CLAIMS

1. Use of: a first therapeutic agent that inhibits mitochondrial biogenesis and targets the large mitochondrial ribosome, a second therapeutic agent that inhibits mitochondrial biogenesis and targets the small mitochondrial ribosome, and a third therapeutic agent that induces mitochondrial oxidative stress, in the manufacture of a medicament for reducing one or more of hair loss, hearing loss, vision loss, memory loss, mental slowness, joint stiffness, muscle loss, strength loss, speed loss, balance loss, endurance loss, agility loss, sexual dysfunction, virility loss, testosterone reduction, lipofuscin deposits, and inflammation, wherein the first therapeutic agent is selected from ~~the~~a group consisting of an erythromycin family member and an erythromycin family member conjugated with a first fatty acid~~macrolide family, the ketolide family, the amphenicol family, the lincosamide family, the pleuromutilin family, derivatives thereof, and combinations thereof~~, wherein the second therapeutic agent is selected from a group consisting of ~~the~~a tetracycline family member and a tetracycline family member conjugated with a second fatty acid, ~~the glycylcycline family, the fluorocycline family, the aminoglycoside family, the oxazolidinone family, derivatives thereof, and combinations thereof,~~ and wherein the third therapeutic agent is selected from Vitamin C and an ascorbate derivative.

2. Use of: a first therapeutic agent that inhibits mitochondrial biogenesis and targets the large mitochondrial ribosome, a second therapeutic agent that inhibits mitochondrial biogenesis and targets the small mitochondrial ribosome, and a third therapeutic agent that induces mitochondrial oxidative stress, in the manufacture of a medicament for improving one or more of hair regeneration, hearing, vision, memory, mental acuity, joint mobility, muscle growth, muscular

strength, muscular endurance, speed, balance, agility, and sexual performance, wherein the first therapeutic agent is selected from a group consisting of an erythromycin family member and an erythromycin family member conjugated with a first fatty acid~~the macrolide family, the ketolide family, the amphenicol family, the lincosamide family, the pleuromutilin family, derivatives thereof, and combinations thereof~~, wherein the second therapeutic agent is selected from a group consisting of~~the~~ a tetracycline family member and a tetracycline family member conjugated with a second fatty acid, ~~the glycylcycline family, the fluorocycline family, the aminoglycoside family, the oxazolidinone family, derivatives thereof, and combinations thereof,~~ and wherein the third therapeutic agent is selected from Vitamin C and an ascorbate derivative.

3. Use of: a first therapeutic agent that inhibits mitochondrial biogenesis and targets the large mitochondrial ribosome, a second therapeutic agent that inhibits mitochondrial biogenesis and targets the small mitochondrial ribosome, and a third therapeutic agent that induces mitochondrial oxidative stress, in the manufacture of a medicament for restoring hair growth, restores natural hair color, restores muscular coordination and gait, restores overall mobility, increases muscle mass, increases grip strength, increases concentration, increases mental clarity, and increases memory, wherein the first therapeutic agent is selected from a group consisting of an erythromycin family member and an erythromycin family member conjugated with a first fatty acid~~the macrolide family, the ketolide family, the amphenicol family, the lincosamide family, the pleuromutilin family, derivatives thereof, and combinations thereof~~, wherein the second therapeutic agent is selected from a group consisting of ~~the~~a tetracycline family member and a tetracycline family member conjugated with a second fatty acid, ~~the glycylcycline family, the fluorocycline family, the aminoglycoside family, the oxazolidinone family, derivatives thereof,~~

~~and combinations thereof,~~ and wherein the third therapeutic agent is selected from Vitamin C and an ascorbate derivative.

