Claims

1. A composition comprising one or more of clove oil, eucalyptus oil, basil oil, ginger oil, an extract or component of any of these, or a combination thereof, for use in the treatment, prophylactic treatment or amelioration of an airborne viral infection, or for use in reducing or preventing viral replication in a subject infected with an airborne virus or exposed to an airborne virus capable of causing an airborne viral infection in the subject.

2. The composition of claim 1, further comprising a buffer.

3. An aqueous composition comprising:

(i)	from 1 to 500 mmoles/L	buffer; and
(ii)	from 0.1 to 200 g/L	essential oil, or an extract or component thereof, with antiviral, antibacterial or antifungal activity.

4. The composition of claim 3, wherein the essential oil is selected from clove oil, eucalyptus oil, basil oil, ginger oil, saffron oil, cannabis oil, tea tree oil, black seed oil, an extract or component of any of these, or a combination thereof.

5. The composition of any one of the preceding claims, wherein:

(a) the extract or component of the essential oil is selected from eugenol, zingiberene, eucalyptol, jensenone, ursolic acid, caryophyllene, estragole, 1,8-cineole, camphor, thymol, eugenol epoxide, apigenin, linalool, rosmarinic acid, 6-gingerol, 6-shogaol, gingeronone A, crocetin, crocin, picrocrocin, safranal, caflanone, tetrahydrocannabinol, cannabidiol (or its metabolite 7-hydroxycannabidiol), cannabinol, tetrahydrocannabivarin, terpinen-4-ol, terpinolene, α-terpineol, thymoquinone, ar-curcumene, β-sesquiphellandrene, α-farnesene, α-phellandrene, β-phellandrene, camphene, β-bisabolene, α-terpinene, γ-terpinene, p-cymene, α-pinene, or a mono- or polyunsaturated fatty acid such as palmitoleic acid, heptadecenoic acid, oleic acid, linoleic acid, α-linolenic acid, γ-linolenic acid, arachidonic acid, or erucic acid; or

(b) the essential oil, or the extract or component thereof, has antiviral activity.

6. The composition of any one of claims 2 to 5, wherein the buffer:

(a) comprises hydrogen carbonate ions or an equivalent thereof; or

(b) comprises, consists of or consists essentially of (i) a Good's buffer, an aminosulphonic acid, an aminosulphinic acid, a phosphate, a phosphite, a heteroaryl, a phenolic acid, an amino acid, a peptide, a peptide equivalent, a polymeric buffer, a urea, an ionic liquid buffer, or a combination thereof; and (ii) hydrogen carbonate ions or an equivalent thereof; or

(c) comprises, consists of or consists essentially of:

(i) from 1 to 100 mmoles/L Good's buffer, aminosulphonic acid, aminosulphinic acid, phosphate, phosphite, heteroaryl, phenolic acid, amino acid, peptide, peptide equivalent, polymeric buffer, urea, ionic liquid buffer, or a combination thereof; and

(ii) from 21 to 35 mmoles/L hydrogen carbonate ions or an equivalent thereof; or

(d) comprises, consists of or consists essentially of (i) one or more phosphates, and (ii) hydrogen carbonate ions; or

(e) comprises, consists of or consists essentially of KH_2PO_4, Na_2HPO_4 and $NaHCO_3$.

7. The composition of any one of the preceding claims,

(a) comprising:

(i) from 1 to 500 mmoles/L buffer;

(ii) from 0.1 to 50 g/L clove oil or an extract or component thereof;

(iii) from 0.1 to 50 g/L eucalyptus oil or an extract or component thereof;

(iv) from 0.1 to 50 g/L basil oil or an extract or component thereof; and

(v) from 0.1 to 50 g/L ginger oil or an extract or component thereof; or

(b) comprising:

(i) from 1 to 500 mmoles/L buffer;

(ii) from 0.1 to 200 μmoles/L zinc ions;

(iii) from 0.1 to 50 g/L clove oil or an extract or component thereof;

(iv) from 0.1 to 50 g/L eucalyptus oil or an extract or component thereof;

(v) from 0.1 to 50 g/L basil oil or an extract or component thereof; and

(vi) from 0.1 to 50 g/L ginger oil or an extract or component thereof; or

(c) comprising:

(i) from 25 to 250 mmoles/L one or more phosphates;

(ii) from 1 to 45 mmoles/L hydrogen carbonate ions;
(iii) from 0.1 to 10 g/L clove oil or an extract or component thereof;
(iv) from 0.1 to 10 g/L eucalyptus oil or an extract or component thereof;
(v) from 0.1 to 10 g/L basil oil or an extract or component thereof; and
(vi) from 0.1 to 10 g/L ginger oil or an extract or component thereof; or

(d) comprising:
(i) from 25 to 250 mmoles/L one or more phosphates;
(ii) from 1 to 45 mmoles/L hydrogen carbonate ions;
(iii) from 0.1 to 50 μmoles/L zinc ions;
(iv) from 0.1 to 10 g/L clove oil or an extract or component thereof;
(v) from 0.1 to 10 g/L eucalyptus oil or an extract or component thereof;
(vi) from 0.1 to 10 g/L basil oil or an extract or component thereof; and
(vii) from 0.1 to 10 g/L ginger oil or an extract or component thereof.

