**[0006]** Accordingly, there remains a critical need for new and effective treatments for infectious diseases and disorders, including diseases and disorders associated with viruses. There is also a need for broad spectrum antiviral therapeutics that are effective against multiple virus species and strains.

## SUMMARY

**[0007]** In one aspect, the present disclosure provides a use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for treating a virus-associated disease or disorder, wherein the arginase has at least about 90% sequence identity to SEQ ID NO:1 or 2, or a fragment thereof, and wherein the virus-associated disease or disorder is associated with a virus selected from the group consisting of a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus. In another aspect, the present disclosure provides a use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for treating a virus-associated disease or disorder, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-50 and 56, or a fragment thereof. In another aspect, the present disclosure provides a use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manfacture of a medicament for inhibiting genomic replication of a virus, wherein the arginase has at least about 90% sequence identity to SEQ ID NO:1 or 2, or a fragment thereof, and wherein the virus is selected from the group consisting of a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus.

**[0007a]** In yet another aspect, the present disclosure provides a use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for inhibiting genomic replication of a virus, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-50 and 56, or a fragment thereof. In yet another aspect, the present disclosure provides a use of a composition comprising an arginase, in the manufacture of a medicament for inhibiting transmission of a virus, wherein the arginase has at least about 90% sequence identity to a

protein sequence selected from the group consisting of SEQ ID NO:1 or 2, or a pharmaceutically acceptable salt thereof, wherein the virus is selected from the group consisting of a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus. In yet another aspect, the present disclosure provides a use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for inhibiting transmission of a virus, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-50 and 56, or a fragment thereof. In yet another aspect, the present disclosure provides a use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for inhibiting assembly of a virus, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof.

**[0007b]** In yet another aspect, the present disclosure provides a use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for inhibiting virus gene expression, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof. In yet another aspect, the present disclosure provides a use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for inhibiting virus release, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof. In yet another aspect, the present disclosure provides a use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufucature of a medicament for treating a bacterial disease or disorder, wherein the arginase has at least about 90% sequence identity to SEQ ID NO:1 or 2, or a fragment thereof, and wherein the bacterial disease or disorder is associated with a bacteria selected from the group consisting of: Streptococcus pneumoniae, Mycoplasma pneumoniae, Haemophilus influenzae, Legionella pneumophila, Salmonella enterica, Salmonella bongori, Escherichia coli, Helicobacter pylori, Neisseria gonorrhoeae, Neisseria meningitidis, Staphylococcus aureus, Acinetobacter baumannii, Burkholderia cepacian, Clostridium difficile, Clostridium sordellii, an Enterobacteriaceae, Enterococcus faecalis, Klebsiella pneumoniae, Morganella morganii,

Mycobacterium abscessus, Mycobacterium tuberculosis, a Norovirus, Psuedomonas aeruginosa, and Stenotrophomonas maltophilia.

**[0007c]** In yet another aspect, the present disclosure provides a use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for treating a bacterial disease or disorder, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-50 and 56, or a fragment thereof. In yet another aspect, the present disclosure provides a use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for treating a fungal disease or disorder, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof. In yet another aspect, the present disclosure provides a use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for treating an amoeba disease or disorder, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof.

Described herein is a method of using an arginase (*e.g.*, a non-PEGylated or a PEGylated arginase) in the treatment of a disease or disorder, for example, a virus-associated disease or disorder. For example, described herein is a method of treating a disease or disorder, for example, a virus-associated disease or disorder, where the method includes administering a therapeutically effective amount of a composition comprising an arginase (*e.g.*, a non-PEGylated or a PEGylated arginase), or a pharmaceutically acceptable salt thereof. In some examples the method includes administering a therapeutically effective amount of the composition to a patient, for example, a patient in need of treatment.

**[0008]** In some examples, the arginase (*e.g.*, a non-PEGylated or a PEGylated arginase), or a pharmaceutically acceptable salt thereof, or a composition comprising the arginase, is effective to inhibit genomic replication of a virus. In some examples, the arginase, or a composition comprising the arginase, or a pharmaceutically acceptable salt thereof, is effective to inhibit transmission of a virus. In some examples, the arginase, or a pharmaceutically acceptable salt thereof, or a composition comprising the arginase, is effective to inhibit viral gene expression. In some examples, the arginase, or a pharmaceutically acceptable salt thereof, or a composition comprising the arginase, is effective to inhibit assembly of a virus. Kits containing an arginase,

or a pharmaceutically acceptable salt thereof, or a composition comprising the arginase, or a pharmaceutically acceptable salt thereof, are also described herein.

**[0009]** The amino acid arginine, while critical for processes in mammalian cells such as cell proliferation and growth, is considered to be a non-essential amino acid in humans due to the ability to metabolize citrulline to derive an arginine pool (Hecker *et al.* (1990) Proc. Natl. Acad. Sci. USA. 87(21): 8612-6). In contrast, many viruses are reliant on exogenous arginine for protein synthesis (US 9,011,845 B2). The inventors have discovered that arginase and PEGylated-arginase are effective to deplete arginine levels and presents an unexpected mechanism for treatment of viral infection, with the ability to target a broad spectrum of viruses.

