



National Institute for Occupational
Safety and Health
1090 Tusculum Avenue
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January 10, 2018
HHE 2017-0034

James T. Johnson
Managing Director, Legal - Environmental
4333 Amon Carter Boulevard, MD5675
Fort Worth, Texas 76155

Dear Mr. Johnson:

This letter is in response to an employee request to the National Institute for Occupational Safety and Health (NIOSH) at the Centers for Disease Control and Prevention (CDC) for a health hazard evaluation (HHE) regarding symptoms attributed to uniforms introduced from May to September 2016 among American Airline (AA) employees. In the course of this HHE, we performed a number of activities and gathered substantial amounts of information to evaluate employees' concerns. In this letter we present a summary of the information we reviewed and our conclusions and recommendations. We include detailed information concerning background, methods, findings, and literature review for this HHE in the Appendix to this letter.

Information about AA Uniforms

During our evaluation, we learned that flight attendants must wear uniforms at all times when on duty. In February 2015, Twin Hill, a subsidiary of Tailored Brands, was contracted by AA to supply new uniforms to their 70,000 employees. The new uniform consisted of garments made of wool blend fabric (53% wool, 45% polyester, 2% spandex) and non-wool blend (63% polyester, 33% viscose, 4% elastane). Garment linings were made of 94% polyester, 6% spandex; the wool and non-wool blend female flight attendant single-breasted jackets were also available with linings made of 100% polyester.

Employees began reporting symptoms they associated with touching or wearing the new Twin Hill uniforms in May 2016. In response to the increase in symptoms, in August 2016, the Association of Professional Flight Attendants (APFA) posted an internet form for reporting complaints about the uniform. In October 2016, AA management offered employees two options: (1) wearing the older uniform instead of the new Twin Hill uniform; or (2) purchasing (with reimbursement) and wearing look-alike shirts and slacks from retail stores. AA management also established a call center to handle concerns about the uniform. In March 2017, AA offered a third "off-the-shelf" uniform supplied by Aramark. These uniforms included a 100% polyester jacket (with pant/skirt combination), 100% cotton shirts, and an acrylic/cotton blend sweater.

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In order to address concerns raised in the HHE request, we held conference calls, collected information by email, and reviewed documents including laboratory textile testing methods and results with representatives from AA, APFA, and Twin Hill Corporation. We consulted with

NIOSH chemists, private industry experts, medical experts, and representatives from the Hohenstein Textile Testing Institute (contracted by APFA), Intertek Chemicals and Materials, and Intertek Scientific and Regulatory Consultancy (both contracted by AA). APFA provided a de-identified database of employee symptom reports from August 11, 2016, through May 2, 2017, and updated summary information from this database. They also provided laboratory textile testing results. We reviewed AA Occupational Safety and Health Administration (OSHA) 300 logs for 2015 through April 2017, as well as a summary of AA Workers Compensation claims. We communicated directly with 50 AA employees who contacted NIOSH.

In order to determine whether one or more specific substances in the uniforms may have caused the reported symptoms, we evaluated: (1) the reported symptoms and health problems; and (2) information about the uniforms and fabrics. We reviewed reports of symptoms from several sources. Symptoms were reported related to the skin; the respiratory tract; the eyes; and the musculoskeletal, gastrointestinal, neurological, endocrine, and reproductive systems. We focused our evaluation on reported skin symptoms and reported respiratory symptoms since these were the most commonly reported symptoms. Reported skin problems included hives, rashes, blistering, itching, and other conditions. Reported respiratory problems included shortness of breath, wheezing, cough, congestion, and other respiratory conditions.

As stated above, uniform garments for flight attendants were available in both a wool blend and a non-wool blend. The types of garments and fabric contents of the Twin Hill uniforms are presented in Table 1.

