Claims

1. A molecular exchange device comprising;

a casing, extending from a proximal end to a distal end, supporting at least two fluid passageways, that are in fluid communication with one another, extending from the proximal end to the distal end; the casing comprising at least ~~one~~ two exchange apertures between the distal end and the proximal end, wherein each of the fluid passageways have an aligned or non aligned exchange aperture, and a portion of ~~the~~ each fluid passageway exposed by the exchange aperture is porous.

2. A molecular exchange device according to Claim 1, wherein a separator extends along the casing for at least a length of the exchange aperture, separating the at least two fluid passageways.

3. A molecular exchange device according to any one of Claims 1 to 2, wherein the separator extends along substantially the entire length of the casing, from the distal end to the proximal end, separating the at least two fluid passageways.

4. A molecular exchange device according to any one of Claims 2 to 3, wherein the separator extends along a central axis of the casing.

5. A molecular exchange device according to Claim 4, wherein two fluid passageways are arranged on aligning sides of the central separator.

6. A molecular exchange device according to Claim 4, wherein two or more of the fluid passageways are arranged around the central separator.

~~7. A molecular exchange device according to any one of the preceding claims, wherein the at least two fluid passageways are defined by the casing and/or separator.~~

~~8~~7. A molecular exchange device according to any one of the preceding Claims ~~1 to 7~~, wherein the at least two fluid passageways are not defined by the casing and/or separator.

~~9~~8. A molecular exchange device according to Claim ~~8~~ 7, wherein~~,~~ the at least two fluid passageways are at least one tube held within the casing.

~~10~~9. A molecular exchange device according to Claim ~~9~~ 8, wherein the at least one tube is a porous membrane.

~~11~~10. A molecular exchange device according to any one of Claims 1 to ~~7~~ 6, wherein the porous region of the fluid passageway is a porous membrane bonded with the casing at the proximal and distal ends of the exchange aperture.

~~12. A molecular exchange device according to any one of Claims 10 to 11, wherein the porous membrane is a dialysis membrane.~~

~~13~~11. A molecular exchange device according to ~~any one of Claims 9 to 12~~ Claim 8 or 9, wherein the at least one tube extends from the proximal end to the distal end of the casing, folds back on itself at the distal end and extends from the distal end to the proximal end of the casing, providing two fluid passageways.

~~14. The molecular exchange device according to any one Claims 9 to 10, wherein the at least one conduit has a circular or non-circular shaped~~

~~cross section, preferably, the cross section has one straight edge and, more preferably, the cross section is D-shaped.~~

~~15. A molecular exchange device according to any one of the preceding claims, wherein the exchange aperture is an opening, preferably formed by cutting away a portion of the casing.~~

~~16. A molecular exchange device according to any one of Claims 1 to 14, wherein the exchange aperture is an opening, preferably formed by treating the casing to render a portion of the casing porous.~~

~~17~~12. A molecular exchange device according to any one of the preceding claims, wherein more than one exchange aperture exposes the same fluid passageway.

~~18~~13. A molecular exchange device according to any one of the preceding claims, wherein the porous portions of the ~~more than one~~ exchange aperture~~s~~ have different porosities.

~~19. The molecular exchange device according any one of the preceding claims, wherein the at least two fluid passageways have aligned or non-aligned exchange apertures.~~

~~20. The molecular exchange device according to any one of the preceding claims, wherein the distal end of the device comprises a plug in the end of the casing.~~

~~21~~14. The molecular exchange device according to any one of Claims 2 to ~~15~~ 13, wherein the separator extends to the distal end of the casing and contains a fluid aperture to allow flow from one fluid passageway to another fluid passageway.

~~22~~15. The molecular exchange device according to any one of the preceding claims, wherein the distal end of the casing is formed as a tip containing a flow chamber to allow flow from one end of at least one fluid passageway into the end of another fluid passageway.

~~23. The molecular exchange device according to Claim 22, wherein the ends of the at least one fluid passageways extend into the flow chamber.~~

~~24~~16. The molecular exchange device according to ~~any one of Claims 22 to 23~~ Claim 15, wherein the flow chamber has a sensor arrangement to, preferably, enable spectrologic measurement.

