Chemical Allergy Masquerade

by Patty Taylor, RN, BA

Imagine a nurse, let's call her Jill, who faces multiple "scrub-ins" every day as part of her operating room (OR) role. She struggles with a rash on her hands and wrists that just won't go away, causing both physical and emotional trauma. These recurring and often painful skin conditions – which range from mild irritations to more serious reactions – can persist, despite the care taken by nurses and hospitals. Add to that the toll in sick leaves and absenteeism, and the cost of this condition can be painful to both staff and administration. Despite the care and costs, hospitals have not solved the problem. But there is an answer!

Our fictional OR nurse, Jill, suffers from a condition that is all too real in hospitals around the world: allergic contact dermatitis (ACD); also known as Type IV allergy or chemical allergy. A chemical allergy is an expansive allergic condition which represents approximately 30 percent of occupationally induced skin diseases – and it is the second largest occupational disability reported to OSHA. While Jill's hospital probably has an allergy management program, the focus is likely on latex allergy, allergenic risks that may be associated with the use of natural rubber (hevea brasiliensis) latex gloves. Meanwhile, the real cause of Jill's condition is allowed to roam hospitals at will, causing suffering to thousands of healthcare workers (HCWs), costing an estimated $100,000 per year[1] to hospitals and burdening the national system to the tune of $1 billion per year.[2]

Symptoms

A chemical allergy is a reaction to specific allergens such as chemical accelerators used in the glove manufacturing process of both latex and synthetic gloves. Clinically, a chemical allergy presents as a red, raised and palpable area at the area of contact with the glove, accompanied by subjective symptoms such as itching, burning and tingling. Additional symptoms include erythema, swelling, cracking, itching, weeping and dryness of the skin at the site of contact and may often extend beyond the area of contact.

The chemical allergy response begins when the antigens (such as residual chemical accelerators) leaches from the glove and penetrates the skin, triggering the formation of T cells sensitized to the specific antigens. Repeated exposure to the antigen in allergic individuals results in the re-activation of sensitized T cells and the production of an inflammatory response causing the chemical allergy symptoms.

These effects typically appear anywhere from six to 48 hours following exposure to the antigen-containing product and can last up to four days. Allergic contact dermatitis brings an even greater risk of bloodborne pathogen infection, because the body's most efficacious barrier – intact skin – becomes compromised. The breakdown of the dermis may also permit the passage of latex proteins into the body, thereby facilitating latex protein hypersensitivity in some individuals. It is important to note that chemical allergy can occur from the use of both latex gloves and non-latex (synthetic) medical gloves.

Incidence

Among HCWs, medical gloves are the most frequent cause of chemical allergy.[3] The growing impact of chemical allergies is clear – of the total healthcare worker population, 33% of glove related reactions are chemical allergies, while 17% are latex allergies.[4, 5] Today, over 13 million US workers nationwide are potentially exposed to chemicals through the skin.[6] While healthcare professionals are highly conscious of latex allergy (Type I allergy) risks linked to natural rubber latex gloves, the prevalence of chemical allergy (Type IV allergy) remains a mystery in many hospitals.

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Clinical evidence (Heese, 1989-1992) shows that chemical allergies represent up to 28 percent of glove-related allergic reactions, with up to 90 percent of these allergies due to vulcanization accelerators used in the glove manufacturing process.[7] The most frequent chemical issues are from accelerators which catalyze the cross-linking of elastomeric particles during production.[8]

The Cause

Chemical accelerators are traditionally used to accelerate the linkage of rubber molecules in natural or synthetic rubber. It's this accelerator group of chemicals (especially thiruams and carbamates) that induce the majority of the skin dermatitis reactions.

Chemical accelerators used in the manufacture of NRL and synthetic medical gloves transform the original raw liquid rubber state into a very thin, strong, elastic glove film and give the glove its benefits:

- Promotes cross-linking of the glove material to give strength to the glove
- Gives integrity to the glove during use
- Provides elasticity to the glove
- Stabilizes the glove material for long-term storage

These chemicals, if not controlled, were recognized as a problem for healthcare workers more than 50 years ago, as reactions were occurring by exposure not only to latex gloves, but also to many other non-latex types of medical glove materials. The problem is basically an old dog showing off the same old tricks. And these tricks are going unrecognized by many HCWs.

