WHAT IS CLAIMED IS:

1. A system for single-pass, countercurrent diafiltration of a fluid feed comprising: two or more filtration stages; conduits to facilitate fluid communication between manifolds in the filtration stages; a conduit and at least one feed pump to provide a fluid feed to the first filtration stage; a conduit and at least one buffer pump to provide diafiltration buffer to the final filtration stage; a conduit and at least one buffer pump per filtration stage to provide permeate and diafiltration buffer from a subsequent to a prior filtration stage; and a conduit and a filtrate pump to remove permeate (and diafiltration buffer, if any remains) from the system;

wherein each filtration stage comprises:

(i) a manifold segment and (ii) one or more tangential flow filtration ("TFF") cassettes; wherein the manifold segment comprises: a first manifold (i.e., inlet) for receiving and carrying the fluid feed or retentate into the filtration stage, a second manifold (i.e., outlet) for receiving and carrying retentate out of the filtration stage, a third manifold (i.e., inlet) for receiving and carrying permeate and diafiltration buffer through the filtration stage, and a fourth manifold (i.e., outlet) for receiving and carrying permeate and diafiltration buffer out of the filtration stage; and wherein the manifold segment is fluidly connected to the one or more TFF cassettes;

wherein the filtration stages are fluidly connected through the manifold segments to provide a flow path between filtration stages, by coupling of the second manifold in a manifold segment to the first manifold of a manifold segment in a subsequent filtration stage, such that the retentate of one stage serves as the feed for the next filtration stage, and by coupling of the fourth manifold in a manifold segment to the third manifold of a manifold segment in the prior filtration stage;

wherein the first filtration stage in the system receives the fluid feed from a conduit connected to a feed pump; and wherein the second manifold on the final filtration stage is a retentate outlet that allows the retentate to leave the system and does not connect to a prior filtration stage; and

wherein the TFF cassettes comprise a diafiltration channel, a flat first filtration membrane, a retentate channel, a flat second filtration membrane, and a permeate/diafiltration buffer collection channel, configured such that (i) the flat first filtration membrane delimits the diafiltration channel and the retentate channel from one another, (ii) the flat second filtration membrane delimits the retentate channel and the permeate/diafiltration buffer collection channel from one another, (iii) the diafiltration channel is fluidly connected to at least one inlet for the diafiltration medium, (iv) the retentate channel is fluidly connected to at least one inlet for the feed fluid and to at least one outlet for the retentate, and (v) the permeate/diafiltration buffer collection channel is fluidly connected to at least one outlet for the permeate/diafiltration buffer.

2. The system of claim 1, wherein exactly two filtration stages are present in the system.

3. The system of claim 1, wherein the system comprises three filtration stages.

4. The system of any one of claims 1–3, wherein the first filtration membrane has a molecular weight cut-off in the range of 30 kD to 1,500 kD.

5. The system of any one of claims 1–4, wherein the second filtration membrane has a molecular weight cutoff in the range of 5 kD to 1,500 kD.

6. A method for filtering a fluid feed, the method comprising: (i) passing a fluid feed through a single-pass, countercurrent diafiltration system of any one of claims 1–5, and (ii) recovering permeate and retentate from the system in separate containers.

7. The method of claim 6, wherein the method can be used to achieve a diafiltration equivalent of at least 8 diavolumes.

8. The method of claim 6 or claim 7, wherein exactly two filtration stages are present in the system.

9. The method of claim 6 or claim 7, wherein the system comprises three filtration stages.

10. The method of any one of claims 6–9, wherein the fluid feed comprises a biologic product and one or more impurities or buffer components.

11. The method of any one of claims 6–10, wherein the method occurs at or near the end of a purification process for a biologic product.

12. The method of claim 10 or 11, wherein the fluid feed is obtained from a source of the biologic product.

13. The method of any one of claims 10–12, wherein the biologic product in the fluid feed is a monoclonal antibody present in the elution buffer from a chromatography step.