8. The composition of any one of the preceding claims, wherein the composition:

(a) further comprises from 0.1 to 200 μmoles/L zinc ions; or

(b) further comprises from 1 to 100 μmoles/L transferrin and/or iron ions; or

(c) further comprises:
(i) calcium ions and magnesium ions at a molar concentration ratio of from 5:1 to 1:1, wherein said calcium ions are at a concentration of from 0.1 to 2.5 mmoles/L;
(ii) from 2.5 to 20 mmoles/L potassium ions;
(iii) from 96 to 126 mmoles/L chloride ions; and
(iv) from 100 to 300 mmoles/L sodium ions; or

(d) further comprises one or more additional components selected from NaCl, KCl, $MgCl_2$, xylitol, EDTA, $CaCl_2$, glycerol, HPMC, PEG 400, poloxamer 188, benzalkonium chloride and sodium hyaluronate; or

(e) further comprises an antibiotic, an emulsifying agent and/or an antioxidant; or

(f) further comprises one or more of:
(i) from 2 to 11 mmoles/L glucose;
(ii) from 50 to 150 μmoles/L glycerol;
(iii) from 7 to 15 μmoles/L choline ions;
(iv) from 5 to 400 μmoles/L glutamate;

(v) from 5 to 200 µmoles/L aspartate;
(vi) from 100 to 2000 µmoles/L glutamine;
(vii) from 20 to 215 µmoles/L pyroglutamate;
(viii) from 20 to 200 µmoles/L arginine;
(ix) from 1 to 250 nmoles/L thiamine pyrophosphate ions;
(x) from 40 to 100 µmoles/L carnitine;
(xi) from 5 to 600 mIU/L porcine or human insulin;
(xii) from 20 to 200 µmoles/L hyaluronic acid;
(xiii) from 1 to 100 µmoles/L transferrin;
(xiv) from 20 to 250 µmoles/L leucine;
(xv) from 10 to 100 µmoles/L linoleic acid;
(xvi) from 200 to 1000 µmoles/L cholesterol;
(xvii) from 20 to 500 µmoles/L pyridoxal-5-phosphate; or
(xviii) from 10 to 250 µmoles/L chitosan.

9. The composition of any one of the preceding claims, wherein the composition is an emulsion or comprises microdroplets.

10. The composition of any one of the preceding claims, wherein the composition is an aqueous composition

(a) comprising:
(i) from 1 to 100 mmoles/L (preferably from 1 to 12 mmoles/L) Good's buffer, aminosulphonic acid, aminosulphinic acid, phosphate, phosphite, heteroaryl, phenolic acid, amino acid, peptide, peptide equivalent, polymeric buffer, urea, ionic liquid buffer, or a combination thereof;
(ii) calcium ions and magnesium ions at a molar concentration ratio of from 5:1 to 1:1, wherein said calcium ions are at a concentration of from 0.1 to 2.5 mmoles/L;
(iii) from 21 to 35 mmoles/L hydrogen carbonate ions or an equivalent thereof;
(iv) from 2.5 to 6.2 mmoles/L potassium ions;
(v) from 96 to 126 mmoles/L chloride ions; and
(vi) from 100 to 150 mmoles/L sodium ions; or

(b) comprising:
(i) from 1 to 100 mmoles/L (preferably from 1 to 12 mmoles/L) Good's buffer, aminosulphonic acid, aminosulphinic acid, phosphate, phosphite, heteroaryl,

phenolic acid, amino acid, peptide, peptide equivalent, polymeric buffer, urea, ionic liquid buffer, or a combination thereof;

(ii) calcium ions and magnesium ions at a molar concentration ratio of from 5:1 to 1:1, wherein said calcium ions are at a concentration of from 0.1 to 2.5 mmoles/L;

(iii) from 21 to 35 mmoles/L hydrogen carbonate ions or an equivalent thereof;

(iv) from 2.5 to 6.2 mmoles/L potassium ions;

(v) from 96 to 126 mmoles/L chloride ions;

(vi) from 100 to 150 mmoles/L sodium ions; and

(vii) from 0.1 to 200 μmoles/L zinc ions; or

(c) comprising:

(i) from 1 to 100 mmoles/L (preferably from 1 to 12 mmoles/L) Good's buffer, aminosulphonic acid, aminosulphinic acid, phosphate, phosphite, heteroaryl, phenolic acid, amino acid, peptide, peptide equivalent, polymeric buffer, urea, ionic liquid buffer, or a combination thereof;

(ii) calcium ions and magnesium ions at a molar concentration ratio of from 5:1 to 1:1, wherein said calcium ions are at a concentration of from 0.1 to 2.5 mmoles/L;

(iii) from 21 to 35 mmoles/L hydrogen carbonate ions or an equivalent thereof;

(iv) from 2.5 to 6.2 mmoles/L potassium ions;

(v) from 96 to 126 mmoles/L chloride ions;

(vi) from 100 to 150 mmoles/L sodium ions;

(vii) from 1 to 100 μmoles/L transferrin; and

(viii) from 1 to 100 μmoles/L iron ions.

