WHAT IS CLAIMED IS:

1. A cap and filter step reduction tool assembly for use in separating product excreted externally of living cells from liquids, growth media and debris in which the product exists within a container, the container having a neck defining an opening to the container, the product having a size measured by molecular weight, comprising:

a cap having a first portion configured to cover the opening of the container, an outlet and a filter assembly located therebetween, the filter assembly comprising:

a filter housing having a porous support with a rim around a periphery of the porous support;

a graded porosity filter fitting within that rim and having a small pore size sufficiently large to pass the product through the filter while retaining the debris and optionally some growth media;

a locking ring urging a periphery of the filter against an outer portion of the filter; and

a frit located to place the filter between the porous support and the frit, the frit being sealed to the housing so fluid flows through the frit and to the filter during use;

2. The cap and filter step reduction tool assembly of claim 1, wherein the filter comprises one of a plurality of planar filters of different porosity, a plurality of lenticular filters, or beads forming the graded porosity filter

3. The cap and filter step reduction tool assembly of claim 1further comprising a vent opening extending through the cap with a vent tube connected to the portion of the cap defining the vent opening, the vent tube having a length selected to extend into an ullage of the container when the container is inverted so product flows from the container through the cap and filter step reduction tool.

4. The cap and filter step reduction tool assembly of claim 1 wherein the locking ring has at least one annular rib around a periphery of the locking ring and located to abut an upstream surface of the filter during use, and wherein the cap has at least one annular rib around a periphery of the cap and located to abut a downstream surface of the filter during use.

5. The cap and filter step reduction tool assembly of claim 2 wherein the locking ring has at least one annular rib around a periphery of the locking ring and located to abut an upstream surface of the filter during use, and wherein the cap has at least one annular rib around a periphery of the cap and located to abut a downstream surface of the filter during use.

6. The cap and filter step reduction tool assembly of claim 1, wherein the filter assembly is press fit into a cylindrical recess in the cap formed by a cylindrical sidewall of the cap.

7. The cap and filter step reduction tool assembly of claim 1, wherein the filter assembly is press fit into a cylindrical recess in the cap formed by a cylindrical sidewall of the cap, which cylindrical recess is located downstream of a threaded skirt configured to threadingly engage the container.

8. The cap and filter step reduction tool assembly of claim 2, wherein the filter assembly is press fit into a cylindrical recess in the cap formed by a cylindrical sidewall of the cap, which cylindrical recess is located downstream of a threaded skirt configured to threadingly engage the container.

9. The cap and filter step reduction tool assembly of claim 7, wherein the cylindrical recess has a flat, annular periphery with an inner portion that tapers to an outlet fitting forming the outlet therein.

10. The cap and filter step reduction tool assembly of claim 8, wherein an inner surface of the flat, annular periphery abuts the filter housing.

11. The cap and filter step reduction tool assembly of claim 2, wherein the vent opening comprises a tubular fitting extending from opposing surfaces of the cap.

12. The cap and filter step reduction tool assembly of claim 2, further comprising a source of positive pressure in fluid communication with the vent opening so as to provide a positive pressure to the inside of the container during use of the cap and filter step reduction tool.

13. The cap and filter step reduction tool assembly of claim 1, wherein the filter comprises a plurality of filters, each with a different porosity.

14. The cap and filter step reduction tool assembly of claim 1, wherein the filter comprises at least one graded porosity filter having an interstitial pore spacing that decreases in the downstream direction.

15. The cap and filter step reduction tool assembly of claim 1, wherein the frit comprises a graded porosity filter having an interstitial pore spacing that decreases in the downstream direction.

16. The cap and filter step reduction tool assembly of claim 1, further comprising a purification column in fluid communication with the outlet of the cap.

17. The cap and filter step reduction tool assembly of claim 1, wherein the first portion of the cap is a cylindrical flange and the outlet fitting is a tube having a longitudinal axis coinciding with the longitudinal axis of the filter assembly but offset from a longitudinal axis of the cylindrical flange.