14. A method of manufacturing a biologic product of interest comprising the steps of:

(I) cultivating a eukaryotic cell expressing the biologic product of interest in cell culture;

(II) harvesting the biologic product of interest from the cell culture in the form of a fluid feed comprising (a) the biologic product of interest and (b) one or more impurities and/or buffer components;

(III) purifying the fluid feed comprising the biologic product of interest and the one or more impurities and/or buffer components to isolate the biologic product of interest from the fluid feed; and

(IV) optionally formulating the biologic product of interest into a pharmaceutically acceptable formulation suitable for administration; and

wherein the method further comprises:

(a) passing the fluid feed through a single-pass, countercurrent diafiltration system, and (b) recovering permeate (and diafiltration buffer, if any remains) and retentate from the system in separate containers;

wherein the single-pass, countercurrent diafiltration system comprises: two or more filtration stages; conduits to facilitate fluid communication between manifolds in the filtration stages; a conduit and at least one feed pump to provide the fluid feed to the first filtration stage; a conduit and at least one buffer pump to provide diafiltration buffer to the final filtration stage; a conduit and at least one buffer pump per filtration

stage to provide permeate and diafiltration buffer from a subsequent to a prior filtration stage; and a conduit and a filtrate pump to remove permeate (and diafiltration buffer, if any remains) from the system;

wherein each filtration stage comprises:

(i) a manifold segment and (ii) one or more tangential flow filtration ("TFF") cassettes; wherein the manifold segment comprises: a first manifold (i.e., inlet) for receiving and carrying the fluid feed or retentate into the filtration stage, a second manifold (i.e., outlet) for receiving and carrying retentate out of the filtration stage, a third manifold (i.e., inlet) for receiving and carrying permeate and diafiltration buffer through the filtration stage, and a fourth manifold (i.e., outlet) for receiving and carrying permeate and diafiltration buffer out of the filtration stage; and wherein the manifold segment is fluidly connected to the one or more TFF cassettes;

wherein the filtration stages are fluidly connected through the manifold segments to provide a flow path between filtration stages, by coupling of the second manifold in a manifold segment to the first manifold of a manifold segment in a subsequent filtration stage, such that the retentate of one stage serves as the feed for the next filtration stage, and by coupling of the fourth manifold in a manifold segment to the third manifold of a manifold segment in the prior filtration stage;

wherein the first filtration stage in the system receives the fluid feed from a conduit connected to a feed pump; and wherein the second manifold on the final (i.e., last) filtration stage is a retentate outlet that allows the retentate to leave the system and does not connect to a prior filtration stage; and

wherein the TFF cassettes comprise a diafiltration channel, a flat first filtration membrane, a retentate channel, a flat second filtration membrane, and a permeate/diafiltration buffer collection channel, configured such that (i) the flat first filtration membrane delimits the diafiltration channel and the retentate channel from one another, (ii) the flat second filtration membrane delimits the retentate channel and the permeate/diafiltration buffer collection channel from one another, (iii) the diafiltration channel is fluidly connected to at least one inlet for the diafiltration

medium, (iv) the retentate channel is fluidly connected to at least one inlet for the feed fluid and to at least one outlet for the retentate, and (v) the permeate/diafiltration buffer collection channel is fluidly connected to at least one outlet for the permeate/diafiltration buffer.

15. The method of claim 14, wherein the biologic product of interest is a recombinant protein.

16. The method of claim 14 or claim 15, wherein the step of cultivating a eukaryotic cell expressing the biologic product of interest in cell culture occurs in a fed-batch cell culture.

17. The method of claim 14 or claim 15, wherein the step of cultivating a eukaryotic cell expressing the biologic product of interest in cell culture occurs in a continuous cell culture.

18. The method of any one of claims 14–17, wherein steps (a) and (b) can be used to achieve a diafiltration equivalent of at least 8 diavolumes.

19. The method of any one of claims 14–18, wherein exactly two filtration stages are present in the system.

20. The method of any one of claims 14–18, wherein the system comprises three filtration stages.