

APPARATUSES, SYSTEMS, AND METHODS FOR AEROSOLIZED DRUG ADMINISTRATION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Application No. 63/591,432, filed October 18, 2023, the entire contents of which are incorporated herein by reference in their entirety.

FIELD

[0002] The present disclosure relates generally to apparatuses, systems, and methods for administration of an aerosolized drug. The present disclosure also generally relates to drugs for use in the treatment of a disease or disorder wherein the drug is administered by the apparatuses, systems, and methods of the disclosure.

BACKGROUND

[0003] Inhalation of an aerosolized drug is a technique to deliver drugs to a user. The aerosolized drug is inhaled into the lungs of a patient, which leads to absorption of the drug into the bloodstream and systemic distribution.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Further features of the present disclosure will become apparent to those skilled in the art to which the present disclosure relates from reading the following specification with reference to the accompanying drawings, in which:

[0005] FIG. 1A is an isometric view of a connect element and a holding chamber, according to at least one instance of the present disclosure;

[0006] FIG. 1B is a front view of a connect element and a holding chamber;

[0007] FIG. 2 is a bottom view of a connect element and a holding chamber;

[0008] FIG. 3 is an isometric view of a drug assembly

[0009] FIG. 4 is a front view of a drug assembly;

[0010] FIG. 5 is a left side view of a drug assembly;

[0011] FIG. 6 is a right side view of a drug assembly;

[0012] FIG. 7 is a bottom isometric view of a drug assembly;

[0013] FIG. 8 is an isometric view of a mouthpiece;

[0014] FIG. 9 is a front view of a mouthpiece;

- [0015] FIG. 10 is a rear view of a mouthpiece;
[0016] FIG. 11 is an isometric view of a vaporizer;
[0017] FIG. 12 is a front view of a vaporizer;
[0018] FIG. 13 is a rear view of a vaporizer; and
[0019] FIG. 14 is a flow chart of a method in one example.

DETAILED DESCRIPTION

[0020] It will be appreciated that for simplicity and clarity of illustration, where appropriate, reference numerals have been repeated among the different figures to indicate corresponding or analogous elements. In addition, numerous specific details are set forth in order to provide a thorough understanding of the embodiments described herein. However, it will be understood by those of ordinary skill in the art that the embodiments described herein can be practiced without these specific details. In other instances, methods, procedures, and components have not been described in detail so as not to obscure the related relevant feature being described. The drawings are not necessarily to scale and the proportions of certain parts may be exaggerated to better illustrate details and features. The description is not to be considered as limiting the scope of the embodiments described herein.

[0021] Several definitions that apply throughout this disclosure will now be presented.

[0022] The term “coupled” is defined as connected, whether directly or indirectly through intervening components, and is not necessarily limited to physical connections. The connection can be such that the objects are permanently connected or releasably connected. The term “substantially” is defined to be essentially conforming to the particular dimension, shape or other word that substantially modifies, such that the component need not be exact. For example, substantially cylindrical means that the object resembles a cylinder, but can have one or more deviations from a true cylinder. The term “comprising” means “including, but not necessarily limited to”; it specifically indicates open-ended inclusion or membership in a so-described combination, group, series and the like.

[0023] As used herein, when referring to any numerical value, the term “about” means a value falling within a range that is ± 10 percent of the stated value.

[0024] Ranges can be expressed herein as from “about” one particular value, and/or to “about” another particular value. When such a range is expressed, a further aspect includes from the one particular value and/or to the other particular value. Similarly,

when values are expressed as approximations, by use of the antecedent “about,” it will be understood that the particular value forms a further aspect. It will be further understood that the endpoints of each of the ranges are significant both in relation to the other endpoint and independently of the other endpoint. It is also understood that there are a number of values disclosed herein, and that each value is also herein disclosed as “about” that particular value in addition to the value itself. For example, if the value “10” is disclosed, then “about 10” is also disclosed. Where the term “about” is used in relation to a particular value, the term “about” is optional. It is also understood that each unit between two particular units are also disclosed. For example, if 10 and 15 are disclosed, then 11, 12, 13, and 14 are also disclosed.

[0025] The term “aerosol,” “aerosolized,” or any other variation of such terms, is defined as a substance (e.g., the drug) diffused or suspended in air, or turning a substance (e.g., the drug) into a form that can be diffused or suspended in air.

[0026] As used herein, unless stated otherwise, the term “patient” refers to a subject having at least one of the diseases or disorders as disclosed herein. The subject is typically a human or non-human animal e.g. mammal. Preferably, the subject is a human.

[0027] As used herein, unless stated otherwise, the terms “mental disorder” and “nervous system disorder” mean any disorder that affects mood, thinking and behaviour, including but not limited to, postpartum depression, sleep disturbance, major depressive disorder, persistent depressive disorder, bipolar disorder (such as bipolar I disorder and bipolar II disorder), anxiety disorder, posttraumatic stress disorder, body dysmorphic disorder, obsessive-compulsive disorder, eating disorder and psychoactive substance abuse. Diagnosis of a patient with a “mental disorder” or a “nervous system disorder” can be in accordance with the Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition (DSM-5) published by the American Psychiatric Association as suffering from a mental disorder or nervous system disorder. The diagnosis can be by a physician or a psychologist. It is generally not sufficient that the human subject themselves considers that they are suffering from one of the disorders.

[0028] As used herein, unless stated otherwise, the terms “treating” and “treatment” include the management and care of a patient for the purpose of combating a disease or disorder and includes administration of drugs (e.g. by the methods and systems

disclosed here) according to the present application to alleviate the signs and/or symptoms or eliminate the disease or disorder.

[0029] The problem solved by the disclosed subject matter included finding a solution where the active pharmaceutical ingredient (API), or the drug, is properly administered to a patient in need thereof. The disclosed apparatuses, systems, and methods provide better consistency of delivered dose uniformity, particle size distribution, and ease of use for physicians and other administrators of aerosols. For example, the apparatuses, systems, and methods provided herein allow for safe and effective administration of an aerosol, which can include an aerosolized drug. Furthermore, the disclosed apparatuses, systems, and methods enable production of aerosols with characteristics (e.g., particle size distribution) suited to deep lung deposition. In addition, the disclosed apparatuses, systems, and methods provide safe production and administration of psychoactive compounds because they enable the production and administration of aerosols with reduced risk of leakage and inadvertent exposure.

[0030] The present application provides a method for administration for drugs (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) through inhalation into the lungs of an aerosolized drug ultimately leading to the absorption of the drug into the bloodstream and systemic distribution. The aerosolized drug can be generated by exposing drug-containing materials to high temperatures. The drug can be heated to a vapor then subsequently cool and condense into an aerosolized drug. The aerosolized drug can be delivered with a volume of air.

[0031] Based on their pharmacological activities, there are potential medical uses of drugs. For example, uses in human clinical trials and uses in an approved medical product for treatment of patients require administration of the drug in high purity.

[0032] The present application provides a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for use as a medicament wherein the drug is administered to a patient in need thereof by the method disclosed herein.

[0033] The present application provides a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for use in the treatment of a disease or disorder wherein the treatment comprises administering the drug to a patient in need thereof, wherein the drug is administered by the method disclosed herein.

[0034] The present application provides the use of a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for the manufacture of a medicament for the treatment of a disease or disorder wherein the treatment comprises

administering the drug to a patient in need thereof, wherein the drug is administered by the method disclosed herein.

[0035] The present application provides a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for use as a medicament wherein the drug is administered to a patient in need thereof by the system disclosed herein.

[0036] The present application provides a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for use in the treatment of a disease or disorder wherein the treatment comprises administering the drug to a patient in need thereof, wherein the drug is administered by the system disclosed herein.

[0037] The present application provides the use of a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for the manufacture of a medicament for the treatment of a disease or disorder wherein the treatment comprises administering the drug to a patient in need thereof, wherein the drug is administered by the system disclosed herein.

[0038] The present application provides a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for use as a medicament wherein the drug is comprised within the drug assembly as disclosed herein.

[0039] The present application provides a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for use in the treatment of a disease or disorder wherein the drug is comprised within the drug assembly as disclosed herein.

[0040] The present application provides the use of a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for the manufacture of a medicament for the treatment of a disease or disorder wherein the drug is comprised within the drug assembly as disclosed herein.

[0041] Examples of diseases or disorders that can be treated by the present disclosure include postpartum depression, sleep disturbance, major depressive disorder, persistent depressive disorder, bipolar disorder, anxiety disorder, posttraumatic stress disorder, body dysmorphic disorder, obsessive-compulsive disorder, eating disorder, psychoactive substance abuse, epilepsy, sickness associated with chemotherapy, acute pain, chronic pain, phantom pain, migraine, multiple sclerosis, multiple sclerosis spasms, schizophrenia, insomnia, rheumatoid arthritis, psychosis, HIV-induced anorexia, sleep apnea, alcohol use disorder, suicidal ideation, psychoactive substance use disorder, smoking cessation,

Parkinson's disease, dementia, pleuropneumonitis, parasitic conditions, pneumocystis pneumonia, HIV related dementia, cough, diarrhoea, nausea, opioid abuse, seizures and shortness of breath. In at least one example, the diseases or disorders that can be treated by the present disclosure include postpartum depression, sleep disturbance, major depressive disorder, persistent depressive disorder, bipolar disorder, anxiety disorder, posttraumatic stress disorder, body dysmorphic disorder, obsessive-compulsive disorder, eating disorder, psychoactive substance abuse, epilepsy, acute pain, chronic pain, phantom pain, migraine, multiple sclerosis, schizophrenia, insomnia, rheumatoid arthritis, psychosis, sleep apnea, suicidal ideation, Parkinson's disease, dementia, pleuropneumonitis, parasitic conditions, pneumocystis pneumonia, diarrhoea and nausea.

[0042] The present application provides a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for use in treatment of a mental disorder or a nervous system disorder comprising administering the drug to a patient in need thereof, wherein the drug is administered by the method disclosed herein.

[0043] The present application also provides a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for use in treatment of a mental disorder or a nervous system disorder wherein the drug is administered by the system disclosed herein.

[0044] The present application also provides a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for use in treatment of a mental disorder or a nervous system disorder comprising administering the drug to a patient in need thereof, wherein the drug is comprised within the drug assembly disclosed herein.

[0045] Examples of mental disorders or nervous system disorders that can be treated by the present disclosure include postpartum depression, sleep disturbance, major depressive disorder, persistent depressive disorder, bipolar disorder, anxiety disorder, posttraumatic stress disorder, body dysmorphic disorder, obsessive-compulsive disorder, eating disorder and psychoactive substance abuse. In a preferred example, the mental disorder or nervous system disorder is major depressive disorder.

[0046] The present application also provides a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for use in treating a treatment-resistant form of a mental disorder or a nervous system disorder comprising

administering the drug to a patient in need thereof, wherein the drug is administered by the method disclosed herein.

[0047] The present application also provides a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for use in treating a treatment-resistant form of a mental disorder or a nervous system disorder comprising administering the drug to a patient in need thereof, wherein the drug is administered by the system disclosed herein.

[0048] The present application also provides a drug (e.g., 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, etc.) for use in treating a treatment-resistant form of a mental disorder or a nervous system disorder wherein the drug is comprised within the drug assembly disclosed herein.

[0049] Unless stated otherwise, the drug is administered as an aerosolized drug. Administration of an aerosolized drug to a patient by the methods and systems disclosed herein, or as part of the drug assemblies disclosed herein, leads to absorption of the drug into the bloodstream of the patient and can achieve systemic distribution.

[0050] The drug can be pre-packaged for transportation and storage. By retaining the drug in a drug cartridge prior to packaging, transportation, and/or storage, the dosage of the drug and the correct administration of the drug via the drug cartridge is ensured. In an example, the drug cartridge can be retained in or integral to a drug cartridge housing. Together, the drug cartridge and drug cartridge housing can be referred to as a drug assembly. However, the drug assembly should be able to retain the drug without leakage to ensure that the correct dosage of the drug is provided. The drug assembly should also be able to deliver the desired thermal energy to the drug retained thereon so that the drug efficiently vaporizes. Further, the drug assembly should also have sufficient porosity to permit air to flow therethrough to promote and release the drug.

[0051] In at least one example, the drug cartridge can be retained in a drug cartridge housing during storage, transport and use. When in use, the drug cartridge housing retaining the drug cartridge can be utilized with the vaporizer without the need for removal of the drug cartridge. Retaining the drug cartridge in the housing can, for example, make the cartridge easier to handle and/or, for example, render it more tamper resistant.

[0052] Disclosed herein is a system for providing an aerosol to a patient in need thereof. The system can include a drug assembly, an aerosol containment device, a mouthpiece, and a vaporizer.

[0053] FIGS. 1A-2 illustrate an aerosol containment device in one example. The aerosol containment device can include a connect element 100 coupled to a holding chamber 108. The connect element 100 can include one or more mating mechanisms. As illustrated in FIGS. 1A-2, the one or more mating mechanisms can include a first locking clip 114(a) (e.g., snap arm) and a first releasing tab 102(a) and a second locking clip 114(b) (e.g., snap arm) and second releasing tab 102(b). The one or more mating mechanisms can further include four slots 112(a), 112(b), 112(c), 112(d). Each of the four slots 112(a), 112(b), 112(c), 112(d) can be located adjacent either side of the first locking clip 114(a) and first releasing tab 102(a) and the second locking clip 114(b) and second releasing tab 102(b), respectively.

[0054] The locking clips 114(a), 114(b) can be received within respective slots in a drug assembly. The locking clips 114(a), 114(b) can lock into place within the respective slots, thereby creating a secure connection between the connect element 100 and the drug assembly. The releasing tabs 102(a), 102(b) can be compressed to release (i.e., unlock) the locking clips 114(a), 114(b) from the respective slots. The bottom portion of the releasing tabs 102(a), 102(b) can have grooves that can be compressed to release the locking clips 114(a), 114(b) from the respective slots. More than two releasing tabs, locking clips, and slots can be used. For example, the connect element 100 can include three, four, five, six, seven, eight, nine, ten or more releasing tabs and locking clips configured to removably couple to respective slots in a drug cartridge housing and/or mouthpiece. Other mating mechanisms can be used to removably couple the connect element 100 to the drug assembly. For example, other snap-fit mechanisms, groove and projection (e.g., rotating lock) mechanisms, latches, magnetic connections, or other mating mechanisms known in the art can be used. The one or more mating mechanisms of the connect element 100 can provide a retaining function between the connect element 100 and the drug assembly and/or mouthpiece such that a seal is created and maintained between internal channels of the connect element 100 and the drug assembly and/or mouthpiece.