Additionally, the inventors have discovered that arginine depletion by non-PEGylated arginase or PEGylated arginase provides a method of treating previously unencountered viruses, or viruses for which no approved therapeutic currently exists, such as SARS-CoV-2 (COVID-19).

**[0010]** Described herein is a method of treating a disease or disorder, for example, virus-associated disease or disorder, where the method includes administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase (*e.g.*, a non-PEGylated or a PEGylated arginase), or a pharmaceutically acceptable salt thereof. In some examples described herein, the PEGylated arginase comprises at least one polyethylene glycol (PEG) molecule conjugated to an arginase sequence.

**[0011]** In some examples, the arginase has at least about 90% sequence identity to a protein sequence of SEQ ID NO:1-41, or a fragment thereof. In some examples, the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-41, or a fragment thereof. In some examples, the arginase has at least about 90% sequence identity to a protein sequence of SEQ ID NO:1 or 2, or a fragment thereof. In some examples, the arginase comprises a protein sequence selected from the group consisting of SEQ ID NO:1-41. In some examples, the arginase comprises a protein sequence selected from the group consisting of SEQ ID NO:3-41. In some examples, the arginase comprises a protein sequence of SEQ ID NO:1 or 2.

**[0012]** Thus, in some examples described herein, the method includes administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, wherein the arginase: has at least about 90% sequence identity to a protein sequence of SEQ ID NO:1-41, or a fragment thereof; has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-41, or a fragment thereof; has at least about 90% sequence identity to a protein sequence of SEQ ID NO:1 or 2, or a fragment thereof; comprises a protein sequence selected from the group consisting of SEQ ID NO:1-41; comprises a protein sequence selected from the group consisting of SEQ ID NO:3-41; or comprises a protein sequence of SEQ ID NO:1 or 2.

**[0013]** Accordingly, in one example, the present disclosure provides a method of treating a virus-associated disease or disorder, the method comprising administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, wherein the non-PEGylated or the PEGylated arginase

has at least about 90% sequence identity to SEQ ID NO:1 or 2, or a fragment thereof, and wherein the virus-associated disease or disorder is associated with a virus selected from the group consisting of a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase. In some examples, the virus-associated disease or disorder is a virus infection. For example, in some examples, the virus-associated disease or disorder is a virus infection selected from the group consisting of: a coronavirus infection, a papillomavirus infection, a pneumovirus infection, a picornavirus infection, a flavivirus infection, an alphavirus infection, an ebolavirus infection, a morbillivirus infection, an enterovirus infection, an orthopneumovirus infection, a lentivirus infection, and a hepatovirus infection.

**[0014]** In another example, the present disclosure provides a method of treating a virus-associated disease or disorder, the method comprising administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, wherein the non-PEGylated or the PEGylated arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-50 and 56, or a fragment thereof. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase. In some examples, the virus-associated disease or disorder is associated with a virus selected from the group consisting of an RNA virus, a DNA virus, a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, an influenza virus, an adenovirus, a cytomegalovirus, a polyomavirus, a poxvirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus. In some examples, the virus-associated disease or disorder is a virus infection. For example, in some examples, the virus-associated disease or disorder is a virus infection selected from the group consisting of: an RNA virus infection, a DNA virus infection, a coronavirus infection, a papillomavirus infection, a pneumovirus infection, a picornavirus infection, an influenza virus infection, an adenovirus infection, a cytomegalovirus infection, a polyomavirus infection, a poxvirus infection, a flavivirus infection, an alphavirus infection, an ebolavirus infection, a morbillivirus infection, an

enterovirus infection, an orthopneumovirus infection, a lentivirus infection, and a hepatovirus infection.

**[0015]** In some examples, the virus-associated disease or disorder is localized to or affects an organ or a tissue of the patient. In some examples, the virus-associated disease or disorder comprises a virus infection of an organ or a tissue of the patient. In certain examples, the organ or the tissue can be, but is not limited to, an eye, an ear, an inner ear, a lung, a trachea, a bronchus, bronchioli, a liver, a gall bladder, a bile duct, a kidney, a bladder, a testicle, a cervix, an ovary, a uterus, skin, or a brain. For example, in certain examples, the organ or the tissue is selected from the group consisting of an eye, an ear, an inner ear, a lung, a trachea, a bronchus, bronchioli, a liver, a gall bladder, a bile duct, a kidney, a bladder, a testicle, a cervix, an ovary, a uterus, skin, and a brain.

**[0016]** In some examples, the virus-associated disease or disorder can be, but is not limited to: acute respiratory distress syndrome; chronic obstructive pulmonary disease (COPD); pneumonia; drug-resistant pneumonia; hand, foot, and mouth disease; atopic asthma; or non-atopic asthma. In some examples, the virus-associated disease or disorder is selected from the group consisting of: acute respiratory distress syndrome; COPD; pneumonia; drug-resistant pneumonia; hand, foot, and mouth disease; atopic asthma; and non-atopic asthma.