18. The cap and filter step reduction tool assembly of claim 1, further comprising a purification column in fluid communication with the outlet of the cap, with a vacuum port downstream of the filter assembly in order to apply a negative pressure to the fluid in the container during use of the cap and filter step reduction tool.

19. The cap and filter step reduction tool assembly of claim 1, wherein the filters are selected to pass product having a molecular weight from 10,000 to 3,000,000 MW.

20. The cap and filter step reduction tool assembly of claim 1, wherein the filters are selected to pass product having a molecular weight from about 100-10,000 MW.

21. The cap and filter step reduction tool assembly of claim 1, wherein the filters are selected to pass product having a molecular weight from

22. The cap and filter step reduction tool assembly of claim 2, wherein the cap and filter are fastened to a container containing mammalian cells and growth media.

23. The cap and filter step reduction tool assembly of claim 2, wherein the cap and filter are fastened to a container containing insect cells and growth media.

24. The cap and filter step reduction tool assembly of claim 2, wherein the cap and filter are fastened to a container containing algae or cyanobacteria cells and growth media.

25. The cap and filter step reduction tool assembly of claim 1, wherein the cap and filter are fastened to a container containing living cells and growth media.

26. A method of separating product excreted externally of living cells from liquids, growth media and debris in which the product exists within a container, the container having a neck defining an opening to the container, the product having a size measured by molecular weight, the method comprising the steps of:

fastening a cap over the opening of the container to form a fluid-tight connection;

passing fluid contents of the container through a filter assembly in the cap, the filter assembly having a frit upstream of a graded porosity filter having a small pore size sufficiently large to pass the product through the filter while retaining the debris and optionally some growth media, the product passing through a cap outlet located downstream of the filter assembly; and

passing gas through a vent tube that is in fluid communication with an ullage of the container located above the filter assembly.

27. The method of claim 26, wherein the step of passing gas through the vent tube applies positive pressure to the ullage of the container.

28. The method of claim 26, further comprising passing the product through a purification chromatography column in fluid communication with the cap and filter step reduction tool.

29. The method of claim 26, further comprising applying a negative pressure downstream of the filter assembly to draw product through the filter assembly.

30. The method of claim 26, wherein the cells retained in the filter assembly are recovered and reused in a growth media.

31. The method of claim 26, wherein the fluid contents of the container include one of insect or mammalian cell fragments.

32. A kit for transferring fluid from a container having a neck defining an opening to the container, the container having therein a product excreted externally of living cells that were contained in a growth media in the container, the container further containing fragments of those cells, the product having a size measured by molecular weight, comprising:

a cap having a first portion configured to cover the opening of the container, an outlet and a filter assembly located there between, the filter assembly comprising:

a filter housing having a porous support with a rim around a periphery of the porous support;

a filter fitting within that rim and having a small pore size sufficiently large to pass the product through the filter while retaining the debris and optionally some growth media, the filter comprises a graded porosity filter;

a locking ring urging a periphery of the filter against an outer portion of the filter; and

a frit located to place the filter between the porous support and the frit, the frit and locking ring being sealed to each other and the filter housing so that fluid flows through the frit and then through the filter and out the cap outlet during use; and

a vent opening extending through the cap;

a vent tube having a first end configured to be connected to the portion of the cap defining the vent opening, the vent tube having a length selected to extend into an ullage of the container when the container is inverted so product flows from the container through the cap.

33. The kit of claim 32, further including a fluid communication assembly comprising:

a first fluid transfer tube having one end configured to be connected to the outlet of the cap;

a fluid flow control valve configured to be placed in fluid communication with the first tube either directly or through intervening fluid connections; and

a second tube having a first end configured to be placed in fluid communication with a downstream end of the valve either directly or through intervening fluid connections, and having a second end configured to connect to one of a Luer lock or an inlet of a purification column.