Some individuals may also be sensitive to other substances associated with medical gloves:

- Lanolin, used as a glove softener by some manufacturers
- Polyoxypropyleneglycol, a coagulant used in the glove manufacturing process
- Coloring pigments, either organic or inorganic
- Quaternary ammonium compounds
- Antioxidants which are used to prevent the degradation of NRL products
- Preservatives

Research Ansell conducted at the 2010 AORN Congress showed that 53.9 percent of 954 respondents indicated that staff continued to experience allergy issues even after switching to non-latex gloves.[9] That's because, as we've seen, chemical accelerators are generally used in the manufacturing of NRL and synthetic gloves. In fact, 78.3 percent of 947 respondents had experienced hand irritation that was determined to NOT be a Type I latex allergy.

Chemical allergies are not easily recognized, even by experienced healthcare workers like our fictional nurse, Jill. Take a look at these statistics from the AORN Congress over two consecutive years.

- A significant percentage of OR nurses surveyed at the Congress in March 2009 (39 percent of 1,125 survey participants) and March 2010 (52.7 percent of 942 participants) demonstrated they did not know about chemical allergies.
- AORN survey results showed just 13.2 percent of 1,152 respondents have been tested by an allergist for a latex allergy. Only 4.5 percent of 1,149 respondents had been tested for Type IV chemical allergies.

The Cost

A retrospective analysis of one state's dermatitis-related workers' compensation claims, merged with U.S. census data, reported that the average cost per claim was $3,552, and the average

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disability time was 23.9 days.[10] Skin disorders are among the most frequently reported occupational illnesses and result in an estimated annual cost in the U.S. of over $1 billion.[11]

Treatment

Chemical allergies and other adverse glove reactions in HCWs and patients can be managed by understanding and recognizing them and then taking appropriate action. HCWs should be encouraged to report any symptoms. Individuals experiencing recurrent or persistent dermatitis should consult with their doctor or an allergist or dermatologist in order to establish a specific diagnosis.

A diagnosis is made on the basis of a detailed medical history, physical exam, and the relevance of positive patch tests with offending glove chemicals.[12, 13] Comprehensive patch testing should only be performed by physicians who have extensive training, interest, knowledge, and expertise in chemical allergy and patch testing.[14] In comprehensive patch testing, the patient is tested with a large number of allergens, usually between 65 and 200. The specific allergens used and the number of allergens tested are tailored to each person, based on his/her medical history, findings on examination, and environmental exposure history. Comprehensive patch testing has repeatedly demonstrated a much higher probability of yielding a diagnosis of a specific allergy for an individual, in contrast to limited patch testing, thereby resulting in a much higher probability of a cure.

A preferred treatment option is the short-term use of potent topical corticosteroids to control the symptoms; nonsteroidal topical immunomodulators, such as tacrolimus or pimecrolimus, can also be beneficial.[15] Very severe cases of ACD may require a short course of oral corticosteroids and immunosuppressive therapy, such as cyclosporine.

Chemical allergy (allergic contact dermatitis) is one of the only types of dermatitis that is completely curable; this means that if specific allergens are identified and appropriate strategies are implemented for allergen avoidance, many individuals will no longer require physician visits and prescriptions.[16] Therefore, most healthcare personnel who have ACD can return to work.

Next Steps

At Ansell, we are passionate about raising awareness of this widespread issue among HCWs. Chemical related skin allergies are inconvenient, painful, embarrassing and costly. But they are also preventable. Here are some important steps to take in solving the mystery of Type IV chemical allergies:

- Get tested to determine what chemicals you are susceptible to. It's an important step and one that should not be put off. The costs are very high to you, your career and the level of care you can provide your patients.
- Ask your hospital administration about education programs to help you understand the causes and solutions to allergies and skin conditions related to your occupation.
- Not all accelerators are used in the manufacturing of medical gloves. Select gloves that do not use the accelerator you are allergic to.
- Look into new technologies that have led to the development of accelerator-free gloves. Accelerator-free gloves are the latest innovation in the ongoing effort by Ansell to provide effective barrier protection without causing allergic reactions.

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