

Correspondence

Contact allergy to acrylates in Apple AirPods Pro® headphones: A case series

Dear Editor,

Apple AirPods® are the best-selling wireless headphones on the market.¹ A recent case report described one case of allergic contact dermatitis (ACD) associated with the original (1st/2nd generation) AirPods®.² Patch testing implicated acrylates as the primary allergen. We present four additional cases of ACD to Apple AirPods® devices.

Each patient below was patch tested according to the North American Contact Dermatitis Group (NACDG) protocol.³

A 35-year-old male presented with a 7-month history of rash on the ears which he attributed to his Apple AirPods Pro® headphones. Eventually, he purchased a pair of Apple AirPods Pro Max® over-ear headphones which caused a rash of the entire pinna. Patch testing was performed to the 2019–2020 NACDG baseline series, supplemental series (rubber, plastic/glues, acrylates, metals), and the patient's headphones (Fig. 1).

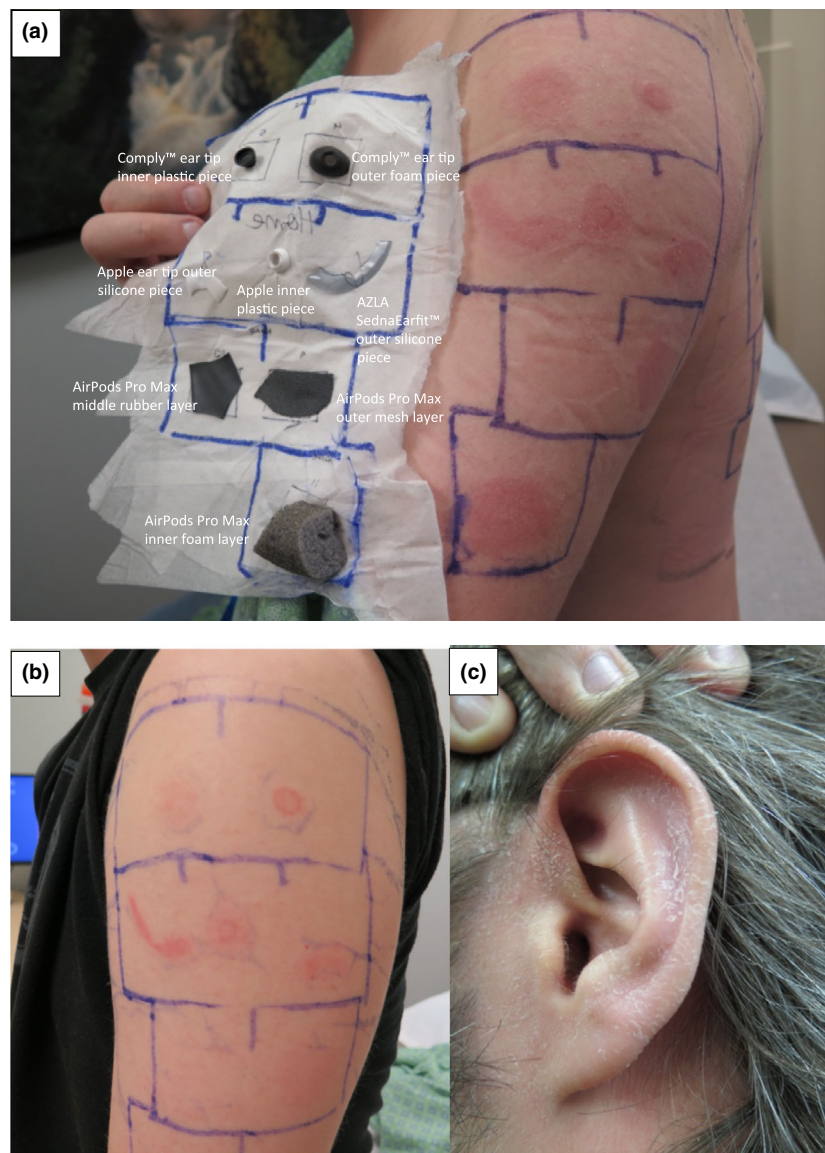


Figure 1 Positive patch test reactions to detachable headphone tips and AirPods Pro Max® ear cushions on Day 2 (a) and Day 7 (b). Image (c) shows scaly, shiny pink plaques on the left auricle and external auditory canal