[0055] The one or more mating mechanisms of the connect element 100 can further include two retaining tabs 104(a), 104(b). The retaining tabs 104(a), 104(b) can be configured to fit through holes in the drug assembly and directly contact a drug

assembly port of a vaporizer. Once the drug assembly is removably coupled to the connect element 100, the drug assembly and connect element 100 can be removably coupled to the drug assembly port of the vaporizer. Both the drug assembly and the connect element 100 can have components configured to directly couple to the drug assembly port of the vaporizer. The two retaining tabs 104(a), 104(b) of the connect element 100 pass through holes in the drug assembly and contact a corresponding face of the drug assembly port. The two retaining tabs 104(a), 104(b) can be triangular. The two retaining tabs 104(a), 104(b) can be other shapes operable to prevent rotation with corresponding tabs in the corresponding face of the drug assembly port of the vaporizer. When the drug assembly and connect element 100 is rotated to removably couple to the drug assembly port, the two retaining tabs 104(a), 104(b) can slide over corresponding tabs in the face of the drug assembly port, thereby clicking into place and preventing rotation of the drug assembly and connect element 100 in one direction. The two retaining tabs 104(a), 104(b) perform a retaining function, thereby preventing removal of the drug assembly from the drug assembly port of the vaporizer by preventing rotation of the drug assembly in a reverse direction (e.g., opposite the direction of rotation to couple the drug assembly and connect element 100 to the vaporizer port). The connect element 100 must be uncoupled from the drug assembly, by compressing the releasing tabs 102(a), 102(b), before the drug assembly can be removed from the drug assembly port due to the two retaining tabs 104(a), 104(b).

[0056] The retaining tabs 104(a), 104(b) are configured to lock rotation of the drug assembly and connect element 100 in the drug assembly port of the vaporizer, but do not prevent removal of the connect element 100 in a translational manner (e.g., removing in a direction perpendicular to the rotational axis of the drug assembly port). The projections in the drug assembly, described herein, prevent removal of the drug assembly from a groove of the drug assembly port translationally (e.g., removing in a direction perpendicular to the drug assembly port). Therefore, the connect element 100 must be removed from the drug assembly port of the vaporizer before the drug assembly is removed from the drug assembly port.

[0057] The one or more mating mechanisms of the connect element 100 can further include two additional slots 118(a), 118(b). The slots 118(a), 118(b) can be configured to receive a tab of a mouthpiece. Other mating mechanisms can be used to removably couple the connect element 100 to the mouthpiece. For example, other snap-fit mechanisms, groove and projection (e.g., rotating lock) mechanisms, latches,

magnetic connections, or other mating mechanisms known in the art can be used. The slots 118(a), 118(b), when removably coupled to tabs of the mouthpiece, can provide a retaining function between the connect element 100 and the mouthpiece such that there is no leakage of fluid between connected internal channels of the connect element 100 and the mouthpiece.

[0058] The connect element 100 can have a slot 112(a) adjacent to the releasing tab 102(b) and locking clip 114(b). The connect element 100 can have another slot 112(d) adjacent to the opposite side of the releasing tab 102(b) and locking clip 114(b) as illustrated, for example, in FIG. 2. Similarly, slots 112(b), 112(c) can be adjacent each side of the releasing tab 102(a) and locking clip 114(a). The slots 112(a), 112(b), 112(c), 112(d) can be configured to receive respective projections from a mouthpiece, thereby guiding the mating mechanisms of the connect element 100 to removably couple with the mating mechanisms of the mouthpiece. The locking clips 114(a), 114(b) can further provide a guiding function by fitting between the projections in the mouthpiece. The locking clips 114(a), 114(b) can ensure that the mouthpiece and the connect element 100 can only move relative to one another along one axis. The slots 118(a), 118(b), and corresponding tabs in the mouthpiece, can provide a permanent or near-permanent connection (e.g., irreversibly coupled) between the connect element 100 and the mouthpiece. The retaining tabs 104(a), 104(b) can flex radially outward to allow the tabs of the mouthpiece to couple to the slots 118(a), 118(b). The retaining tabs 104(a), 104(b) can then hold the tabs of the mouthpiece in place in the slots 118(a), 118(b). The slots 118(a), 118(b), 112(a), 112(b), 112(c), 112(d) can be formed in the exterior of the connect element 100.

[0059] The connect element 100 can be connected to a holding chamber 108. The holding chamber 108 can be configured to receive and contain an aerosolized drug. The connect element 100 and the holding chamber 108 can be connected via a permanent seal. The permanent seal can be a ring 106. The ring 106 can be a silicone gasket or other similar type of ring operable to seal the holding chamber 108 and the connect element 100. Snap fit connections or other connection mechanisms can additionally be used to connect and seal the connect element 100 to the holding chamber 108. The connect element 100 can be directly connected to the holding chamber 108 using the material of the holding chamber 108 soldered, welded, or otherwise sealed, to the connect element 100.

[0060] The holding chamber 108 can be manufactured in a rolled configuration for ease of transport and can be unrolled before use. The holding chamber 108 can be collapsible (e.g., foldable, rollable, etc.) for ease of transport. The holding chamber 108 can have a volume of about 0.5 liters (L) to about 1 L, about 1 L to about 2 L, about 2 L to about 3 L, about 3 L to about 4 L, about 4 L to about 5 L, or more. The holding chamber 108 can have a coating on its interior surface configured to prevent adhesion of an aerosolized drug. The holding chamber 108 can be made of a material the stands upright therefore allowing the full volume of the holding chamber 108 to be filled without any resistance from the holding chamber walls. For example, the holding chamber 108 can be made of a material the stands upright therefore allowing the full volume of the holding chamber 108 to be filled without any obstruction from the holding chamber walls. Further, the holding chamber 108 can be configured to stand in an upright position to enhance aerosolized drug formation and minimize the impaction of the aerosolized drug on the holding chamber walls upon entry of the aerosolized drug into the holding chamber. The holding chamber 108 can be made of a rigid material that is not rollable. The holding chamber 108 can include an outer rigid material configured to stand upright and an inner flexible material configured to contain the aerosolized drug. The outer rigid material can enclose the inner flexible material or can be open ended. The interior surface of the holding chamber 108 can be antistatic. The interior surface of the holding chamber 108 can have an inlet (e.g., coupled/sealed to the connect element) configured to minimize adhesion of the aerosolized drug.

[0061] As illustrated in FIG. 1B, the holding chamber 108 can include one or more materials. The holding chamber 108 can include one or more transparent sections 124 and one or more opaque sections 122. The one or more transparent sections 124 can be fully transparent or partially transparent. The one or more transparent sections 124 can allow a user to view the interior contents of the holding chamber 108. For example, a user can assess a fill level of the holding chamber 108 by viewing the interior contents of the holding chamber 108 through the one or more transparent sections 124. The one or more transparent sections 124 can allow the user to assess if the holding chamber 108 is full or empty. The entire holding chamber 108 can be formed of a transparent or partially transparent material.

[0062] The connect element 100 can have a channel 110 (e.g., internal fluid flow path). The channel 110 can be in fluid communication with the holding chamber 108, thereby providing a fluid flow path for fluid to flow from the connect element 100 to the holding

chamber 108. The channel 110 can create a sealed fluid flow path between the mouthpiece and/or drug cartridge housing and the holding chamber 108 when the connect element is coupled to the mouthpiece and/or drug assembly.

[0063] The connect element 100 can be made of a metal, plastic, or other materials. The holding chamber 108 can be made of plastic or another flexible or rigid material that creates a sealed volume of fluid. The connect element 100 and the holding chamber 108 can be heat resistant. The connect element 100 and holding chamber 108 can be made of materials that are resistant to melting or giving off toxic fumes when in close proximity to the vaporizer, thereby preventing the generation and addition of undesired particles into the dose of the aerosolized drug to be administered to the patient.

[0064] The connect element 100 can have a valve in the channel 110. The valve in the channel 110 can have an open state and a closed state. In the open state, the valve can allow fluid to flow through the channel 110 into the holding chamber 108 or out of a mouthpiece attached to an end of the connect element 100 opposite of the holding chamber 108. In the closed state, the valve can prevent fluid from flow to or from the holding chamber 108. The valve can create a seal (e.g., contact the side walls of the channel 110) in the closed state. In this manner, the valve can retain any fluid in the holding chamber 108 and prevent any fluid from entering the holding chamber 108.

[0065] The valve can be naturally in a close state, meaning when no force is applied the valve is in the closed state. When the connect element 100 is coupled to the drug assembly, the valve can be provided a force from the drug assembly. The force provided to the valve can place the valve in the open state (e.g., allowing fluid flow through the connect element 100 into the holding chamber 108). In this manner, the valve can be in the open state (e.g., from the force provided by the drug assembly) when the drug is being transitioned to an aerosolized drug in the holding chamber 108. Connection between the drug assembly and the connect element 100 can automatically place the valve in the open state. When the mouthpiece is attached to the connect element 100, the valve can be placed in the open state by applying a force (e.g., translating the mouthpiece inward toward the connect element 100). The valve can be transitioned to the open state when a patient is ready to inhale the aerosolized drug by pressing the mouthpiece toward the connect element. Connections between the mouthpiece, drug assembly, and connect element are further described herein.

[0066] The valve in the channel 110 of the connect element can have a linkage arm 120. The linkage arm 120 can have a spring. The force provided from either the drug assembly or the mouthpiece can be provided to the linkage arm 120. When the force is provided to the linkage arm 120, the linkage arm 120 can cause the valve to transition to the open state. When the force is provided by the drug assembly, the spring force is overcome the entire time the drug assembly is attached to the connect element due to the geometry of the drug assembly (e.g., the drug assembly is configured such that, once connected, the force on the spring is overcome by the connection force of the drug assembly). When the force is provided by the mouthpiece, the spring can cause an opposing force on the mouthpiece, such that a greater force than the force provided by the spring must be provided on the mouthpiece to transition the valve to the open state.

[0067] As illustrated in FIG. 3, the system can include a drug assembly 200 which includes a drug cartridge housing 216 and a drug cartridge 300. The drug assembly 200 can have a channel 204 and one or more mating mechanisms configured to removably couple to various components of the system. The drug assembly 200 can have a first housing mating mechanism, a second housing mating mechanism, and a third housing mating mechanism. The first housing mating mechanism can be a first slot 202(a) and a second slot 202(b). The first slot 202(a) and the second slot 202(b) can be located on opposite sides of the drug assembly 200. The slots 202(a), 202(b) can be configured to removably couple to the locking clips 114(a), 114(b) of the connect element 100. The first housing mating mechanism can be another type of mating mechanism configured to removably couple to the one or more mating mechanism of the connect element 100. The first housing mating mechanism can include other snap-fit mechanisms, groove and projection (e.g., rotating lock) mechanisms, latches, magnetic connections, or other mating mechanisms known in the art. Any kind of opposing mating mechanisms can be used to secure the connect element 100 to the drug assembly 200.

[0068] As illustrated in FIG. 4, the drug assembly 200 can have two guides 206(a), 206(b) above the first slot 202(a) and the second slot 202(b), respectively. The guides 206(a), 206(b) can be used to align the first slot 202(a) and the second slot 202(b) with the locking clips 114(a), 114(b) of the connect element 100.

[0069] The drug assembly 200 can automatically place the valve of the connect element 100 in the open state when the drug assembly 200 is removably coupled to

the connect element. The drug assembly 200 can have one or more crosshair posts 214(a), 214(b) operable to provide a force to the linkage arm 120 of the drug assembly. Either crosshair post 214(a), 214(b) can be in communication with the linkage arm, depending on the orientation of the connection. The crosshair post has a length sufficient to provide the force to the linkage arm constantly once the drug assembly 200 is removably coupled to the connect element 100, thereby causing the valve to remain in the open state. Once the drug assembly 200 is uncoupled from the connect element, the force from either of the crosshair posts 214(a), 214(b) is removed and the valve transitions back to the closed state.

[0070] The drug assembly 200 can include a channel 204. The channel 204 can be of sufficient length such that the valve within the channel 110 of the connect element 100 is actuated (e.g., a force is applied) when the drug assembly 200 is removably coupled to the connect element 100. In this manner, fluid flow between the drug assembly 200 and the holding chamber 108 can be provided.

[0071] The channel 204 of the drug assembly 200 and the channel 110 of the connect element 100 can be configured (e.g., sized) to create an airtight seal, such that no fluid provided to the drug assembly 200 escapes the drug assembly channel 204, the channel 110 of the connect element, or the holding chamber 108. The drug assembly channel 204 and the connect element channel 110 can have an airtight seal provided by compliant seals and/or o-rings configured to seal the channels when connected.

[0072] As illustrated in FIGS. 4-7, a drug cartridge 300 can be connected to the drug cartridge housing 216, thereby forming a drug assembly 200. The drug cartridge 300 can be integral to the drug cartridge housing 216 (e.g., irreversibly coupled). The drug cartridge 300 and the drug cartridge housing 216 can be manufactured as one component (e.g., formed from a single piece). The drug cartridge 300 can be coupled to the drug cartridge housing 216 via a second housing mating mechanism.

[0073] As illustrated in FIG. 7, the second housing mating mechanism can have three tabs 208(a), 208(b), 208(c) and a retention member 212. The drug cartridge 300 can have a flange that sits above the retention member 212 (e.g., proximal the channel 204). The retention member 212 can be held in place by the tabs 208(a), 208(b), 208(c). The drug cartridge 300 can be inserted within the drug cartridge housing 216. The retention member 212 can then be inserted below the flange of the drug cartridge 300. The retention member 212 can then be locked into place by the tabs 208(a), 208(b), 208(c). In this manner, the drug cartridge 300 can be held in place within the

drug assembly 200. Other mating mechanisms and configurations can be used to hold the drug cartridge 300 in the drug cartridge housing 216. The second housing mechanism can be other snap-fit mechanisms, groove and projection (e.g., rotating lock) mechanisms, latches, magnetic connections, or other mating mechanisms known in the art. Any mating mechanisms can be used to secure the drug cartridge 300 to the drug cartridge housing 216. The drug cartridge 300 can only be inserted into and not uncoupled from the drug cartridge housing 216. The drug cartridge 300 is permanently connected to the drug cartridge housing 216. By permanently connecting the drug cartridge 300 to the drug cartridge housing 216, unauthorized use of the drug can be prevented. Further, adequate dosing of the drug can be ensured since the drug can be dosed at a manufacturing facility rather than by the end user. The configuration of the drug cartridge housing 216 and the drug cartridge 300 being permanently (e.g., irreversibly) coupled enhances usability and user friendliness by minimizing the number of assembly steps.

