immature animals relies solely on the innate immune systems and often is associated with negative physiologic responses such as diarrhea, vomiting, fever, inflammation, etc.. Such systemic responses to infection are the expression of the very large numbers of immune effectors that can be extremely metabolically expensive, even fatal to the host.

One of the most common dangers associated with an unchecked systemic response by the innate immune system is diarrheal dehydration triggered by infectious diseases or parasites. Diarrheal dehydration affects over 2 billion people each year and is the most common cause of death for Third World infants, responsible for over 1.5 million deaths per year. Besides re-hydration, most efforts to treat diarrhea have focused on increasing human mucosal immunity by modulating systemic immune responses, such as by using intestinal motility reducing drugs, mucous permeability modifiers or antibiotic therapies. These approaches have limited success but introduce undesirable risks of side effects, pathogen resistance, or physiologic senescence.

There is constant commercial demand for botanical alternatives to antibiotics and synthetic chemical disinfectants for the control of disease associated with water, surface, and food borne pathogens. The explosive rise in antibiotic resistant diseases has been associated with the overuse of antibiotics in both humans and livestock. Many regional governments and international health organizations have called for phase out of unnecessary antibiotic use, especially in livestock feeds where they are used sub-therapeutically to enhance growth. To date, it is widely recognized that there are few cost effective and environmentally sound alternatives for the safe control of pathogens. Decades of research on plants as sources of new antimicrobials has primarily focused on mechanical or solvent extraction of specific plant compounds and has not been successful in generating compositions with potency, safety, user preference and environmental profile necessary to match the performance of current antibiotics and germicides.

SUMMARY

In an embodiment, a biochemical composition comprises a processed fluid containing a molecule having a hydroxyl group is combined with an activating mechanism to activate the molecule by oxidizing the hydroxyl group with an oxidizing agent and a catalyst. Activating

the molecule increases the binding affinity of the molecule.

In one embodiment, the molecule comprises a polyphenol. In an alternative embodiment, the molecule comprises a polymeric carbohydrate molecule or polysaccharide derivatives. In another embodiment, the polyphenol is derived from a plant. In an embodiment, the plant comprises camellia sinensis, or punica granatum or other polyphenol bearing plants. In another embodiment, the polyphenol is derived from the root, leaves, sterns, bark, fruit or other tissues of polyphenol bearing plants.

In an alternative embodiment, the molecule comprises tannin, lignin, flavonoid, hydroxycoumarin, or alkaloids. In another embodiment, the molecule comprises at least an artificial synthetic section. In an embodiment, the catalyst comprises a catalase, a peroxidase, a phenoloxidases, a tyrosinase, or a metal catalyst. In an alternative embodiment, the catalyst is located at an animal cell. In another embodiment, the catalyst is generated by a pathogen. In an embodiment, the pathogen comprises virus, bacteria, fungi, an eukaryotic organism, or prionic. In an alternative embodiment, the oxidizing agent comprises reactive oxygen species (ROS).

In another embodiment, the reactive oxygen species comprises hydrogen peroxide. In another embodiment, the reactive oxygen species comprises inorganic or organic peroxides. In an embodiment, the reactive oxygen species comprises a product of ozone reduction by superoxide dismutase, glucose oxidase, hydration of a percarbonate, or hydration of carbamide peroxide (urea peroxide) or other indirect method of generating stable reactive oxygen species. In an alternative embodiment, the processed fluid is prepared from a dry mixture containing a polyphenol or a polysaccharide derivative. In another embodiment, the processed fluid is prepared from intact plant material containing a polyphenol. In another embodiment, the activating mechanism is initiated when the polyphenol or the polysaccharide derivative is in contact with the enzyme and the oxidizing agent in a solution. In an embodiment, the hydroxyl group becomes a carbonyl group after the activation of the hydroxyl group. In an alternative embodiment, the molecule comprises a quinonic group after the activation of the hydroxyl group. In another embodiment, the molecule has an effect in inactivating a pathogen after the activation of the hydroxyl group. In an embodiment, the oxidizing agent provides free radicals. In alternative embodiments, the activated molecule provides free radicals.

Disclosed herein is a polyphenol-oxidiser composition for use in antimicrobial therapy, the composition comprising: a. a water-soluble extract of a plant tissue containing polyphenols including a tannin; and b. an exogenous reactive oxygen species including hydrogen peroxide; and wherein the composition is substantially free of active reducing agents and enzymes.

Disclosed herein is the use of a polyphenol-oxidiser composition comprising: a. a water-soluble extract of a plant tissue containing polyphenols including a tannin; and b.an exogenous hydrogen peroxide; and wherein the composition is substantially free of active reducing agents and enzymes, in the manufacture of a medicament for treating a microbial infection.

Disclosed herein is a non-therapeutic use of a composition as an antimicrobial, wherein the composition comprises: a. a water-soluble extract of a plant tissue containing polyphenols including a tannin; and b. an exogenous reactive oxygen species including hydrogen peroxide; and wherein the composition is substantially free of active reducing agents and enzymes.