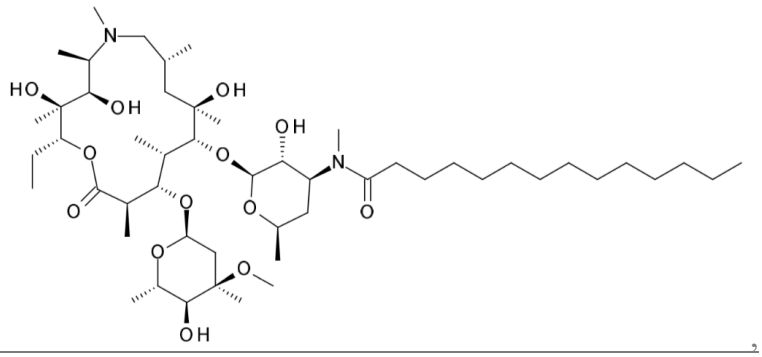
4. The use of any of claims 1-3, wherein the first therapeutic agent comprises azithromycin, the second therapeutic agent comprises doxycycline, and the third therapeutic agent is Vitamin C.

5. The use of any of claims 1-3, wherein the first therapeutic agent comprises an erythromycin family member conjugated with a first fatty acid, and the second therapeutic agent comprises a tetracycline family member conjugated with a second fatty acid.

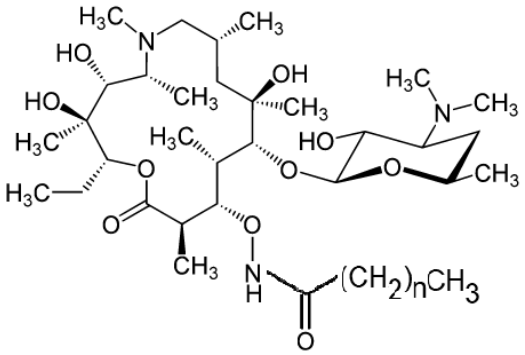
6. The use of claim 5, wherein at least one of the first fatty acid and the second fatty acid comprises myristic acid.

7. The use of any of claims 1-3, wherein the first therapeutic agent comprises ~~a compound of claim 14.~~

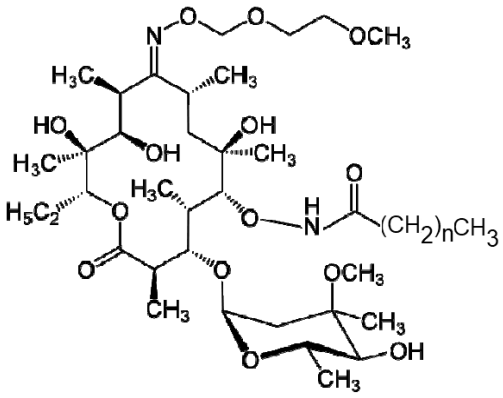
a conjugate of azithromycin and a first fatty acid selected from the group consisting of:



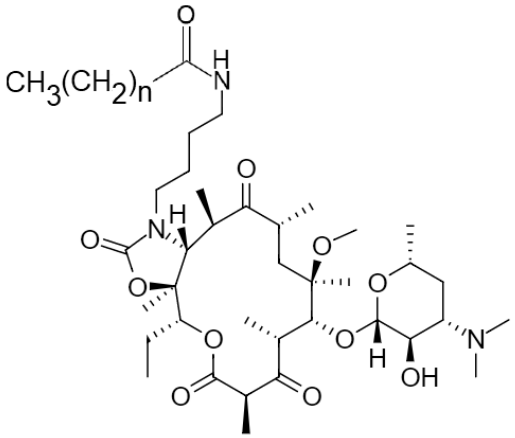
,



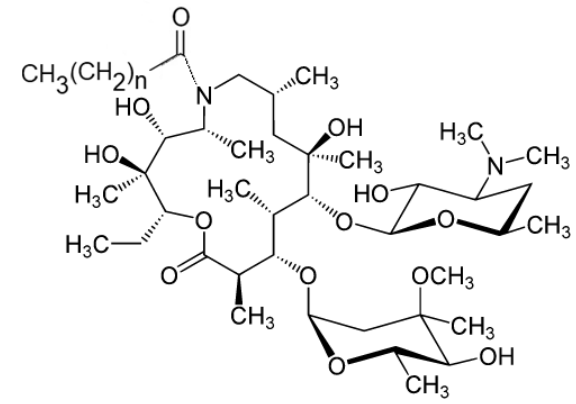
, wherein n is an integer from 1-20;