Table 1 Patch test reactions in Apple AirPods®-allergic patients

Acrylate/Methacrylate tested	Case 1	Case 2	Case 3	Case 4	Patient 5 (Chan et al) ^a
1,4-Butanediol dimethacrylate 2% pet	++	—	—	—	—
1,4-Butanediol diacrylate 0.1% pet	+	—	—	—	—
Isobornyl acrylate 0.1% pet	++	—	++	—	—
2-Hydroxypropyl acrylate 0.1% pet	+	+/-	—	—	—
1,6-Hexanediol diacrylate 0.1% pet	+/-	—	—	—	—
Diethylene glycol diacrylate 0.1% pet	+/-	—	—	—	—
Tetraethylene glycol dimethacrylate 2% pet	+/-	—	—	—	—
Ethyl cyanoacrylate 10% pet	—	+	—	—	—
2-Hydroxyethyl acrylate 0.1% pet	—	+	—	—	—
2-Hydroxyethyl methacrylate ^a	—	—	—	—	++
Ethyl acrylate ^a	—	—	—	—	++
Triethylene glycol dimethacrylate ^a	—	—	—	—	++
Bisphenol A-glycidyl methacrylate ^a	—	—	—	—	++
Outer component of AirPods Pro ear tip	+	—	—	+/-	NT
Inner component of AirPods Pro ear tip	+/-	+/-	+	+	NT
AirPods Pro Max outer mesh layer	—	NT	NT	NT	NT
AirPods Pro Max middle rubber layer	+/-	NT	NT	NT	NT
AirPods Pro Max inner foam layer	++	NT	NT	NT	NT
Body of AirPods Pro ear bud	NT	NT	NT	+	NT

Reaction strength; ++, strong; +, mild; +/-, doubtful; —, negative.

Abbreviation: NT, not tested.

^aRefers to patient/reactions detailed in Chan et al.,¹ test concentrations were not provided.

Results on Day 7 of testing revealed reactions to five acrylates and two (meth-)acrylates (Table 1). He also had reactions to the inner foam layer of the AirPods Pro Max® ear cushion, the outer portion of the AirPods Pro® tip, the inner piece of the AirPods Pro® tip, and the rubber layer of his AirPods Pro Max® cushion.

A 59-year-old female reported a history of rash in the external auditory canals several hours after using AirPods Pro® headphones. The rash lasted 5 days, resolving completely after avoidance of the headphones. Patch testing was performed to acrylates from the 2019 to 2020 NACDG baseline series, supplemental series (acrylates and plastics/glues), and the patient's AirPods Pro® tips. Results on Day 5 of testing revealed reactions to three acrylates and the inner portion of the AirPods Pro® tips (Table 1).

A 41-year-old female presented with a rash of the concha, tragus, and anti-tragus of both ears that developed after 2 weeks' use of AirPods Pro® headphones. The patient also reported experiencing dermatitis from her FreeStyle Libre™ glucose monitor. Patch testing was performed to the 2019–2020 NACDG baseline series, supplemental series (acrylates and plastics/glues), and the outer flexible and inner plastic pieces of an Apple AirPods Pro® tip. Results on Day 5 of testing revealed reactions to isobornyl acrylate and the inner piece of the Apple AirPods Pro® tip.

A 39-year-old male reported a history of dermatitis of the bilateral external auditory canals and conchae occurring hours after use of Apple AirPods Pro®. Patch testing was performed to acrylates from the 2019 to 2020 NACDG baseline series,

supplemental series (acrylates and plastics/glues), and the patient's AirPods Pro® body and tip. Results on Day 5 of testing revealed reactions to the body of the AirPods Pro® as well as both the inner and outer portions of the tip (Fig. 2). He had no acrylate reactions.

Acrylic monomers are potent sensitizers.⁴ While the likelihood of developing an allergy to cured acrylates and (meth-)acrylates is low, exposure to trace monomers may occur due to incomplete polymerization.⁴

According to Apple, "AirPods, AirPods Pro, AirPods Max, and Beats headphone products contain trace amounts of acrylates and (meth-)acrylates from adhesives."⁵ A recent case report detailed a patient who developed dermatitis of the ears several hours after using original (first/second generation) AirPods®.² Results of patch testing revealed reactions to one acrylate and three (meth-)acrylates (Table 1). Additionally, one of our patients reacted to AirPods Pro® when tested "as-is" yet had no reaction to any of the acrylates or (meth-)acrylates tested. The heterogeneous nature of these reactions suggests there may be a proprietary acrylate/(meth-)acrylate contained within the device that cross-reacts with other acrylates/(meth-)acrylates.⁶

Shared reactions among our patients included those to isobornyl acrylate and 2-hydroxypropyl acrylate (Table 1). Sensitization to isobornyl acrylate from glucose monitoring devices has been theorized to occur through the diffusion of the allergen from the glue used to assemble the device.⁷ We suspect a similar mechanism of exposure to acrylates from AirPods® devices.

