazilian Blowout Acai Professional Smoothing Solution – Formaldehyde Free Smoothing Formula, the Brazilian Blowout Acai Professional Anti-Residue Shampoo, and the Brazilian Blowout Acai Deep Conditioning Masque from the containers present in the salon. These bulk samples were analyzed by high performance liquid chromatography using an ultraviolet detector. At the end of our visit, we met with you and the two hair stylists to summarize our activities and discuss the next steps.

Occupational Exposure Limits

In the United States, occupational exposure limits (OELs) have been established by federal agencies, professional organizations, state and local governments, and other entities. Some OELs are legally enforceable limits, while others are recommendations. The U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) are legal limits enforceable in workplaces covered under the Occupational Safety and Health Act of 1970. NIOSH recommended exposure limits (RELs) are recommendations based on a critical review of the scientific and technical information available on a given hazard and the adequacy of methods to identify and control the hazard.

The following OELs exist for formaldehyde in the workplace. Under the OSHA general industry standard [29 CFR¹ 1910.1048] for airborne exposure to formaldehyde, the PEL is 0.75 parts per million (ppm) for an 8-hour time weighted average (TWA), the action level (AL) is 0.5 ppm for an 8-hour TWA, and the short-term exposure limit (STEL) is 2 ppm for a 15-minute TWA. The standard requires medical surveillance for employees exposed to formaldehyde at or above the AL or STEL.

The NIOSH REL for formaldehyde is 0.016 ppm for up to a 10-hour TWA. NIOSH also has a 15-minute ceiling limit of 0.1 ppm that is not to be exceeded during a work shift [NIOSH 2005]. NIOSH recognized formaldehyde as a potential occupational carcinogen in 1981 and, following the NIOSH carcinogen policy in existence at the time, set the REL to the “lowest feasible concentration,” which for formaldehyde was defined as the analytical limit of quantification of 0.016 ppm for up to 10-hours [NIOSH 1981]. Since then, experience has shown that this REL is actually not the “lowest feasible concentration” because formaldehyde in the ambient air can exceed 0.016 ppm, a fact later acknowledged by NIOSH [Lemen 1987]. Additionally, the subsequent revision of the NIOSH carcinogen policy [NIOSH 1995], combined with better exposure characterization and advances in risk assessment and management strategies, support the need for NIOSH to reassess the formaldehyde REL. This effort is in progress.

The American Conference of Governmental Industrial Hygienists (ACGIH®) lists formaldehyde as a sensitizer and has a ceiling limit of 0.3 ppm [ACGIH 2011]. An ACGIH ceiling limit is an exposure that should not be exceeded at any time during the work shift.

The most commonly reported and best documented health complaints due to exposure to low concentrations of formaldehyde include irritation of the eyes, nose, and throat; nasal congestion; headaches; skin rash; and asthma. It is often difficult to attribute specific health effects to particular concentrations of formaldehyde because some people may have symptoms at levels where others may experience no symptoms. For example, irritant effects may occur in some people exposed to formaldehyde at concentrations below 0.10 ppm, but more typically irritation may not occur until exposures are at levels of 1.0 ppm or greater. However, individuals with pre-existing allergies or respiratory disease, and people who have become sensitized from prior exposure may experience symptoms due to exposure to concentrations of formaldehyde between 0.05 and 0.10 ppm [NRC 1981]. Formaldehyde is also a skin sensitizer [Markowitz 2005]. In addition, the International Agency for Research on Cancer classifies formaldehyde as a human carcinogen (group 1) based upon associations between formaldehyde exposure and nasopharyngeal cancer and leukemia [Baan et al. 2009]. NIOSH considers formaldehyde as a potential occupational carcinogen; ACGIH lists formaldehyde as a suspected human carcinogen; and the U.S. Department of Health and Human Services lists formaldehyde as reasonably anticipated to be a human carcinogen in its 11th report on carcinogens [NIOSH 1981; ACGIH 2011; DHHS 2011].

¹ Code of Federal Regulations. See CFR in references.