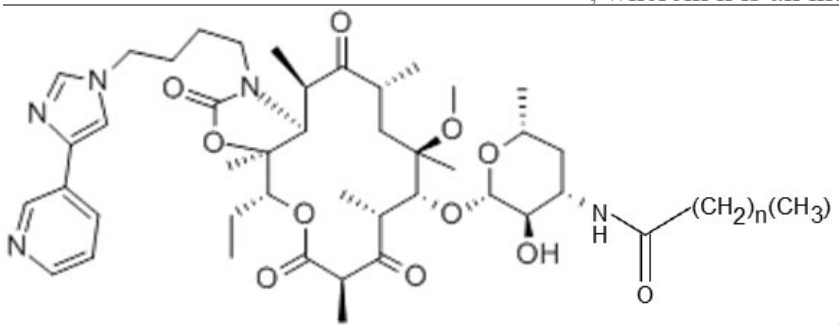
, wherein n is an integer from 1-20;



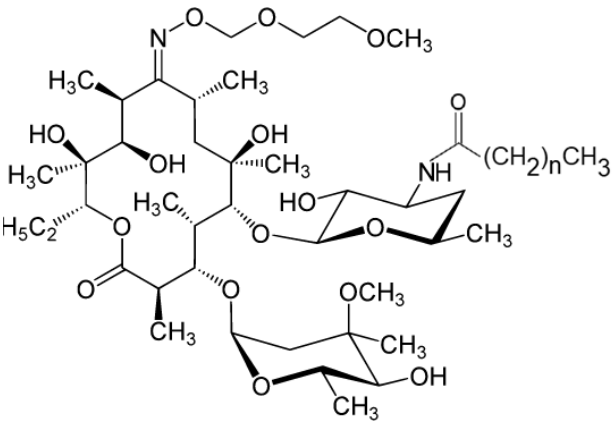
, wherein n is an integer from 1-20;



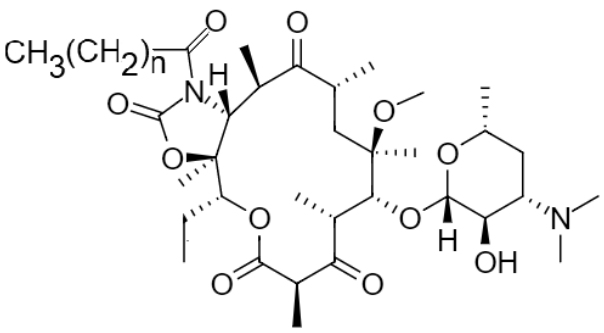
, wherein n is an integer from 1-20;



, wherein n is an integer from 1-20;



, wherein n is an integer from 1-20; and



, wherein n is an integer from 1-20.

8. The use of any of claims 1-3, wherein the first therapeutic agent comprises an azithromycin and myristic acid conjugate, and the second therapeutic agent comprises a doxycycline and myristic acid conjugate.

9. The use of any of claims 1-3, wherein at least one therapeutic agent comprises a conjugate with a tri-phenyl-phosphonium (TPP) moiety.

10. The use of any of claims 1-3, wherein mitochondrial oxidative stress in cancer cells is induced by one of radiation therapy, and a third therapeutic agent comprising at least one of Vitamin C and ascorbyl palmitate.

11. The use of claim 4, wherein the concentration of at least one of azithromycin and doxycycline is sub-antimicrobial, and the third therapeutic agent is Vitamin C at a concentration sufficient to achieve a peak Vitamin C concentration between 100 μM and 250 μM in at least one of blood, plasma, and serum.

