

Effect of air transport on acrylate/methacrylate allergens in syringes and IQ chambers

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Introduction

Patch test preparations undergoing transport are subjected to wide variations of ambient temperature, air pressure, humidity, etc. We investigated the stability of acrylate/methacrylate allergens sent via air transport. Three methacrylate allergens

of known concentration compounded in our laboratory at the Department of Occupational and Environmental Dermatology, Skåne University Hospital, Malmö, Sweden were sent from Malmö, Sweden to Singapore and back via normal airmail.

Methods, Materials and Results

Three methacrylate allergens, methyl methacrylate (MMA), 2-hydroxyethyl methacrylate (2-HEMA), and ethyleneglycol dimethacrylate (EGDMA), were purchased from Chemotechnique Diagnostics (Vellinge, Sweden). These were compounded in 2.0% wt/wt petrolatum (pet.) and inserted into capped polypropylene syringes (with and without aluminium foil wrapping) and IQ chambers (Chemotechnique Diagnostics) without aluminium foil. Approximately 4 ml of each preparation was inserted into a syringe and approximately 30 mg of preparation into each polyethylene IQ chamber. The tape with the chambers was protected by the manufacturer's stiff plastic cover with 10 compartments that correspond to the chambers on the tape. The syringes were sent in triplicate for each allergen with and without aluminium foil wrapping, and two unwrapped samples in IQ chambers for each methacrylate were sent. These were then packaged in an airtight plastic bag and sent via normal airmail to the National Skin Centre, Singapore. Upon receipt of the packaging, the allergens were then sent back to the Malmö department immediately, without being opened in Singapore. The estimated travelling time was approximately 28 hr by air and at least 4 hr on land.

Upon arrival back at our laboratory, the allergens in the syringes and IQ chambers were analysed by high-performance liquid chromatography (to be published) for actual methacrylate allergen content. The detection limit for the allergens in the system that we used was 0.00011%.

The results are shown in Table 1. After allowing for the allergen loss due to our compounding process, we found that the patch test preparations sent in capped syringes retained their original allergen concentration whether or not they had been wrapped in aluminium foil, whereas those in IQ chambers with lids but without aluminium foil wrapping had lost almost their entire allergen content, for MMA and 2-HEMA in particular.

Discussion

Patch test preparations may lose some of their allergen content when subjected to higher temperatures or lower air pressure over prolonged periods. Suppliers of patch test preparations usually recommend that syringes containing allergens be stored in the refrigerator at temperatures between 2°C and 8°C. However, during air transport, these syringes would be subjected to much lower air pressures for hours. When being delivered in tropical climates, they may also be subjected to temperatures in excess of 25°C. For allergens that are volatile, a significant amount of allergen could be lost, especially if shipped in containers where the preparations have large surface area to volume ratios (e.g. IQ or Finn Chambers®), even if they are covered with the recommended lids. These lids are not airtight, and allow a fairly large volume of air to be present around each chamber. The mechanism of loss could be by evaporation, chemical degradation (reactions with air and moisture), or spontaneous polymerization. The evaporation rate of aqueous test solutions from Finn Chambers was 1 mg/3 min in one study (1).

Acrylate/methacrylate patch test preparations sent in syringes with caps have retained their allergen content much better than those sent in IQ chambers with lids. We thus conclude that patch test preparations that are volatile, such as acrylates/methacrylates, should never

Table 1. Final concentrations of methacrylate allergens in petrolatum in syringes and IQ chambers after air transport from Malmö, Sweden to Singapore and back

Methacrylate allergen	Original concentration ^a (%)	Capped syringe with foil ^a (%)	Capped syringe without foil ^a (%)	IQ chamber without foil ^b (%)
Methyl methacrylate (MMA)	1.3	1.3	1.2	< 0.0001
2-Hydroxyethyl methacrylate (2-HEMA)	1.8	1.8	1.7	< 0.0001
Ethyleneglycol dimethacrylate (EGDMA)	1.7	1.7	1.6	0.01

^aAnalyzed in triplicate.

^bSingle sample only.

be pre-loaded in IQ chambers or other test chambers and sent out to users.

Conflicts of interest: The authors have declared no conflicts.

Reference

1. Fischer T, Maibach H. Finn chamber patch test technique. *Contact Dermatitis* 1984; 11: 137–140.

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