[0010] In another aspect, the present pharmaceutical formulation maximizes the bioavailability of the clostridial derivative by preventing or minimizing the adsorption of the clostridial derivative to catheters, deliver device surfaces (syringe, patch, microneedle, engineered injector (Bioject, etc.), tubing and containers.

[0011] According to another aspect, the present disclosure provides methods for treating medical disorders in a patient, the methods comprise the step of administering a pharmaceutical composition provided in accordance with the present disclosure, thereby treating the medical disorders. In one embodiment, the present methods alleviate one or more symptoms of the medical disorders. In one embodiment, the medical disorders include neurogenic idiopathic bladder dysfunction, or bladder pain. In some aspects, a method is provided for treating a patient with a neurogenic or idiopathic bladder dysfunction, bladder pain, comprising: intravesically instilling into the bladder of the patient a pharmaceutical composition comprising a therapeutically effective amount of a clostridial derivative and at least one permeabilizing agent present in an amount effective to substantially increase the permeability of the bladder wall to the clostridial derivative at a therapeutically effective rate.

[0011a] In another aspect, the present disclosure provides the use of a pharmaceutical composition comprising a therapeutically effective amount of a clostridial derivative and at least one permeabilizing agent in the manufacture of a medicament for treating a patient with a neurogenic bladder dysfunction, wherein the at least one permeability agent is present in an amount effective to substantially increase the permeability of the bladder wall to the botulinum neurotoxin at a therapeutically effective rate, and wherein the medicament is to be intravesically instilled to the bladder wall of the patient.

[0011b] In another aspect, the present disclosure provides a pharmaceutical composition comprising a therapeutically effective amount of a clostridial derivative and at least one permeabilizing agent,
wherein the clostridial derivative is a botulinum toxin, and wherein the at least one permeabilizing agent comprises a non-ionic surfactant and a mucoadhesive, which is a cationic polymer, and

wherein the at least one permeabilizing agent is present in an amount effective to substantially and reversibly increase the permeability of the bladder wall to the clostridial derivative.

[0011c] In another aspect, the present disclosure provides use of the pharmaceutical composition as described herein in the manufacture of a medicament for treating a patient with a neurogenic bladder dysfunction, wherein the medicament is to be intravesically instilled to the bladder wall of the patient.

[0012] Other aspects and variations of the present pharmaceutical formulations and methods summarized above are also contemplated and will be more fully understood when considered with respect to the following disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] **FIG. 1** shows a prior art intracystinal injection of a botulinum toxin to the bladder wall;

[0014] **FIGS. 2A-2C** are schematics of the urothelium, wherein:

A) The urothelium consists of three cell layers: basal, intermediate, and superficial umbrella cells.

B) The umbrella cells display plaques on their apical membrane and a cytoplasmic network of vesicles containing fibrils joined at the tight junction and the desmosomes on the smooth basal membrane.

C) The apical membrane of the urothelium viewed for the lumen shows the plaque and hinge regions.

[0015] **FIG. 3** is a pictorial diagram establishing a basis for assessing the extent of penetration into the bladder of a test formulation; wherein cleaved SNAP 25 was used as a biomarker of

WE CLAIM:

1. A pharmaceutical composition comprising a therapeutically effective amount of a clostridial derivative and at least one permeabilizing agent,
wherein the clostridial derivative is a botulinum toxin, and wherein the at least one permeabilizing agent comprises a non-ionic surfactant and a mucoadhesive, which is a cationic polymer, and
wherein the at least one permeabilizing agent is present in an amount effective to substantially and reversibly increase the permeability of the bladder wall to the clostridial derivative.
2. The pharmaceutical composition of claim 1, wherein the surfactant comprises an alkyl aryl polyether.
3. The pharmaceutical composition of claim 1, wherein the mucoadhesive comprises chitosan, chitosan analogs, chitosan derivatives or combinations thereof.
4. The pharmaceutical composition of claim 1, wherein the surfactant is present in an amount ranging from about 0. 01% to about 0.5% (w/v).
5. The pharmaceutical composition of claim 2, wherein the mucoadhesive is present in an amount ranging from about 0.01% to about 5% (w/v).
6. The pharmaceutical composition of claim 2, wherein the surfactant comprises octoxynol-9.
7. The pharmaceutical composition of claim 2, wherein the surfactant comprises nonoxynol-9.
8. The pharmaceutical composition of claim 6, wherein the surfactant is present in an amount of about 0.1% (w/v).
9. The pharmaceutical composition of claim 7, wherein the surfactant is present in an amount of about 0.1% (w/v).
10. Use of the pharmaceutical composition according to claim 1 in the manufacture of a medicament for treating a patient with a neurogenic bladder dysfunction, wherein the medicament is to be intravesically instilled to the bladder wall of the patient.
11. The use according to claim 10, wherein the surfactant comprises an alkyl aryl polyether.
12. The use according to claim 10, wherein the mucoadhesive comprises chitosan, chitosan analogs, chitosan derivatives or combinations thereof.

13. The use according to claim 10, wherein the surfactant is present in an amount ranging from about 0.01% to about 0.5% (w/v).
14. The use according to claim 12, wherein the mucoadhesive is present in an amount ranging from about 0.01% to about 5% (w/v).
15. The use according to claim 11, wherein the surfactant comprises octoxynol-9.