CLAIMS

1. An array of hollow microneedles for rapid, high-volume, intradermal infusion with minimal pain, the array comprising:

10 to 30 hollow microneedles having a length of greater than 100 μm, with a microneedle spacing of no less than 1.5 mm on average between adjacent microneedles;

the array being adapted for pumping greater than 200 μL through the hollow microneedles at a rate of greater than 20 μL/min.

2. The array of claim 1, wherein the array has 13 to 20 microneedles.

3. The array of claims 1 or 2, wherein the hollow microneedles have an average channel bore of 20 to 50 μm^2 cross-sectional area.

4. The array of any preceding claim, wherein the microneedles have a length of between 500 μm and 750 μm.

5. The array of any preceding claim, wherein the microneedles have a spacing density of 30 to 50 microneedles per cm^2.

6. The array of any preceding claim, wherein at least 750 μL of fluid is pumped through the microneedles.

7. The array of any preceding claim, wherein the fluid is pumped through the hollow microneedles at a rate of at least 400 μL/min.

8. The array of any preceding claim, wherein the microneedles have an exit hole located on a sidewall of each microneedle.

9. The array of any preceding claim, wherein the microneedles are spaced an average of at least 2 mm apart from each other.

CLAIMS

1. An array of hollow microneedles for rapid, high-volume, intradermal infusion with minimal pain, the array comprising:

10 to 30 hollow microneedles having a length of greater than 100 μm, with a microneedle spacing of no less than 1.5 mm on average between adjacent microneedles;

the microneedle array capable of pumping greater than 200 μL through the hollow microneedles at a rate of greater than 20 μL/min.

2. The microneedle array of claim 1, wherein the array has 13 to 20 microneedles.

3. The microneedle array of claims 1 or 2, wherein the hollow microneedles have an average channel bore of 20 to 50 μm^2 cross-sectional area.

4. The microneedle array of any preceding claim, wherein the microneedles have a length of between 500 μm and 750 μm.

5. The microneedle array of any preceding claim, wherein the microneedles have a spacing density of 30 to 50 microneedles per cm^2.

6. The microneedle array of any preceding claim, wherein the microneedles have an exit hole located on a sidewall of each microneedle.

7. The microneedle array of any preceding claim, wherein the microneedles are spaced an average of at least 2 mm apart from each other.