11. The composition of any one of the preceding claims, having a pH of from 6.7 to 7.9 at a temperature of 37°C.

12. The composition of any one of the preceding claims, wherein the composition is suitable for:

(a) inhalation into the oral cavity, upper respiratory tract, lower respiratory tract, nasal cavity, pharynx, larynx, trachea, bronchi or lungs; or

(b) administration by inhaler, nebulizer, nasal spray, mouth spray, bronchial spray, nasal drops, nasal wash, nasal lavage, neti pot, nasal packing, mouthwash or gargle, or in the form of a cream, gel, emulsion or ointment; or

(c) application to a mask or other face covering, or wherein the composition is suitable for use in a receptacle configured to allow an oxygen-containing gas to be bubbled through the composition prior to inhalation of the gas by a subject, or wherein the composition is suitable for diffusing or spraying into the air prior to inhalation of the air by a subject.

13. The composition of any one of the preceding claims, for use in the treatment, prophylactic treatment or amelioration of an airborne viral infection, or for use in reducing or preventing viral replication in a subject infected with an airborne virus or exposed to an airborne virus capable of causing an airborne viral infection in the subject.

14. The composition of claim 13, wherein the airborne viral infection is caused by (i) an RNA virus, such as a coronavirus (including a coronavirus selected from MERS-CoV, SARS-CoV, and SARS-CoV-2), an influenza virus (including an influenza virus selected from influenza A virus, influenza B virus, influenza C virus, and parainfluenza virus), a rhinovirus, Measles virus, Mumps virus, Rubella virus, or human respiratory syncytial virus, or (ii) a DNA virus, such as Parvovirus B19, an adenovirus, an adeno-associated virus, a herpes virus (including a herpes virus selected from Varicella-Zoster virus (VZV or HHV-3), Epstein-Barr virus (EBV or HHV-4), human herpes virus 6 (HHV-6A and HHV-6B), and human herpes virus 7 (HHV-7)), a polyomavirus (including a polyomavirus selected from BK polyomavirus and WU polyomavirus), or Variola virus.

15. A method of preparing the composition of any one of claims 1 to 14, comprising combining all components with a solvent (preferably water), optionally making up to the desired volume, optionally filtering and optionally storing in a sealed vessel.

16. A concentrate for the preparation of the composition of any one of claims 1 to 14, comprising:

(a) water and all components, wherein the concentrate is dilutable with water to form the composition of any one of claims 1 to 14; or

(b) water and all components except the hydrogen carbonate ions or the equivalent thereof and their countercations, wherein the concentrate is dilutable with water comprising the hydrogen carbonate ions or the equivalent thereof and their countercations to form the composition of any one of claims 1 to 14.

17. Use of the composition of any one of claims 1 to 14 in the manufacture of a medicament for the treatment, prophylactic treatment or amelioration of an airborne viral infection in a subject.

18. Use of the composition of any one of claims 1 to 14 in the manufacture of a medicament for reducing or preventing viral replication in a subject infected with an airborne virus or exposed to an airborne virus capable of causing an airborne viral infection in the subject.

19. The method of claim 17 or 18, wherein the airborne viral infection is caused by (i) an RNA virus, such as a coronavirus (including a coronavirus selected from MERS-CoV, SARS-CoV, and SARS-CoV-2), an influenza virus (including an influenza virus selected from influenza A virus, influenza B virus, influenza C virus, and parainfluenza virus), a rhinovirus, Measles virus, Mumps virus, Rubella virus, or human respiratory syncytial virus, or (ii) a DNA virus, such as Parvovirus B19, an adenovirus, an adeno-associated virus, a herpes virus (including a herpes virus selected from Varicella-Zoster virus (VZV or HHV-3), Epstein-Barr virus (EBV or HHV-4), human herpes virus 6 (HHV-6A and HHV-6B), and human herpes virus 7 (HHV-7)), a polyomavirus (including a polyomavirus selected from BK polyomavirus and WU polyomavirus), or Variola virus.

20. A method of reducing the risk of viral infection with an airborne virus in a subject, the method comprising:

(a) applying the composition of any one of claims 1 to 14 to a mask or other face covering; or

(b) bubbling an oxygen-containing gas through the composition of any one of claims 1 to 14 prior to inhalation of the gas by the subject; or

(c) diffusing or spraying the composition of any one of claims 1 to 14 into the air prior to inhalation of the air by the subject.

21. A spray, inhaler, nebulizer, nasal spray, mouth spray, bronchial spray, nasal drops, nasal wash, nasal lavage, neti pot, nasal packing, mouthwash or gargle, receptacle, cream, gel, emulsion or ointment,

(a) comprising the composition of any one of claims 1 to 14; or

(b) comprising (i) the concentrate of claim 16(a), and (ii) water; or

(c) comprising (i) the concentrate of claim 16(b), and (ii) water comprising hydrogen carbonate ions or an equivalent thereof and their countercations.

22. A mask or other face covering coated or impregnated with the composition of any one of claims 1 to 14.

23. A method of cleaning an object, the method comprising applying the composition of any one of claims 1 to 14 to the object.