Results

Results of the task-based and short-term PBZ air samples collected on the hair stylist performing the Brazilian Blowout treatments are presented in Table 1. The formaldehyde concentrations for the task-based air samples ranged from 0.018–1.1 ppm. The short-term sample concentrations ranged from 0.018–1.3 ppm. For both the task-based and the short-term air sampling, the product application had the highest concentration followed by the post application blow drying and flat ironing tasks of the treatment. Six of seven short-term air samples exceeded the NIOSH ceiling limit of 0.1 ppm and four samples exceeded the ACGIH ceiling limit of 0.3 ppm. None of the PBZ samples exceeded the OSHA STEL of 2 ppm.

Table 1. Formaldehyde PBZ air sampling results of a hair stylist performing the Brazilian Blowout smoothing treatment

Task	Task-based		Short-term	
	Sampling Time (minutes)	Concentration (ppm)	Sampling Time (minutes)	Concentration (ppm)
Hair Washing	10	0.018	9	0.018
Product Application	33	1.1	16	0.36
			18	1.3
Blow Drying Post Application	20	0.78	19	0.90
Flat Ironing	20	0.46	16	0.36
Masque Application and Hair Wash	11	0.25*	15	0.24
Blow Drying Post Washing	18	0.14	19	0.12

* Backup section collected >10% of the front section, so concentration may be underestimated

We collected a PBZ sample on the other hair stylist in the salon and the formaldehyde concentration was 0.10 ppm for a sampling period of 112 minutes (the duration of the Brazilian Blowout treatment). This hair stylist was conducting a haircut and performing other tasks around the salon during the treatment. While conducting the haircut, the hair stylist was located approximately six feet from the Brazilian Blowout treatment.

Results of the GA air sampling for formaldehyde are presented in Table 2. When no treatment was performed, the GA air concentrations of formaldehyde ranged from 0.0044–0.025 ppm. The dispensary air sample concentration (0.025 ppm) was higher than the levels found in other rooms and could be because of the Brazilian Blowout Acai Professional Smoothing Solution – Formaldehyde Free Smoothing Formula that was dispensed before the start of the treatment. The Brazilian Blowout Acai Professional Smoothing Solution – Formaldehyde Free Smoothing Formula was poured from the manufacturer’s bottle into a small dish. When the Brazilian Blowout treatment was

performed, the GA air concentrations of formaldehyde ranged from 0.057–0.11 ppm. The hair treatment room air sample had the highest formaldehyde concentration (0.11 ppm) of the GA air samples. Although these GA air samples are not a direct estimate of employee exposures, they do indicate that hair stylists or salon employees (especially those working near the treatment) can be exposed to formaldehyde air concentrations during the Brazilian Blowout treatment that are higher than background levels. Further sampling is needed to characterize their personal formaldehyde exposures.

Table 2. General area air sampling results for formaldehyde

Area	No Treatment		Brazilian Blowout Treatment	
	Sampling Time (minutes)	Concentration (ppm)	Sampling Time (minutes)	Concentration (ppm)
Reception Desk	238	0.0069*	145	0.062
Hair Treatment Room	244	0.0087	144	0.11
Hair Wash/Dry Room	247	0.0044	143	0.057
Dispensary	390	0.025	NA	NA

* Backup section collected >10% of the front section, so concentration may be underestimated.

Bulk sample analyses indicated that the Brazilian Blowout Acai Professional Smoothing Solution – Formaldehyde Free Smoothing Formula contained 11% formaldehyde by weight and the Brazilian Blowout Acai Professional Anti-Residue Shampoo contained 0.046% formaldehyde. The Brazilian Blowout Acai Deep Conditioning Masque contained formaldehyde that was estimated at 0.0013% which is above the limit of detection but below the limit of quantitation of 0.0060% and hence the reported concentration has uncertainty associated with it.

The three people present in the salon filled out our questionnaire. One applied the treatment, one received the treatment, and one was performing other duties. None reported symptoms while the treatment was applied, but one reported throat irritation when applying the product in the past. All reported using latex gloves when applying the treatment.