12. The use of claim 4, wherein the medicament is suitable for administering 250 mg of azithromycin twice per week, 100 mg of doxycycline twice per day, and 500 mg of Vitamin C 500 mg once per day.

13. The use of any of claims 1-3, wherein the third therapeutic agent is one of Vitamin C, an ascorbate derivative, a chemotherapeutic, and radiation.

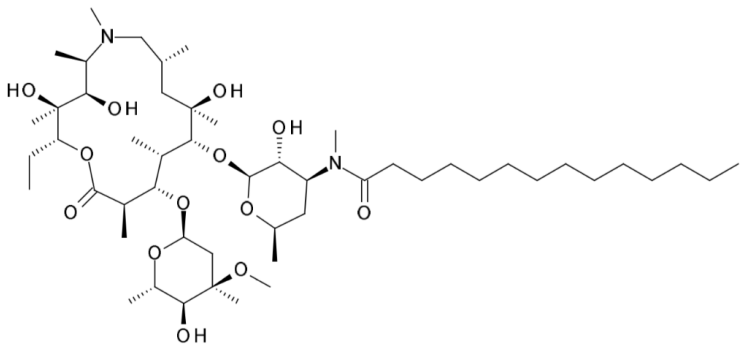
14. The use of any of claims 1-3, wherein at least one therapeutic agent is chemically modified with one of a membrane-targeting signal and a mitochondria-targeting signal.

15. The use of any of claims 1-3, wherein the first therapeutic agent comprises a conjugate of azithromycin and a first fatty acid, the second therapeutic agent comprises a conjugate of doxycycline and a second fatty acid, and the third therapeutic agent comprises at least one of Vitamin C, ascorbyl palmitate, and an ascorbate derivative.

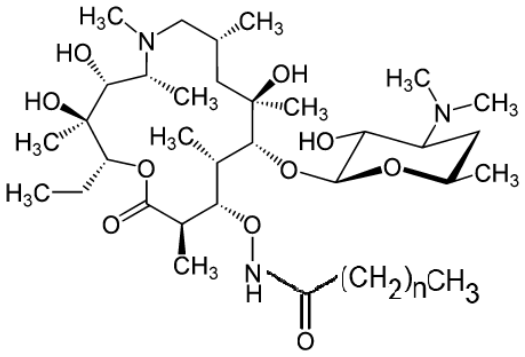
16. The use of claim 15, wherein at least one of the first fatty acid and the second fatty acid is myristic acid.

17. An anti-senescence pharmaceutical composition comprising the combination of a first therapeutic agent selected from ~~azithromycin~~an erythromycin family member and a conjugate of ~~azithromycin~~an erythromycin family member and a first fatty acid, a second therapeutic agent selected from ~~doxycycline~~a tetracycline family member and a conjugate of ~~doxycycline~~a tetracycline family member and a second fatty acid, and a third therapeutic agent selected from Vitamin C, ascorbyl palmitate, and an ascorbate derivative.

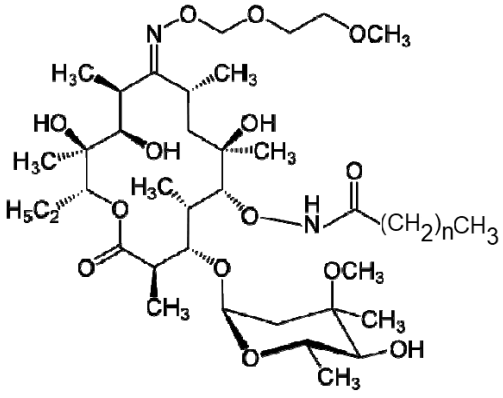
18. The pharmaceutical composition of claim 17, wherein the first therapeutic agent is a conjugate of azithromycin and a first fatty acid selected from the group consisting of:



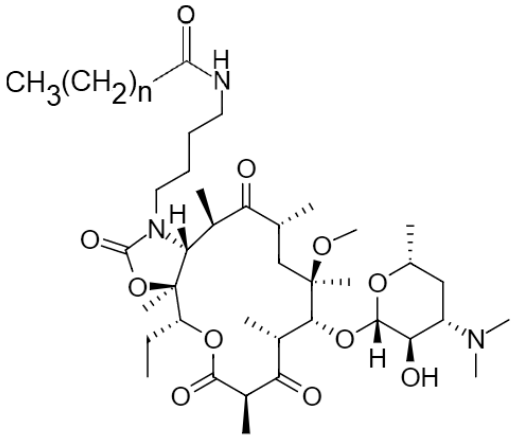
,



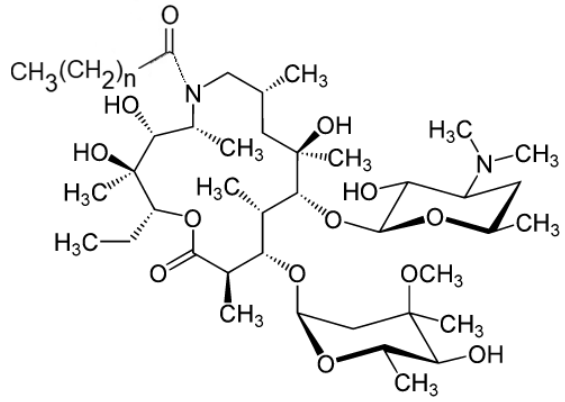
, wherein n is an integer from 1-20;



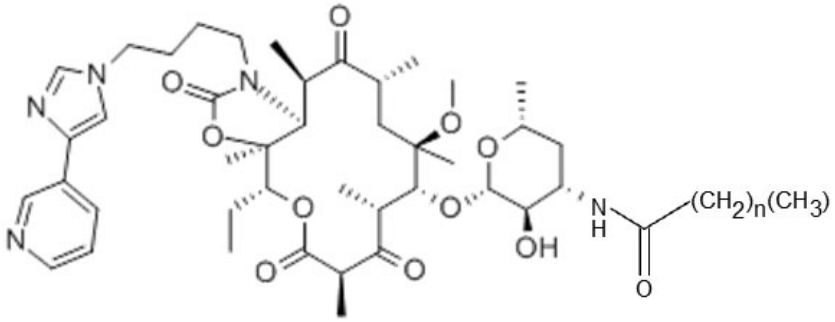
, wherein n is an integer from 1-20;



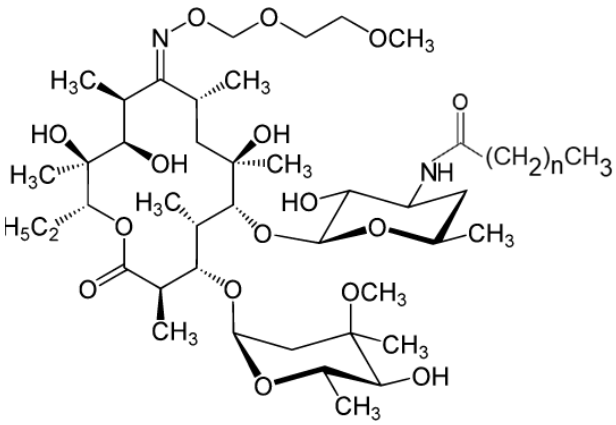
, wherein n is an integer from 1-20;



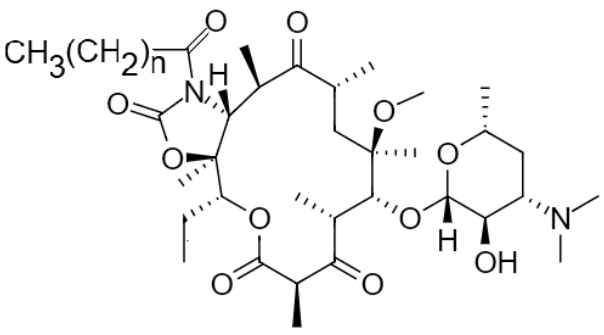
, wherein n is an integer from 1-20;



