FIGURE 39.6 The Dermastamp, an example of the numerous MN devices marketed for cosmetic applications. (Reproduced with permission from [158].)

version of the Dermaroller technology. This device is designed to be applied in a vertical fashion by a trained clinician only and is highly suited for use on areas of the skin that are difficult for the conventional Dermaroller to reach [157]. Another is the Beauty Mouse, which is a computer mouse–shaped device with three separate Dermaroller heads situated on its underside. An approved medical device on the Australian Register of Therapeutic Goods (ARTG), the Beauty Mouse is designed to be used in a home care setting for the treatment of stretchmarks and cellulite over large areas of the body [157]. A further variation is the Dermapen, which is a spring-loaded oscillating MN device with the dimensions of a pen. This device is designed to overcome any issues associated with the variation in pressures applied by trained administrators, as well as being suited to use on areas of skin that are hard to reach [157]. Interestingly, a device similar in appearance to the Dermapen, known commercially as the INTRAcel, utilizes fractional radiofrequency emitted from MN tips to enhance tissue remodeling within the skin. Finally, a device comparable to the Dermaroller but with the addition of photodynamic therapy (PDT) (LED light emitted from MN tips) is commercially available for the treatment of skin aging.

In a similar fashion to the MN-mediated delivery of drugs not intended for cosmetic purposes, MN technology can be used to deliver many cosmeceutical agents. Leading on from the combination of MNs with PDT, the enhanced delivery of the photosensitizing agent 5-aminolevulinic acid (5-ALA) for the treatment of actinic keratosis caused by prolonged sun exposure was demonstrated in 2010 [159]. In this instance Clementoni et al. treated the skin with a rolling MN device like those described previously and then applied an ALA solution directly to the skin, which was washed off after one hour. Treated areas were then exposed to pulsed LED red light for a defined period of time [159]. At six months posttreatment, 90% of participants judged the improvement in skin condition to be greater than 50% compared to baseline photography [159]. Pretreatment of the skin with MNs followed by application of a topical preparation (without subsequent PDT) is an uncomplicated method of enhancing the permeation of a cosmeceutical. This methodology has been used to demonstrate improved delivery of multiple cosmeceutic agents, including eflornithine to treat hirsutism and minoxidil to treat androgenic alopecia [160, 161]. The delivery of a peptide-based cosmeceutical, melanostatin, was enhanced through a similar methodology by Mohammed et al. [162]. With the level of research into MN-mediated peptide delivery increasing, it is likely that advancements