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## Exposure to tri-*o*-cresyl phosphate detected in jet airplane passengers

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### Abstract

The aircraft cabin and flight deck ventilation are supplied from partially compressed unfiltered bleed air directly from the engine. Worn or defective engine seals can result in the release of engine oil into the cabin air supply. Aircrew and passengers have complained of illness following such “fume events”. Adverse health effects are hypothesized to result from exposure to tricresyl phosphate mixed esters, a chemical added to jet engine oil and hydraulic fluid for its anti-wear properties.

Our goal was to develop a laboratory test for exposure to tricresyl phosphate. The assay was based on the fact that the active-site serine of butyrylcholinesterase reacts with the active metabolite of tri-*o*-cresyl phosphate, cresyl saligenin phosphate, to make a stable phosphorylated adduct with an added mass of 80 Da. No other organophosphorus agent makes this adduct in vivo on butyrylcholinesterase.

Blood samples from jet airplane passengers were obtained 24–48 h after completing a flight. Butyrylcholinesterase was partially purified from 25 ml serum or plasma, digested with pepsin, enriched for phosphorylated peptides by binding to titanium oxide, and analyzed by mass spectrometry. Of 12 jet airplane passengers tested, 6 were positive for exposure to tri-*o*-cresyl phosphate that is, they had detectable amounts of the phosphorylated peptide FGEpSAGAAS.

The level of exposure was very low. No more than 0.05 to 3% of plasma butyrylcholinesterase was modified. None of the subjects had toxic symptoms. Four of the positive subjects were retested 3 to 7 months following their last airplane trip and were found to be negative for phosphorylated butyrylcholinesterase. In conclusion, **this is the first report of an assay that detects exposure to tri-*o*-cresyl phosphate in jet airplane travelers.**

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