WHAT IS CLAIMED IS:

1. A cap and filter step reduction tool assembly for use in separating product excreted externally of living cells from liquids, growth media and debris in which the product exists within a container, the container having a neck defining an opening to the container, the product having a size measured by molecular weight, comprising:

a cap having a first portion configured to cover the opening of the container, an outlet and a filter assembly located therebetween, the filter assembly comprising:

a filter housing having a porous support with a rim around a periphery of the porous support;

a graded porosity filter fitting within that rim and having a small pore size sufficiently large to pass the product through the filter while retaining the debris;

a locking ring urging a periphery of the filter against an outer portion of the filter; and

a frit located to place the filter between the porous support and the frit, the frit being sealed to the housing so fluid flows through the frit and to the filter during use;

a vent opening extending through the cap with a vent tube connected to the portion of the cap defining the vent opening, the vent tube having a length selected to extend into an ullage of the container when the container is inverted so product flows from the container through the filter and outlet of the cap.

2. The cap and filter step reduction tool assembly of claim 1, wherein the graded porosity filter comprises one of a plurality of planar filters of different porosity or a plurality of lenticular filters.

3. The cap and filter step reduction tool assembly of claim 2 wherein the locking ring has at least one annular rib around a periphery of the locking ring and located to abut an upstream surface of the filter during use, and wherein the cap has at least one annular rib around a periphery of the cap and located to abut a downstream surface of the filter during use.

4. The cap and filter step reduction tool assembly of claim 2, wherein the filter assembly is press fit into a cylindrical recess in the cap formed by a cylindrical sidewall of the cap, which cylindrical recess is located downstream of a threaded skirt configured to threadingly engage the container.

5. The cap and filter step reduction tool assembly of claim 4, wherein an inner surface of the flat, annular periphery abuts the filter housing.

6. The cap and filter step reduction tool assembly of claim 2, wherein the vent opening comprises a tubular fitting extending from opposing surfaces of the cap.

7. The cap and filter step reduction tool assembly of claim 2, further comprising a source of positive pressure in fluid communication with the vent opening so as to provide a positive pressure to the inside of the container during use of the cap and filter step reduction tool.

8. The cap and filter step reduction tool assembly of claim 2, wherein the filters are selected to pass product having a molecular weight from 10,000 to 3,000,000 MW.

9. The cap and filter step reduction tool assembly of claim 2, wherein the filters are selected to pass product having a molecular weight from about 100-10,000 MW.

10. The cap and filter step reduction tool assembly of claim 2, wherein the filters are selected to pass product having a molecular weight from about 100-150 MW.

11. The cap and filter step reduction tool assembly of claim 2, wherein the first portion of the cap is connected to the opening of the container, the container containing mammalian cells and growth media.

12. The cap and filter step reduction tool assembly of claim 2, wherein the first portion of the cap is connected to the opening of the container, the container containing insect cells and growth media.

13. The cap and filter step reduction tool assembly of claim 2, wherein the first portion of the cap is connected to the opening of the container, the container containing algae or cyanobacteria cells and growth media.

14. The cap and filter step reduction tool assembly of claim 1 wherein the locking ring has at least one annular rib around a periphery of the locking ring and located to abut an upstream

surface of the filter during use, and wherein the cap has at least one annular rib around a periphery of the cap and located to abut a downstream surface of the filter during use.

15. The cap and filter step reduction tool assembly of claim 1, wherein the filter assembly is press fit into a cylindrical recess in the cap formed by a cylindrical sidewall of the cap.

16. The cap and filter step reduction tool assembly of claim 1, wherein the filter assembly is press fit into a cylindrical recess in the cap formed by a cylindrical sidewall of the cap, which cylindrical recess is located downstream of a threaded skirt configured to threadingly engage the container.

17. The cap and filter step reduction tool assembly of claim 16, wherein the cylindrical recess has a flat, annular periphery with an inner portion that tapers to an outlet fitting forming the outlet therein.

18. The cap and filter step reduction tool assembly of claim 1, wherein the graded porosity filter comprises a plurality of filters, each with a different porosity.