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Table 1. AA current uniform types and fabric content; lined garments made of poly wool blend or poly man-made fiber blend

Uniform piece	Fabric composition	Lining
Men's jackets	53% Wool / 45% Polyester / 2% Spandex	94% POLY/6%SPANDEX
Men's jackets – nonwool	63% Polyester / 33% Viscose / 4% Elastane	94% POLY/6%SPANDEX
Women's jackets	53% Wool / 45% Polyester / 2% Spandex	94% POLY/6%SPANDEX
Women's jackets	53% Wool / 45% Polyester / 2% Spandex	100% Polyester
Women's jackets – nonwool	63% Polyester / 33% Viscose / 4% Elastane	94% POLY/6%SPANDEX
Women's jackets – nonwool	63% Polyester / 33% Viscose / 4% Elastane	100% Polyester
Men's vest	53% Wool / 45% Polyester / 2% Spandex	94% POLY/6%SPANDEX
Men's vest –nonwool	63% Polyester / 33% Viscose / 4% Elastane	94% POLY/6%SPANDEX
Women's vests	53% Wool / 45% Polyester / 2% Spandex	94% POLY/6%SPANDEX
Women's vest – nonwool	63% Polyester / 33% Viscose / 4% Elastane	94% POLY/6%SPANDEX
Dress	53% Wool / 45% Polyester / 2% Spandex	94% POLY/6%SPANDEX
Dress – nonwool	63% Polyester / 33% Viscose / 4% Elastane	94% POLY/6%SPANDEX
Men's pant	53% Wool / 45% Polyester / 2% Spandex	94% POLY/6%SPANDEX
Men's pant – nonwool	63% Polyester / 33% Viscose / 4% Elastane	94% POLY/6%SPANDEX
Women's pant	53% Wool / 45% Polyester / 2% Spandex	94% POLY/6%SPANDEX
Women's pant – nonwool	63% Polyester / 33% Viscose / 4% Elastane	94% POLY/6%SPANDEX
Skirts	53% Wool / 45% Polyester / 2% Spandex	94% POLY/6%SPANDEX
Skirts – nonwool	63% Polyester / 33% Viscose / 4% Elastane	94% POLY/6%SPANDEX
Men's all weather coat	100% Polyester	94% POLY/6%SPANDEX
Women's all weather coat	100% Polyester	94% POLY/6%SPANDEX
Men's wool car coat	64% Wool / 25% Polyester / 8% Polyamide / 3% Other Fibres	94% POLY/6%SPANDEX
Women's topper coat	53% Polyester / 44% Wool / 3% Elastane	94% POLY/6%SPANDEX
Men's cardigan	49% acrylic / 21% wool / 30% nylon	Unlined
Men's cardigan – nonwool	80% acrylic / 20% nylon	Unlined
Men's heavy sweater – nonwool	80% acrylic / 20% nylon	Unlined
Women's cardigan	61% acrylic / 23% wool / 16% nylon	Unlined
Women's cardigan – nonwool	80% acrylic / 20% nylon	Unlined
Women's heavy zip sweater	60% acrylic / 25% wool / 15% nylon	Unlined
Women's heavy zip sweater – nonwool	80% acrylic / 20% nylon	Unlined

Men's and women's shirts and blouses of different styles and colors were unlined and made from 100% cotton with one exception. Women's twill shirts were made of 65% polyester and 35% cotton blend. The all-cotton alternative garments were also available to order, but Twin Hill reported receiving very few orders for these.

We obtained and reviewed fabric testing results from laboratories and toxicologists that have been involved in this issue. Uniform pieces were tested by companies contracted by AA, APFA, and Twin Hill. These private laboratories identified several potentially irritating or sensitizing

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chemicals in the new and returned AA garments, but the chemical compounds were not found consistently across all garments thought to be related to dermal reactions. In our literature search we found that, for most of the identified sensitizing agents, there is little data available in the scientific literature or within regulatory guidelines about the amount of dermal exposure necessary to cause sensitization or to cause a reaction in a sensitized individual. The results of the uniform samples testing did not reveal a pattern of chemical or metal contamination that would indicate a cause for the widespread reported symptoms.