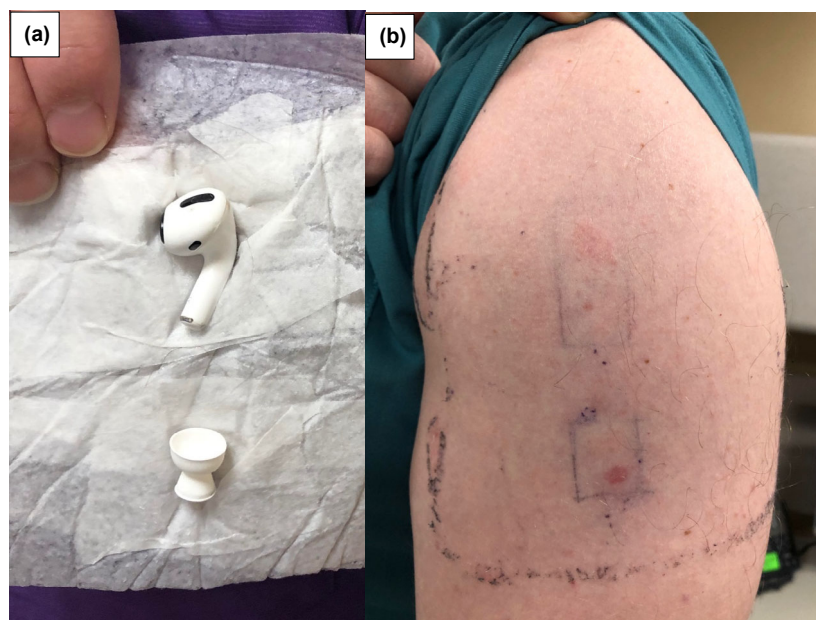


Figure 2 Day 5 patch test reactions (b) to body and detachable tip of AirPods Pro® (a)

ACD to Apple AirPods® is likely due to one or more proprietary acrylate or (meth-)acrylate. With the widespread use of these devices, providers should be aware of their sensitizing potential.

Rob L. Shaver^{1,2*}, BS 
 Michele Buonomo^{1,2}, BS 
 Joseph A. Scherman¹, MD
 Anne B. Neeley¹, MD

¹Park Nicollet Contact Dermatitis Clinic, HealthPartners
 Institute, Minneapolis, Minnesota, USA

²University of Minnesota Medical School, Minneapolis,
 Minnesota, USA

*E-mail: shav0049@umn.edu

Conflict of interest: None.

Funding source: None.

doi: 10.1111/ijd.15954

References

- 1 <https://news.strategyanalytics.com/press-releases/press-release-details/2021/Strategy-Analytics-True-Wireless-Stereo-Headset-Sales-Surge-90-in-2020-as-Chinese-Vendors-Surge/default.aspx>. Accessed on 5-2-2021.
- 2 Chan J, Rabi S, Adler BL. Allergic contact dermatitis to (meth) acrylates in Apple AirPods headphones. *Dermatitis* 2021. <https://doi.org/10.1097/DER.0000000000000735>
- 3 DeKoven JG, Silverberg JI, Warshaw EM, *et al*. North American Contact Dermatitis Group patch test results: 2017-2018. *Dermatitis* 2021; **32**: 111–123. <https://doi.org/10.1097/DER.0000000000000729>
- 4 Sasseville D. Acrylates. *Dermatitis* 2012; **23**: 3–5. <https://doi.org/10.1097/DER.0b013e31823d5cd8>
- 5 <https://support.apple.com/en-us/HT211158>. Accessed on 4-22-2021.
- 6 Kanerva L. Cross-reactions of multifunctional (meth-)acrylates and acrylates. *Acta Odontol Scand* 2001; **59**: 320–329. <https://doi.org/10.1080/000163501750541200>
- 7 Aerts O, Herman A, Mowitz M, *et al*. Isobornyl acrylate. *Dermatitis* 2020; **31**: 4–12. <https://doi.org/10.1097/DER.0000000000000549>