(therapeutically relevant dose) of the composition, thereby providing relief of symptoms associated with the viral infection or amelioration of the viral infection. Administration of the composition to the animal can begin immediately after infection or any time within zero to about 5 days after infection or at the earliest time after definite diagnosis of infection with virus. The virus can be any virus described herein; however, some viruses are preferred. Chronic administration can be achieved by repeated daily administration of rapid or immediate release dosage form(s) (or composition(s)) or by repeated administration (daily, weekly or monthly) of extended (controlled) release dosage form(s).

[0038] Accordingly, the disclosure also provides a method of treating viral infection in a mammal, the method comprising administering to the mammal one or more therapeutically effective doses of the antiviral composition. The one or more therapeutic dose(s) is(are) not lethal or fatal to the animal. One or more doses are administered on a daily, weekly, and/or monthly basis. One or more doses per day can be administered. The virus can be any virus described herein that is pathogenic to animals.

[0038a] One aspect of the disclosure provides use of an antiviral composition comprising oleandrin in the manufacture of a medicament for treating viral infection in an animal in need thereof, wherein one or more doses of the antiviral composition comprising oleandrin is to be administered to the animal, and wherein the viral infection is selected from the group consisting of bovine coronavirus (BCV), porcine coronavirus (PCV), bovine viral diarrhea virus (BVDV), bovine respiratory syncytial virus (BRSV), and porcine reproductive and respiratory syndrome virus (PRRSV).

[0039] The disclosure also provides a method of treating viral infection in an animal in need thereof, the method comprising:

determining whether or not the animal has a viral infection;

indicating administration of antiviral composition;

administering an initial dose of antiviral composition to the animal according to a prescribed initial dosing regimen for a period of time;

periodically determining the adequacy of the animal's clinical response and/or therapeutic response to treatment with antiviral composition; and

if the animal's clinical response and/or therapeutic response is adequate, then continuing treatment with antiviral composition as needed until the desired clinical endpoint is achieved; or

[0041] The individual steps of the methods of the disclosure can be conducted at separate facilities or within the same facility.

[0042] The disclosure provides alternate examples, for all the examples described herein, wherein the oleandrin is replaced with digoxin or used in combination with digoxin. The methods of the disclosure may employ oleandrin, digoxin, or a combination of oleandrin and digoxin. Accordingly, oleandrin, digoxin, oleandrin-containing composition, digoxin-containing composition, or oleandrin- and digoxin-containing composition may be used in the methods of the disclosure. Cardiac glycoside can be taken to mean oleandrin, digoxin or a combination thereof. A cardiac glycoside-containing composition comprises oleandrin, digoxin or a combination thereof.

[0043] The disclosure also provides a method of treating coronavirus infection, in particular an infection of coronavirus that is pathogenic to animals, e.g. BCV infection or PCV infection, the method comprising chronically administering to an animal, having said infection, therapeutically effective doses of cardiac glycoside (cardiac glycoside-containing composition).

[0044] The disclosure provides a method of preventing an animal from exhibiting one or more symptoms associated with viral infection, the method comprising administering to said animal one or more therapeutically effective doses of cardiac glycoside-containing composition, wherein said one or more doses are administered a) prior to said animal being infected with virus; or b) within a period of up to five days, up to four days, up to three days, up to two days, or up to one day of said animal having been infected with virus.

[0044a] Another aspect of the disclosure provides use of an antiviral composition comprising oleandrin in the manufacture of a medicament for preventing viral infection in an animal at risk of contracting said viral infection, wherein one or more doses of the antiviral composition comprising oleandrin is to be administered chronically to the animal on a recurring or continuous basis over an extended treatment period prior to the animal contracting the viral infection, thereby preventing the animal from contracting said viral infection, and wherein the viral infection is selected from the group consisting of bovine coronavirus (BCV), porcine coronavirus (PCV), bovine viral diarrhea virus (BVDV),

bovine respiratory syncytial virus (BRSV), and porcine reproductive and respiratory syndrome virus (PRRSV).

[0045] The disclosure provides a method of preventing a viral infection in an animal from progressing to a disease state or from exhibiting one or more symptoms associated with viral infection, the method comprising administering to said animal one or more therapeutically effective doses of cardiac glycoside-containing composition within a period of up to seven days, up to six days, up to five days, up to four days, up to three days, up to two days, or up to one day of said animal having been infected with the virus. In other words, the composition might not stop the infection from occurring, but it would stop the infection from progressing to the disease state.

[0045a] Another aspect of the disclosure provides use of a cardiac glycoside-containing composition comprising oleandrin in the manufacture of a medicament for preventing an animal from exhibiting one or more symptoms associated with viral infection, wherein one or more doses of the cardiac glycoside-containing composition comprising oleandrin is to be administered to said animal, wherein the viral infection is selected from the group consisting of bovine coronavirus (BCV), porcine coronavirus (PCV), bovine viral diarrhea virus (BVDV), bovine respiratory syncytial virus (BRSV), and porcine reproductive and respiratory syndrome virus (PRRSV), and wherein said one or more doses are to be administered a) prior to said animal being infected with virus; or b) within a period of up to five days, up to four days, up to three days, up to two days, or up to one day of said animal having been infected with virus.

