In the case of dissolvable microneedles, the local anesthetic in the microneedles dissolves in the tissue. As such, the dose may be controlled without fear of delivering more than is needed or toxic levels.

Accordingly, in one ~~embodiment~~aspect there is provided a medical device, comprising:

an array of microneedles, and

a coating disposed on the microneedles,

wherein the coating comprises:

a local anesthetic selected from the group consisting of lidocaine, prilocaine, and a combination thereof; and

a local anesthetic dose-extending component selected from the group consisting of alpha 1 adrenergic agonists, alpha 2 adrenergic agonists, and a combination thereof;

wherein the local anesthetic is present in an amount of at least 1 wt-% based upon total weight of solids in the coating, and

wherein the dose-extending component/local anesthetic weight ratio is at least 0.0001.

In another embodiment, there is provided a method of extending a topically delivered local anesthetic dose in mammalian tissue, the method comprising:

contacting the tissue with a local anesthetic-coated microneedle device,

wherein the device comprises:

an array of microneedles, and

a coating disposed on the microneedles,

wherein the coating comprises:

a local anesthetic selected from the group consisting of lidocaine, prilocaine, and a combination thereof; and

a local anesthetic dose-extending component selected from the group consisting of alpha 1 adrenergic agonists, alpha 2 adrenergic agonists, and a combination thereof;

wherein the local anesthetic is present in an amount of at least 1 wt-% based upon total weight of solids in the coating, and

wherein the dose-extending component/local anesthetic weight ratio is at least 0.0001.

In another ~~embodiment~~aspect, there is provided a method of making a local anesthetic-coated microneedle device comprising:

providing an array of microneedles,

providing a composition comprising:

a local anesthetic selected from the group consisting of lidocaine, prilocaine, and a combination thereof;

a local anesthetic dose-extending component selected from the group consisting of alpha 1 adrenergic agonists, alpha 2 adrenergic agonists, and a combination thereof; and

a volatilizable carrier;

wherein the dose-extending component/local anesthetic weight ratio is at least 0.0001;

contacting the microneedles with the composition, and

volatilizing at least a portion of the carrier to provide a coating disposed on the microneedles;

wherein the coating comprises the local anesthetic in an amount of at least 1 wt-% based upon total weight of solids in the coating; and

wherein the device comprises the array of microneedles with the coating disposed on the microneedles.

In another ~~embodiment~~aspect, there is provided a medical device, comprising an array of dissolvable microneedles, the microneedles comprising:

a dissolvable matrix material;

at least 1 wt-% of a local anesthetic selected from the group consisting of lidocaine, prilocaine, and a combination thereof; and

a local anesthetic dose-extending component selected from the group consisting of alpha 1 adrenergic agonists, alpha 2 adrenergic agonists, and a combination thereof;

wherein the dose-extending component/local anesthetic weight ratio is at least 0.0001, and

wherein wt-% is based upon total weight of solids in all portions of the dissolvable microneedles which contain the local anesthetic.

In another embodiment, there is provided a method of extending a topically delivered local anesthetic dose in mammalian tissue, the method comprising: