

cocatalysts (such as copper, rhodium, silver, platinum, gold, etc.), or other suitable metal oxide photocatalysts. Purified gas hydrogen peroxide gas may also be produced by electrolytic processes using anodes and cathodes made from any suitable metal, or constructed from metal oxide ceramics using morphology that permits immediate removal of hydrogen peroxide gas before it can be reduced. Alternatively, hydrogen peroxide gas may be produced by high frequency excitation of gaseous water and oxygen molecules on a suitable supporting substrate using morphology that permits immediate removal of hydrogen peroxide gas before it can be reduced.

SUMMARY OF THE INVENTION

[0015] In an aspect, the present disclosure provides for, and includes, enclosed spaces for human or veterinary use in a medical treatment of a respiratory disease, comprising a therapeutic amount of purified hydrogen peroxide gas (PHPG) at a concentration of at least 0.01 parts per million wherein said PHPG is non-hydrated and free of ozone.

[0016] In another embodiment, the present disclosure provides for, and includes, dwellings having purified hydrogen peroxide gas (PHPG) at concentration of at least 0.05 parts per million wherein said PHPG is non-hydrated and free of ozone.

[0016a] In yet another embodiment, the present disclosure provides for a method of improving air quality in an enclosed space comprising introducing purified hydrogen peroxide gas (PHPG) concentration of at least 0.01 parts per million wherein said PHPG is non-hydrated and free of ozone, wherein said air stream is introduced from an indoor air recirculation stream.

[0017] In a further embodiment, the present disclosure provides for, and includes, a method for preparing a purified hydrogen peroxide gas (PHPG) containing environment comprising generating PHPG that is substantially free of hydration and ozone, and accumulating said PHPG until a final concentration of at least 0.01 parts per million (ppm) is achieved.

[0018] In an embodiment, the present disclosure provides for, and includes, a method for preparing a purified hydrogen peroxide gas (PHPG) containing environment comprising generating PHPG that is substantially free of hydration and ozone, and accumulating said PHPG until a final concentration of at least 0.01 parts per million (ppm) is achieved.

[0019] In an embodiment, the present disclosure provides for, and includes, a method for providing an enclosed space comprising a purified hydrogen peroxide gas (PHPG) comprising providing PHPG that is substantially free of hydration and ozone to said environment at a rate sufficient to maintain PHPG gas at a final concentration of at least 0.01 parts per million (ppm)

[0020] In another aspect, the present disclosure provides for the use of a composition comprising purified hydrogen peroxide gas (PHPG) in the manufacture of a medicament for treating a respiratory illness in a subject, wherein said composition is to be provided in an enclosed space that is substantially free of hydration and ozone at a final concentration of between 0.01 parts per million (ppm) and 7.0 ppm; and wherein the subject is to be exposed to said environment for at least one period of time, wherein said treating comprises reducing the severity of a respiratory infection, reducing the duration of a respiratory infection, reducing the severity of an allergy, preventing transmission of a respiratory infection, reducing transmission of a respiratory infection in a population, improving lung function, or any combination thereof.

[0020a] In a further aspect, there is provided the use of a purified hydrogen peroxide gas (PHPG) in the manufacture of a medicament for controlling a pathogen in the respiratory system of a subject, wherein said medicament comprises an environment that is substantially free of hydration and ozone, wherein said environment accumulates said PHPG at a final concentration of at least 0.01 parts per million, and wherein said subject is to be exposed to said PHPG containing environment for a period of time to receive a therapeutic dose.

[0020b] In an embodiment, the present disclosure provides for, and includes, a method of treatment comprising providing a treatment environment comprising an enclosed space suitable for habitation wherein said treatment environment comprises a purified hydrogen peroxide gas (PHPG) concentration of at least 0.01 parts per million and the PHPG is non-hydrated and free of ozone and exposing a subject in need of treatment to the treatment environment for a treatment period.

[0021] In an embodiment, the present disclosure provides for, and includes, a method for treating a respiratory illness in a subject comprising providing an environment comprising a purified hydrogen peroxide gas (PHPG) that is substantially free of hydration and ozone at a final concentration of at least 0.01 parts per million (ppm) and exposing the subject to the environment for at least one period of time, wherein the treating comprises reducing the severity of a respiratory infection, reducing the duration of a respiratory infection, reducing the severity of an allergy, preventing transmission of a respiratory infection, reducing transmission of a respiratory infection in a population, improving lung function, or any combination thereof.

[0022] In an embodiment, the present disclosure provides for, and includes, a method for treating a respiratory condition in a subject in need thereof comprising providing the subject in need with an environment comprising a purified hydrogen peroxide gas (PHPG) that is substantially free of hydration and ozone at a final concentration of at least 0.01 parts per million (ppm).

[0023] In an embodiment, the present disclosure provides for, and includes, a method for reducing the severity of a respiratory infection in a subject comprising providing a purified hydrogen peroxide gas (PHPG) containing environment comprising PHPG that is substantially free of hydration and ozone at a final concentration of at least 0.01 parts per million (ppm), and exposing the subject to the PHPG containing environment for a period of time, wherein the severity of the respiratory infection is reduced.

[0024] In an embodiment, the present disclosure provides for, and includes, a generating a purified hydrogen peroxide gas (PHPG) that is substantially free of hydration and ozone to an environment, wherein the environment accumulates the PHPG at a final concentration of at least 0.01 parts per million, and exposing the subject to the PHPG containing environment for a period of time.

peroxide gas (PHPG) that is substantially free of hydration and ozone to an environment wherein the environment accumulates the PHPG at a final concentration of at least 0.01 parts per million, and exposing the subject to the PHPG containing environment for a period of time.

5 **[0031]** In an embodiment, the present disclosure provides for, and includes, a method of decreasing the severity of a respiratory infection in a subject comprising providing an environment comprising a purified hydrogen peroxide gas (PHPG) that is substantially free of hydration and ozone at a final concentration of at least 0.01 parts per million and exposing the subject to the environment for one or more periods of time, wherein the severity of the
10 respiratory infection is decreased.

[0032] In an embodiment, the present disclosure provides for, and includes, a method of increasing the rate of hypothiocyanate ion production catalyzed by lactoperoxidase (LPO) in the lungs of a subject comprising providing an environment comprising a purified hydrogen peroxide gas (PHPG) that is substantially free of hydration and ozone at a final concentration
15 of at least 0.01 parts per million and exposing the subject to the environment for one or more periods of time.

[0033] In an embodiment, the present disclosure provides for, and includes, a method of improving the lung function of a subject comprising providing an environment comprising a purified hydrogen peroxide gas (PHPG) that is substantially free of hydration and ozone at a
20 final concentration of at least 0.01 parts per million and exposing the subject to the environment for one or more periods of time.

[0034] In an aspect, the present disclosure provides for, and includes, the use of a purified hydrogen peroxide gas (PHPG) for the preparation of an environment suitable for preventing, treating, or controlling a respiratory illness in a subject comprising generating a hydrogen
25 peroxide gas that is substantially free of hydration and ozone and providing the hydrogen peroxide gas to an environment wherein the environment accumulates the PHPG at a final concentration of at least 0.01 parts per million.

[0035] The present disclosure also provides for, and includes, a method for preparing an environment suitable for occupancy of a subject comprising providing a device for producing
30 purified hydrogen peroxide gas (PHPG), wherein the PHPG is substantially free of hydration