Disclosed herein is the use of a composition to stimulate growth in animals, wherein the composition comprises: a. a water-soluble extract of a plant tissue containing polyphenols including a tannin; and b. an exogenous reactive oxygen species including hydrogen peroxide; and wherein the composition is substantially free of active reducing agents and enzymes.

Disclosed herein is a method of stimulating growth in animals, the method comprising administering a composition to the animal, wherein the composition comprises: a. a water-soluble extract of a plant tissue containing polyphenols including a tannin; and b. an exogenous reactive oxygen species including hydrogen peroxide; and wherein the composition is substantially free of active reducing agents and enzymes.

Disclosed herein is a kit comprising a dried form of the composition for use as defined herein.

Disclosed herein is a method of producing the polyphenol-oxidiser composition for use as defined herein, wherein the method comprises: obtaining a plant tissue; inactivating or removing active reducing agents and catalysts from the plant tissue; extracting polyphenol substrates from the plant tissue that are substantially free of active reducing agents and catalysts; and mixing the polyphenol substrates with exogenous hydrogen peroxide.

In an embodiment, a method of preparing a composition comprises obtaining a biopolymer from a plant and activating a hydroxyl group on the biopolymer, so that a molecular binding affinity of the biopolymer is increased.

In an embodiment, the biopolymer comprises a polyphenol, a polysaccharide derivative, or a polymeric molecule. In alternative embodiments, the activating is performed by placing the biopolymer in contact with an enzyme or an oxidizing agent. In another embodiment, the method further comprises cross-linking the activated biopolymer with a protein of an animal. In an embodiment, the method further comprises a plurality of biopolymers forming cross-linking structures among themselves. In an alternative embodiment, the method further comprises binding the biopolymer with a pathogen. In an alternative embodiment, the method comprises binding the biopolymer with a cell. In another embodiment, the method comprises binding the biopolymer with a virus. In a further embodiment, the binding of the polymer to multiple pathogens causes agglomeration or removal of microorganisms, proteins or proteinaceous structures from solution. In another embodiment, the binding ceases the propagation of the pathogen. In some embodiments, the activated biopolymer is capable of blocking a metabolic pathway of a pathogen. In an alternative embodiment, the method further comprises treating a diarrhea symptom of an animal using the activated biopolymer. In a further embodiment, the method comprises treating any damaged tissue of an animal using the activated biopolymer. In another embodiment, the activating the hydroxyl group is triggered by an enzyme on a site of an animal. In an embodiment, the activating the hydroxyl group is achieved by exogenous addition of an enzyme. In an alternative embodiment, the method further comprises removing or inactivating an oxidoreductase or a reducing compound that reacts with an oxidizer. In another embodiment, the method further comprises forming a barrier by cross-linking the biopolymer with a protein of an animal, so an invasion of a pathogen is prevented. In a further embodiment, the method comprises cross-linking the biopolymer with a protein of an animal, so as to promote accelerated wound healing.

In an embodiment, a method of facilitating a localized reaction comprises localizing an added reactive oxygen species in a reactive proximity of a hydroxyl group on a biopolymer, activating the hydroxyl group of the biopolymer, and applying the biopolymer to a target site.

In an embodiment, the biopolymer comprises a polyphenol or a polysaccharide

derivative. In an alternative embodiment, the activating is achieved by causing an encountering of an enzyme. In another embodiment, the reactive oxygen species comprises hydrogen peroxide. In an embodiment, the method further comprises increasing the density of the hydrogen peroxide in the reactive proximity of a hydroxyl group by adding hydrogen peroxide to a solution containing the biopolymer. In an alternative embodiment, the biopolymer comprises multiple hydroxyl groups.

In an embodiment, a controlled chemical delivery method comprises preparing a bio-molecule containing a pre-selected chemical substance and selecting a size, a weight, or a combination thereof to control a penetration rate of the bio-molecule through an animal tissue.

In an embodiment, the chemical substance comprises a phenolic compound. In an alternative embodiment, the chemical substance comprises quinonic compound. In another embodiment, the bio-molecule comprises some amount of an extract from a plant. In an embodiment, preparing the molecule comprises isolating the molecule. In an alternative embodiment, selecting comprises extracting. In another embodiment, the penetration rate is moderate, so that an application of the bio-molecule to an animal does not cause a toxic response from the tissue of the animal. In a further embodiment, an application of the bio-molecule to an animal reduces the external stimulation of immune response from the animal system. In an embodiment, the ingestion of the bio-molecule improves the utilization of nutrition for growth in animal systems.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates several reaction pathways for phenol unit conversion into quinones in accordance with an embodiment of the present application.

Figure 2 illustrates a composition prepared in accordance with one embodiment of the present application.

Figure 3 illustrates a flowchart of a method of preparing a plant-based composition in accordance with one embodiment of the present application.

Figure 4 illustrates a flowchart of a method of inactivating reducing agents/enzymes

We Claim:

1. A polyphenol-oxidiser composition for use in antimicrobial therapy, the composition comprising:
    a. a water-soluble extract of a plant tissue containing polyphenols including a tannin; and
    b. an exogenous reactive oxygen species including hydrogen peroxide; and

wherein the composition is substantially free of active reducing agents and enzymes.