**[0017]** In various examples, disclosed herein is a method of inhibiting genomic replication of a virus, a method of inhibiting transmission of a virus, a method of inhibiting assembly of a virus, a method of inhibiting virus gene expression, and a method of inhibiting virus release. The aforementioned methods can include administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase (for example, an arginase comprising an amino acid sequence of SEQ ID NO:1 or 2 or an arginase comprising an amino acid sequence selected from the group consisting of SEQ ID NO:3-50 and 56), or a pharmaceutically acceptable salt thereof. For example, provided herein is a method of inhibiting genomic replication of a virus, the method comprising administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase comprising an amino acid sequence of SEQ ID NO:1 or 2, or a pharmaceutically acceptable salt thereof, wherein the arginase has at least about 90% sequence identity to SEQ ID NO:1 or 2, or a fragment thereof, and wherein the virus is selected from the group consisting of a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an

enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase.

**[0018]** In another example, provided herein is a method of inhibiting genomic replication of a virus, the method comprising administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-50 and 56, or a fragment thereof. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase. In some examples, the virus is selected from the group consisting of an RNA virus, a DNA virus, a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, an influenza virus, an adenovirus, a cytomegalovirus, a polyomavirus, a poxvirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus.

**[0019]** In another example, provided herein is a method of inhibiting transmission of a virus, the method comprising administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, and wherein the arginase has at least about 90% sequence identity to a protein sequence comprising an arginase amino acid sequence of SEQ ID NO:1 or 2, wherein the virus is selected from the group consisting of a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase.

**[0020]** In another example, provided herein is a method of inhibiting transmission of a virus, the method comprising administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, and wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-50 and 56, or a fragment thereof. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase. In some examples, the virus is selected from the group consisting of an RNA virus, a DNA virus, a coronavirus, a papillomavirus, a pneumovirus, a

picornavirus, an influenza virus, an adenovirus, a cytomegalovirus, a polyomavirus, a poxvirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus.

**[0021]** In another example, provided herein is a method of inhibiting assembly of a virus, the method comprising administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase.

**[0022]** In another example, provided herein is a method of inhibiting virus gene expression, the method comprising administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase. In some examples, the inhibiting comprises inhibiting gene expression of a specific group of genes. For example, in some examples, the inhibiting comprises inhibiting β gene expression, γ gene expression, or β gene expression and γ gene expression.

**[0023]** In another example, provided herein is a method of inhibiting virus release, the method comprising administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase. In some examples, the virus is selected from the group consisting of an RNA virus, a DNA virus, a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, an influenza virus, an adenovirus, a cytomegalovirus, a polyomavirus, a poxvirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus.

**[0024]** In some examples described herein, the method of treating a virus-associated disease or disorder includes a method of treating a virus-associated disease or disorder associated with a coronavirus. Also described herein are a method of inhibiting genomic replication of a virus, a method of inhibiting transmission of a virus, a method of inhibiting assembly of a virus, a method of inhibiting virus gene expression, and a method of inhibiting virus release, wherein the virus is a coronavirus. In certain examples, the coronavirus is selected from the group consisting of: 229E alpha coronavirus, NL63 alpha coronavirus, OC43 beta coronavirus, HKU1 beta coronavirus, Middle East Respiratory Syndrome (MERS) coronavirus (MERS-CoV), severe acute respiratory syndrome (SARS) coronavirus (SARS-CoV), and SARS-CoV-2 (COVID-19).

**[0025]** In some examples described herein, the method of treating a virus-associated disease or disorder includes a method of treating a virus-associated disease or disorder associated with an influenza virus. Also described herein are a method of inhibiting genomic replication of a virus, a method of inhibiting transmission of a virus, a method of inhibiting assembly of a virus, a method of inhibiting virus gene expression, and a method of inhibiting virus release, wherein the virus is an influenza virus. In certain examples, the influenza virus is selected from the group consisting of influenza virus A (*e.g.*, H1N1 and H5N1), influenza virus B, influenza virus C, influenza virus D.

**[0026]** In some examples described herein, the method of treating a virus-associated disease or disorder includes a method of treating a virus-associated disease or disorder associated with an adenovirus. Also described herein are a method of inhibiting genomic replication of a virus, a method of inhibiting transmission of a virus, a method of inhibiting assembly of a virus, a method of inhibiting virus gene expression, and a method of inhibiting virus release, wherein the virus is an adenovirus. In certain examples, the adenovirus is AdV5.

**[0027]** In some examples described herein, a virus is a drug-resistant virus.

**[0028]** In some examples, a method described herein further comprises administering a composition comprising an antiviral agent. In some examples the administering includes administering a therapeutically effective amount of a composition comprising an antiviral agent. In some examples the administering a composition comprising an antiviral agent is to a patient, for example, a patient in need of treatment. In some examples, the antiviral agent is selected from the group consisting of lamivudine, an interferon alpha composition (*e.g.*, Interferon alfa (INN; HuIFN-alpha-Le)), a VAP anti-idiotypic antibody, enfuvirtide, amantadine,

rimantadine, pleconaril, aciclovir, zidovudine, fomivirsen, a morpholino, a protease inhibitor, double-stranded RNA activated caspase oligomerizer (DRACO), Rifampicin, zanamivir, peramivir, danoprevir, ritonavir, remdesivir, and oseltamivir. In certain examples, the virus to be treated is an influenza virus, and the composition comprises zanamivir. In certain examples, the virus to be treated is a hepatitis virus, *e.g.,* hepatitis B virus, and the composition comprises lamivudine. In certain examples, the administering of the antiviral agent is before, during, or after the administering of the arginase. For example, described herein is a method of treating a disease or disorder, for example, virus-associated disease or disorder, where the method includes administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase (*e.g.*, a PEGylated arginase), or a pharmaceutically acceptable salt thereof, and the method further includes administering (for example, administering to a patient in need thereof) a composition comprising an antiviral agent (for example a therapeutically effective amount of a composition comprising an antiviral agent).

