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1: [Cornea](#). 2006 Feb;25(2):214-9.

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Oxygen transmissibility of piggyback systems with conventional soft and silicone hydrogel contact lenses.

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PURPOSE: To investigate the apparent oxygen transmissibility of various piggyback systems using conventional and silicone hydrogel soft contact lenses of different water content and permeability, rigid poly(methyl methacrylate), and rigid gas-permeable lenses of medium, high, and ultrahigh oxygen permeability. The aim of the study was to establish which material (rigid or hydrogel) is more representative of the resulting oxygen performance of piggyback systems. **METHODS:** The apparent oxygen transmissibility of 66 piggyback systems was measured with an electrochemical method. Eighteen of these combinations involved the use of silicone hydrogel contact lenses currently available. One hyperpermeable rigid gas-permeable contact lens (tisilfocon A) was also included in the study. **RESULTS:** Measured apparent transmissibility correlates with rigid lens permeability ($r = 0.403$; $SE = +/- 3.03$ barrer/cm; $P < 0.001$) and hydrogel lens permeability ($r = 0.334$; $SE = +/- 3.2$ barrer/cm; $P < 0.001$). As expected, a linear model comprising permeability values from both rigid and soft materials gave a more precise estimation of the piggyback transmissibility ($r = 0.736$; $SE = +/- 2.02$ barrer/cm; $P < 0.001$). The highest values of apparent oxygen transmissibility were found for the combination of tisilfocon A rigid material with any of the 3 silicone hydrogel lenses. Tisilfocon A material significantly improved the transmissibility of all piggyback systems even when conventional hydrogels are involved. **CONCLUSION:** The combination of

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hypertransmissible rigid gas permeable lenses with silicone hydrogel soft materials should result in normal corneal function under daily wear conditions. When fitting piggyback systems, clinicians must be aware of material selection to optimize oxygen performance. This is of particular importance in already compromised corneas.

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