[0074] The drug assembly 200 can have a third housing mating mechanism. The third housing mating mechanism can be a plurality of projections configured to lock or guide movement into a groove of a drug assembly port of a vaporizer. The third housing mating mechanism can be two projections 210(a), 210(b) (e.g., port mating mechanism). The two projections 210(a), 210(b) can be configured to insert into a groove in a vaporizer drug assembly port. The drug assembly 200 can be rotated, thereby rotating the projections 210(a), 210(b) in the groove, to guide the retaining tabs 104(a), 104(b) of the connect element 100 to lock into place with corresponding tabs in the drug assembly port. The two projections 210(a), 210(b) can lock into place within the drug assembly port using a snap-fit, latch, or other similar mating mechanism. The third housing mating mechanism can be any other kind of mating mechanism described herein that is operable to secure the drug assembly 200 to the drug assembly port of the vaporizer. As described above, the retaining tabs 104(a), 104(b) can lock the coupled connect element 100 and drug assembly 200 into the drug assembly port and prevent reverse rotation (e.g., rotating the drug assembly 200 and connect element 100 opposite the direction of rotation that locked the drug assembly 200 and connect element 100 into place), thereby requiring removal of the connect element 100 before the drug assembly 200 can be removed from the drug assembly port of the vaporizer.

[0075] The drug cartridge housing 216 can be made of a material that is resistant to heat, meaning the drug cartridge housing 216 does not melt or exude toxic particles when heated and is suitable for handling. The drug cartridge housing 216 can be made of metal, plastic, or other suitable materials.

[0076] The drug cartridge 300 can be operable to hold a drug in solid form. The drug can be 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT), cannabinoid, tetrahydrocannabinol, entactogen 3,4-methylenedioxymethamphetamine, ketamine, lysergic acid diethylamide, psilocybin, N,N-dimethyltryptamine, phenylalkylamine mescaline, other tryptamines, other ergolines, other serotonergic compounds, second generation psychedelics, nicotine, pentamidine, and/or opioids such as fentanyl, morphine, naloxone, or other drugs configured to be administered in a aerosolized form. The drug can be 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT), cannabinoid, tetrahydrocannabinol, entactogen 3,4-methylenedioxymethamphetamine, ketamine, lysergic acid diethylamide, psilocybin, N,N-dimethyltryptamine, phenylalkylamine mescaline, nicotine, pentamidine, and/or opioids such as fentanyl, morphine, naloxone. The drug can be 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT), cannabinoid, tetrahydrocannabinol, entactogen 3,4-methylenedioxymethamphetamine, ketamine, lysergic acid diethylamide, psilocybin, N,N-dimethyltryptamine, phenylalkylamine mescaline and/or pentamidine. Preferably, the drug is 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT), (i.e., mebufotenin) or pharmaceutical salts thereof. In particular, the drug is 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT), (i.e., mebufotenin) free base. The drug can be hydrophilic or hydrophobic. The aerosolization process can differ depending on whether the drug is hydrophilic or hydrophobic. The drug can have a melting point of about 50 degrees C to about 80 degrees C. The drug can have a melting point of about 67.5 degrees C. Preferably, the drug is 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT), (i.e., mebufotenin) free base having a melting point of about 67.5 degrees C. Other drugs having other melting points can be used. The drug can be an HBr salt of 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT), (i.e., mebufotenin) having a melting point of about 173 degrees C. In another example, other pharmaceutical salts can be used having melting points of about 100 degrees C to about 250 degrees C.

[0077] FIGS. 8-10 illustrate a mouthpiece 400. The mouthpiece 400 can be configured to connect to the connect element 100 when the holding chamber 108 is filled with an aerosolized drug dose. The mouthpiece 400 is configured to allow a patient to inhale

the aerosolized dose from the holding chamber 108. The mouthpiece 400 can have one or more mating mechanisms configured to removably couple to the one or more mating mechanisms of the connect element 100. The mouthpiece mating mechanisms can include at least one projection and at least one tab. The one or more mating mechanisms of the mouthpiece 400 can be four projections 402(a), 402(b), 402(c), 402(d) and two tabs 404(a), 404(b). The mouthpiece 400 can further include a front plate 410, an opening 408, a lip 412, and a channel 406 in fluid communication with the opening 408.

[0078] The four projections 402(a), 402(b), 402(c), 402(d) can be operable to be inserted in the slots 112(a), 112(b), 112(c), 112(d) of the connect element 100. By inserting the four projections 402(a), 402(b), 402(c), 402(d) into the slots 112(a), 112(b), 112(c), 112(d) of the connect element 100, the tabs 404(a), 404(b) of the mouthpiece 400 can be aligned with the slots 118(a), 118(b) of the connect element 100. The tabs 404(a), 404(b) of the mouthpiece 400 can lock into the slots 118(a), 118(b) of the connect element 100, thereby coupling the mouthpiece 400 to the connect element 100. The retaining tabs 104(a), 104(b) can flex radially outward to allow the tabs 404(a), 404(b) of the mouthpiece 400 to slide into the slots 118(a), 118(b). Then the tabs 104(a), 104(b) can snap back into place preventing the tabs 404(a), 404(b) from being removed from the slots 118(a), 118(b) of the connect element 100. Further, other mating mechanisms described herein can be used to couple the mouthpiece 400 to connect element 100. The mating mechanisms can create a permanent or near-permanent connection between the mouthpiece 400 and the connect element 100. In some examples, once the mouthpiece 400 is coupled to the connect element 100, the mouthpiece 400 cannot be uncoupled from the connect element 100.

[0079] The mouthpiece 400 can have a channel 406, an opening 408, and a front plate 410. The channel 406 of the mouthpiece 400 can create an airtight seal with the channel 110 of the connect element, thereby preventing fluid from entering the external environment. The airtight seal between the channel 406 of the mouthpiece 400 and the channel 110 of the connect element 100 can be provided by compliant seals and/or one or more O-rings. The one or more O-rings can include one or more parylene coated O-rings. The one or more O-rings can include a single O-ring or multiple O-rings. The one or more O-rings can surround a circumferential edge of channel 110 and/or channel 406. The mouthpiece 400 can have one or more posts

414(a), 414(b) that are configured to provide a force to the linkage arm 120 of the connect element. The patient can provide a force to the mouthpiece (e.g., on the front plate 410), thereby causing the posts 414(a), 414(b) to provide the force to the linkage arm 120. When a force is provided to the linkage arm 120, the linkage arm 120 causes the valve in the connect element 100 to transition to the open state. The posts 414(a), 414(b) can be sized such that the mouthpiece 400 must be translated inward towards the connect element for the posts 414(a), 414(b) to provide a force to the linkage arm 120. The linkage arm 120 can have a spring that returns the valve to the closed state when the force from the patient is removed. When the valve is in the open state, the patient can inhale the aerosolized drug from the holding chamber 108 through the opening 408 in the mouthpiece 400. Other configurations of the mouthpiece 400 can be used to provide the contact and force to the linkage arm. For example, the lip 412 can have one or more posts or other projections to contact and provide a force to the linkage arm 120. The one or more parylene coated O-rings can be configured to reduce mouthpiece activation force and ensure that when the mouthpiece activation force is not supplied the holding chamber 108 is sealed (e.g., ensures the valve is in the closed state).

[0080] The mouthpiece 400 can have additional posts 418(a), 418(b), 418(c), 418(d), 418(e), 418(f). The additional posts 418(a), 418(b), 418(c), 418(d), 418(e), 418(f) can also be used to contact the linkage arm 120 of the connect element in the same manner as the posts 414(a), 414(b).

[0081] The posts 414(a), 414(b), 418(a), 418(b), 418(c), 418(d), 418(e), 418(f) of the mouthpiece 400 can be sized such that the valve in the channel 110 of the connect element 100 is not actuated automatically by the connection of the mouthpiece 400 to the connect element 100. In this manner, premature expulsion of the aerosolized drug in the holding chamber 108 can be prevented. A patient can supply a force to the opening 408 or the front plate 410 of the mouthpiece 400 to push the channel 406 of the mouthpiece 400 inward towards the connect element 100. When the patient applies the force, the valve in the channel 110 of the connect element 100 can be actuated to the open state and the aerosolized drug in the holding chamber 108 can be inhaled by the patient through the opening 408.

[0082] The mouthpiece 400 can be integral to the connect element 100. For example, the mouthpiece can be integral to the end of the connect element 100 opposite the holding chamber 108.

[0083] The mouthpiece 400 can include one or more vents to allow the patient to inhale a volume greater than the volume of in the holding chamber 108. The mouthpiece 400 can include four vents 416(a), 416(b), 416(c), 416(d). The vents 416(a), 416(b), 416(c), 416(d) can allow the patient to take a “chaser” breath, meaning the breath continues past the volume held in the holding chamber 108. The vents 416(a), 416(b), 416(c), 416(d) can allow air from outside the holding chamber 108 to also be inhaled by the patient after the total volume of the holding chamber 108 has been inhaled. The chaser breath can allow for deep lung inhalation. Further, the chaser breath can prevent a dead-stop sensation for the patient when the entire volume of the holding chamber 108 has been inhaled.

[0084] As illustrated in FIGS. 11-13, the system can include a vaporizer 500. The vaporizer 500 can include a drug assembly port 504, a heating element, and a display screen 502. The drug assembly port 504 can be configured to receive (e.g., dock) the drug assembly 200. The drug assembly port 504 can include a groove 506 operable to receive the two projections 210(a), 210(b) of the drug assembly 200. The two projections 210(a), 210(b) of the drug assembly 200 can be inserted into the groove 506 of the drug assembly port 504. The drug assembly 200 can then be rotated, thereby rotating the two projections 210(a), 210(b) in the groove 506 of the drug assembly port 504. The drug assembly 200, attached connect element 100, can be rotated until the retaining tabs 104(a), 104(b) of the connect element 100 snap or click into place with corresponding tabs 514(a), 514(b) on the drug assembly port. In another example, the two projections 210(a), 210(b) can lock into place within the groove 506 using a mating mechanism such as a snap fit or other locking mechanism. In this manner, the drug assembly 200 can be removably coupled to the vaporizer 500. The drug assembly 200, the connect element 100, and the vaporizer 500 can be coupled such that the internal components of the drug assembly 200, connect element 100, holding chamber 108, and vaporizer 500 are sealed from the external environment, thereby preventing any leakage of fluid to the external environment.

[0085] To release the locking clips 114(a), 114(b) from the slots 202(a), 202(b) in the drug assembly 200, the releasing tabs 102(a), 102(b) of the connect element 100 can be compressed. Ridges on the releasing tabs 102(a), 102(b) can be compressed to uncouple the connect element 100 and holding chamber 108 from the drug assembly 200, while leaving the drug assembly 200 coupled to the drug assembly port 504 of the vaporizer 500. Other mating mechanisms described herein can be used to

removably couple the connect element 100 directly to the vaporizer 500 while the connect element 100 is also removably coupled to the drug assembly 200.

[0086] The vaporizer 500 can include a power source port 512. The power source port 512 can be configured to receive electrical power from a power source. The vaporizer 500 can be powered by a battery or any other power source known in the art. The vaporizer 500 can include an on/off switch 508. The on/off switch 508 can be configured to turn the vaporizer 500 on or off.

[0087] The vaporizer 500 can further include a fan located inside the vaporizer 500. The fan can provide cooling to the components of the vaporizer 500, thereby preventing the vaporizer 500 from overheating. The fan can be in fluid communication with a plurality of vent holes 510. The plurality of vent holes 510 can allow air from the fan to exit the vaporizer 500. The fan and plurality of vent holes 510 can also be used to bring air into the vaporizer 500. For example, the fan can be configured to draw air from the external environment into the vaporizer 500. The air drawn into the vaporizer 500 can be heated and used as the vaporization volume of air. A pump can be used to provide a vaporization volume of air to the heated drug to form an aerosolized drug.

[0088] The heating element of the vaporizer 500 can be configured to provide heat to the drug cartridge 300 through the drug assembly port 504. Once the drug assembly 200, the connect element 100, and the holding chamber 108 are all coupled together and coupled to the vaporizer 500, the vaporizer 500 can provide heat to at least a portion of the drug cartridge 300 to influence aerosolization of the drug. The vaporizer 500 can also provide air flow (e.g., a vaporization volume of air) to the drug to move the aerosolized drug into the holding chamber 108. The vaporizer can have a conductive column that heats the air to a vaporization temperature before the air is provided to the drug in the drug cartridge 300, thereby further influencing transition of the drug to an aerosolized drug. The vaporization volume of air can be passed over the conductive column, thereby heating the vaporization volume of air. The vaporization volume of air can spiral around the conductive column, entering at the bottom of the conductive column and exiting at the top. The vaporization volume of air and the heated drug cartridge 300 can influence the transition of the drug from a solid state to a vapor, which subsequently cools and condenses to form an aerosolized drug suspended in the vaporization volume of air. The aerosolized drug can be suspended in the vaporization volume of air flowing through the drug cartridge 300, thereby providing the aerosolized drug to the holding chamber 108. The aerosolized drug can

form from subsequent cooling and thermal condensation in the drug assembly 200 and in the holding chamber 108.

[0089] The drug in the drug cartridge 300 within the drug assembly 200 is subjected to conductive heating and the drug is also subjected to convective heating by the heated vaporization volume of air. The conductive heating to the drug cartridge 300 is provided by a conductive column within the vaporizer. The convective heating is provided by the vaporization volume of air that spirals around the conductive column and then is carried through the drug cartridge 300 to heat the drug. In an example, the conductive column is a solid column. Both the vaporization volume of air and the drug cartridge 300 are provided heating by the conductive column. The drug is heated by both the conductive heating and the convective heating. The drug is heated to a vapor and then an aerosolized drug is formed in the holding chamber due to subsequent thermal condensation.