**[0029]** Also described herein are a method of inhibiting genomic replication of a virus, a method of inhibiting transmission of a virus, a method of inhibiting assembly of a virus, a method of inhibiting virus gene expression, and a method of inhibiting virus release, wherein the described method includes administering to a patient (for example, a patient in need thereof) a therapeutically effective amount of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, and the method further includes administering (for example, administering to a patient in need thereof) a composition comprising an antiviral agent (for example a therapeutically effective amount of a composition comprising an antiviral agent).

**[0030]** In another example, provided herein is a method of treating a bacterial disease or disorder, the method comprising administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase selected from the group consisting of SEQ ID NO:1 or 2, or a pharmaceutically acceptable salt thereof, wherein the arginase has at least about 90% sequence identity to SEQ ID NO:1 or 2, or a fragment thereof, and wherein the bacterial disease or disorder is associated with a bacteria selected from the group consisting of: Streptococcus pneumoniae, Mycoplasma pneumoniae, Haemophilus influenzae, Legionella pneumophila, Salmonella enterica, Salmonella bongori, Escherichia coli, Helicobacter pylori, Neisseria gonorrhoeae, Neisseria meningitidis, Staphylococcus aureus, Acinetobacter baumannii, Burkholderia cepacian, Clostridium difficile, Clostridium sordellii, an Enterobacteriaceae,

Enterococcus faecalis, Klebsiella pneumoniae, Morganella morganii, Mycobacterium abscessus, Mycobacterium tuberculosis, a Norovirus, Psuedomonas aeruginosa, and Stenotrophomonas maltophilia. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase.

**[0031]** In another example, provided herein is a method of treating a bacterial disease or disorder, the method comprising administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-50 and 56, or a fragment thereof. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase. In some examples, the bacterial disease or disorder is associated with a bacteria selected from the group consisting of: Chlamydia pneumoniae, Vibrio cholerae, Streptococcus pneumoniae, Mycoplasma pneumoniae, Haemophilus influenzae, Legionella pneumophila, Salmonella enterica, Salmonella bongori, Escherichia coli, Helicobacter pylori, Neisseria gonorrhoeae, Neisseria meningitidis, Staphylococcus aureus, Acinetobacter baumannii, Burkholderia cepacian, Clostridium difficile, Clostridium sordellii, an Enterobacteriaceae, Enterococcus faecalis, Klebsiella pneumoniae, Morganella morganii, Mycobacterium abscessus, Mycobacterium tuberculosis, a Norovirus, Psuedomonas aeruginosa, and Stenotrophomonas maltophilia.

**[0032]** In another example, provided herein is a method of treating a fungal disease or disorder, the method comprising administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase. In some examples, the fungal disease is associated with a fungus selected from the group consisting of a Pneumocystis fungus, an Aspergillus fungus, and a Candida fungus.

**[0033]** In another example, provided herein is a method of treating an amoeba disease or disorder, the method comprising administering to a patient in need thereof a therapeutically effective amount of a composition comprising an arginase, or a pharmaceutically acceptable salt

thereof, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase. In some examples, the amoeba disease or disorder is associated with an amoeba selected from the group consisting of Dientamoeba fragilis, Entamoeba histolytica, Naegleria fowleri, an Acanthamoeba, Acanthamoeba keratitis, Balamuthia mandrillaris, and Sappinia diploidea.

**[0034]** In some examples, the arginase is administered at a dose of about 1 ng/kg body weight per day to about 1 mg/kg body weight per day.

**[0035]** In some examples, the administering is topical, parenteral, oral, pulmonary, intratracheal, intranasal, intrathecal, transdermal, subcutaneous, intraocular, intravitreal, intraperitoneal, or intraduodenal administration. A dose may include or consist essentially of about 1 ng/kg to 1 mg/kg of an arginase, or a pharmaceutically acceptable salt thereof, as described herein.

**[0036]** In some examples, the arginase comprises an amino acid sequence that includes a protein tag sequence. For example, in some examples, the arginase comprises the amino acid sequence of SEQ ID NO:1-43 and a protein tag sequence. In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase. In certain examples, the protein tag sequence is a 6xHis tag sequence of SEQ ID NO:51. In certain examples, the protein tag sequence is located at the amino terminus of the arginase. In certain examples, the protein tag sequence is located at the carboxy terminus of the arginase.

