What Is Claimed:

1. A method for purifying a cellular population comprising:

expanding a biological cell population in a fluid medium, the biological cell population comprising biological cells in an unsupported state, the biological cell population being contained in a bioreactor and having a cell density of at least 1 x 10^6 cells/mL;

removing and filtering the fluid medium from the bioreactor at a flow rate of 5 to 10 mL/mins, 10 to 15 mL/mins, or 20 to 25 mL/mins to minimize cell loss, the fluid medium being filtered through a filter apparatus comprising a filter member, the filter member having a pore size that inhibits the biological cells from being withdrawn from the bioreactor as the fluid medium is withdrawn; and

adding to the biological cell population a buffer medium.

2. The method as defined in claim 1, wherein the fluid medium contains biological byproducts and wherein the filter member has a pore size that permits passage of the biological byproducts with the fluid medium that is withdrawn, preferably wherein the biological byproducts comprise a protein, serum, and mixtures thereof, preferably wherein, after the fluid medium is withdrawn from the bioreactor, the biological cell population contains the biological byproducts in an amount less than 0.1% by weight.

3. The method as defined in any of the preceding claims, wherein greater than 50% of the volume of the fluid medium is withdrawn and at least partially is replaced with the buffer medium, preferably wherein the fluid medium is withdrawn from the bioreactor at a flow rate such that at least 50% of the volume of the fluid medium in the bioreactor is withdrawn in a period of time of less than 1 hour.

4. The method as defined in any of the preceding claims, wherein the biological cell population and fluid medium has a volume of from 1L to 10L, preferably wherein the biological cell population and fluid medium has a volume of from 5L to 75L.

5. The method as defined in any of the preceding claims, wherein the method is repeated from 2 cycles to 5 cycles.

6. The method as defined in any of the preceding claims, wherein the biological cells comprise T cells or NK cells.

7. The method as defined in any of the preceding claims, further comprising the step of dispensing the biological cell population and buffer medium into flexible bag vessels for cryogenic storage, preferably wherein the biological cells and buffer medium are also combined with a cryogenic buffer medium, even more preferably wherein the cryogenic buffer medium comprises an alkyl sulfoxide.

8. The method as defined in any of the preceding claims, wherein the filter member of the filter apparatus has an absolute pore size of from 1 micron to 9 microns, preferably from 1 micron to 6 microns.

9. The method as described in any of the preceding claims, wherein the filter apparatus comprises a hollow tubular member having a first end defining a first opening and a second and opposite end defining a second opening, the filter member being located at the second end of the hollow tubular member, the filter member completely surrounding and enclosing the second opening, the filter member defining an interior surface and an exterior surface, preferably wherein the exterior surface of the filter member has a surface area and wherein the surface area is greater than 2 in^2 and less than 50 in^2.

10. The method as defined in any of the preceding claims, wherein the biological cell population comprises at least two different cell types including first cells and second cells and wherein the method further comprises placing one or more microcarriers in the fluid medium with the biological cell population and wherein the first cells comprise the biological cells that bind to the one or more microcarriers but the second cells do not; and

removing and filtering the fluid medium from the bioreactor, the fluid medium being filtered through the filter member having a pore size that permits passage of the second cells but inhibits passage of the one or more microcarriers for separating the first cells from the second cells, preferably wherein at least a portion of the one or more microcarriers is magnetic.

11. The method as defined in claim 10, wherein at least one of the first cells or the second cells comprise T-cells or NK cells, preferably unsupported T-cells, even more preferably wherein the unsupported T-cells are activated by adding to the bioreactor an antibody that provides primary and co-signals for T-cell activation, such as a soluble tetrameric antibody complex.

12. The method according to any of the preceding claims, wherein the filter apparatus is periodically operated in a back flush mode or is configured for continuous perfusion .

13. A filter apparatus suitable for use in bioreactors comprising:

a hollow tubular member for filtering fluid from a bioreactor, the hollow tubular member having a first end defining a first opening and a second end, opposite the first end, the second end defining a second opening; and

a filter member located at the second end of the hollow tubular member configured to filter fluid from the bioreactor at a flow rate of 5 to 10 mL/mins, 10 to 15 mL/mins, or 20 to 25 mL/mins to minimize cell loss, the filter member completely surrounding and enclosing the second opening, the filter member defining an interior surface and an exterior surface, the filter member comprising a porous material, the porous material having an absolute pore size of from 1 micron to 9 microns and a distal end of the filter member is a closed, non-porous end.

14. The filter apparatus as defined in claim 13, wherein

the filter member comprises a porous mesh,

the porous material has an absolute pore size of from 1 micron to 6 microns,

the filter member comprises a nonwoven mesh formed from sintered metal fiber, and preferably wherein the sintered metal fiber comprises stainless steel.

15. The filter apparatus as defined in claim 13 or 14, wherein the filter member has a length along an axial direction of the hollow tubular member, the length of the filter member being 1 inch or greater and 12 inches or less, preferably wherein the length of the filter member being 2 inches or greater and 8 inches or less.

16. The filter apparatus as defined in one of claims 13-15, wherein the exterior surface of the filter member has a surface area and wherein the surface area is greater than 0.5 in^2, preferably wherein the surface area is greater than 2 in^2 and less than 10 in^2.

17. The filter apparatus as defined in one of claims 13-16, wherein a ratio between a cross-sectional area of the second opening and a surface area of the filter member is from 1:5 to 1:200, such as from 1:15 to 1:100.

18. The filter apparatus as defined in one of claims 13-17, wherein the hollow tubular member:

is made from stainless steel or a thermoplastic polymer, preferably wherein the filter member comprises a polymer mesh or nonwoven, even more preferably wherein the polymer mesh or nonwoven comprises a polyamide or a polyolefin, or

has a diameter of from 0.2 inches to 0.7 inches.

19. The filter apparatus as defined in one of claims 13-18, wherein the interior surface of the filter member has an absolute pore size and the exterior surface of the filter member has an absolute pore size, and wherein the absolute pore size of the interior surface is larger than the absolute pore size of the exterior surface, the absolute pore size of the exterior surface being from 1 micron to 9 microns, preferably wherein the absolute pore size of the interior surface of the filter member is from 5 microns to 20 microns.

20. The filter apparatus as defined in one of claims 13-19, wherein the hollow tubular member includes a first straight section, a second straight section, and an angled section positioned between the first straight section and the second straight section, the angled section for locating the second opening and filter member at a location in a bioreactor without contacting a rotating impeller.

21. The filter apparatus as defined in claim 13, wherein the hollow tubular member includes an angular member located adjacent to the second end, the hollow tubular member including a straight section that transitions into the angular member, the angular member being at an angle to the straight section of from 50° to 90°.

22. The filter apparatus as defined in claim 13, wherein the hollow tubular member and the filter member are movably enclosed in a collapsible bellows, wherein the collapsible bellows includes a sterile connection port on one end for connecting to a matching sterile connection port of the bioreactor.

23. The filter apparatus as defined in claim 13, wherein the filter member includes a mesh patch on a side or bottom wall of a bioreactor, the filter member further including a cone connecting the mesh patch to the hollow tubular member.

24. A method for culturing cell growth comprising:

inoculating biological cells into a bioreactor, the bioreactor containing a fluid medium for cell growth;

perfusing the fluid medium contained in the bioreactor by inserting into the bioreactor a filter apparatus according to any one of claims 13 to 23; and

replenishing the fluid medium within the bioreactor in order to promote cell growth.

25. The method of any one of claims 1-12, wherein the removing and filtering causes less than 2% cell loss within the bioreactor.