CLAIMS

1. An enclosed space for human or veterinary use in a medical treatment of a respiratory disease, said enclosed space comprising a therapeutic amount of purified hydrogen peroxide gas (PHPG) at a concentration of at least 0.01 parts per million wherein said
5 PHPG is non-hydrated and free of ozone.
2. The enclosed space for human or veterinary use according to claim 1, wherein said enclosed space is a dwelling comprising said purified hydrogen peroxide gas (PHPG) at concentration of at least 0.05 parts per million wherein said PHPG is non-hydrated and free of ozone.
- 10 3. Use of a composition comprising purified hydrogen peroxide gas (PHPG) in the manufacture of a medicament for treating a respiratory illness in a subject, wherein said composition is to be provided in an enclosed space that is substantially free of hydration and ozone; and at a final concentration of at between 0.01 parts per million (ppm) and 7.0 ppm ; and
15 wherein said subject is to be exposed to said environment for at least one period of time,
wherein said treating comprises reducing the severity of a respiratory infection, reducing the duration of a respiratory infection, reducing the severity of an allergy, preventing transmission of a respiratory infection, reducing transmission of a
20 respiratory infection in a population, improving lung function, or any combination thereof.
4. The use of claim 3, wherein said improving lung function comprises increasing static lung volume, increasing total lung capacity, increasing the partial pressure of oxygen in arterial blood gases, decreasing residual volume, or any combination thereof.
- 25 5. The use of claim 3, wherein said period of time is at least 15 consecutive minutes.
6. The use of claim 3, wherein said period time is at least 60 minutes over a 24 hour period.
7. The use of claim 3, wherein said period time is at least 8 hours over a 7 day period.

8. The use of claim 3, wherein the total time of exposure is at least 1 hour.
9. The use of claim 3, wherein said exposure is repeated daily.
10. The use of claim 3, wherein said environment comprises PHPG at a final concentration of at least at least 0.5 ppm.
- 5 11. The use of claim 3, wherein said composition is for reducing the severity of a respiratory infection, wherein said respiratory infection is selected from the group consisting of severe acute respiratory syndrome (SARS), Middle East Respiratory Syndrome (MERS), ebola, porcine reproductive and respiratory syndrome virus (PRRSV) infection, and respiratory syncytial virus.
- 10 12. Use of a purified hydrogen peroxide gas (PHPG) in the manufacture of a medicament for controlling a pathogen in the respiratory system of a subject,

wherein said medicament comprises an environment that is substantially free of hydration and ozone, wherein said environment accumulates said PHPG at a final concentration of at least 0.01 parts per million, and

15 wherein said subject is to be exposed to said PHPG containing environment for a period of time to receive a therapeutic dose.
13. The use of claim 12, wherein said pathogen is selected from the group consisting of a virus, a bacterium, a fungus, and a parasite.
14. The use of claim 12, wherein said respiratory system comprises one or more of the
20 trachea, the bronchi, the conducting bronchioles, the respiratory bronchioles, the alveolar sac, the oral cavity, and the nasopharyngeal cavity.
15. The use of claim 13, wherein said fungus is from the genus *Aspergillus*.
16. The use of claim 13, wherein said fungus is selected from the group consisting of
25 *Histoplasma capsulatum*, blastomyces, *Cryptococcus neoformans*, *Pneumocystis jiroveci*, *Coccidioides immitis*, *Blastomyces dermatitidis*, *Pneumocystis jirovecii*, *Sporothrix schenckii*, *Cryptococcus neoformans*, *Aspergillus fumigatus*, and *Candida albicans*.

17. The use of claim 13, wherein said virus is a double stranded DNA virus, a single-stranded DNA virus, a double-stranded RNA virus, a positive sense single-stranded RNA virus, a negative sense single-stranded RNA virus, a single stranded RNA retrovirus, or a double-stranded DNA retrovirus.
- 5 18. The use of claim 13, wherein said bacterium is *Acinetobacter baumannii*, *Mycoplasma*, *Pneumococcus*, *Chlamydophila pneumoniae*, *Mycobacterium tuberculosis*, *Streptococcus pneumoniae*, *Haemophilus* species, or *Staphylococcus aureus*.
- 10 19. The use of claim 12, wherein said controlling comprises preventing infection of a subject by said pathogen; preventing the transmission of said pathogen from a subject to a second subject, decreasing the number of pathogen infected subjects in a population, reducing the number or severity of the symptoms of infection with said pathogen, decreasing the length of time a subject is infected with said pathogen, decreasing the number of sick days taken by a subject infected with said pathogen, or
15 decreasing the use of over-the-counter medication by a subject.
20. The use of claim 3, wherein said period of time is at least four hours.
21. The use of claim 3, wherein said final concentration is between 0.1 ppm and 7.0 ppm.
22. The use of claim 5, wherein said total time of exposure is at least 4 hours daily.
- 20 23. The use of claim 3, wherein said patient is to be exposed to a minimum dose of 0.05 units of PHPG per day.