[0045b] Another aspect of the disclosure provides use of an antiviral composition comprising oleandrin in the manufacture of a medicament for preventing a viral infection in an animal from progressing to a disease state, wherein one or more doses of the antiviral composition is to be administered on a recurring or continuous basis to the animal having the viral infection that has not progressed to the disease state, thereby preventing progression of said viral infection to a disease state, and wherein the viral infection is selected from the group consisting of bovine coronavirus (BCV), porcine coronavirus (PCV), bovine viral diarrhea virus (BVDV), bovine respiratory syncytial virus (BRSV), and porcine reproductive and respiratory syndrome virus (PRRSV).

[0045c] Another aspect of the disclosure provides use of a cardiac glycoside-containing composition comprising oleandrin in the manufacture of a medicament for preventing a viral infection in an animal from progressing to a disease state or from exhibiting one or

more symptoms associated with viral infection, wherein one or more therapeutically effective doses of the cardiac glycoside-containing composition comprising oleandrin is to be administered to said animal within a period of up to seven days, up to six days, up to five days, up to four days, up to three days, up to two days, or up to one day of said animal having been infected with the virus, and wherein the viral infection is selected from the group consisting of bovine coronavirus (BCV), porcine coronavirus (PCV), bovine viral diarrhea virus (BVDV), bovine respiratory syncytial virus (BRSV), and porcine reproductive and respiratory syndrome virus (PRRSV).

[0046] In some examples, the animal has been in close contact (within six feet) with another animal having a viral infection. Close contact might also be due to said uninfected

CLAIMS

1) Use of an antiviral composition comprising oleandrin in the manufacture of a medicament for treating viral infection in an animal in need thereof, wherein one or more doses of the antiviral composition comprising oleandrin is to be administered to the animal, and wherein the viral infection is selected from the group consisting of bovine coronavirus (BCV), porcine coronavirus (PCV), bovine viral diarrhea virus (BVDV), bovine respiratory syncytial virus (BRSV), and porcine reproductive and respiratory syndrome virus (PRRSV).

2) Use of an antiviral composition comprising oleandrin in the manufacture of a medicament for preventing viral infection in an animal at risk of contracting said viral infection, wherein one or more doses of the antiviral composition comprising oleandrin is to be administered chronically to the animal on a recurring or continuous basis over an extended treatment period prior to the animal contracting the viral infection, thereby preventing the animal from contracting said viral infection, and wherein the viral infection is selected from the group consisting of bovine coronavirus (BCV), porcine coronavirus (PCV), bovine viral diarrhea virus (BVDV), bovine respiratory syncytial virus (BRSV), and porcine reproductive and respiratory syndrome virus (PRRSV).

3) Use of a cardiac glycoside-containing composition comprising oleandrin in the manufacture of a medicament for preventing an animal from exhibiting one or more symptoms associated with viral infection, wherein one or more doses of the cardiac glycoside-containing composition comprising oleandrin is to be administered to said animal, wherein the viral infection is selected from the group consisting of bovine coronavirus (BCV), porcine coronavirus (PCV), bovine viral diarrhea virus (BVDV), bovine respiratory syncytial virus (BRSV), and porcine reproductive and respiratory syndrome virus (PRRSV), and wherein said one or more doses are to be administered a) prior to said animal being infected with virus; or b) within a period of up to five days, up to four days, up to three days, up to two days, or up to one day of said animal having been infected with virus.

4) Use of an antiviral composition comprising oleandrin in the manufacture of a medicament for preventing a viral infection in an animal from progressing to a disease state, wherein one or more doses of the antiviral composition is to be administered on a recurring or continuous basis to the animal having the viral infection that has not progressed to the disease

state, thereby preventing progression of said viral infection to a disease state, and wherein the viral infection is selected from the group consisting of bovine coronavirus (BCV), porcine coronavirus (PCV), bovine viral diarrhea virus (BVDV), bovine respiratory syncytial virus (BRSV), and porcine reproductive and respiratory syndrome virus (PRRSV).

5) Use of a cardiac glycoside-containing composition comprising oleandrin in the manufacture of a medicament for preventing a viral infection in an animal from progressing to a disease state or from exhibiting one or more symptoms associated with viral infection, wherein one or more therapeutically effective doses of the cardiac glycoside-containing composition comprising oleandrin is to be administered to said animal within a period of up to seven days, up to six days, up to five days, up to four days, up to three days, up to two days, or up to one day of said animal having been infected with the virus, and wherein the viral infection is selected from the group consisting of bovine coronavirus (BCV), porcine coronavirus (PCV), bovine viral diarrhea virus (BVDV), bovine respiratory syncytial virus (BRSV), and porcine reproductive and respiratory syndrome virus (PRRSV).