**[0037]** In some examples, the PEGylated-arginase comprises 2, 3, 4, or more polyethylene glycol molecules conjugated to the arginase sequence. In some examples, the polyethylene glycol molecule is about 5 kDa, about 10 kDa, about 15 kDa, about 20 kDa, about 30 kDa, or about 40 kDa. In certain examples, the polyethylene glycol is from about 10 kDa to about 30 kDa or from about 20 kDa to about 40 kDa.

**[0038]** In some examples, the composition further comprises a non-native metal cofactor. In certain examples, the non-native metal cofactor is selected from the group consisting of cobalt, manganese, iron, and zinc.

**[0039]** In another aspect, the present disclosure provides a composition comprising:

an arginase, or a pharmaceutically acceptable salt thereof, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof;

an antiviral agent; and

a pharmaceutically acceptable excipient.

**[0040]** In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase. In some examples, the antiviral agent included in a composition disclosed herein is selected from the group consisting of lamivudine, an interferon alpha composition (*e.g.*, Interferon alfa (INN; HuIFN-alpha-Le)), a VAP anti-idiotypic antibody, enfuvirtide, amantadine, rimantadine, pleconaril, aciclovir, zidovudine, fomivirsen, a morpholino, a protease inhibitor, double-stranded RNA activated caspase oligomerizer (DRACO), Rifampicin, zanamivir, peramivir, danoprevir, ritonavir, remdesivir, and oseltamivir.

**[0041]** In some examples, the arginase included in a composition disclosed herein includes a protein tag sequence. In some examples, the protein tag sequence is a 6xHis tag sequence of SEQ ID NO:51. In certain examples, the protein tag sequence is located at the amino terminus of the arginase. In certain examples, wherein the protein tag sequence is located at the carboxy terminus of the arginase.

**[0042]** In some examples, the PEGylated-arginase included in a composition disclosed herein comprises 2, 3, 4, or more polyethylene glycol molecules conjugated to the arginase sequence. In some examples, the polyethylene glycol molecule is about 5 kDa, about 10 kDa, about 15 kDa, about 20 kDa, about 30 kDa, or about 40 kDa. In certain examples, the polyethylene glycol molecule is from about 10 kDa to about 30 kDa or from about 20 kDa to about 40 kDa.

**[0043]** In some examples, a composition described herein further comprises a non-native metal cofactor. In certain examples, the non-native metal cofactor is selected from the group consisting of cobalt, manganese, iron, and zinc.

**[0044]** In another aspect, provided herein is a kit comprising:

an arginase, or a pharmaceutically acceptable salt thereof, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof; and

buffers, reagents, and detailed instructions for inhibiting production of a virus.

**[0045]** In some examples, the arginase is a PEGylated-arginase comprising at least one polyethylene glycol molecule conjugated to the arginase. In some examples, the kit further comprises an antiviral agent. In certain examples, the antiviral agent is selected from the group consisting of lamivudine, an interferon alpha composition (*e.g.*, Interferon alfa (INN; HuIFN-alpha-Le)), a VAP anti-idiotypic antibody, enfuvirtide, amantadine, rimantadine, pleconaril, aciclovir, zidovudine, fomivirsen, a morpholino, a protease inhibitor, double-stranded RNA activated caspase oligomerizer (DRACO), Rifampicin, zanamivir, peramivir, danoprevir, ritonavir, remdesivir, and oseltamivir.

**[0046]** In some examples, the kit is for inhibiting production of a coronavirus. In certain examples, the coronavirus is selected from the group consisting of: 229E alpha coronavirus, NL63 alpha coronavirus, OC43 beta coronavirus, HKU1 beta coronavirus, Middle East Respiratory Syndrome (MERS) coronavirus (MERS-CoV), severe acute respiratory syndrome (SARS) coronavirus (SARS-CoV), and SARS-CoV-2 (COVID-19).

**[0047]** In some examples, the arginase included in a kit described herein includes a protein tag sequence. In certain examples, the protein tag sequence is a 6xHis tag sequence of SEQ ID NO:51. In certain examples, the protein tag sequence is located at the amino terminus of the arginase. In certain examples, the protein tag sequence is located at the carboxy terminus of the arginase.

**[0048]** In some examples, the PEGylated-arginase included in a kit described herein comprises 2, 3, 4, or more polyethylene glycol molecules conjugated to the arginase sequence. In some examples, the polyethylene glycol is about 5 kDa, about 10 kDa, about 15 kDa, about 20 kDa, about 30 kDa, or about 40 kDa. In certain examples, the polyethylene glycol is from about 10 kDa to about 30 kDa or from about 20 kDa to about 40 kDa.

**[0049]** In some examples, a kit described herein further comprises a non-native metal cofactor. In certain examples, the non-native metal cofactor is selected from the group consisting of cobalt, manganese, iron, and zinc.

WHAT IS CLAIMED IS:

1. Use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for treating a virus-associated disease or disorder,

wherein the arginase has at least about 90% sequence identity to SEQ ID NO:1 or 2, or a fragment thereof, and

wherein the virus-associated disease or disorder is associated with a virus selected from the group consisting of a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus.

