Claims

1. A layered dressing comprising:

a permeable wound contact layer for placing in contact with a wound;

a breathable barrier layer;

a fluid collection layer disposed between the wound contact layer and breathable barrier layer, the fluid collection layer comprising a biosensor housing portion and a fluid collection portion comprising a plurality of channels each having a terminus at the biosensor housing portion; and

a biosensor sensing array comprising one or more electrodes, the biosensor sensing array being disposed between the biosensor housing portion of the fluid collection layer and the breathable barrier layer,

wherein:

the channels within the fluid collection portion of the fluid collection layer are configured such that, when in use, the channels deliver wound fluid by capillary action from a wound in contact with the wound contact layer to the biosensor sensing array, and where the biosensor sensing array is configured to detect one or more markers in said wound fluid.

2. The layered dressing according to Claim 1, wherein the wound contact layer comprises a plurality of perforations.

3. The layered dressing according to Claim 1 or 2, wherein the fluid collection portion of the fluid collection layer has an annular shape having an outer surface, where annular shape defines a central portion, and where the biosensor housing portion of the fluid collection layer is located at the central portion, optionally , wherein the fluid collection portion has an outer surface, and where the plurality of channels each run from the outer surface of the fluid collection portion to the biosensor housing portion.

~~4. The layered dressing according to Claim 3, wherein the fluid collection portion has an outer surface, and where the plurality of channels each run from the outer surface of the fluid collection portion to the biosensor housing portion.~~

~~5~~4. The layered dressing according to any one of Claims 1 to ~~4~~3, wherein the plurality of channels are configured to allow the flow of fluid from a wound in only a single direction along the channels, optionally wherein the plurality of channels each comprise a plurality of interconnected half-open saw-tooth-shaped capillary channels.

~~6. The layered dressing according to Claim 5, wherein the plurality of channels each comprise a plurality of interconnected half-open saw-tooth-shaped capillary channels.~~

~~7~~5. The layered dressing according to any one of Claims 1 to ~~6~~4, wherein the plurality of channels do not have uniform width throughout their length.

~~8~~6. The layered dressing according to Claim ~~7~~5, wherein the channels comprise a first portion configured to draw fluid from a wound in contact with the wound contact layer, and a second portion proximal to the biosensor sensing array as compared to the first portion, where the width of the channels at the first portion is greater than the width of the channels at the second portion, optionally wherein the channels comprise a first end and a second end, and where the width of the channels at the first end is from 180 μm to 220 μm, and the width of the channels at the second end is from 140 μm to 180 μm.

~~9. The layered dressing according to Claim 8, wherein the channels comprise a first end and a second end, and where the width of the channels at the first end is from about 180 μm to about 220 μm, and the width of the channels at the second end is from about 140 μm to about 180 μm.~~

~~10~~7. The layered dressing according to any one of the preceding claims, wherein the biosensor sensing array comprises one or more electrodes, each electrode being configured to detect a marker selected from the group consisting of a healing biomarker and a bioburden biomarker.

~~11~~8. The layered dressing according to Claim ~~10~~7, wherein the healing biomarker is selected from the group consisting of TNF-α, IL-6, IL-8, TGF-β_1, and pH.

~~12~~9. The layered dressing according to Claim ~~10~~7, wherein the bioburden biomarker comprises a biomarker for *S. aureus*.

~~13~~10. The layered dressing according to any one of Claims ~~10–~~7 to ~~12~~9, wherein the biosensor sensing array comprises two or more electrodes, each electrode being configured to detect a marker selected from the group consisting of TNF-α, IL-6, IL-8, TGF-β_1, pH and a biomarker for *S. aureus*, optionally wherein the biosensor sensing array comprises six electrodes, each electrode being configured to detect a marker selected from the group

consisting of TNF-α, IL-6, IL-8, TGF-β_1, pH and a biomarker for *S. aureus*, such that the biosensor sensing array is able to simultaneously detect TNF-α, IL-6, IL-8, TGF-β_1, pH and a biomarker for *S. aureus*.

~~14. The layered dressing according to Claim 13, wherein the biosensor sensing array comprises six electrodes, each electrode being configured to detect a marker selected from the group consisting of TNF-α, IL-6, IL-8, TGF-β_1, pH and a biomarker for *S. aureus*, such that the biosensor sensing array is able to simultaneously detect TNF-α, IL-6, IL-8, TGF-β_1, pH and a biomarker for *S. aureus*.~~

~~15~~11. The layered dressing according to any one of Claims ~~12~~ 9 to ~~14~~10, wherein the biomarker for *S. aureus* is an epitope.

