

The Importance of Bubbles at High Altitude



To the Editor:

Hypoglycemia may occur for the jet aircraft traveler with insulin-pump treated diabetes mellitus. Low body mass index (BMI) is common in type 1 diabetes. Aircraft ascending above 10,000 meters with cabins pressurized to 2500-3000 meters above sea level may cause bubbles invisible at sea level to expand in the closed space of the tubing with uncontrolled infusion of insulin, resulting in hypoglycemia. In vitro studies using a hypobaric chamber have demonstrated formation of bubbles with reduction of pressure from 760 mm Hg (sea level) to 560 mm Hg (cabin pressure mandated by aviation regulations). These visible bubbles disappeared as pressure returned to 760 mm Hg.¹⁻³

A 78-year-old female with type I diabetes mellitus (61 years, insulin pump for 28 years), BMI 32 kg/m², and a frequent transcontinental flier without hypoglycemic symptoms provided a snapshot of bubbles in her insulin pump chamber during 1 flight (photo provided by her husband, [Figure](#)). Insulin resistance associated with elevated BMI protected her from hypoglycemia.

A gentleman with type 1 diabetes, trained to recognize hypoglycemic risk at high altitude, recognized that individuals with little muscle or adipose to act as an inhibitor to excess insulin would be susceptible. His educational program suggested that he pay attention if a stewardess was seen dashing back and forth for orange juice and alert anxious parents that there was a possibility that rapid-acting insulin could be injected by their child's insulin pump at aircraft cabins pressurized at 2500-3000 meters above sea level. Faced with this scenario, he did alert the stewardess that pump action should be temporarily stopped. This advice was followed and symptoms of hypoglycemia abated. The young person's parents were grateful.

When oral glucose fails to reverse pump-related hypoglycemia, the pump must be disarmed or the line removed from under the skin, which is a more drastic approach than



Figure Photo demonstrates an air bubble at 37,000 feet altitude. Expansion of proximal bubbles in the insulin pump reservoir may displace insulin distally causing inadvertent injection and potential hypoglycemia.

commonly used at sea level. Increased use of insulin pumps makes these observations important for the diabetes community during air travel.

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