6) The use of any one of the above claims, wherein the antiviral composition is to be administered systemically.

7) The use of any one of the above claims, wherein the animal has been within six feet of another animal having a viral infection, and/or wherein the uninfected animal has been living with, sharing food with, sharing shelter with, sharing air with, or sharing water with a virally infected animal.

8) The use of any one of the above claims, wherein

a) said animal is a cow and the dose of antiviral composition provides a maximum plasma concentration of oleandrin of no more than 1 ng/mL;

b) said animal is a pig and the dose of antiviral composition provides a maximum plasma concentration of oleandrin of no more than 5 ng/mL;

c) said animal is a horse and the dose of antiviral composition provides a maximum plasma concentration of oleandrin of no more than 5 ng/mL;

d) said animal is a sheep and the dose of antiviral composition provides a maximum plasma concentration of oleandrin of no more than 5 ng/mL; or

e) said animal is a goat and the dose of antiviral composition provides a maximum plasma concentration of oleandrin of no more than 10 ng/mL.

9) The use of any one of the above claims, wherein a dose of said antiviral composition comprises 0.05-0.5 microg/kg/day, 0.05-0.35 microg/kg/day, 0.05-0.22 microg/kg/day, 0.05-0.4 microg/kg/day, or 0.05-0.3 microg/kg/day, based upon the unit amount of oleandrin per kg of bodyweight per day.

10) The use of any one of the above claims, wherein the cardiac glycoside is to be administered in at least two dosing phases: a loading phase and a maintenance phase.

11) The use of any one of claims 1-7, wherein following administration of said one or more doses, the plasma concentration of oleandrin in said subject is in the range of 0.05 to 2 ng/ml, 0.005 to 10 ng/mL, 0.005 to 8 ng/mL, 0.01 to 7 ng/mL, 0.02 to 7 ng/mL, 0.03 to 6 ng/mL, 0.04 to 5 ng/mL, or 0.05 to 2.5 ng/mL, in terms of the amount of oleandrin per mL of plasma.

12) The use of any one of the above claims, wherein a) plural doses are one or more doses to be administered per day for two or more days per week; b) 1-10 doses of cardiac glycoside (cardiac glycoside-containing composition) per day are to be administered for a treatment period of 2 days to 2 months; or c) one or more doses of cardiac glycoside (cardiac glycoside-containing composition) are to be administered per day for plural days and plural weeks until the viral infection is cured.

13) The use of claim 12, wherein dosing is to be continued for one or more weeks per month.

14) The use of claim 13, wherein dosing is to be continued for one or more months per year.

15) The use of any one of the above claims, wherein said antiviral composition comprises
a) oleandrin;
b) a combination of oleandrin, oleanolic acid and ursolic acid;
c) a combination of oleandrin, oleanolic acid and betulinic acid;
d) a combination of oleandrin, oleanolic acid, ursolic acid, and betulinic acid;
e) a combination of oleandrin, oleanolic acid, ursolic acid, and betulinic acid;

f) a combination of oleandrin and at least two triterpenes selected from the group consisting of oleanolic acid, ursolic acid, betulinic acid; or
g) a combination of at least oleandrin, oleanolic acid, ursolic acid, betulinic acid, kanerocin, kanerodione, oleandrigenin, Nerium F, neritaloside, odoroside, adynerin, odoroside-G-acetate, and gitoxigenin,
wherein each of oleanolic acid, ursolic acid, and betulinic acid are independently selected upon each occurrence from its free acid form or salt form.

16) The use of any one of the above claims, wherein said antiviral composition further comprises polyphenol(s), carbohydrate(s), flavonoid(s), amino acid(s), soluble protein(s), cellulose, starch, alkaloid(s), saponin(s), tannin(s), or any combination thereof.

17) The use of any one of the above claims, wherein said antiviral composition comprises an extract of biomass.

18) The use of claim 17, wherein said extract is prepared by hot-water extraction, cold-water extraction, organic solvent extraction, supercritical fluid extraction, subcritical liquid extraction, or a combination thereof.

19) The use of claims 17 or 18, wherein said extract comprises a combination of oleandrin and one or more compounds extracted from said biomass.

20) The use of claim 19, wherein said biomass is plant material from *Nerium* species or *Agrobacterium* species biomass.

21) The use of claim 19, wherein said extract further comprises one or more cardiac glycoside precursors, one or more glycone constituents of cardiac glycosides, or a combination thereof.

22) The use of any one of the above claims, wherein the animal is selected from the group consisting of pig, cow, horse, sheep, goat, llama, alpaca, buffalo, deer, elk, giraffe, camel, dog, cat, chicken, turkey, pigeon, duck, pheasant, and guinea.

23) The use of any one of the above claims, wherein said antiviral composition is included in a feed and/or liquid to be administered orally to the animal.