~~25. The molecular exchange device according to Claim 24, wherein the spectrologic measurement is spectrophotometric measurement.~~

~~26. The molecular exchange device according to any one of Claims 24 or 25, wherein the sensor arrangement is a reflector, wave guide, conductor, photoelectric, electro-active or electrochemical sensor.~~

~~27. The molecular exchange device according to any one of the preceding claims, further comprising a channel leading from the proximal end of the casing to the distal end of the casing to provide additional materials to the interior and/or exterior of the distal end of the casing.~~

~~28. The molecular exchange device according to Claim 27, wherein the channel is integral with the separator.~~

~~29. The molecular exchange device according to Claim 28, wherein the channel is formed within the central axis of the separator.~~

~~30. The molecular exchange device according to any one of Claims 27 to 28, wherein the channel provides access to/for an optical, sonic and/or electrical probe.~~

~~31. The molecular exchange device according to any one of the preceding claims, wherein the proximal end of the casing is adapted for attachment to a catheter and/or cannular.~~

~~32. The molecular exchange device according to any one of the preceding claims, wherein the proximal end of the casing is a lockable-mating arrangement and or anchoring member for connecting to an invasive port.~~

~~33. The molecular exchange device according to any one of the preceding claims, wherein the proximal end of the casing is adapted for attachment to a pump.~~

~~34. The molecular exchange device according to any one of the preceding claims, wherein the proximal end of the casing is adapted for attachment to an external device.~~

~~35~~17. A system for controlling the concentration of a first substance in a fluid passageway of ~~the~~ a molecular exchange device, the system comprising a molecular exchange device as claimed in any one of the preceding claims, and a control device linked to the molecular exchange device, wherein the control device measures the concentration of a second substance in a fluid passageway and controls the supply of the first substance into a fluid passageway, preferably in response to the measured concentration.

~~36~~18. A system ~~according to~~ as claimed in Claim ~~35~~ 17, wherein the first and second substances may be the same or different from one another.

~~37~~19. A system as claimed in Claim 17 or 18, wherein the system is used for providing a self-maintaining mechanism for drug delivery to maintain the concentration of the drug at a predetermined level.

~~38~~20. A method of manufacturing a molecular exchange device according to any one of ~~the preceding claims~~ Claims 1 to 16, wherein the method comprises the steps of:

i) forming of a casing

ii) providing at least two fluid passageways within the casing

iii) forming of at least ~~one~~ two exchange aperture~~s~~ in the casing.

~~39~~21. A method of according to Claim ~~38~~ 20, wherein steps i), ii) and/or iii) occur simultaneously.

~~40~~22. A method according to Claim ~~38~~ 20, further comprising the step of forming a separator to separate the at least two fluid passageways.

~~41. A method according to any one of Claims 38 to 40, wherein the casing is formed by moulding.~~

~~42. A method according to any one of Claim 41, wherein the at least one exchange aperture is formed by the moulding of the casing.~~

~~43. A method according to any one of Claims 38 to 42, wherein the casing is formed through an extrusion process.~~

~~44. A method according to any one of Claims 38 to 43, wherein the exchange aperture is formed by cutting away a portion of the casing.~~

~~45. A method according to any one of Claims 38 to 43, wherein the exchange aperture is formed by treating the casing, by a laser, such as laser~~

~~ablation, x-ray, such spark erosion, etching, oxidation use of salt treatment during an extrusion process or other microfabrication processes, to render the casing porous.~~

~~46. A method according to Claim 45, wherein the casing is treated during and/or post formation of the casing.~~

~~47~~23. A method according to any one of Claims ~~38~~ 20 to ~~46~~ 22, wherein the at least two fluid passageways are inserted into the casing after forming the exchange apertures.

~~48. A method according to any one of Claims 38 to 47, wherein the fluid passageways are inserted into casing after the sealing of the distal end of the casing.~~

~~49~~24. A method according to any one of Claims ~~38~~ 20 to ~~48~~ 23, wherein the at least one fluid passageway has a circular or non-circular shaped cross section, preferably, the cross section has one straight edge and, more preferably, the cross section is D-shaped, for orientation into the lumen.

~~50. A method according to any one of Claims 38 to 49, wherein the distal end of the casing is sealed.~~

~~51. A method according to any one of Claims 38 to 50, wherein the distal end of the casing is sealed by heat sealing, cold sealing, crimping or mechanical methods.~~