We performed an extensive review of the scientific literature about exposures to low levels of chemical agents (including mixtures, and including textile-related exposures) and potential health effects from such exposures. For example, we learned that there is evidence in the literature that subthreshold concentrations of irritants can have an additive effect on the skin and that allergic contact dermatitis can occur with highly finished garments, such as uniforms. We also are aware of the difficulty of detecting newer textile allergens because chemicals used in textiles are not always declared. Garment testing may not identify these chemicals. Additionally, there is some evidence that skin exposure to certain chemical allergens (e.g., isocyanates and beryllium) may have the potential to cause sensitization of the respiratory tract, but conclusions related to these issues cannot be made due to lack of data. In the course of our research, we also learned that laundering garments several times reduces concentrations of water-soluble textile chemicals.

A minority of the reports describe occurrence of symptoms after working in close proximity or on the same aircraft with an employee who was wearing the uniform. We know that the chemicals identified in the uniforms have low volatility in the temperatures found on an aircraft and in normal indoor environments, and the levels of chemicals found in the garments would be unlikely to “off-gas” and lead to air concentrations that would cause symptoms.

Conclusions

1. It is possible that textile chemicals in the uniforms or the physical irritant properties of the uniform fabrics have caused skin symptoms among some AA employees who wore the uniforms. Irritant and allergenic compounds were identified in some uniform garments, which could cause these skin symptoms.
2. As described fully in the Appendix, * the evidence from the extensive garment testing does not identify a single chemical, an individual uniform component, or combinations that were responsible for the constellation of symptoms. The concentrations and types of chemicals were found to vary widely even in different sections of many of the individual uniforms tested, as well as across the multiple new uniform pieces.
3. We cannot make a determination whether working in proximity to others wearing the new uniform would cause employees to experience symptoms because of the current limitations

* See pages 15-21 of the Appendix for a summary of our review of the laboratory testing.

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involved in assessing work-related exposures (including limitations in the methods of testing the garments), and the inability to determine the precise significance of some of the reported symptoms. Based on our review of the analytical data and available literature regarding health and exposure to textiles, we think that proximity exposure is unlikely to result in symptoms.

Recommendations

The actions taken (e.g., allowing employees multiple uniform choices) to address employee's symptoms attributed to uniform wear have been important steps in addressing those symptoms. We recommend the actions listed below to further address employee's symptoms.

1. Continue to offer the multiple choices of uniforms to the employees. Instruct employees who have developed symptoms when wearing the uniform to take advantage of any of the three alternative uniform choices.
2. Instruct employees to wash new clothing, before wearing them for the first time. Follow garment label instructions when laundering uniforms.
3. Encourage employees to report potential work-related health conditions to their supervisor.
4. Employees with persistent symptoms should be individually evaluated by an occupational medicine physician or a medical provider specializing in workplace illnesses. The Association of Occupational and Environmental Clinics has an online directory of such providers at <http://www.aoec.org/directory.htm>.
5. Employees with persistent rash should be evaluated by a dermatologist with expertise in occupational health and skin patch testing. The dermatologist may then decide if skin patch testing with textile chemical allergens and with pieces of the uniform is warranted.
6. Remove employees with physician-diagnosed health problems related to the uniform from exposure, and retain pay and benefits for these employees. Follow recommendations from the diagnosing physician concerning return-to-work for employees previously removed because of work-related exposures. In some cases of allergic asthma and allergic contact dermatitis, employees may need to be reassigned (with retention of pay and employment status) with work conditions in which exposure is minimal or nonexistent.
7. Conduct additional garment testing if a particular substance is identified to be related to the signs and symptoms that the flight attendants were experiencing. Further investigations into the sensitization potential of the garments may be warranted. Skin patch testing with uniform components should be guided by a professional with appropriate expertise, such as an occupational dermatologist as noted above.

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This letter serves as a final report and concludes this health hazard evaluation. NIOSH recommends that employers post a copy of this letter for 30 days at or near work areas of affected employees. We are sending a copy of this letter to the Occupational Safety and Health Administration Region IV Office and the North Carolina Department of Health and Human Services.

Thank you for your cooperation with this evaluation. If you have questions, please call Loren Tapp at (513) 841-4404 or Kendra Broadwater at (513) 841-4543.

Sincerely yours,

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Attachments (1): Appendix

cc: Confidential employee requestors
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Occupational Safety and Health Administration Region IV Office
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