[0090] The heating element of the vaporizer 500 can provide heat at a temperature sufficient to aerosolize the drug in the drug cartridge 300 (e.g., vaporization temperature). For example, the vaporizer 500 can provide heat at a temperature of about 200 degrees Celsius (C) to about 260 degrees C. The vaporizer 500 can provide heat at a temperature of about 235 degrees C to the drug cartridge 300 and the vaporization volume of air. In some examples, the drug does not reach the vaporization temperature. The flow of air to the drug can move the aerosolized drug to the holding chamber 108 through the drug cartridge 300, drug cartridge housing 216, and connect element 100. In some examples, the vaporizer 500 can provide an air flow rate of about 2 L/min to about 25 L/min. The vaporizer 500 can provide an air flow rate of about 2 L/min to about 3 L/min, about 3 L/min to about 4 L/min, about 4 L/min to about 5 L/min, about 5 L/min to about 6 L/min, about 6 L/min to about 7 L/min, about 7 L/min to about 8 L/min, about 8 L/min to about 9 L/min, about 9 L/min to about 10 L/min, about 10 L/min to about 11 L/min, about 11 L/min to about 12 L/min, about 12 L/min to about 13 L/min, about 13 L/min to about 14 L/min, about 14 L/min to about 15 L/min, about 15 L/min to about 16 L/min, about 16 L/min to about 17 L/min, about 17 L/min to about 18 L/min, about 18 L/min to about 19 L/min, about 19 L/min to about 20 L/min, about 20 L/min to about 21 L/min, about 21 L/min to about 22 L/min, about 22 L/min to about 23 L/min, about 23 L/min to about 24 L/min, about 24 L/min to about 25 L/min, or more. The air flow rate can be about 7 L/min. The vaporizer 500 can provide heat and air flow until the volume of the aerosolized drug and air in the holding

chamber 108 is about 1 L to about 3 L. The vaporizer 500 can provide heat and air flow until the volume of the aerosolized drug and air in the holding chamber 108 is about 2 L.

[0091] The vaporizer 500 can heat the drug cartridge 300 and the vaporization volume of air and immediately begin filling the holding chamber 108 with the aerosolized drug once the drug assembly 200 and the connect element 100 are coupled to the drug assembly port 504 of the vaporizer 500. The vaporizer 500 can begin heating the drug cartridge 300 before providing an air flow. The vaporizer 500 can provide heat for a heating period and then provide air flow during a filling period (e.g., carrying the aerosolized drug into the holding chamber 108 via the vaporization volume of air). The heating period can continue during the filling period. The heating period can be about 30 seconds to about 1 minute, about 1 minute to about 2 minutes, about 2 minutes to about 3 minutes, about 3 minutes to about 4 minutes, about 4 minutes to about 5 minutes, or more. The filling period can be about 10 seconds to about 20 seconds, about 20 seconds to about 30 seconds, about 30 seconds to about 40 seconds, about 40 seconds to about 50 seconds, about 50 seconds to about 1 minute, about 1 minute to about 2 minutes, or more. The heating period and the filling period can overlap. For example, the filling period can begin while the heating period is still in process.

[0092] After the aerosolized drug is filled into the holding chamber 108, the connect element 100 can be uncoupled from the drug assembly 200 and the vaporizer 500. As discussed above, the connect element 100 can be uncoupled from the drug assembly 200 by compressing the releasing tabs 102(a), 102(b), thereby releasing the locking clips 114(a), 114(b) from the slots 202(a), 202(b) in the drug assembly 200. The mouthpiece 400 can then be coupled to the connect element 100 using the one or more mating mechanisms of the connect element 100 and the mouthpiece 400, as discussed above. When the patient is ready to inhale the dose of the aerosolized drug, the patient can actuate the valve in the connect element 100 by providing a force to the mouthpiece 400, as discussed above, and then inhale the aerosolized drug.

[0093] The vaporizer 500 can further include one or more sensors. The vaporizer can include a temperature sensor, a flow rate sensor, a location sensor (e.g., contact sensor), and/or other sensors to provide information related to the vaporization process. The temperature sensor can measure the temperature provided to the drug assembly port 504 and thereby the temperature supplied to the drug cartridge 300 and the vaporization volume of air. The flow sensor can measure the flow rate of air

provided to the drug assembly port 504 and the flow rate of air provided to the drug, the drug assembly 200, the connect element 100, and the holding chamber 108. The location sensor can measure the locations of the various mating mechanisms and thereby ensure that the components of the system are properly connected. The one or more sensors can be in communication with the display screen 502. The connection of the various components of the system can also be ensured by audible, tactile, and visual feedback. Audible feedback can be provided by audible clicking of the components together. Tactile feedback can also be provided when components are coupled together. Visual feedback can be provided by inspecting the various connections and/or indications on a display screen. Additionally, the vaporizer 500 can be configured to include a detector that determines when the drug assembly 200 is attached to the vaporizer 500. The detector can be the temperature sensor described herein. The temperature sensor can detect a temperature change indicative of the drug assembly 200 being attached to the vaporizer 500. When the drug assembly 200 is coupled to the vaporizer 500, the temperature sensor can detect a temperature decrease as the heated air in the vaporizer 500 escapes towards the drug assembly 200. The detector can be the location sensor described herein (e.g., a contact sensor operable to determine the drug assembly 200 is properly connected and/or positioned with respect to the vaporizer 500). Additionally, the detector can be formed through use of one or more sensors including one or more temperature sensors. The detector can be operable to determine a change in temperature through the one or more temperature sensors, whereby the detector determines that the drug assembly 200 is connected to the vaporizer 500. The vaporizer 500 can be configured to prevent heating of the drug assembly 200 and/or further operation unless the vaporizer 500 determines that the drug assembly 200 is attached.

[0094] The vaporizer 500 can further include a pulse width modulator. The pulse width modulator can be operable to regulate the flow rate and/or volume of air provided by the vaporizer 500 to aerosolize the drug. The pulse width modulator can regulate (e.g., control) the flow rate and volume of air provided by the vaporizer 500 utilizing pulse width modulation duty cycling. The pulse width modulator can pulse air delivery on and off in cycles to provide a time-averaged flow rate and a total volume of air. The pulse width modulator can actuate the pump or fan on and off to control the flow rate and volume of air (e.g., vaporization volume of air). In this manner, the flow rate and volume of air provided can be regulated. The pulse width modulator can operate in

conjunction with the flow sensor. The pulse width modulator can be an alternative to the flow sensor.

[0095] The vaporizer 500 can have a display screen 502. The display screen 502 can be in communication with the one or more sensors. The display screen 502 can be operable to display information about the vaporization process. For example, the display screen 502 can display temperature, flow rate, and location data from the one or more sensors. Further, the display screen 502 can be operable to receive parameters from a user. The display screen 502 can receive parameters such as a desired dose, desired vaporization temperature, desired air flow rate, and other parameters. The display screen 502 can also be used to display instructions to the user regarding the administration of the aerosolized drug. For example, the display screen 502 can indicate when to connect the drug assembly 200, connect element 100, and holding chamber 108 to the drug assembly port 504. For example, the display screen 502 can indicate that the drug assembly 200 should be coupled to the connect element 100 and the holding chamber 108 prior to being connected to the vaporizer 500. The display screen 502 can also indicate that the holding chamber 108 and the connect element 100 should be removed from the vaporizer 500 while leaving the drug assembly 200 coupled to the vaporizer 500. The display screen 502 can indicate when the dose is fully filled into the holding chamber 108 (e.g., aerosolized drug generation complete) and thereby instruct the user to remove the connect element 100 and the holding chamber 108 from the drug assembly 200. The display screen 502 can also include one or more timers for instructing a user when to proceed to a certain step in the vaporization process. The display screen 502 can display errors or warnings regarding improper operation of the vaporizer 500. For example, the display screen 502 can provide errors or warnings related to improper connections of components, temperature warnings, flow rate warnings, or other warnings to a user.

[0096] The display screen 502 can also display a status of the system, such as proper connections completed, preheat complete, aerosolized drug generation in progress, aerosolized drug generation completed, or other statuses of the system. The display screen 502 can also display one or more indicators including device ready to proceed to preheat, preheat in progress, preheat complete, ready to begin vaporization, vaporization in progress, aerosolized drug generation complete. The one or more indicators can further include a notification that the predefined temperature has been reached, a notification instructing a user to confirm that the drug assembly and aerosol

containment device have been attached to the vaporizer, a notification instructing the user to initiate vaporization, and a notification indicating that vaporization is complete and to proceed immediately to administering the drug to the patient.

[0097] The vaporizer 500 can also include one or more indicator lights. The indicator lights can be LEDs or other lights known in the art. The indicator lights can display warnings (e.g., improperly connected components, temperature errors, flow rate errors, or other warnings or errors related to the operation of the system) and completion of steps (e.g., correct connections of components, preheat complete, aerosolized drug generation in progress, aerosolized drug generation complete, or other steps related to the operation of the system).

[0098] The holding chamber 108 can have one or more sensors, audible, or visual indicators operable to determine whether the complete volume of the aerosolized drug in the holding chamber 108 has been inhaled. For example, the one or more sensors can be mechanical volume sensors or digital volume sensors operable to confirm and display an indication that the entire volume of the aerosolized drug has been inhaled by the patient. A notification, alert, and other audible and visual indicators can be provided indicating that the entire volume of the aerosolized drug has been inhaled.

[0099] Further provided herein is a method for administering a drug to a patient in need thereof. FIG. 14 illustrates an exemplary method 1600 for administering a drug to a patient in need thereof. The method 1600 can begin at block 1602. At block 1602, a vaporizer can be heated to a predefined vaporization temperature. The predefined vaporization temperature can be about 200 degrees C to about 260 degrees C. The predefined vaporization temperature can be about 235 degrees C.

[0100] At block 1604, the method 1600 can include securing a drug assembly an aerosol containment device. The aerosol containment device can include a holding chamber and a connect element. The drug assembly can include the drug configured to be aerosolized. The drug can be 5-Methoxy-N,N-Dimethyltryptamine, tetrahydrocannabinol, entactogen 3,4-methylenedioxymethamphetamine, ketamine, lysergic acid diethylamide, psilocybin, N,N-dimethyltryptamine, phenylalkylamine mescaline, other tryptamines, other ergolines, other serotonergic compounds, second generation psychedelics, nicotine, pentamidine, and/or opioids such as fentanyl, morphine, naloxone, or other drugs configured to be administered in a aerosolized form. The drug can be 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT) (i.e., mebufotenin) or pharmaceutical salts thereof. The holding chamber can be configured

to contain an aerosolized form of the drug. Securing the drug assembly to the holding chamber can include aligning one or more slots in the drug assembly with one or more locking clips of a connect element connected to the holding chamber. Other mating mechanisms can be used to secure the drug assembly to the holding chamber. For example, snap-fit mechanisms, magnetic connection mechanisms, latches, projection and groove (e.g., rotating lock) mechanisms, or other mechanisms known in the art can be used to secure the drug assembly to the holding chamber. Securing the drug assembly to the holding chamber can provide an airtight channel between the drug assembly and the holding chamber, thereby preventing fluid from leaking into the external environment.

[0101] At block 1606, the method 1600 can include securing the drug assembly to a drug assembly port of a vaporizer. Securing the drug assembly to the drug assembly port can include docking the drug assembly to the drug assembly port. Securing the drug assembly to the drug assembly port can include aligning one or more projections on a bottom surface of the drug assembly with a groove in the drug assembly port and rotating the drug assembly until one or more retaining tabs of the connect element are locked with one or more corresponding tabs in the drug assembly port. The one or more projections of the drug assembly can be locked within the groove using a snap-fit or other locking mechanism. Securing the drug assembly to the drug assembly port can provide an airtight seal between the drug assembly port, the drug assembly, the connect element, and the holding chamber, thereby preventing fluid from leaking into the external environment. The one or more tabs of the connect element can also removably couple to one or more slots in the drug assembly port. The slots in the drug assembly port can be configured such that the connect element and the holding chamber must be removed from the drug assembly port before the drug assembly is removed from the drug assembly port. Additionally, the vaporizer can be configured to determine when the drug assembly is coupled and/or attached to the vaporizer. For example, a detector can be a sensor to determine the coupling of the drug assembly to the vaporizer. Additionally, the detector can be operable to determine a change in temperature through the one or more temperature sensors, whereby the detector determines that the drug assembly 200 is connected to the vaporizer 500.

[0102] The method 1600 can include purging a volume of air from the vaporizer prior to securing the drug assembly to the drug assembly port of the vaporizer. Purging a volume of air from the vaporizer can prevent any unwanted particles from entering the

drug assembly. By purging a volume of air prior to securing the drug assembly to the drug assembly port, the drug assembly port is cleaned of any particles that can otherwise enter into the drug assembly when vaporization begins. The volume of the purged air can be about 0.1 L to about 0.2 L, about 0.2 L to about 0.3 L, about 0.3 L to about 0.4 L, about 0.4 L to about 0.5 L, about 0.5 L to about 0.6 L, about 0.6 L to about 0.7 L, about 0.7 L to about 0.8 L, about 0.8 L to about 0.9 L, about 0.9 L to about 1 L, or more.

[0103] To provide ease of transport, the holding chamber can be transported in a rolled, folded, or otherwise collapsed configuration. Therefore, when the holding chamber is transported in a rolled, folded, or collapsed configuration, the method 1600 can include unrolling, unfolding, or expanding the holding chamber at any step prior to aerosolizing the drug.

[0104] At block 1608, the method 1600 can include aerosolizing the drug into the holding chamber. The drug can be aerosolized by providing a vaporization temperature to a drug cartridge of the drug assembly and to a vaporization volume of air. The vaporization temperature can be about 200 degrees C to about 260 degrees C. The vaporization temperature can be about 200 degrees C to about 210 degrees C, about 210 degrees C to about 220 degrees C, about 220 degrees C to about 230 degrees C, about 230 degrees C to about 240 degrees C, about 240 degrees C to about 250 degrees C, about 250 degrees C to about 260 degrees C or more. The vaporization temperature can be about 235 degrees C. Aerosolizing the drug can further include providing a volume of vaporization air to the drug assembly to move the aerosolized drug through the drug assembly and into the holding chamber. The vaporization volume of air can also be heated to the vaporization temperature, thereby further influencing transition of the drug to an aerosolized drug. The volume of vaporization air can be about 0.5 L to about 1 L, 1 L to about 1.5 L, about 1.5 L to about 2 L, about 2 L to about 2.5 L, about 2.5 L to about 3 L, or more. In an example, the drug does not reach the vaporization temperature. The volume of vaporization air can be provided by a pump in the vaporizer. In various examples, the volume of vaporization air can be provided at a flow rate of about 1 L/min to about 2 L/min, about 2 L/min to about 3 L/min, about 3 L/min to about 4 L/min, about 4 L/min to about 5 L/min, about 5 L/min to about 6 L/min, about 6 L/min to about 7 L/min, about 7 L/min to about 8 L/min, about 8 L/min to about 9 L/min, about 9 L/min to about 10 L/min, about 10 L/min to about 11 L/min, about 11 L/min to about 12 L/min, about 12 L/min

to about 13 L/min, about 13 L/min to about 14 L/min, about 14 L/min to about 15 L/min, about 15 L/min to about 16 L/min, about 16 L/min to about 17 L/min, about 17 L/min to about 18 L/min, about 18 L/min to about 19 L/min, about 19 L/min to about 20 L/min, about 20 L/min to about 21 L/min, about 21 L/min to about 22 L/min, about 22 L/min to about 23 L/min, about 23 L/min to about 24 L/min, about 24 L/min to about 25 L/min, or more. The volume of vaporization air can be about 2 L provided at an air flow rate of about 7 L/min.

[0105] Block 1608 can be automated. For example, the vaporizer can be preprogrammed to aerosolize the drug. The vaporizer can be preprogrammed for optimal aerosol generation. The vaporizer can be preprogrammed to provide heated air at a vaporization temperature of about 235 degrees C at a flow rate of 7 L/min. The vaporizer can be preprogrammed to deliver a 2 L volume of vaporization air. In some examples, once the drug assembly and aerosol containment device are connected to the vaporizer, a user can turn on the vaporizer and the vaporizer is preprogrammed to aerosolize the drug.

[0106] The drug cartridge within the drug assembly can be subjected to conductive heating and the drug is also subjected to convective heating by the heated vaporization volume of air. The conductive heating to the drug cartridge is provided by a conductive column within the vaporizer. The convective heating is provided by the vaporization volume of air that spirals around the conductive column and then is carried through the drug cartridge to heat the drug. Both the vaporization volume of air and the drug cartridge are provided heating by the conductive column. The drug is heated by both the conductive heating and the convective heating. The drug is heated to a vapor and then an aerosolized drug is formed due to subsequent thermal condensation. The final aerosolized drug for inhalation by the patient is formed in the holding chamber due to subsequent thermal condensation of the vapor. The subsequent thermal condensation can occur in the drug assembly and in the holding chamber.

[0107] The method 1600 can include holding the holding chamber in an upright position during the vaporization step of block 1608. Holding the holding chamber in an upright position can ensure that the desired dose of the drug is fully contained in the holding chamber. An operator can physically hold the holding chamber in an upright position. A holding mechanism, such as a clamp or similar mechanisms, can be used to ensure the holding chamber is held in an upright position during vaporization. The

holding chamber can be made of a material that inherently stands upright (e.g., rigid material). The holding chamber can be made of a material that stands upright therefore allowing the full volume of the holding chamber to be filled without any resistance from the holding chamber walls. The holding chamber can be made of a rigid material that is not rollable. The holding chamber can be made of a flexible material such that it is rollable, foldable, or otherwise collapsible. When the holding chamber is made of a flexible material, the holding chamber can be held upright by an operator or a holding mechanism. The holding chamber can be configured to stand in an upright position to enhance aerosolized drug formation and minimize the impaction of the aerosolized drug on the holding chamber walls upon entry of the aerosolized drug into the holding chamber. The interior surface of the holding chamber 108 can be antistatic. The interior surface of the holding chamber 108 can have an inlet (e.g., coupled/sealed to the connect element) configured to minimize adhesion of the aerosolized drug.

[0108] At block 1610, the method 1600 can include removing the aerosol containment device from the drug assembly. Removing the aerosol containment device from the drug assembly can include compressing one or more tabs of the connect element to release the one or more locking clips from the slots in the drug assembly. Removing the aerosol containment device from the drug assembly can include compressing a ridge on one or more tabs of the connect element where each tab is in mechanical communication with a locking clip. If other mating mechanisms are used, releasing the mating mechanisms from a locked to an unlocked position can remove the aerosol containment device from the drug assembly. The aerosol containment device can be removed from the drug assembly and the vaporizer, while the drug assembly remains coupled to the vaporizer. In an example, the drug assembly cannot be removed from the vaporizer until the aerosol containment device is removed from the vaporizer.

[0109] At block 1612, the method 1600 can include securing a mouthpiece to the aerosol containment device. Securing the mouthpiece to the aerosol containment device can include aligning one or more projections on the mouthpiece with one or more slots in the connect element. The projections of the mouthpiece can be slid into the slots in the connect element. The mouthpiece can further include one or more locking tabs configured to removably couple to one or more additional slots in the connect element. The one or more locking tabs of the mouthpiece can removably couple to the one or more additional slots in the connect element, as described above. Other types of mating mechanisms can be used to secure the mouthpiece to the

connect element and thereby the holding chamber. Other mating mechanisms can include snap-fit mechanisms, magnetic connection mechanisms, latches, projection and groove (e.g., rotating lock) mechanisms, or other mechanisms known in the art. The securing a mouthpiece to the aerosol containment device can include at least two steps. The inclusion of more than a single step can assist in prevention of accidental valve actuation.

[0110] The method 1600 can include instructing the patient to sit on a surface low to the ground. The surface can be a mattress laying on the floor or slightly raised from the floor. The patient can sit on the floor. The patient can sit on a bed or a reclining seat. The location the patient is sitting can include protective measures such as side barriers.

[0111] At block 1614, the method 1600 can include administering the aerosolized drug to the patient via the mouthpiece. Administering the aerosolized drug via the mouthpiece can include instructing the patient to press their lips firmly against the mouthpiece and inhale a full volume of the aerosolized drug from the holding chamber. When the patient firmly presses their lips against the mouthpiece, the mouthpiece translates (e.g., moves) towards the connect element and a force is supplied to the connect element. When the force is supplied, a valve or valve assembly within the connect element is actuated to an open state, thereby allowing the aerosolized drug to flow from the holding chamber to an opening in the mouthpiece. The opening in the mouthpiece supplies the aerosolized drug to the patient. When the patient removes their lips from the mouthpiece, the valve reverts to the closed state, thereby preventing any of the aerosolized drug from exiting the opening in the mouthpiece. Administering the aerosolized drug can occur about 1 minute to about 2 minutes, about 2 minutes to about 3 minutes, or less from the completion of aerosolizing the drug to ensure the desired dose is delivered to the patient.

[0112] The mouthpiece can have one or more posts that are configured to provide a force to a linkage arm in communication with the valve of the connect element. The patient can provide a force to the mouthpiece, thereby causing the posts to provide the force to the linkage arm. When a force is provided to the linkage arm, the linkage arm causes the valve in the connect element to transition to the open state. The posts can be sized such that the mouthpiece must be translated inward towards the connect element for the posts to provide a force to the linkage arm. The linkage arm can have a spring that returns the valve to the closed state when the force from the patient is

removed. When the valve is in the open state, the patient can inhale the aerosolized drug from the holding chamber through the opening in the mouthpiece. Other configurations of the mouthpiece can be used to provide the contact and force to the linkage arm. For example, a lip of the mouthpiece can have one or more posts or other projections to contact and provide a force to the linkage arm.

[0113] The mouthpiece can include one or more vents to allow the patient to inhale a volume greater than the volume of in the holding chamber. The mouthpiece can include four vents. The vents can allow the patient to take a “chaser” breath, meaning the breath continues past the volume held in the holding chamber. The vents can allow air from outside the holding chamber to also be inhaled by the patient after the total volume of the holding chamber has been inhaled. The chaser breath can allow for deep lung inhalation. Further, the chaser breath can prevent a dead-stop sensation for the patient when the entire volume of the holding chamber has been inhaled.

The method 1600 can further include palpating the holding chamber to ensure the aerosolized drug has been completely inhaled. Palpating the holding chamber can be accomplished by the user administering the drug. The holding chamber can have one or more sensors, audible feedback, or visual indicators operable to determine whether the complete volume of the aerosolized drug in the holding chamber has been inhaled. For example, the one or more sensors can be mechanical volume sensors or digital volume sensors operable to confirm and display an indication that the entire volume of the aerosolized drug has been inhaled by the patient. Further, the one or more sensors can be in communication with the display screen of the vaporizer to indicate that the entire volume of aerosolized drug has been inhaled by the patient. A notification, alert, and other audible and visual indicators can be provided indicating that the entire volume of the aerosolized drug has been inhaled.

[0114] Illustrative aspects of the present disclosure include:

[0115] Aspect 1. A method for administration of a drug to a patient in need thereof, the method comprising: heating a vaporizer to a predefined vaporization temperature; securing a drug assembly to an aerosol containment device, wherein the drug assembly comprises the drug configured to be aerosolized and wherein the aerosol containment device is configured to contain an aerosolized drug; securing the drug assembly to a drug assembly port of the vaporizer; vaporizing the drug into the aerosol containment device; removing the aerosol containment device from the drug assembly

and the vaporizer; and administering the aerosolized drug to the patient via a mouthpiece.

[0116] The disclosed apparatuses, systems, and methods provide better consistency of delivered dose uniformity, particle size distribution, and ease of use for physicians and other administrators of aerosols. For example, the apparatuses, systems, and methods provided herein allow for safe and effective administration of an aerosol, which can include an aerosolized drug. Furthermore, the disclosed apparatuses, systems, and methods enable production of aerosols with characteristics (e.g., particle size distribution) suited to deep lung deposition. In addition, the disclosed apparatuses, systems, and methods provide safe production and administration of psychoactive compounds because they enable the production and administration of aerosols with reduced risk of leakage and inadvertent exposure.

[0117] Aspect 2. The method of Aspect 1, wherein the aerosol containment device comprises a connect element and a holding chamber.

[0118] Aspect 3. The method of Aspect 2, wherein the method further comprises holding the holding chamber upright while vaporizing the drug.

[0119] Aspect 4. The method of any one of Aspects 1 to 3, the method further comprising securing the mouthpiece to the aerosol containment device.

[0120] Aspect 5. The method of Aspect 2 or Aspect 4 when dependent on Aspect 2, wherein the holding chamber is configured to stand in an upright position to enhance aerosolized drug formation and minimize impaction of the aerosolized drug on one or more walls of the holding chamber upon entry of the aerosolized drug into the holding chamber.

[0121] Aspect 6. The method of any one of Aspects 1 to 5, wherein the drug comprises 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT) or a pharmaceutical salt thereof, cannabinoid, tetrahydrocannabinol, entactogen, 3,4-methylenedioxymethamphetamine, ketamine, lysergic acid diethylamide, psilocybin, N,N-dimethyltryptamine, phenylalkylamine, mescaline, other tryptamines, other ergolines, other serotonergic compounds, second generation psychedelics, nicotine, pentamidine, and/or opioids such as fentanyl, morphine, and/or naloxone.

[0122] Aspect 7. The method of any one of Aspects 1 to 6, wherein the vaporizer will not operate unless the aerosol containment device is attached to the drug assembly prior to connecting the drug assembly to the vaporizer.

[0123] Aspect 8. The method of any one of Aspects 1 to 7, wherein a user is instructed to attach the aerosol containment device to the drug assembly prior to connecting the drug assembly to the vaporizer.

[0124] Aspect 9. The method of any one of Aspects 1 to 8, wherein administering the aerosolized drug comprises instructing the patient to press their lips firmly against the mouthpiece and inhale a full volume of the aerosolized drug from the aerosol containment device.

[0125] Aspect 10. The method of Aspect 9, wherein when the patient presses their lips firmly against the mouthpiece a valve is opened thereby releasing the aerosolized drug.

[0126] Aspect 11. The method of Aspect 2 or any one of Aspects 3 to 10 when dependent on Aspect 2, the method further comprising palpating the holding chamber to ensure the aerosolized drug has been completely inhaled.

[0127] Aspect 12. The method of any one of Aspects 1 to 11, the method further comprising confirming the aerosolized drug is fully inhaled via one or more sensors configured to determine that the aerosolized drug in the aerosol containment device has been completely inhaled.

[0128] Aspect 13. The method of Aspect 2 or any one of Aspects 3 to 12 when dependent on Aspect 2, wherein securing the drug assembly to the aerosol containment device comprises aligning one or more slots in the drug assembly with one or more locking clips of the connect element.

[0129] Aspect 14. The method of Aspect 2 or any one of Aspects 3 to 13 when dependent on Aspect 2, the method further comprising unrolling and/or unfolding the holding chamber prior to vaporizing the drug.

[0130] The holding chamber can be manufactured in a rolled configuration for ease of transport and can be unrolled before use.

[0131] Aspect 15. The method of Aspect 2 or any one of Aspects 3 to 14 when dependent on Aspect 2, wherein the holding chamber comprises a rigid material configured to stand upright.

[0132] The holding chamber can be made of a material the stands upright therefore allowing the full volume of the holding chamber to be filled without any resistance from the holding chamber walls. For example, the holding chamber 108 can be made of a material the stands upright therefore allowing the full volume of the holding chamber 108 to be filled without any obstruction from the holding chamber walls.

[0133] Aspect 16. The method of Aspect 13 or any one of Aspects 14 and 15 when dependent on Aspect 14, wherein removing the aerosol containment device from the drug assembly comprises compressing one or more releasing tabs of the connect element to release the one or more locking clips from the one or more slots of the drug assembly.

[0134] Aspect 17. The method of Aspect 16, wherein the drug assembly remains coupled to the vaporizer when the aerosol containment device is removed from the drug assembly.

[0135] Aspect 18. The method of Aspect 17, wherein one or more retaining tabs of the connect element removably couple to one or more corresponding tabs in the drug assembly port.

[0136] Aspect 19. The method of Aspect 18, wherein removably coupling the one or more retaining tabs of the connect element to one or more corresponding tabs in the drug assembly port prevents removal of the drug assembly from the drug assembly port before removing the aerosol containment device from the drug assembly port.

[0137] Aspect 20. The method of any one of Aspects 1 to 19, wherein the aerosol containment device must be removed from the vaporizer before the drug assembly is removed from the vaporizer.

[0138] Aspect 21. The method of any one of Aspects 1 to 20, wherein the drug assembly cannot be removed from the vaporizer when the drug assembly is coupled to the aerosol containment device.

[0139] Aspect 22. The method of any one of Aspects 1 to 21, wherein securing the drug assembly to the drug assembly port of the vaporizer comprises docking the drug assembly to the drug assembly port and rotating the drug assembly.

[0140] Aspect 23. The method of any one of Aspects 1 to 22, the method further comprising purging a purging volume of air from the vaporizer prior to securing the drug assembly to the drug assembly port of the vaporizer.

[0141] Aspect 24. The method of Aspect 23, wherein the purging volume of air is about 0.1 L to about 0.5 L.