Discussion

Formaldehyde (Chemical Abstracts Service [CAS] number 50-0-0) is a colorless gas at room temperature and is known and marketed in products under various names, including methanal, methylene oxide, formalin, and methylene glycol [NIST 2011]. Note: the CAS number is a unique identifier assigned to chemicals. Formaldehyde in a solution of water containing alcohol stabilizer is referred to as formalin and has the same CAS number of 50-0-0. However, formaldehyde when dissolved in water forms a diol called methylene glycol or methane diol which has a different CAS number of 463-57-0. Formaldehyde gas and the methylene glycol solution exist in a dynamic and reversible equilibrium, and

therefore, the aqueous solution is capable of releasing formaldehyde gas [Winkleman et al. 2002; Consumer Federation of American 2011; Oregon OSHA 2011]. An Oregon OSHA report concluded that for the purposes of worker protection it is appropriate to refer to both the hydrated and the non-hydrated formaldehyde as formaldehyde [Oregon OSHA 2011]. In addition, the OSHA formaldehyde standard applies to all occupational exposures to formaldehyde, i.e. formaldehyde gas, its solutions, and other materials that release formaldehyde [29 CFR 1910.1048].

Our PBZ air sampling results showed that hair stylists using the Brazilian Blowout Acai Professional Smoothing Solution – Formaldehyde Free Smoothing Formula were exposed to formaldehyde air concentrations that exceeded the NIOSH ceiling limit for all tasks (except the initial hair wash) associated with the Brazilian Blowout treatment. The ACGIH ceiling limit was exceeded during the product application, blow drying post application, and flat ironing tasks of the treatment. None of the reported formaldehyde concentrations exceeded the OSHA PEL or OSHA STEL. These results are consistent with the Oregon OSHA findings from their evaluation of seven different salons that used the same “formaldehyde free” product [Oregon OSHA 2010].

We found that the Brazilian Blowout Acai Professional Smoothing Solution – Formaldehyde Free Smoothing Formula contained 11% formaldehyde by weight, which is similar to the average formaldehyde content of 8.8% reported by Oregon OSHA for the same “formaldehyde free” product [Oregon OSHA 2011]. We also found that the Brazilian Blowout Acai Professional Anti-Residue Shampoo contained 0.046% formaldehyde which is similar to the 0.05% average formaldehyde content reported by Oregon OSHA for this same shampoo [Oregon OSHA 2011].

Because we found formaldehyde air concentrations greater than 0.1 ppm and the Brazilian Blowout Acai Professional Smoothing Solution – Formaldehyde Free Smoothing Formula contained formaldehyde at greater than 0.1%, the hazard communication requirements of the OSHA formaldehyde standard are applicable [29 CFR 1910.1048 (m)]. This standard requires employers to discuss specific health hazards with their employees including cancer, irritation, and sensitization of the skin and respiratory system. The standard also requires a written hazard communication program that includes requirements for MSDSs and employee training.

The OSHA formaldehyde standard requires that manufacturers provide their downstream users (or clients), such as you, with accurate MSDSs that address health hazards associated with exposure to formaldehyde. In addition, manufacturers are required to modify their labels to indicate the presence of formaldehyde in their product. If the product is capable of releasing formaldehyde at levels exceeding 0.5 ppm, the label shall contain the words “Potential Cancer Hazard.”

The MSDS provided by the manufacturer for the product you use (Brazilian Blowout Acai Professional Smoothing Solution – Formaldehyde Free Smoothing Formula) indicated that

it contained less than 5% methylene glycol. However, this MSDS does not state specifically that it is for the Formaldehyde Free Smoothing Formula. We contacted the product manufacturer directly to inquire whether the Brazilian Blowout Professional Smoothing Solution MSDS is for the “Formaldehyde Free Smoothing Formula” used by during our evaluation and to request MSDSs for the Brazilian Blowout Acai Professional Anti-Residue Shampoo and Brazilian Blowout Acai Deep Conditioning Masque. We received MSDSs for all three products and although none of the product names on the MSDSs were the same as the product labels, we were assured by the manufacturer that they were correct. The “Formaldehyde Free” portion of the product label has been removed. The MSDSs for the Brazilian Blowout Acai Professional Anti-Residue Shampoo and Brazilian Blowout Acai Deep Conditioning Masque did not list any hazardous components.