2. The use of claim 1, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

3. The use of claim 1 or claim 2, wherein the virus-associated disease or disorder is a virus infection selected from the group consisting of: a coronavirus infection, a papillomavirus infection, a pneumovirus infection, a picornavirus infection, a flavivirus infection, an alphavirus infection, an ebolavirus infection, a morbillivirus infection, an enterovirus infection, an orthopneumovirus infection, a lentivirus infection, and a hepatovirus infection.

4. Use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for treating a virus-associated disease or disorder,

wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-50 and 56, or a fragment thereof.

5. The use of claim 4, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

6. The use of claim 4 or claim 5, wherein the virus-associated disease or disorder is associated with a virus selected from the group consisting of an RNA virus, a DNA virus, a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, an influenza virus, an adenovirus, a cytomegalovirus, a polyomavirus, a poxvirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus.

7. The use of any one of claims 4-6, wherein the virus-associated disease or disorder is a virus infection selected from the group consisting of: an RNA virus infection, a DNA virus infection, a coronavirus infection, a papillomavirus infection, a pneumovirus infection, a picornavirus infection, an influenza virus infection, an adenovirus infection, a cytomegalovirus infection, a polyomavirus infection, a poxvirus infection, a flavivirus infection, an alphavirus infection, an ebolavirus infection, a morbillivirus infection, an enterovirus infection, an orthopneumovirus infection, a lentivirus infection, and a hepatovirus infection.

8. The use of any one of claims 1 to 7, wherein the virus-associated disease or disorder comprises a virus infection of an organ or a tissue of the patient.

9. The use of claim 8, wherein the organ or the tissue is selected from the group consisting of an eye, an ear, inner ear, a lung, trachea, bronchus, bronchioli, liver, gall bladder, bile duct, a kidney, bladder, a testicle, cervix, ovary, uterus, skin, and brain.

10. The use of any one of claims 1 to 9, wherein the virus-associated disease or disorder is selected from the group consisting of: acute respiratory distress syndrome; chronic obstructive pulmonary disease (COPD); pneumonia; drug-resistant pneumonia; hand, foot and mouth disease; atopic asthma; and non-atopic asthma.

11. Use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manfacture of a medicament for inhibiting genomic replication of a virus,

wherein the arginase has at least about 90% sequence identity to SEQ ID NO:1 or 2, or a fragment thereof, and

wherein the virus is selected from the group consisting of a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus.

12. The use of claim 11, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

13. Use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for inhibiting genomic replication of a virus,

wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-50 and 56, or a fragment thereof.

14. The use of claim 13, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

15. The use of claim 13 or 14, wherein the virus is selected from the group consisting of an RNA virus, a DNA virus, a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, an influenza virus, an adenovirus, a cytomegalovirus, a polyomavirus, a poxvirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus.

16. Use of a composition comprising an arginase, in the manufacture of a medicament for inhibiting transmission of a virus,

wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1 or 2, or a pharmaceutically acceptable salt thereof, wherein the virus is selected from the group consisting of a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus.

17. The use of claim 16, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

18. Use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for inhibiting transmission of a virus,

wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-50 and 56, or a fragment thereof.

19. The use of claim 18, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

20. The use of claim 18 or 19, wherein the virus is selected from the group consisting of an RNA virus, a DNA virus, a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, an influenza virus, an adenovirus, a cytomegalovirus, a polyomavirus, a poxvirus, a flavivirus, an

alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus.

21. Use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for inhibiting assembly of a virus,

wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof.

22. The use of claim 21, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

23. Use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for inhibiting virus gene expression,

wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof.

24. The use of claim 23, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

25. The use of claim 23 or 24, wherein the inhibiting comprises inhibiting β gene expression, γ gene expression, or β gene expression and γ gene expression.

26. Use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for inhibiting virus release,

wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof.

27. The use of claim 26, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

28. The use of any one of claims 23-27, wherein the virus is selected from the group consisting of an RNA virus, a DNA virus, a coronavirus, a papillomavirus, a pneumovirus, a picornavirus, an influenza virus, an adenovirus, a cytomegalovirus, a polyomavirus, a poxvirus, a flavivirus, an alphavirus, an ebolavirus, a morbillivirus, an enterovirus, an orthopneumovirus, a lentivirus, and a hepatovirus.

29. The use of any preceding claim, wherein the virus is a coronavirus.

30. The use of claim 29, wherein the coronavirus is selected from the group consisting of: 229E alpha coronavirus, NL63 alpha coronavirus, OC43 beta coronavirus, HKU1 beta coronavirus, Middle East Respiratory Syndrome (MERS) coronavirus (MERS-CoV), severe acute respiratory syndrome (SARS) coronavirus (SARS-CoV), and SARS-CoV-2 (COVID-19).

31. The use of any one of claims 6-10, 13-15, and 18-28, wherein the virus is an influenza virus.

32. The use of claim 31, wherein the influenza virus is selected from the group consisting of influenza virus A (*e.g.*, H1N1 and H5N1), influenza virus B, influenza virus C, influenza virus D.

33. The use of any one of claims 6-10, 13-15, and 18-28, wherein the virus is an adenovirus virus.

34. The use of claim 33, wherein the adenovirus virus is AdV5.

35. The use of any preceding claim, wherein the virus is a drug-resistant virus.

36. The use of any one of claims 1 to 35, further comprising that a composition comprising an antiviral agent is to be administered.

