Introduction
Silicones have a number of qualities that make them ideal materials for use in skin and wound care. They are inert, non-irritating, have low toxicity, low thermal conductivity and are water-repellent. A number of clinical studies have been performed which demonstrate how these properties confer specific advantages over other wound dressing materials. Silicones are also used as a standard treatment for the prevention and treatment of hypertrophic and keloid scarring. Several studies have shown that long term use of silicone gels and sheets can reduce itching and discomfort of scarred skin tissue, flatten and soften margins and reduce discolouration. Silicone is often described as a ‘skin friendly adhesive’ solution. Here we investigate the various characteristics of a new range of silicone materials designed specifically for use in skin and wound care.

Methods
- Moisture vapour transfer rate (MVTR) testing was carried out on perforated and non-perforated silicone gel adhesives and measured at 37˚C equivalent to 24 hours using upright Paddington cups (BSEN 13726-2:2002).
- Peel adhesion was measured at a constant peel angle using a 25mm width of adhesive material.
- Trauma on removal was investigated using porcine skin stained with methylene blue. Silicone gel and medical grade adhesive were applied to the skin surface with constant pressure and then removed following 2 hours to understand the degree of skin trauma caused on removal. Silicone gel adhesives were compared to medical grade acrylic adhesives.
- Effect of adhesive removal on the in vitro stratum corneum was visualised macroscopically and also quantified by measuring the absorbance of methylene blue dye released from tissue and adhesive samples in to 2mls of dimethyl sulfoxide (DMSO).

Figure 1
Macroscopic images of methylene blue-dyed porcine skin demonstrated that the acrylic adhesive removed more of the dyed skin surface than the low trauma silicone adhesive.

Results
- Both visualisation of the porcine skin (Figure 1) and quantification (Figure 2) of the methylene blue dye from the samples demonstrated that the silicone gel adhesive removed less of the stained skin surface cells than the medical grade acrylic adhesive.
- The silicone gel adhesive had a low MVTR value; however, perforation of the material permitted vapour transfer through the gel (Figure 3).
- Peel testing of the perforated and non-perforated material showed that the drop in adhesion was proportional to the amount of silicone adhesive removed and did not affect the overall adhesive performance of the material (Figure 4).

Conclusion
- As expected, the new silicone gel adhesive studied was shown to have a low MVTR level. This occlusive characteristic provides evidence that this material may help to reduce scar formation on newly healed wounds.
- Perforation of the silicone gel adhesive allows for moisture permeability without significantly affecting the peel adhesion of the silicone gel which allows this adhesive to be used as a wound contact layer in combination with an absorbent layer such as a foam even in exuding wounds.
- Results of the in vitro skin trauma testing proved that the silicone gel had ‘skin-friendly’ characteristics since skin trauma was reduced significantly when compared to the acrylic adhesive.
- Skin-friendly silicone gel adhesives are ideal materials for use as skin and wound contact layers in applications ranging from advanced wound care to medical device fixation.