[0142] Aspect 25. The method of any one of Aspects 1 to 24, wherein the drug is hydrophilic.

[0143] Aspect 26. The method of any one of Aspects 1 to 24, wherein the drug is hydrophobic.

[0144] Aspect 27. The method of any one of Aspects 1 to 26, wherein the aerosolized drug is administered to the patient within three minutes of vaporizing the drug.

[0145] Aspect 28. The method of any one of Aspects 1 to 27, wherein the predefined vaporization temperature is about 200 degrees Celsius to about 260 degrees Celsius.

[0146] Aspect 29. The method of any one of Aspects 1 to 28, wherein vaporizing the drug comprises: heating a conductive column to the predefined vaporization temperature and passing a vaporization volume of air over the conductive column and through the drug assembly, thereby exposing the drug to the vaporization volume of air heated to the predefined vaporization temperature; and heating a drug cartridge holding the drug to the predefined vaporization temperature, wherein heat provided to the drug cartridge and the heated vaporization volume of air cause the drug to transition to a vapor, wherein the vapor subsequently cools and condenses to form an aerosolized drug suspended in the vaporization volume of air, wherein the vaporization volume of air carries the aerosolized drug to the aerosol containment device.

[0147] Aspect 30. The method of Aspect 29, wherein a final aerosolized drug for administration to the patient is formed during additional thermal condensation that occurs in the aerosol containment device.

[0148] Aspect 31. The method of any one of Aspects 1 to 30, wherein the predefined vaporization temperature is about 200 degrees Celsius to about 260 degrees Celsius.

[0149] Aspect 32. The method of aspect 31, wherein the predefined vaporization temperature is about 235 degrees Celsius.

[0150] Aspect 33. The method of Aspect 29 or any one of Aspects 30 to 32 when dependent on Aspect 29, wherein the vaporization volume of air is about 0.5 L to about 3 L.

[0151] Aspect 34. The method of Aspect 33, wherein the vaporization volume of air is about 2 L.

[0152] Aspect 35. The method of Aspect 29 or any one of Aspects 30 to 34 when dependent on Aspect 29, wherein the vaporization volume of air is provided at a flow rate of about 5 L/min to about 25 L/min.

[0153] Aspect 36. The method of Aspect 35, wherein the flow rate is about 7 L/min.

[0154] Aspect 37. The method of any one of Aspects 1 to 36, wherein the drug has a melting point of about 50 degrees C to about 80 degrees C.

[0155] Aspect 38. The method of any one of Aspects 1 to 37, wherein the drug has a melting point of about 67.5 degrees C.

[0156] Aspect 39. The method of Aspect 2 or any one of Aspects 3 to 39 when dependent on Aspect 2, wherein an interior surface of the holding chamber is configured to prevent adhesion of the aerosolized drug.

[0157] Aspect 40. The method of Aspect 39, wherein the interior surface of the holding chamber is antistatic.

[0158] Aspect 41. The method of Aspect 2 or any one of Aspects 3 to 40 when dependent on Aspect 2, wherein an inlet of the holding chamber is configured to minimize adhesion of the aerosolized drug.

[0159] Aspect 42. The method of any one of Aspects 1 to 41, wherein the method further comprises displaying instructions to a user on a display screen of the vaporizer.

[0160] Aspect 43. The method of Aspect 43, wherein the instructions comprise: securing the aerosol containment device to the drug assembly prior to securing the drug assembly and the aerosol containment device to the vaporizer; and removing only the aerosol containment device from the vaporizer and leaving the drug assembly coupled to the vaporizer after aerosolized drug generation is complete.

[0161] Aspect 44. The method of any one of Aspects 1 to 43, wherein the method further comprises displaying one or more indicators on a display screen of the vaporizer.

[0162] Aspect 45. The method of Aspect 44, wherein the one or more indicators are one or more of device ready to proceed to preheat, preheat in progress, preheat complete, ready to begin vaporization, vaporization in progress, aerosolized drug generation complete, temperature measurements, flow rate measurements, location measurements, warnings of improper connections, and errors.

[0163] Aspect 46. The method of Aspect 44 or Aspect 45, wherein the one or more indicators include a notification that the predefined vaporization temperature has been reached, a notification instructing a user to confirm that the drug assembly and aerosol containment device have been attached to the vaporizer, a notification instructing the user to initiate vaporization, and a notification indicating that vaporization is complete and to proceed immediately to administering the drug to the patient.

[0164] Aspect 47. A system for administering an aerosolized drug, the system comprising: a connect element having a first end, a second end opposite the first end, and one or more mating mechanisms proximal the first end; and a holding chamber connected to the second end of the connect element, the holding chamber operable to contain the aerosolized drug.

[0165] Aspect 48: The system of Aspect 47, wherein the holding chamber includes one or more transparent sections operable to indicate a fill level of the holding chamber.

[0166]. The one or more transparent sections can allow a user to view the interior contents of the holding chamber. For example, a user can assess a fill level of the holding chamber by viewing the interior contents of the holding chamber through the one or more transparent sections. The one or more transparent sections can allow the user to assess if the holding chamber is full or empty

[0167] Aspect 49. The system of Aspect 47 or Aspect 48, wherein the holding chamber has a volume of about 0.5 L to about 4 L.

[0168] Aspect 50. The system of any one of Aspects 47 to Aspect 49, wherein the connect element and the holding chamber are coupled via a seal.

[0169] Aspect 51. The system of Aspect 50, wherein the seal is a permanent seal.

[0170] Aspect 52. The system of Aspect 50, wherein the seal is a ring.

[0171] Aspect 53. The system of Aspect 52, wherein the ring is a silicone gasket.

[0172] Aspect 54. The system of any one of Aspects 47 to 53, wherein the one or more mating mechanisms comprise a plurality of slots formed in an exterior of the connect element.

[0173] Aspect 55. The system of Aspect 54, wherein the one or more mating mechanisms further comprise a plurality of locking clips.

[0174] Aspect 56. The system of Aspect 55, wherein the system further comprises a drug assembly, the drug assembly comprising: a housing comprising: a first housing mating mechanism; and a housing chamber operable to allow air flow through the housing; and a drug cartridge coupled to the housing, the drug cartridge operable to hold a drug configured to be aerosolized.

[0175] Aspect 57. The system of Aspect 56, wherein the drug cartridge contains the drug configured to be aerosolized.

[0176] Aspect 58. The system of Aspect 57, wherein the drug configured to be aerosolized comprises 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT) or a pharmaceutical salt thereof, cannabinoid, tetrahydrocannabinol, entactogen 3,4-methylenedioxymethamphetamine, ketamine, lysergic acid diethylamide, psilocybin, N,N-dimethyltryptamine, phenylalkylamine mescaline, other tryptamines, other ergolines, other serotonergic compounds, second generation psychedelics, nicotine, pentamidine, and/or opioids such as fentanyl, morphine, and/or naloxone.

[0177] Aspect 59. The system of Aspect 56 to 58, wherein the first housing mating mechanism is configured to be removably coupled to the connect element.

[0178] Aspect 60. The system of Aspect 59, wherein the first housing mating mechanism comprises a first slot and a second slot on opposing sides of the housing.

[0179] Aspect 61. The system of Aspect 60, wherein the plurality of locking clips is configured to removably couple to the first slot and the second slot of the housing.

[0180] Aspect 62. The system of Aspect 61, the connect element further comprising a valve, wherein when the drug assembly is coupled to the connect element the valve is placed in an open state.

[0181] Aspect 63. The system of Aspect 62, wherein the housing provides a force to the valve to actuate the valve to the open state.

[0182] Aspect 64. The system of Aspect 63, wherein the open state allows fluid flow into the holding chamber.

[0183] Aspect 65. The system of Aspect 62, wherein the valve has a closed state configured to prevent fluid flow into or out of the holding chamber.

[0184] Aspect 66. The system of Aspect 65, wherein when no force is applied the valve is in the closed state.

[0185] Aspect 67. The system of Aspect 66, wherein when the drug assembly is uncoupled from the connect element and the holding chamber the valve is transitioned to the closed state.

[0186] Aspect 68. The system of Aspect 60 or any one of Aspects 61 to 67, wherein the system further comprises a vaporizer, the vaporizer comprising: a drug assembly port operable to be removably coupled to a port mating mechanism on the housing and a connect element mating mechanism; and a heating element operable to heat a vaporization volume of air and at least a portion of the drug cartridge, wherein the heat provided to the portion of the drug cartridge vaporizes the drug, wherein the heated vaporization volume of air is passed through the drug cartridge thereby vaporizing the drug, wherein the vaporized drug subsequently cools and condenses to form the aerosolized drug.

[0187] Aspect 69. The system of Aspect 68, wherein the vaporizer further comprises one or more sensors.

[0188] Aspect 70. The system of Aspect 69, wherein the one or more sensors include a temperature sensor, a flow rate sensor, and a location sensor.

[0189] Aspect 71. The system of Aspect 68 or any one of Aspects 69 to 70, wherein the vaporizer further comprises a pulse width modulator operable to regulate a flow rate and volume of the heated vaporization volume of air.

[0190] Aspect 72. The system of Aspect 71, wherein the vaporizer further comprises a pump or fan operable to provide the heated vaporization volume of air, wherein the pulse width modulate controls the pump or fan.

[0191] Aspect 73. The system of Aspect 68 or any one of Aspects 69 to 72, wherein the drug assembly port comprises a groove.

[0192] Aspect 74. The system of Aspect 73, wherein port mating mechanism comprises two or more projections operable to be received within the groove.

[0193] Aspect 75. The system of Aspect 74, wherein rotating the drug assembly and the connect element while the two or more projections of the port mating mechanism are in the groove locks one or more retaining tabs of the connect element with one or more corresponding tabs of the drug assembly port and thereby couples the drug assembly and the connect element to the drug assembly port.

[0194] Aspect 76. The system of Aspect 55 or any one of Aspects 56 to 74 when dependent on Aspect 55, wherein the system further comprises a mouthpiece operable to couple to the connect element, the mouthpiece comprising: four mouthpiece projections, each mouthpiece projection operable to be received in a respective slot of the connect element; at least one mouthpiece tab operable to removably couple to the connect element; and an opening in fluid communication with the connect element and the holding chamber when the mouthpiece is coupled to the connect element.

[0195] Aspect 77. The system of Aspect 76, wherein the plurality of slots in the connect element are configured to receive and couple to the at least one mouthpiece tab.

[0196] Aspect 78. The system of Aspect 77, wherein the connect element further comprises a valve.

[0197] Aspect 79. The system of Aspect 78, wherein the valve is actuated to an open state by applying a force to the mouthpiece to translate the mouthpiece inward toward the connect element.

[0198] Aspect 80. The system of Aspect 79, wherein the aerosolized drug is administered to a patient when the patient presses their lips to the mouthpiece thereby translating the mouthpiece inward toward the connect element to place the valve in the open state and inhales.

[0199] Aspect 81. The system of Aspect 80, wherein the valve is in a closed state when no force is applied to the valve.

[0200] Aspect 82. The system of Aspect 81, wherein the mouthpiece and/or the connect element further comprises an O-ring configured to reduce the force required to place the valve in the open state.

[0201] Aspect 83. The system of Aspect 82, wherein the O-ring is configured to ensure that the valve is in the closed state when no force is applied to the valve.

[0202] Aspect 84. The system of Aspect 82 or Aspect 83, wherein the O-ring is a parylene coated O-ring.

[0203] Aspect 85. A drug assembly configured to contain a drug, the drug assembly comprising: a housing comprising: a first mating mechanism; and a chamber operable to allow air flow through the housing; and a drug cartridge coupled to the housing; wherein the drug cartridge is coupled to the first mating mechanism.

[0204] Aspect 86. The drug assembly of Aspect 85, wherein the housing further comprises a second mating mechanism operable to removably couple to a connect element mating mechanism of a connect element.

[0205] Aspect 87. The drug assembly of Aspect 86, wherein the second mating mechanism comprises two slots located on opposing sides of the housing.

[0206] Aspect 88. The drug assembly of Aspect 87, wherein the connect element mating mechanism comprises two locking clips operable to removably couple to the two slots of the housing.

[0207] Aspect 89. The drug assembly of Aspect 88, wherein the housing further comprises a third mating mechanism operable to be removably coupled to a drug assembly port of a vaporizer.

[0208] Aspect 90. The drug assembly of Aspect 89, wherein two retaining tabs of the connect element mating mechanism are configured to project through the drug assembly and removably couple to two corresponding tabs of the drug assembly port.

[0209] Aspect 91. The drug assembly of Aspect 90, wherein the third mating mechanism comprises two or more projections operable to be received within a groove of the drug assembly port of the vaporizer.

[0210] Aspect 92. The drug assembly of Aspect 91, wherein the two or more projections are locked into the groove of the drug assembly port of the vaporizer by rotating the drug assembly and locking the two retaining tabs of the connect element mating mechanism to the two corresponding tabs of the drug assembly port.

[0211] Aspect 93. The drug assembly of Aspect 92, wherein the two retaining tabs of the connect element mating mechanism prevent rotation of the drug assembly and the connect element when the two retaining tabs are locked into the two corresponding tabs of the drug assembly port.

[0212] Aspect 94. A drug for use as a medicament wherein the drug is administered to a patient in need thereof by the method of any of Aspects 1 to 5 or 7 to 46.

[0213] Aspect 95. A drug for use in the treatment of a disease or disorder wherein the treatment comprises administering the drug to a patient in need thereof, wherein the drug is administered by the method defined in any of Aspects 1 to 5 or 7 to 46.

[0214] Aspect 96. A drug for use as a medicament wherein the drug is administered to a patient in need thereof by the system defined in any of Aspects 47 to 84.

[0215] Aspect 97. A drug for use in the treatment of a disease or disorder wherein the treatment comprises administering the drug to a patient in need thereof, wherein the drug is administered by the system defined in any of Aspects 47 to 84.

[0216] Aspect 98. A drug for use as a medicament wherein the drug is comprised within the drug assembly defined in any of Aspects 85 to 93.

[0217] Aspect 99. A drug for use in the treatment of a disease or disorder wherein the drug is comprised within the drug assembly as defined in any of Aspects 85 to 93.

[0218] Aspect 100. The drug for use according to any of Aspects 95, 97 or 99, wherein the disease or disorder is a mental disorder or nervous system disorder.

