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Ele 382
Frequency Modulation for Skin
Permeability

There has been extensive animal and human testing showing that radiation on the ultrasonic spectrum decreases the external resistance of the skin, making ions and other chemicals more permeable with the epidermis. This technology has many applications in diabetes and vaccination technologies, where injections into the blood stream are commonplace. This technology allows insulin and other medical injections to become possible without the inconvenience and danger of needles.

A Sonoprep cartridge product has been developed to allow direct injections that will permeate through the skin in less than 1 minute. The ultrasonic exposure takes an additional 15 seconds as a preparatory procedure before the adhesive cartridge is applied.

The permeation is made possible by the ultrasonic exposure. The ultrasonic exposure causes the particles to oscillate, and cause cavitation "bubbles". It is theorized that these bubbles allow aqueous channels to form, which allow ions and other particles to freely diffuse through the skin with minimal external skin resistance. Normal skin resistance is about 100K. After the application of this product, skin resistance is measured as only 1K, or approximately equal to that of wet skin.

The cost of the Sonoprep device is approximately \$2000. None of the patients exposed to ultrasonic radiation complained of any pain during the procedure. The sensation the patients feel is described as a slight tingling. The skin resistance in the effected area

returns to normal within 24 hours after the procedure.



Sources:

- ✦ Low-Frequency Sonophoresis: A Noninvasive Method of Drug Delivery and Diagnostics - *Biotechnology Progress* 2000, 16:488-492
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- ✦ A. Boucaud, J. Montharu, L. Machet, B. Arbeille, M.C. Machet, F. Patat and L. Vaillant, Clinical, histologic, and electron microscopy study of skin exposed to low-frequency ultrasound. *Anatomical Rec.* **264** (2001), pp. 114_119
- ✦ <http://mail.rochester.edu/~cq001m/bme/current.html>