Claims:

~~1. A pre-wetted, single-use hydrophobic hollow fiber filter for perfusion cell culture, wherein the filter is~~

~~pre-wetted with an alcohol and is stored in a buffered solution.~~

1~~2~~. ~~The filter of claim 1, further comprising a~~A filter housing~~, the filter housing~~ comprising:

an inlet;

a retentate outlet;

a permeate outlet;

at least one pre-wetted hydrophobic hollow fiber filter extending between the inlet and the retentate outlet, thereby fluidly separating the permeate outlet from the retentate outlet and the inlet; and

a potting material connecting the hydrophobic hollow fibers to the filter housing and sealing at least one of the inlet and the retentate outlet from the permeate outlet,

wherein the pre-wetted hydrophobic hollow fiber filter consists of hydrophobic polymers and lacks hydrophilic polymers, and

wherein the filter is contained in an aqueous solution within the filter housing.

2~~3~~. The filter housing of claim 1~~2~~, wherein the hydrophobic hollow fiber comprises a plurality of pores.

3~~4~~. The filter of claim 2~~3~~, wherein the pores are 0.05 um to 2.0 um in diameter or from 0.05 um to 0.2 um.

4~~5~~. The filter housing of any one of claims 1 to 3~~2~~ ~~of claim 1,~~ wherein the hydrophobic hollow fiber has a surface area of 10 cm2 to 90 m2.

5~~6~~. The filter housing of any one of claims 1 to 4~~2of claim 1~~, wherein the hydrophobic hollow fiber has an inner diameter of 0.2 mm to 5.0 mm.

6~~7~~. The filter housing of any one of claims 1 to 5~~2of claim 1~~, wherein the hydrophobic hollow fiber has a wall thickness of 50 um to 500 um.

~~8. The filter of claim 1, wherein the hydrophobic hollow fiber comprises a polyolefin or a fluoropolymer.~~

7~~9~~. The filter housing of any of the preceding claims~~claim 2 or 3of claim 8~~, wherein the hydrophobic hollow fiber filter comprises polypropylene, or a co-polymer thereof. ~~polyolefin is polypropylene, polyethylene, or copolymers thereof~~.

8~~10~~. A method for perfusion cell culture, comprising:

circulating a cell culture fluid through ~~a~~ the hydrophobic hollow fiber filter in the filter housing of claim 1~~2~~, thereby separating the cell culture fluid into a filtrate and a retentate; and

returning the retentate to the bioreactor.

9~~11~~. The method of claim 8~~10~~, wherein the perfusion cell culture is selected from the group consisting of: n-1 culture and media exchange, in either case wherein the filtrate is not retained.

10~~12~~. The method of claim 8~~10~~, wherein the perfusion cell culture is selected from the group consisting of: high productivity harvest, concentrated fed batch culture, or continuous perfusion, in each case wherein the filtrate comprises a bioproduct of interest and is retained.

11~~13~~. The method of any one of claims 8 to 10, wherein the cell culture is a mammalian cell culture, yeast cell culture, prokaryotic cell culture, or insect cell culture.

12~~14~~. The method of any one of claims 8 to 11~~10~~, wherein the circulation of the cell culture is performed by alternating tangential flow.

13~~15~~. The method of any one of claims 8 to 11 ~~10~~, wherein the circulation of the cell culture is performed by tangential flow filtration.

14~~16~~. The method of any one of claims 8 to 13~~10~~, wherein the circulation of the cell culture fluid is performed at a filter flux of 1, 2, 3, 4, 5, 10, 15, 20, 22.5, 25, 30 l/m2▪h.

15~~17~~. The method of any one of claims 8 to 14~~claim 10~~, wherein the separation system contains one or more of the following: peristaltic tubing through a peristaltic pumphead, maglev pump, ATF pump, and other positive displacement disposable pumps.

16~~18~~. The method of any one of claims 8 to 15~~10~~, wherein the method is performed over 10, 20, 30, 40, 50 days.

17~~19~~. The method of any one of claims 8 to 16 ~~10~~, wherein the hydrophobic hollow fiber comprises a polyolefin or a fluoropolymer.

18~~20~~. The method~~filter~~ of claim 17~~19~~, wherein the polyolefin is polypropylene, polyethylene, or copolymers

thereof.

19~~21~~. A method of assembling a perfusion culture system~~,~~ comprising the filter housing of claim 1~~2~~ comprising the steps of:

disposing ~~a~~ the pre-wetted hydrophobic hollow-fiber filter into ~~a~~ the filter housing ~~of the perfusion culture system~~ and, optionally, connecting a permeate outlet of the filter housing to a permeate collection vessel, wherein:

(a) the perfusion culture system comprises a process vessel, a first conduit fluidly connecting an interior of the process vessel to an interior of the filter housing to define a filter feed channel and, optionally, a second conduit connecting the interior of the filter housing to the process vessel and defining a retentate channel, and (b) prior to disposal within the filter housing the hydrophobic hollow fiber filter is pre-wetted with a solution comprising an alcohol and is stored in a buffered aqueous solution.

20~~22~~. The method of claim 19~~21~~, wherein the filter housing further comprises an outlet for a filtrate, the outlet being fluidly separated from the feed and retentate channels by the hollow fiber hydrophobic filter.