[0219] Aspect 101. The drug for use according to any of Aspects 94 to 100, wherein the drug comprises 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT) or a pharmaceutical salt thereof, cannabinoid, tetrahydrocannabinol, entactogen 3,4-methylenedioxymethamphetamine, ketamine, lysergic acid diethylamide, psilocybin, N,N-dimethyltryptamine, phenylalkylamine mescaline, other tryptamines (e.g., a tryptamine other than 5-MeO-DMT and N,N-dimethyltryptamine), other ergolines, other serotonergic compounds, second generation psychedelics, nicotine, pentamidine, and/or opioids such as fentanyl, morphine, and/or naloxone.

[0220] Aspect 102. The drug for use according to any of Aspects 94 to 100, wherein the drug is 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT) or a pharmaceutical salt thereof, cannabinoid, tetrahydrocannabinol, entactogen 3,4-methylenedioxymethamphetamine, ketamine, lysergic acid diethylamide, psilocybin, N,N-dimethyltryptamine, phenylalkylamine mescaline, other tryptamines (e.g., a tryptamine other than 5-MeO-DMT and N,N-dimethyltryptamine), other ergolines,

other serotonergic compounds, second generation psychedelics, nicotine, pentamidine, and/or opioids such as fentanyl, morphine, and/or naloxone.

[0221] Aspect 103. The drug for use according to Aspect 102, wherein the second generation psychedelic is selected from the group consisting of deuterated tryptamines and non-hallucinogenic psychoplastogens, optionally wherein the non-hallucinogenic psychoplastogens is tabernanthalog, *N*-dimethylaminoisotryptamine or derivatives thereof.

[0222] Aspect 104. The drug for use according to Aspect 101, wherein the drug comprises 5-Methoxy-*N,N*-Dimethyltryptamine (5-MeO-DMT) or a pharmaceutical salt thereof, preferably wherein the drug comprises 5-Methoxy-*N,N*-Dimethyltryptamine (5-MeO-DMT) free base.

[0223] Aspect 105. The drug for use according to Aspect 102, wherein the drug is 5-Methoxy-*N,N*-Dimethyltryptamine (5-MeO-DMT) or a pharmaceutical salt thereof preferably, wherein the drug is 5-Methoxy-*N,N*-Dimethyltryptamine (5-MeO-DMT) free base.

[0224] Aspect 106. The drug for use according to any of Aspects 95, 97, 99 or 101 to 104, wherein the disease or disorder is selected from the group consisting of postpartum depression, sleep disturbance, major depressive disorder, persistent depressive disorder, bipolar disorder, anxiety disorder, posttraumatic stress disorder, body dysmorphic disorder, obsessive-compulsive disorder, eating disorder, psychoactive substance abuse, epilepsy, sickness associated with chemotherapy, acute pain, chronic pain, phantom pain, migraine, multiple sclerosis, multiple sclerosis spasms, schizophrenia, insomnia, rheumatoid arthritis, psychosis, HIV-induced anorexia, sleep apnea, alcohol use disorder, suicidal ideation, psychoactive substance use disorder, smoking cessation, Parkinson's disease, dementia, pleuropneumonitis, parasitic conditions, pneumocystis pneumonia, HIV related dementia, cough, diarrhoea, nausea, opioid abuse, seizures and shortness of breath.

[0225] Aspect 107. The drug for use according to Aspects 100 or 106, wherein the disease or disorder is selected from the group consisting of postpartum depression, sleep disturbance, major depressive disorder, persistent depressive disorder, bipolar disorder, anxiety disorder, posttraumatic stress disorder, body dysmorphic disorder, obsessive-compulsive disorder, eating disorder and psychoactive substance abuse.

[0226] Aspect 108. The drug for use according to any of Aspects 95, 97, 99, 101, 104 or 106, wherein the drug comprises 5-Methoxy-*N,N*-Dimethyltryptamine (5-MeO-DMT)

or a pharmaceutical salt thereof and the disease or disorder is selected from the group consisting of postpartum depression, sleep disturbance, major depressive disorder, persistent depressive disorder, bipolar disorder, anxiety disorder, posttraumatic stress disorder, body dysmorphic disorder, obsessive-compulsive disorder, eating disorder and psychoactive substance abuse.

[0227] Aspect 109. The drug for use according to any of Aspects 95, 97, 99, 102, 105 or 106, wherein the drug is 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT) or a pharmaceutical salt thereof and the disease or disorder is selected from the group consisting of postpartum depression, sleep disturbance, major depressive disorder, persistent depressive disorder, bipolar disorder, anxiety disorder, posttraumatic stress disorder, body dysmorphic disorder, obsessive-compulsive disorder, eating disorder and psychoactive substance abuse.

[0228] Aspect 110. The drug for use according to Aspect 108, wherein the drug comprises 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT) or a pharmaceutical salt thereof and the disease or disorder is major depressive disorder.

[0229] Aspect 111. The drug for use according to Aspect 109, wherein the drug is 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT) or a pharmaceutical salt thereof and the disease or disorder is major depressive disorder.

[0230] Aspect 112. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises a cannabinoid and the disease or disorder is selected from the group consisting of epilepsy, sickness associated with chemotherapy, chronic pain, multiple sclerosis spasms, anxiety disorder, posttraumatic stress disorder, major depressive disorder, bipolar disorder, schizophrenia and insomnia.

[0231] Aspect 113. The drug for use according any of Aspects 95, 97, 99, 102 or 106, wherein the drug is a cannabinoid and the disease or disorder is selected from the group consisting of epilepsy, sickness associated with chemotherapy, chronic pain, multiple sclerosis spasms, anxiety disorder, posttraumatic stress disorder, major depressive disorder, bipolar disorder, schizophrenia and insomnia.

[0232] Aspect 114. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises a tetrahydrocannabinol and the disease or disorder is selected from the group consisting of HIV-induced anorexia, sickness associated with chemotherapy, chronic pain, sleep apnea and multiple sclerosis.

[0233] Aspect 115. The drug for use according to any of Aspects 95, 97, 99, 102 or 106, wherein the drug is a tetrahydrocannabinol and the disease or disorder is selected

from the group consisting of HIV-induced anorexia, sickness associated with chemotherapy, chronic pain, sleep apnea and multiple sclerosis.

[0234] Aspect 116. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises entactogen 3,4-methylenedioxymethamphetamine and the disease or disorder is selected from the group consisting of posttraumatic stress disorder, major depressive disorder and alcohol use disorder.

[0235] Aspect 117. The drug for use according to any of Aspects 95, 97, 99, 102 or 106, wherein the drug is entactogen 3,4-methylenedioxymethamphetamine and the disease or disorder is selected from the group consisting of posttraumatic stress disorder, major depressive disorder and alcohol use disorder.

[0236] Aspect 118. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises ketamine and the disease or disorder is selected from the group consisting of acute pain, nausea, suicidal ideation, psychoactive substance use disorder and posttraumatic stress disorder.

[0237] Aspect 119. The drug for use according to any of Aspects 95, 97, 99, 102 or 106, wherein the drug is ketamine and the disease or disorder is selected from the group consisting of acute pain, nausea, suicidal ideation, drug addiction and posttraumatic stress disorder.

[0238] Aspect 120. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises lysergic acid diethylamide and the disease or disorder is selected from the group consisting of alcohol use disorder, anxiety disorder, psychoactive substance use disorder, and phantom pain.

[0239] Aspect 121. The drug for use according to any of Aspects 95, 97, 99, 102 or 106, wherein the drug is lysergic acid diethylamide and the disease or disorder is selected from the group consisting of alcohol use disorder, anxiety disorder, psychoactive substance use disorder, and phantom pain.

[0240] Aspect 122. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises psilocybin and the disease or disorder is selected from the group consisting of anxiety disorder, psychoactive substance use disorder, smoking cessation, obsessive-compulsive disorder, psychosis, posttraumatic stress disorder and migraine.

[0241] Aspect 123. The drug for use according to any of Aspects 95, 97, 99, 102 or 106, wherein the drug is psilocybin and the disease or disorder is selected from the group consisting of anxiety disorder, psychoactive substance use disorder, smoking

cessation, obsessive-compulsive disorder, psychosis, posttraumatic stress disorder and migraine.

[0242] Aspect 124. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises N,N-dimethyltryptamine and the disease or disorder is selected from the group consisting of postpartum depression, sleep disturbance, major depressive disorder, persistent depressive disorder, bipolar disorder, anxiety disorder, posttraumatic stress disorder, body dysmorphic disorder, obsessive-compulsive disorder, eating disorder, psychoactive substance abuse and Parkinson's disease.

[0243] Aspect 125. The drug for use according to any of Aspects 95, 97, 99, 102 or 106, wherein the drug is N,N-dimethyltryptamine and the disease or disorder is selected from the group consisting of postpartum depression, sleep disturbance, major depressive disorder, persistent depressive disorder, bipolar disorder, anxiety disorder, posttraumatic stress disorder, body dysmorphic disorder, obsessive-compulsive disorder, eating disorder, psychoactive substance abuse and Parkinson's disease.

[0244] Aspect 126. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises phenylalkylamine mescaline and the disease or disorder is selected from the group consisting of alcohol use disorder, psychoactive substance use disorder, posttraumatic stress disorder and anxiety disorder.

[0245] Aspect 127. The drug for use according any of Aspects 95, 97, 99, 102 or 106, wherein the drug is phenylalkylamine mescaline and the disease or disorder is selected from the group consisting of alcohol use disorder, psychoactive substance use disorder, posttraumatic stress disorder and anxiety disorder.

[0246] Aspect 128. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises a tryptamine other than 5-MeO-DMT, psilocybin or N,N-dimethyltryptamine and the disease or disorder is selected from the group consisting of anxiety disorder, schizophrenia, bipolar disorder, psychoactive substance use disorder and chronic pain.

[0247] Aspect 129. The drug for use according to any of Aspects 95, 97, 99, 102 or 106, wherein the drug is a tryptamine other than 5-MeO-DMT, psilocybin or N,N-dimethyltryptamine and the disease or disorder is selected from the group consisting of anxiety disorder, schizophrenia, bipolar disorder, psychoactive substance use disorder and chronic pain.

[0248] Aspect 130. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises an ergoline other than lysergic acid diethylamide (LSD) and the disease or disorder is selected from the group consisting of migraine, Parkinson's disease, and dementia.

[0249] Aspect 131. The drug for use according to any of Aspects 95, 97, 99, 102 or 106, wherein the drug is an ergoline other than lysergic acid diethylamide (LSD) and the disease or disorder is selected from the group consisting of migraine, Parkinson's disease, and dementia.

[0250] Aspect 132. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises a serotonergic compound and the disease or disorder is selected from the group consisting of anxiety disorder, obsessive-compulsive disorder, eating disorder, chronic pain and posttraumatic stress disorder.

[0251] Aspect 133. The drug for use according to any of Aspects 95, 97, 99, 102 or 106, wherein the drug is a serotonergic compound and the disease or disorder is selected from the group consisting of anxiety disorder, obsessive-compulsive disorder, eating disorder, chronic pain and posttraumatic stress disorder.

[0252] Aspect 134. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises nicotine and the disease or disorder is selected from the group consisting of smoking cessation, Parkinson's disease, dementia and preferably Parkinson's disease and dementia.

[0253] Aspect 135. The drug for use according to any of Aspects 95, 97, 99, 102 or 106, wherein the drug is nicotine and the disease or disorder is selected from the group consisting of smoking cessation, Parkinson's disease and dementia, preferably Parkinson's disease and dementia.

[0254] Aspect 136. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises pentamidine and the disease or disorder is selected from the group consisting of parasitic conditions, pneumocystis pneumonia and HIV related dementia.

[0255] Aspect 137. The drug for use according to any of Aspects 95, 97, 99, 102 or 106, wherein the drug is pentamidine and the disease or disorder is selected from the group consisting of parasitic conditions, pneumocystis pneumonia and HIV related dementia.

[0256] Aspect 138. The drug for use according to Aspect 136 or 137, wherein the parasitic condition is selected from the group consisting of African trypanosomiasis, leishmaniasis and Balamuthia.

[0257] Aspect 139. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises fentanyl, morphine, and/or naloxone and the disease or disorder is selected from the group consisting of acute pain, chronic pain, shortness of breath, opioid abuse, cough and diarrhoea.

[0258] Aspect 140. The drug for use according to any of Aspects 95, 97, 99, 102 or 106, wherein the drug is fentanyl, morphine, and/or naloxone and the disease or disorder is selected from the group consisting of acute pain, chronic pain, shortness of breath, opioid abuse, cough and diarrhoea.

[0259] Aspect 141. The drug for use according to any of Aspects 95, 97, 99, 101 or 106, wherein the drug comprises a second generation psychedelic and the disease or disorder is selected from the group consisting of postpartum depression, sleep disturbance, major depressive disorder, persistent depressive disorder, bipolar disorder, anxiety disorder, posttraumatic stress disorder, body dysmorphic disorder, obsessive-compulsive disorder, eating disorder and psychoactive substance abuse.

[0260] Aspect 142. The drug for use according to any of Aspects 95, 97, 99, 102 or 106, wherein the drug is a second generation psychedelic and the disease or disorder is selected from the group consisting of postpartum depression, sleep disturbance, major depressive disorder, persistent depressive disorder, bipolar disorder, anxiety disorder, posttraumatic stress disorder, body dysmorphic disorder, obsessive-compulsive disorder, eating disorder and psychoactive substance abuse.

[0261] All numbered aspects are embodiments of the invention. Although a variety of information was used to explain aspects within the scope of the appended claims, no limitation of the claims should be implied based on particular features or arrangements, as one of ordinary skill would be able to derive a wide variety of implementations. Further and although some subject matter may have been described in language specific to structural features and/or method steps, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to these described features or acts. Such functionality can be distributed differently or performed in components other than those identified herein. Rather, the described features and steps are disclosed as possible components of systems and methods within the scope of the appended claims.

CLAIMS

What is claimed is:

1. A system for administering an aerosolized drug, the system comprising:
 - a connect element having a first end, a second end opposite the first end, and one or more mating mechanisms proximal the first end; and
 - a holding chamber connected to the second end of the connect element, the holding chamber operable to contain the aerosolized drug.
2. The system of claim 1, wherein the holding chamber includes one or more transparent sections operable to indicate a fill level of the holding chamber.
3. The system of claim 1, wherein the holding chamber has a volume of about 0.5 L to about 4 L.
4. The system of claim 3, wherein the connect element and the holding chamber are coupled via a seal.
5. The system of claim 4, wherein the seal is a permanent seal.
6. The system of claim 4, wherein the seal is a ring.
7. The system of claim 6, wherein the ring is a silicone gasket.
8. The system of claim 1, wherein the one or more mating mechanisms comprise a plurality of slots formed in an exterior of the connect element.
9. The system of claim 8, wherein the one or more mating mechanisms further comprise a plurality of locking clips.
10. The system of claim 9, wherein the system further comprises a drug assembly, the drug assembly comprising:
 - a housing comprising:
 - a first housing mating mechanism; and

a housing chamber operable to allow air flow through the housing; and

a drug cartridge coupled to the housing, the drug cartridge operable to hold a drug configured to be aerosolized.