19. The cap and filter step reduction tool assembly of claim 1, wherein the frit comprises a graded porosity filter having an interstitial pore spacing that decreases in the downstream direction.

20. The cap and filter step reduction tool assembly of claim 1, further comprising a purification column in fluid communication with the outlet of the cap.

21. The cap and filter step reduction tool assembly of claim 1, wherein the first portion of the cap is a cylindrical flange and the outlet is a tube having a longitudinal axis coinciding with the longitudinal axis of the filter assembly but offset from a longitudinal axis of the cylindrical flange.

22. The cap and filter step reduction tool assembly of claim 1, further comprising a purification column in fluid communication with the outlet of the cap, with a vacuum port

downstream of the filter assembly in order to apply a negative pressure to the fluid in the container during use of the cap and filter step reduction tool.

23. The cap and filter step reduction tool assembly of claim 1, wherein the first portion of the cap is connected to the opening of the container, the container containing living cells and growth media.

24. The cap and filter step reduction tool assembly of claim 1, wherein the graded porosity filter is configured to retain filter media larger in size than the product.

25. The cap and filter step reduction tool assembly of claim 1, wherein the graded porosity filter comprises at least one graded porosity filter having an interstitial pore spacing that decreases in the downstream direction.

26. A method of separating product excreted externally of living cells from liquids, growth media and debris in which the product exists within a container, the container having a neck defining an opening to the container, the product having a size measured by molecular weight, the method comprising the steps of:

fastening a cap over the opening of the container to form a fluid-tight connection;

passing fluid contents of the container through a filter assembly in the cap, the filter assembly having a frit upstream of a graded porosity filter having a small pore size sufficiently large to pass the product through the filter while retaining the debris and optionally some growth media, the product passing through a cap outlet located downstream of the filter assembly; and

passing gas through a vent tube that is in fluid communication with an ullage of the container located above the filter assembly.

27. The method of claim 26, wherein the step of passing gas through the vent tube applies positive pressure to the ullage of the container.

28. The method of claim 26, further comprising passing the product through a purification chromatography column in fluid communication with the cap and filter step reduction tool.

29. The method of claim 26, further comprising applying a negative pressure downstream of the filter assembly to draw product through the filter assembly.

30. The method of claim 26, wherein the cells retained in the filter assembly are recovered and reused in a growth media.

31. The method of claim 26, wherein the fluid contents of the container include one of insect or mammalian cell fragments.

32. A kit for transferring fluid from a container having a neck defining an opening to the container, the container having therein a product excreted externally of living cells that were contained in a growth media in the container, the container further containing fragments of those cells, the product having a size measured by molecular weight, comprising:

a cap having a first portion configured to cover the opening of the container, an outlet and a filter assembly located there between, the filter assembly comprising:

a filter housing having a porous support with a rim around a periphery of the porous support;

a filter fitting within that rim and having a small pore size sufficiently large to pass the product through the filter while retaining the debris and optionally some growth media, the filter comprises a graded porosity filter;

a locking ring urging a periphery of the filter against an outer portion of the filter; and a frit located to place the filter between the porous support and the frit, the frit and locking ring being sealed to each other and the filter housing so that fluid flows through the frit and then through the filter and out the cap outlet during use; and

a vent opening extending through the cap;

a vent tube having a first end configured to be connected to the portion of the cap defining the vent opening, the vent tube having a length selected to extend into an ullage of the container when the container is inverted so product flows from the container through the cap.

33. The kit of claim 32, further including a fluid communication assembly comprising:

a first fluid transfer tube having one end configured to be connected to the outlet of the cap;

a fluid flow control valve configured to be placed in fluid communication with the first tube either directly or through intervening fluid connections; and

a second tube having a first end configured to be placed in fluid communication with a downstream end of the valve either directly or through intervening fluid connections, and having a second end configured to connect to one of a Luer lock or an inlet of a purification column.