37. The use of claim 36, wherein the antiviral agent is selected from the group consisting of lamivudine, an interferon alpha composition, a VAP anti-idiotypic antibody, enfuvirtide, amantadine, rimantadine, pleconaril, aciclovir, zidovudine, fomivirsen, a morpholino, a protease inhibitor, double-stranded RNA activated caspase oligomerizer (DRACO), Rifampicin, zanamivir, peramivir, danoprevir, ritonavir, remdesivir, and oseltamivir.

38. The use of claim 36 or 37, whereinthe antiviral agent is to be administered before, during, or after the the arginase to be administered.

39. Use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufucature of a medicament for treating a bacterial disease or disorder,

wherein the arginase has at least about 90% sequence identity to SEQ ID NO:1 or 2, or a fragment thereof, and

wherein the bacterial disease or disorder is associated with a bacteria selected from the group consisting of: Streptococcus pneumoniae, Mycoplasma pneumoniae, Haemophilus influenzae, Legionella pneumophila, Salmonella enterica, Salmonella bongori, Escherichia coli, Helicobacter pylori, Neisseria gonorrhoeae, Neisseria meningitidis, Staphylococcus aureus, Acinetobacter baumannii, Burkholderia cepacian, Clostridium difficile, Clostridium sordellii, an Enterobacteriaceae, Enterococcus faecalis, Klebsiella pneumoniae, Morganella morganii, Mycobacterium abscessus, Mycobacterium tuberculosis, a Norovirus, Psuedomonas aeruginosa, and Stenotrophomonas maltophilia.

40. The use of claim 39, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

41. Use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for treating a bacterial disease or disorder,

wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-50 and 56, or a fragment thereof.

42. The use of claim 41, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

43. The use of claim 41 or 42, wherein the bacterial disease or disorder is associated with a bacteria selected from the group consisting of: Chlamydia pneumoniae, Vibrio cholerae, Streptococcus pneumoniae, Mycoplasma pneumoniae, Haemophilus influenzae, Legionella pneumophila, Salmonella enterica, Salmonella bongori, Escherichia coli, Helicobacter pylori, Neisseria gonorrhoeae, Neisseria meningitidis, Staphylococcus aureus, Acinetobacter baumannii, Burkholderia cepacian, Clostridium difficile, Clostridium sordellii, an Enterobacteriaceae, Enterococcus faecalis, Klebsiella pneumoniae, Morganella morganii, Mycobacterium abscessus, Mycobacterium tuberculosis, a Norovirus, Psuedomonas aeruginosa, and Stenotrophomonas maltophilia.

44. Use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for treating a fungal disease or disorder,

wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof.

45. The use of claim 44, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

46. The use of claim 44 or 45, wherein the fungal disease is associated with a fungus selected from the group consisting of a Pneumocystis fungus, an Aspergillus fungus, and a Candida fungus.

47. Use of a composition comprising an arginase, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for treating an amoeba disease or disorder,

wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof.

48. The use of claim 47, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

49. The use of claim 47 or 48, wherein the amoeba disease or disorder is associated with an amoeba selected from the group consisting of Dientamoeba fragilis, Entamoeba histolytica, Naegleria fowleri, an Acanthamoeba, Acanthamoeba keratitis, Balamuthia mandrillaris, and Sappinia diploidea.

50. The use of any one of claims 1 to 49, wherein the arginase is to be administered at a dose of 1 ng/kg body weight per day to 1 mg/kg body weight per day.

51. The use of any one of claims 1 to 50, wherein the administration is topical, parenteral, oral, pulmonary, intratracheal, intranasal, intrathecal, transdermal, subcutaneous, intraocular, intravitreal, intraperitoneal, intraduodenal, or by inhalation.

52. The use of any one of claims 1 to 51, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-43, or a fragment thereof, and wherein the arginase includes a protein tag sequence.

53. The use of claim 52, wherein the protein tag sequence comprises a 6xHis tag sequence of SEQ ID NO:51.

54. The use of claim 52 or 53, wherein the protein tag sequence is located at the amino terminus of the arginase.

55. The use of claim 52 or 53, wherein the protein tag sequence is located at the carboxy terminus of the arginase.

56. The use of any one of claims 1 to 55, wherein the arginase is a PEGylated-arginase comprising 2, 3, 4, or more polyethylene glycol molecules conjugated to the arginase.

57. The use of any one of claims 2, 3, 5-10, 12, 14, 15,17, 19, 20, 22, 24, 25, 27-38, 40, 42, 43, 45, 46, and 48-56, wherein the polyethylene glycol molecule is about 5 kDa, about 10 kDa, about 15 kDa, about 20 kDa, about 30 kDa, or about 40 kDa.

58. The use of any one of claims 2, 3, 5-10, 12, 14, 15,17, 19, 20, 22, 24, 25, 27-38, 40, 42, 43, 45, 46, and 48-56, wherein the polyethylene glycol is from 10 kDa to 30 kDa or from 20 kDa to 40 kDa.

59. The use of any one of claims 1 to 58, wherein the composition further comprises a non-native metal cofactor.

60. The use of claim 59, wherein the non-native metal cofactor is selected from the group consisting of cobalt, manganese, iron, and zinc.