, wherein n is an integer from 1-20;

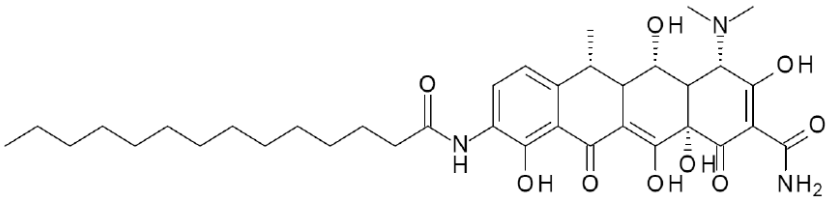


, wherein n is an integer from 1-20; and

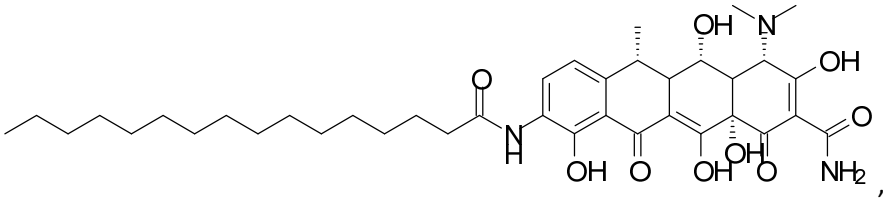


, wherein n is an integer from 1-20

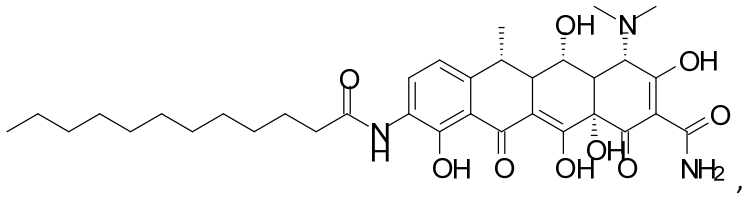
19. The pharmaceutical composition of claim 17, wherein the second therapeutic agent is a conjugate of doxycycline and a second fatty acid selected from the group consisting of:



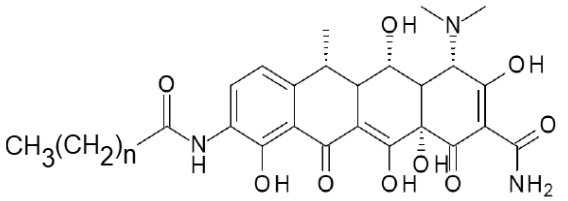
,



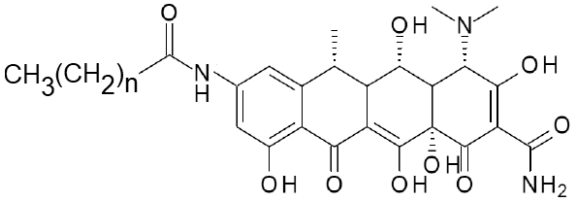
,



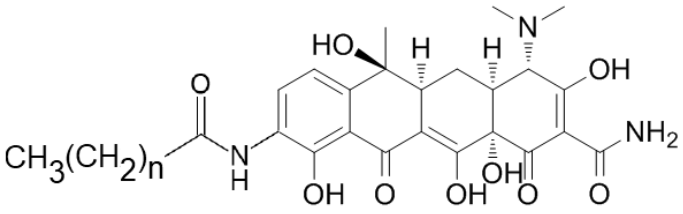
,



, wherein n is an integer from 1-20;



, wherein n is an integer from 1-20; and



, wherein n is an integer from 1-20.