11. The system of claim 10, wherein the first housing mating mechanism is configured to be removably coupled to the connect element.

12. The system of claim 11, wherein the first housing mating mechanism comprises a first slot and a second slot on opposing sides of the housing.

13. The system of claim 12, wherein the plurality of locking clips is configured to removably couple to the first slot and the second slot of the housing.

14. The system of claim 13, the connect element further comprising a valve, wherein when the drug assembly is coupled to the connect element the valve is placed in an open state.

15. The system of claim 14, wherein the housing provides a force to the valve to actuate the valve to the open state.

16. The system of claim 15, wherein the open state allows fluid flow into the holding chamber.

17. The system of claim 14, wherein the valve has a closed state configured to prevent fluid flow into or out of the holding chamber.

18. The system of claim 17, wherein when no force is applied the valve is in the closed state.

19. The system of claim 18, wherein when the drug assembly is uncoupled from the connect element and the holding chamber the valve is transitioned to the closed state.

20. The system of claim 12, wherein the system further comprises a vaporizer, the vaporizer comprising:

a drug assembly port operable to be removably coupled to a port mating mechanism on the housing and a connect element mating mechanism; and

a heating element operable to heat a vaporization volume of air and at least a portion of the drug cartridge,

wherein the heat provided to the portion of the drug cartridge vaporizes the drug,

wherein the heated vaporization volume of air is passed through the drug cartridge thereby vaporizing the drug,

wherein the vaporized drug subsequently cools and condenses to form the aerosolized drug.

21. The system of claim 20, wherein the vaporizer further comprises one or more sensors.

22. The system of claim 21, wherein the one or more sensors include a temperature sensor, a flow rate sensor, and/or a location sensor.

23. The system of claim 20, wherein the vaporizer further comprises a pulse width modulator operable to regulate a flow rate and volume of the heated vaporization volume of air.

24. The system of claim 23, wherein the vaporizer further comprises a pump or fan operable to provide the heated vaporization volume of air, wherein the pulse width modulator controls the pump or fan.

25. The system of claim 20, wherein the drug assembly port comprises a groove.

26. The system of claim 25, wherein the port mating mechanism comprises two or more projections operable to be received within the groove.

27. The system of claim 26, wherein rotating the drug assembly and the connect element while the two or more projections of the port mating mechanism are in the groove locks one or more retaining tabs of the connect element with one or more corresponding tabs of the drug assembly port and thereby couples the drug assembly and the connect element to the drug assembly port.

28. The system of claim 9, wherein the system further comprises a mouthpiece operable to couple to the connect element, the mouthpiece comprising:

four mouthpiece projections, each mouthpiece projection operable to be received in a respective slot of the connect element;

at least one mouthpiece tab operable to removably couple to the connect element; and

an opening in fluid communication with the connect element and the holding chamber when the mouthpiece is coupled to the connect element.

29. The system of claim 28, wherein the plurality of slots in the connect element are configured to receive and couple to the at least one mouthpiece tab.

30. The system of claim 29, wherein the connect element further comprises a valve.

31. The system of claim 30, wherein the valve is actuated to an open state by applying a force to the mouthpiece to translate the mouthpiece inward toward the connect element.

32. The system of claim 31, wherein the aerosolized drug is administered to a patient when the patient presses their lips to the mouthpiece thereby translating the mouthpiece inward toward the connect element to place the valve in the open state and inhales.

33. The system of claim 32, wherein the valve is in a closed state when no force is applied to the valve.

34. The system of claim 33, wherein the mouthpiece and/or the connect element further comprises an O-ring configured to reduce the force required to place the valve in the open state.

35. The system of claim 34, wherein the O-ring is configured to ensure that the valve is in the closed state when no force is applied to the valve.

36. The system of claim 34, wherein the O-ring is a parylene coated O-ring.

37. A drug assembly configured to contain a drug, the drug assembly comprising:

a housing comprising:

a first mating mechanism; and

a chamber operable to allow air flow through the housing; and

a drug cartridge coupled to the housing,

wherein the drug cartridge is coupled to the first mating mechanism.

38. The drug assembly of claim 37, wherein the housing further comprises a second mating mechanism operable to removably couple to a connect element mating mechanism of a connect element.

39. The drug assembly of claim 38, wherein the second mating mechanism comprises two slots located on opposing sides of the housing.

40. The drug assembly of claim 39, wherein the connect element mating mechanism comprises two locking clips operable to removably couple to the two slots of the housing.

41. The drug assembly of claim 40, wherein the housing further comprises a third mating mechanism operable to be removably coupled to a drug assembly port of a vaporizer.

42. The drug assembly of claim 41, wherein two retaining tabs of the connect element mating mechanism are configured to project through the drug assembly and removably couple to two corresponding tabs of the drug assembly port.

43. The drug assembly of claim 42, wherein the third mating mechanism comprises two or more projections operable to be received within a groove of the drug assembly port of the vaporizer.

44. The drug assembly of claim 43, wherein the two or more projections are locked into the groove of the drug assembly port of the vaporizer by rotating the drug assembly and locking the two retaining tabs of the connect element mating mechanism to the two corresponding tabs of the drug assembly port.

45. The drug assembly of claim 44, wherein the two retaining tabs of the connect element mating mechanism prevent rotation of the drug assembly and the connect element when the two retaining tabs are locked into the two corresponding tabs of the drug assembly port.

46. The drug assembly of claim 37, wherein the drug is comprised in the drug assembly.

47. The drug assembly of claim 46, wherein the drug is comprised in the drug cartridge.

48. The drug assembly of claim 46, wherein the drug comprises 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT) or a pharmaceutical salt thereof, cannabinoid, tetrahydrocannabinol, entactogen 3,4-methylenedioxymethamphetamine, ketamine, lysergic acid diethylamide, psilocybin, N,N-dimethyltryptamine, phenylalkylamine mescaline, other tryptamines, other ergolines, other serotonergic compounds, second generation psychedelics, nicotine, pentamidine, and/or opioids such as fentanyl, morphine, and/or naloxone.

49. The drug assembly of claim 46, wherein the drug is 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT) or a pharmaceutical salt thereof, cannabinoid, tetrahydrocannabinol, entactogen 3,4-methylenedioxymethamphetamine, ketamine, lysergic acid diethylamide, psilocybin, N,N-dimethyltryptamine, phenylalkylamine mescaline, other tryptamines, other ergolines, other serotonergic compounds, second generation psychedelics, nicotine, pentamidine, and/or opioids such as fentanyl, morphine, and/or naloxone.

50. A method for administration of a drug to a patient in need thereof, the method comprising:

heating a vaporizer to a predefined vaporization temperature;

securing a drug assembly to an aerosol containment device, wherein the drug assembly comprises the drug configured to be aerosolized and wherein the aerosol containment device is configured to contain an aerosolized drug;

securing the drug assembly to a drug assembly port of the vaporizer;

vaporizing the drug into the aerosol containment device;

removing the aerosol containment device from the drug assembly and the vaporizer; and

administering the aerosolized drug to the patient via a mouthpiece.

51. The method of claim 50, wherein the aerosol containment device comprises a connect element and a holding chamber.

52. The method of claim 51, wherein the method further comprises holding the holding chamber upright while vaporizing the drug.

53. The method of claim 50, wherein the method further comprises securing the mouthpiece to the aerosol containment device.

54. The method of claim 51, wherein the holding chamber is configured to stand in an upright position to enhance aerosolized drug formation and minimize impaction of the aerosolized drug on one or more walls of the holding chamber upon entry of the aerosolized drug into the holding chamber.

55. The method of claim 50, wherein the drug comprises 5-Methoxy-N,N-Dimethyltryptamine (5-MeO-DMT) or a pharmaceutical salt thereof, cannabinoid, tetrahydrocannabinol, entactogen 3,4-methylenedioxymethamphetamine, ketamine, lysergic acid diethylamide, psilocybin, N,N-dimethyltryptamine, phenylalkylamine mescaline, other tryptamines, other ergolines, other serotonergic compounds, second generation psychedelics, nicotine, pentamidine, and/or opioids such as fentanyl, morphine, and/or naloxone.

56. The method of claim 50, wherein the vaporizer will not operate unless the aerosol containment device is attached to the drug assembly prior to connecting the drug assembly to the vaporizer.

57. The method of claim 50, wherein a user is instructed to attach the aerosol containment device to the drug assembly prior to connecting the drug assembly to the vaporizer.

58. The method of claim 50, wherein administering the aerosolized drug comprises instructing the patient to press their lips firmly against the mouthpiece and inhale a full volume of the aerosolized drug from the aerosol containment device.

59. The method of claim 58, wherein when the patient presses their lips firmly against the mouthpiece a valve is opened thereby releasing the aerosolized drug.

60. The method of claim 51, the method further comprising palpating the holding chamber to ensure the aerosolized drug has been completely inhaled.

61. The method of claim 50, the method further comprising confirming the aerosolized drug is fully inhaled via one or more sensors configured to determine that the aerosolized drug in the aerosol containment device has been completely inhaled.

62. The method of claim 51, wherein securing the drug assembly to the aerosol containment device comprises aligning one or more slots in the drug assembly with one or more locking clips of the connect element.

63. The method of claim 51, the method further comprising unrolling and/or unfolding the holding chamber prior to vaporizing the drug.

64. The method of claim 51, wherein the holding chamber comprises a rigid material configured to stand upright.

65. The method of claim 62, wherein removing the aerosol containment device from the drug assembly comprises compressing one or more releasing tabs of the connect element to release the one or more locking clips from the one or more slots of the drug assembly.

66. The method of claim 65, wherein the drug assembly remains coupled to the vaporizer when the aerosol containment device is removed from the drug assembly.

67. The method of claim 66, wherein one or more retaining tabs of the connect element removably couple to one or more corresponding tabs in the drug assembly port.

68. The method of claim 67, wherein removably coupling the one or more retaining tabs of the connect element to one or more corresponding tabs in the drug assembly

port prevents removal of the drug assembly from the drug assembly port before removing the aerosol containment device from the drug assembly port.

69. The method of claim 50, wherein the aerosol containment device must be removed from the vaporizer before the drug assembly is removed from the vaporizer.

70. The method of claim 50, wherein the drug assembly cannot be removed from the vaporizer when the drug assembly is coupled to the aerosol containment device.

71. The method of claim 50, wherein securing the drug assembly to the drug assembly port of the vaporizer comprises docking the drug assembly to the drug assembly port and rotating the drug assembly.

72. The method of claim 50, the method further comprising purging a purging volume of air from the vaporizer prior to securing the drug assembly to the drug assembly port of the vaporizer.

73. The method of claim 72, wherein the purging volume of air is about 0.1 L to about 0.5 L.

74. The method of claim 50, wherein the drug is hydrophilic.

75. The method of claim 50, wherein the drug is hydrophobic.

76. The method of claim 50, wherein the aerosolized drug is administered to the patient within three minutes of vaporizing the drug.

77. The method of claim 50, wherein the predefined vaporization temperature is about 200 degrees Celsius to about 260 degrees Celsius.

78. The method of claim 50, wherein vaporizing the drug comprises:

heating a conductive column to the predefined vaporization temperature and passing a vaporization volume of air over the conductive column and through the drug assembly, thereby exposing the drug to the vaporization volume of air heated to the predefined vaporization temperature; and

heating a drug cartridge holding the drug to the predefined vaporization temperature,

wherein heat provided to the drug cartridge and the heated vaporization volume of air cause the drug to transition to a vapor,

wherein the vapor subsequently cools and condenses to form an aerosolized drug suspended in the vaporization volume of air,

wherein the vaporization volume of air carries the aerosolized drug to the aerosol containment device.

79. The method of claim 78, wherein a final aerosolized drug for administration to the patient is formed during additional thermal condensation that occurs in the aerosol containment device.

80. The method of claim 50, wherein the predefined vaporization temperature is about 200 degrees Celsius to about 260 degrees Celsius.

81. The method of claim 80, wherein the predefined vaporization temperature is about 235 degrees Celsius.

82. The method of claim 78, wherein the vaporization volume of air is about 0.5 L to about 3 L.

83. The method of claim 82, wherein the vaporization volume of air is about 2 L.

84. The method of claim 78, wherein the vaporization volume of air is provided at a flow rate of about 5 L/min to about 25 L/min.

85. The method of claim 84, wherein the flow rate is about 7 L/min.

86. The method of claim 50, wherein the drug has a melting point of about 50 degrees C to about 80 degrees C.

87. The method of claim 50, wherein the drug has a melting point of about 67.5 degrees C.

88. The method of claim 51, wherein an interior surface of the holding chamber is configured to prevent adhesion of the aerosolized drug.

89. The method of claim 88, wherein the interior surface of the holding chamber is antistatic.

90. The method of claim 51, wherein an inlet of the holding chamber is configured to minimize adhesion of the aerosolized drug.

91. The method of claim 50, wherein the method further comprises displaying instructions to a user on a display screen of the vaporizer.

92. The method of claim 91, wherein the instructions comprise:

securing the aerosol containment device to the drug assembly prior to securing the drug assembly and the aerosol containment device to the vaporizer; and

removing only the aerosol containment device from the vaporizer and leaving the drug assembly coupled to the vaporizer after aerosolized drug generation is complete.

93. The method of claim 51, wherein the method further comprises displaying one or more indicators on a display screen of the vaporizer.

94. The method of claim 93, wherein the one or more indicators are one or more of device ready to proceed to preheat, preheat in progress, preheat complete, ready to begin vaporization, vaporization in progress, aerosolized drug generation complete, temperature measurements, flow rate measurements, location measurements, warnings of improper connections, and errors.

95. The method of claim 93, wherein the one or more indicators include a notification that the predefined vaporization temperature has been reached, a notification instructing a user to confirm that the drug assembly and the aerosol containment device have been attached to the vaporizer, a notification instructing the user to initiate vaporization, and a notification indicating that vaporization is complete and to proceed immediately to administering the drug to the patient.