~~16~~12. The layered dressing according to any one of the preceding claims, wherein the biosensor sensing array comprises one or more aptamer-based working electrodes, each comprising an aptamer bonded to an electrode, where the aptamer is suitable for detecting a marker in the wound fluid.

~~17~~13. The layered dressing according to Claim ~~16~~12, wherein the one or more aptamer-based working electrodes comprises an aptamer for IL-8, IL-6, TNF-α, TGF-β_1 and/or *S. aureus*.

~~18~~14. The layered dressing according to Claim ~~17~~13, wherein any one of the following applies:

(a) the aptamer for IL-8 comprises the sequence 5'-/5ThioMC6-D/rGrGrGrGrGrCrUrUrArUrCrArUrUrCrCrArUrUrUrArGrUrGrUrUrArUrGrArUrArArCrC/3MeBIN/-3'; and/or

(b) the aptamer for IL-6 comprises the sequence 5'-/5ThioMC6-D/GGTGGCAGGAGGACTATTTATTTGCTTTTCT/3MeBIN/-3'; and/or

(c) the aptamer for TNF- α comprises the sequence 5'-/5MeBIN/rG*rG*rA*rG*rU*rA*rU*rC*rU*rG*rA*rU*rG*rA*rC*rA*rA*rU*rU*rC*rG*rG*rA*rG*rC*rU*rC*rC/3ThioMC3-D/-3'; and/or

(d) the aptamer for TGF- β_1 comprises the sequence 5'-/5MeBIN/CG*CTCGG*CTTC*ACG*AG*ATT*CGTGT*CGTTGTGT*C*CTGT*A*C*C*CG*C*CTTG*A*C*C*AGT*C*ACT*CT*AG*AGC*AT*C*CGG*A*CTG/iSpC3//3ThioMC3-D/-3'; and/or

(e) the aptamer for *S. aureus* comprises the sequence 5'-/5ThioMC6-D/TCGGCACGTTCTCAGTAGCGCTCGCTGGTCATCCCACAGCTACGTC/3MeBlN/-3'.

~~19~~15. The layered dressing according to Claim ~~18~~14, wherein:
(a) the aptamer for IL-8 comprises the sequence 5'-/5ThioMC6-D/rGrGrGrGrGrCrUrUrArUrCrArUrUrCrCrArUrUrUrArGrUrGrUrUrArUrGrArUrArArCrC/3MeBlN/-3'; and/or
(b) the aptamer for IL-6 comprises the sequence 5'-/5ThioMC6-D/GGTGGCAGGAGGACTATTTATTTGCTTTTCT/3MeBlN/-3'.

~~20~~16. The layered dressing according to any one of Claims ~~16~~ 12 to ~~20~~15, wherein the aptamer comprises a first end region and a second end region, and where the aptamer is bonded to the electrode *via* the first end region.

~~21~~17. The layered dressing according to Claim ~~20~~16, wherein the surface of the one or more aptamer-based working electrodes comprises a layer of electrochemically exfoliated graphene-gold nanoparticles (AuNPs-GP) nanocomposite, optionally wherein the aptamer is bonded to the surface of the electrode by a gold-thiol bond.

~~22. The layered dressing according to Claim 21, wherein the aptamer is bonded to the surface of the electrode by a gold-thiol bond.~~

~~23~~18. The layered dressing according to any one of Claims ~~16~~ 12 to ~~22~~17, wherein the aptamer is conjugated to a redox label, optionally wherein the redox label is methylene blue, optionally wherein the aptamer comprises a first end region and a second end region, where the aptamer is bonded to the biosensor *via* the first end region and the aptamer is conjugated to the redox label *via* the second end region.

~~24. The layered dressing according to Claim 23, wherein the aptamer comprises a first end region and a second end region, where the aptamer is bonded to the biosensor *via* the first end region and the aptamer is conjugated to the redox label *via* the second end region.~~

~~25~~19. The layered dressing according to any one of the preceding claims, wherein the biosensor sensing array comprises a polyaniline pH sensor.

~~26~~20. The layered dressing according to any one of the preceding claims, wherein:

(a) the biosensor sensing array comprises a temperature sensor, optionally wherein the temperature sensor comprises a Wheatstone bridge; and/or

(b) the biosensor sensing array is capable of wirelessly transmitting measurement data to a paired device.

~~27. The layered dressing according to any one of the preceding claims, wherein the biosensor sensing array is capable of wirelessly transmitting measurement data to a paired device.~~