61. A composition comprising:

an arginase, or a pharmaceutically acceptable salt thereof,

wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof;

an antiviral agent; and

a pharmaceutically acceptable excipient.

62. The composition of claim 61, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

63. The composition of claim 61 or 62, wherein the antiviral agent is selected from the group consisting of lamivudine, an interferon alpha composition, a VAP anti-idiotypic antibody, enfuvirtide, amantadine, rimantadine, pleconaril, aciclovir, zidovudine, fomivirsen, a morpholino, a protease inhibitor, double-stranded RNA activated caspase oligomerizer (DRACO), Rifampicin, zanamivir, peramivir, danoprevir, ritonavir, remdesivir, and oseltamivir.

64. The composition of any one of claims 61-63, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-43, or a fragment thereof, and wherein the arginase includes a protein tag sequence.

65. The composition of claim 64, wherein the protein tag sequence comprises a 6xHis tag sequence of SEQ ID NO:51.

66. The composition of claim 64 or 65, wherein the protein tag sequence is located at the amino terminus of the arginase.

67. The composition of claim 64 or 65, wherein the protein tag sequence is located at the carboxy terminus of the arginase.

68. The composition of any one of claims 62 to 67, wherein the PEGylated arginase comprises 2, 3, 4, or more polyethylene glycol molecules conjugated to the arginase sequence.

69. The composition of any one of claims 62-68, wherein the polyethylene glycol molecule is about 5 kDa, about 10 kDa, about 15 kDa, about 20 kDa, about 30 kDa, or about 40 kDa.

70. The composition of any one of claims 62-68, wherein the polyethylene glycol molecule is from 10 kDa to a30 kDa or from kDa to 40 kDa.

71. The composition of any one of claims 61 to 70, wherein the composition further comprises a non-native metal cofactor.

72. The composition of claim 71, wherein the non-native metal cofactor is selected from the group consisting of cobalt, manganese, iron, and zinc.

73. A kit comprising:

an arginase, or a pharmaceutically acceptable salt thereof,

wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:1-50 and 56, or a fragment thereof; and

buffers, reagents, and detailed instructions for inhibiting production of a virus.

74. The kit of claim 73, wherein the arginase is a PEGylated arginase, comprising at least one polyethylene glycol molecule conjugated to the arginase.

75. The kit of claim 73 or 74, further comprising an antiviral agent.

76. The kit of claim 75, wherein the antiviral agent is selected from the group consisting of lamivudine, an interferon alpha composition, a VAP anti-idiotypic antibody, enfuvirtide, amantadine, rimantadine, pleconaril, aciclovir, zidovudine, fomivirsen, a morpholino, a protease inhibitor, double-stranded RNA activated caspase oligomerizer (DRACO), Rifampicin, zanamivir, peramivir, danoprevir, ritonavir, remdesivir, and oseltamivir.

77. The kit of any one of claims 73 to 76, wherein the kit is for inhibiting production of a coronavirus.

78. The kit of claim 77, wherein the coronavirus is selected from the group consisting of: 229E alpha coronavirus, NL63 alpha coronavirus, OC43 beta coronavirus, HKU1 beta coronavirus, Middle East Respiratory Syndrome (MERS) coronavirus (MERS-CoV), severe acute respiratory syndrome (SARS) coronavirus (SARS-CoV), and SARS-CoV-2 (COVID-19).

79. The kit of any one of claims 73-76, wherein the virus is an influenza virus.

80. The kit of claim 79, wherein the influenza virus is selected from the group consisting of influenza virus A (*e.g.*, H1N1 and H5N1), influenza virus B, influenza virus C, influenza virus D.

81. The kit of any one of claims 73-76, wherein the virus is an adenovirus virus.

82. The kit of claim 81, wherein the adenovirus virus is AdV5.

83. The kit of any one of claims 73-82, wherein the arginase has at least about 90% sequence identity to a protein sequence selected from the group consisting of SEQ ID NO:3-43, or a fragment thereof, and wherein the arginase includes a protein tag sequence.

84. The kit of claim 83, wherein the protein tag sequence is a 6xHis tag sequence of SEQ ID NO:51.

85. The kit of claim 83 or 84, wherein the protein tag sequence is located at the amino terminus of the arginase.

86. The kit of claim 83 or 84, wherein the protein tag sequence is located at the carboxy terminus of the arginase.

87. The kit of any one of claims 74 to 86, wherein the PEGylated-arginase comprises 2, 3, 4, or more polyethylene glycol molecules conjugated to the arginase sequence.

88. The kit of any one of claims 74 to 87, wherein the polyethylene glycol is about 5 kDa, about 10 kDa, about 15 kDa, about 20 kDa, about 30 kDa, or about 40 kDa.

89. The kit of any one of claims 74 to 87, wherein the polyethylene glycol is from 10 kDa to 30 kDa or from 20 kDa to 40 kDa.

90. The kit of any one of claims 73 to 89, wherein the kit further comprises a non-native metal cofactor.

91. The kit of claim 90, wherein the non-native metal cofactor is selected from the group consisting of cobalt, manganese, iron, and zinc.