The salon should be aware that salon product MSDSs may not list formaldehyde as being present or may list formaldehyde under other names such as methylene glycol, methane diol, formalin, methylene oxide, paraform, formic aldehyde, methanal, oxomethane, oxymethylene, or CAS Numbers 50-00-0 and 463-57-0.

Recommendations

Federal OSHA, several State OSHA programs, Health Canada, and other government agencies have published alerts and advisories on the use of hair smoothing products that contain or release formaldehyde. Specifically identified is the Brazilian Blowout hair product line as it has been shown to contain formaldehyde. These publications cite a number of studies where air sampling has identified formaldehyde generated from hair smoothing products that are labeled as “formaldehyde-free.” Our air sampling results are consistent with these findings and additionally indicate that salon staff are exposed to formaldehyde in concentrations that exceed short-term OELs. Therefore, we provide the following interim recommendations to improve the health and safety of salon employees.

1. The salon should discontinue the use of Brazilian Blowout Acai Professional Smoothing Solution – Formaldehyde Free Formula product as it has been shown to result in short-term formaldehyde exposures exceeding recommended OELs.
2. If the salon continues to use this hair product:
 - a. Follow the requirements listed in the OSHA formaldehyde standard [29 CFR 1910.1048]. These requirements include use of personal protective equipment, employee training, availability of eye and skin washing equipment, and employee medical surveillance.
 - b. Conduct air sampling to further characterize employee exposures to formaldehyde.
 - i. If air sampling results show formaldehyde concentrations above the OSHA PEL, AL, or STEL, the salon would have to follow the requirements as described the OSHA formaldehyde standard.

- ii. If sampling results show formaldehyde concentrations above the NIOSH ceiling limit or other OELs, the salon should provide employees with the appropriate NIOSH-approved respirator for use until engineering or administrative controls can be implemented to reduce formaldehyde exposures below the OELs. Respirators must be used in the context of a complete respiratory protection program in accordance with the OSHA Respiratory Protection Standard (29 CFR 1910.134).
3. We recommend the use of gloves (nitrile or butyl rubber) other than latex because of the risk of allergic reaction to natural rubber latex.

We have included the following websites and have enclosed the Federal OSHA hazard alert for you to reference while addressing the recommendations provided above.

1. Federal OSHA formaldehyde standard, http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARD&p_id=10075.
2. Federal OSHA hazard alert, http://www.osha.gov/SLTC/formaldehyde/hazard_alert.html.
3. Federal OSHA safety and health topic – formaldehyde, <http://www.osha.gov/SLTC/formaldehyde/index.html>.
4. Oregon OSHA news release alerting hair salons about the presence of formaldehyde in some products, http://www.orosha.org/admin/newsrelease/2010/nr2010_28.pdf.
5. Oregon OSHA final report, http://www.orosha.org/pdf/Final_Hair_Smoothing_Report.pdf.
6. California OSHA informational sheet, <http://www.dir.ca.gov/dosh/HairSmoothingPageVersion1Nov182010.pdf>.
7. Health Canada informational update, http://www.hc-sc.gc.ca/ahc-asc/media/advisories-avis/_2011/2011_56-eng.php.
8. OSHA respiratory protection eTool, <http://www.osha.gov/SLTC/etools/respiratory/index.html>.

While we encourage the salon to discontinue the use of these formaldehyde-containing hair products, if you continue to use these products or the Brazilian Blowout Zero product line and need further assistance in monitoring employee exposures, please contact us to schedule a follow-up evaluation. We will send you a final report upon completion of this evaluation.

Thank you for your cooperation with this ongoing evaluation. For the purpose of informing affected employees, we recommend that copies of this report be posted by the employer in a place accessible to the employees for a period of 30 calendar days. If you have any questions, please do not hesitate to call Srinivas Durgam at (513) 841-4259 or Elena Page at (513) 458-7144.

Sincerely,

Srinivas Durgam, MSPH, MSChE, CIH
Industrial Hygienist

Elena Page, MD, MPH
Medical Officer
Hazard Evaluations and Technical
Assistance Branch
Division of Surveillance, Hazard
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Enclosure: Federal OSHA hazard alert

cc: Primary employee representative

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