2. The composition for use of Claim 1, wherein the hydrogen peroxide is sequestered by the extract to stabilise and concentrate reactive oxygen species in proximity to phenolic units in the composition.

3. The composition for use of Claim 1 or Claim 2, wherein the plant tissue comprises a component selected from the group consisting of rye seeds, mung beans, daikon skin, pomegranate, bearberries, aloe vera skin, organ pipe cactus, Chinese gall, oregano, persimmon fruit, wheat germ, barley seeds, coffee beans, green tea, black tea, punica granatus, tobacco, a succulent, and external plant tissues, roots, leaf cuticles, bark, fruit, rinds, and husks thereof.

4. The composition for use of Claim 1, wherein the plant comprises camellia sinensis punica granatus, or a combination thereof.

5. The composition for use of Claim 1, wherein the extract comprises a polyphenol selected from the group consisting of lignin, flavonoid, hydroxycoumarin and alkaloids.

6. The composition for use of any of Claims 1 to 5 in treating an infection of, or damage to the digestive system; treating, preventing or ameliorating the symptoms of diarrhea; treating or preventing diseases associated with water borne pathogens; treating an infected tissue; or treating a wounded tissue.

7. Use of a polyphenol-oxidiser composition comprising:

a. a water-soluble extract of a plant tissue containing polyphenols including a tannin; and

b. an exogenous hydrogen peroxide; and

wherein the composition is substantially free of active reducing agents and enzymes, in the manufacture of a medicament for treating a microbial infection.

8. The composition for use of any of Claims 1 to 6 or the use of Claim 7, wherein the composition is in a dry powder form.

9. A kit comprising a dried form of the composition for use of any of Claims 1 to 6.

10. The kit of claim 9, wherein the dry form of the hydrogen peroxide generating material comprising a component selected from the group consisting of sodium percabonate, potassium percarbonate, a carbamide peroxide, and urea peroxide.

11. A method of producing the polyphenol-oxidiser composition for use of any of Claims 1 to 6, wherein the method comprises:
obtaining a plant tissue;
inactivating or removing active reducing agents and catalysts from the plant tissue;
extracting polyphenol substrates from the plant tissue that are substantially free of active reducing agents and catalysts; and
mixing the polyphenol substrates with exogenous hydrogen peroxide.

12. The method of Claim 11, wherein polyphenols are extracted from the plant tissue using a solution.

13. The method of Claim 11 or Claim 12, wherein inactivating or removing active reducing agents or catalysts from the plant tissue comprises:
dessicating plant tissue in high-temperature air;
heating the solution of polyphenols extracted from the plant tissue to denature the enzymes; and/or
using a protein denaturing solution to destroy or remove cellular enzymes contained in the plant tissue.

14. The method of Claim 13, wherein dessicated plant tissue is pulverised.

15. A non-therapeutic use of a composition as an antimicrobial, wherein the composition comprises:
a. a water-soluble extract of a plant tissue containing polyphenols including a tannin; and
b. an exogenous reactive oxygen species including hydrogen peroxide; and
wherein the composition is substantially free of active reducing agents and enzymes.

16. The non-therapeutic use of claim 15, wherein the composition is used as or for a cosmetic ingredient; a disinfectant; a biofilm preventative; a product preservative; an oxidizing cleaner; a deodorizer; an oral rinse for halitosis; an agricultural application such as reducing surface pathogens or sealing micro-wounds by spraying or soaking the plant with the composition, strengthening the surface structure, and stimulating enhanced growth or development; a bio-security sanitizer for animal farm facilities; animal feed sterilization; plant, fresh fruit and vegetable washes; extending shelf-life; protecting the surface from or deterring pest-invasion in live crops or agricultural produce; plant seed disinfection for storage and sanitation before germination; preservation spray or water treatment for freshly cut flowers; groundwater remediation; meat and sea food preservation spray to reduce bacteria and to form thin anti-digestive layers to prevent a microbial invasion; meat processing sanitizers for prevention of microbial contamination; pond water sanitization for fisheries; disease treatment for aquatic plants; aquarium sanitizers; preservative additives for liquid-containing products; disinfectant ingredients for surface cleaners; quinone redox cycling coatings for medical devices, clothing and food preparation equipment, hospital equipment and instrument sanitization; antimicrobial hydrating solutions for hydrophilic coated medical devices; industrial water shock preservatives or antifoulants; or hot tub and swimming pool water sanitation.

17. Use of a composition to stimulate growth in animals, wherein the composition comprises:

a. a water-soluble extract of a plant tissue containing polyphenols including a tannin; and

b. an exogenous reactive oxygen species including hydrogen peroxide; and

wherein the composition is substantially free of active reducing agents and enzymes.

18. A method of stimulating growth in animals, the method comprising administering a composition to the animal, wherein the composition comprises:

a. a water-soluble extract of a plant tissue containing polyphenols including a tannin; and

b. an exogenous reactive oxygen species including hydrogen peroxide; and

wherein the composition is substantially free of active reducing agents and enzymes.