21~~23~~. The method of claim 19 or 20~~21~~, wherein the circulation of the cell culture fluid is performed at a filter flux of 1, 2, 3, 4, 5, 10, 15, 20, 22.5, 25, 30 l/m2▪h.

~~24. The filter of claim 21, wherein the hydrophobic hollow fiber comprises a polyolefin or a fluoropolymer.~~

22~~25~~. The ~~filter of claim 24~~method of any one of ~~-~~claims 19 to 21, wherein the hydrophobic hollow fiber filter comprises polypropylene, or a co-polymer thereof.~~polyolefin is polypropylene, polyethylene, or copolymers thereof~~.

23~~26~~. A method of perfusion cell culture, comprising:

passing a cell culture medium through the filter housing of claim 1~~2~~ and tangentially across a hydrophobic hollow fiber filter to reduce a concentration of a first component of the cell culture medium, wherein the first component does not comprise a recombinant peptide, nucleic acid or viral capsid~~, and wherein the hydrophobic hollow fiber filter is a pre-wetted, single-use hollow fiber filter according to any one of claims 1-9~~.

24~~27~~. The method of claim 23~~26~~, wherein the method is performed over 10, 20, 30, 40, 50 days.

25~~28~~. The method of claim 23 or 24~~26~~, wherein the circulation of the cell culture fluid is performed at a filter flux of 1, 2, 3, 4, 5, 10, 15, 20, 22.5, 25, 30 l/m2▪h.

26~~29~~. The method of any one of claims 23 to 25~~26~~, wherein the hydrophobic hollow fiber comprises a polyolefin or a fluoropolymer.

27~~30~~. The method of claim 26~~29~~, wherein the polyolefin is polypropylene, polyethylene, or copolymers thereof.

28~~31~~. A method of filtering a fluid, comprising:

passing the fluid through the filter housing of claim 1~~2~~ ~~a hydrophobic hollow fiber filter system~~ such that the fluid flows in a non-laminar manner through the hydrophobic hollow fiber filter, and such that the fluid is separated into a retentate and a permeate~~, wherein the hydrophobic hollow fiber filter is a pre-wetted, single-use hollow fiber filter according to any one of claims 1-9~~.

29~~32~~. The method of claim 28~~31~~, wherein a product of a feed velocity of the system and an inner diameter of the hydrophobic hollow fiber filter is greater than 2500 mm2s-1.

30~~33~~. The method of claim 28 or 29~~31~~, wherein a Reynolds number characterizing the flow of fluid into the filter is greater than 2000, 2300, 2500 , 3000, 3500, or 4000.

31~~34~~. The method~~filter~~ of any one of claims 28 to 30~~31~~, wherein the hydrophobic hollow fiber comprises a polyolefin or a fluoropolymer.

32~~35~~. The method~~filter~~ of claim 31~~34~~, wherein the polyolefin is polypropylene, polyethylene, or copolymers

thereof.

33~~36~~. The method of any one of claims 28 to 32~~31~~, wherein a direction of flow through the hydrophobic hollow fiber filter is alternated.

34~~37~~. The method of claim 28~~31~~, further comprising a step of collecting a filter permeate.

35~~38~~. The method of any one of claims 28 to 34~~37~~, wherein the hydrophobic hollow fiber filter retains a non-desired species.

36~~39~~. The method of claim 35~~38~~, wherein the retained non-desired species is selected from the group consisting of: a species of mammalian cell origin; a species of microbial cell origin;

a species of viral origin; a protein; a nucleic acid; a polysaccharide; or a complex of any of the foregoing.

37~~40~~. The method of claim 34~~37~~, wherein a desired species passes through the hydrophobic hollow fiber filter into a permeate.

38~~41~~. The method of claim 37~~40~~, wherein the desired species is selected from the group consisting of: a species of mammalian cell origin; a species of microbial cell origin; a species of viral origin; a protein; a nucleic acid; a polysaccharide; a virus; a microcarrier; a particle; or a complex of any of the foregoing.

39~~42~~. A composition comprising a permeate collected according to the method of claim 38~~41~~.

40~~43~~. The composition of claim 39~~42~~, wherein a concentration of a desired species in the composition is at least 10x, 20x, 40x, 50x, 75x or 100x greater than a concentration of the desired species in the fluid.

41~~44~~. The composition of claim 39~~42~~, wherein a concentration of a non-desired species is at least 10x, 20x, 40x, 50x, 75x or 100x less than a concentration of the non-desired species in the fluid.

42~~45~~. A method of claim 28~~31~~, further comprising the step of removing a permeate from the fluid, thereby increasing a concentration of a desired species that is retained by the hydrophobic hollow fiber filter, wherein the concentration of the desired species is increased by 5X, 10X, 20X, 40X, 50X, 75X or 100X.

43~~46~~. A method of filtering a fluid, comprising:

passing the fluid through the filter housing of claim 1~~2~~ and into the ~~a~~ hydrophobic hollow fiber filter under conditions in which a feed velocity is 2000, 2300, 2500, 3000, 3500 or 4000 times greater than the quotient of a kinematic viscosity of the fluid over the hollow fiber filter diameter.