Novel technology may prevent burn scars

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Credit: Tel Aviv University

A group of researchers from Tel Aviv University and Harvard University has devised a new non-invasive method to prevent burn scarring caused by the proliferation of collagen cells. They are using short, pulsed electric fields prevent the formation of burn-related hypertrophic scars—raised tissue caused by excessive amounts of collagen.

Research for the study was led by Dr. Alexander Golberg of TAU's Porter School of Environmental Studies, together with Dr. Martin Yarmush of the Center for Engineering in Medicine at Massachusetts General Hospital, Harvard Medical School and Shriners Burns Hospital in Boston. It was recently published in the *Journal of Investigative*

Dermatology.

Ten percent of all unintentional-injury deaths are the result of fire-related burns, according to the World Health Organization. But even for those who survive the destruction of skin and tissue cells, the road to recovery is never ending. Post-burn scarring creates lifelong physical, psychological and social challenges.

Relieving lifelong suffering

"People don't die from scars, but they do suffer from them," said Dr. Golberg. "We believe that the technology we developed, called partial irreversible electroporation (pIRE), can be used to prevent debilitating burn scars from forming."

The non-invasive pIRE technique harnesses microsecond-pulsed, high-voltage, non-thermal electric fields to control the body's natural response to trauma—the proliferation of collagen cells that cause permanent scarring at the site of injury. The technique partially destroys cells in the wound with short, pulsed electric fields that cause irreversible damage to the collagen cells. But the researchers had to find a delicate balance so that the technique didn't create a new wound or "overheal" the existing wound, because scarring is the body's natural way of healing.

The researchers treated burn injuries in rats in five therapy sessions over six months, then assessed them using an imaging technique developed by Drs. Martin Villiger and Brett Bouma's group at the Wellman Center of Photomedicine at Massachusetts General. The researchers found a 57.9% reduction of the scar area in comparison with untreated scars.

Next step: Human clinical studies

"Surgical excision, laser therapy, electron-beam irradiation, mechanical compression dressing, silicone sheet application and other techniques have been tested to treat scars over the years," said Dr. Golberg, "but there have been only modest improvements in the healing outcomes among all these treatments.

"Scarring is a very complex process, involving inflammation and metabolism," said Dr. Golberg. "We have found a way to partially prevent scar formation in animal models. Next we need to raise funding to develop a device for the clinical study on humans."

More information: Alexander Golberg et al, Preventing Scars after Injury with Partial Irreversible Electroporation, *Journal of Investigative Dermatology* (2016). DOI: 10.1016/j.jid.2016.06.620

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