WHAT IS CLAIMED IS:

1. A system for producing Dupilumab, comprising:
   (a) a bioreactor for culturing cells capable of expressing Dupilumab;
   (b) one or more agitating elements, wherein said one or more agitating elements are configured below an initial working volume of said bioreactor; and
   (c) one or more gas control assemblies coupled to said bioreactor for controlling dissolved gases.
2. The system of claim 1, wherein said bioreactor volume is greater than or equal to 500 L.
3. The system of claim 1, wherein said bioreactor volume is greater than or equal to 3,000 L.
4. The system of claim 1, wherein said bioreactor volume is greater than or equal to 10,000 L.
5. The system of claim 1, wherein said one or more agitating elements comprise one or more impeller assemblies.
6. The system of claim 5, wherein said one or more agitating elements are configured to have an initial agitation rate between 20 rpm and 150 rpm.
7. The system of claim 6, wherein said one or more agitating elements are configured to have an agitation rate that may increase by 25%, 50%, 75%, 100%, 125%, 150%, 175% or 200% on one or more days selected from the group of day 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10, 10.5, and 11.
8. The system of claim 1, wherein said one or more gas control assemblies comprise one or more spargers.
9. The system of claim 8, wherein said one or more spargers are configured with an initial sparging rate of about 25-75 slpm.
10. The system of claim 8, wherein said one or more spargers are configured with a sparging rate that may increase by 25%, 50%, 75%, 100%, 125%, 150%, 175%, 200%, 225%, 250%, 275%, 300%, 325%, 350%, 375%, 400%, 425%, 450%, 475%, or 500% on one or more days selected from the group of day 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10, 10.5, and 11.
11. The system of claim 8, wherein said one or more spargers are configured to

automatically adjust the sparging rate based on dissolved oxygen levels.

12. The system of claim 8, wherein said one or more spargers include between 146 and 292 holes sized between 0.5 mm and 2 mm.
13. A method for enhancing cell growth, cell viability, cell density, or production of Dupilumab in a mammalian cell culture process, comprising the steps of:
    (a) varying agitation rates at different points during the growth and production phases;
    (b) varying sparging rates at different points during the growth and production phases; and
    (c) varying dextrose target levels at different points during the growth and production phases.
14. The method of claim 13, wherein an initial agitation rate is set between 20 rpm and 150 rpm.
15. The method of claim 13, wherein said agitation rate is configured to increase by 25%, 50%, 75%, 100%, 125%, 150%, 175% or 200% on one or more days selected from the group of day 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10, 10.5, and 11.
16. The method of claim 13, wherein more than one sparger is used to vary the sparging rate.
17. The method of claim 16, wherein said spargers are set to an initial sparging rate of about 25-75 slpm.
18. The method of claim 13, wherein said sparging rate is increased by 25%, 50%, 75%, 100%, 125%, 150%, 175%, 200%, 225%, 250%, 275%, 300%, 325%, 350%, 375%, 400%, 425%, 450%, 475%, or 500% on one or more days selected from the group of day 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10, 10.5, and 11.
19. The method of claim 13, wherein said sparging rate is automatically adjusted based on dissolved oxygen levels.
20. The method of claim 16, wherein said spargers comprise between 146 and 292 holes sized between 0.5 mm and 2 mm.
21. The method of claim 13, wherein an initial dextrose target level is set between 5 g/L and 7 g/L.

22. The method of claim 13, wherein a dextrose target level is set to vary between 5 g/L and 7 g/L on day 0 and then stepped-up to vary between 7 g/L and 9 g/L on day 2 and then stepped-up to vary between 9 g/L and 11 g/L on day 4.
23. The method of claim 13, wherein a dextrose target level is set to vary between 5 g/L and 7 g/L on day 0 and then stepped-up to vary between 7 g/L and 11 g/L on day 2 and then decreased to vary between 5 g/L and 7 g/L on day 4.
24. A method of producing an anti-IL-4Rα antibody or antigen-binding fragment thereof, comprising the steps of:
    (a) culturing cells expressing an anti-IL-4Rα antibody or antigen-binding fragment thereof in a cell culture medium wherein a cumulative concentration of one or more polyamines in said cell culture medium is between about 0.03 and about 0.9 mM;
    (b) agitating said cell culture; and
    (c) controlling dissolved gas concentrations in said cell culture.
25. The method of claim 24, wherein said cell culture medium is subjected to High Temperature Short Time (HTST) treatment at about 101°C to 106°C for 8 to 15 seconds.
26. The method of claim 24, wherein two or more impeller assemblies are positioned below a surface of an initial working volume.
27. The method of claim 24, wherein agitation of said cell culture is performed using one or more impeller assemblies and an uppermost impeller is positioned below a surface of an initial working volume.
28. The method of claim 24, wherein an initial agitation rate is configured between 20 rpm and 150 rpm.
29. The method of claim 24, wherein said agitation rate is configured to increase by 25%, 50%, 75%, 100%, 125%, 150%, 175% or 200% on one or more days selected from the group of day 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10, 10.5, and 11.
30. The method of claim 24, wherein said dissolved gas concentrations are controlled by one or more spargers.
31. The method of claim 30, wherein said one or more spargers are configured at an initial sparging rate of about 25-75 slpm.

32. The method of claim 31, wherein said sparging rate is configured to increase by 25%, 50%, 75%, 100%, 125%, 150%, 175%, 200%, 225%, 250%, 275%, 300%, 325%, 350%, 375%, 400%, 425%, 450%, 475%, or 500% on one or more days selected from the group of day 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10, 10.5, and 11.
33. The method of claim 30, wherein a sparging rate is automatically configured based on dissolved oxygen levels.
34. A bioreactor, comprising:
    one or more optical probes in a reservoir of said bioreactor for generating a data signal with reduced signal noise compared to an electrochemical probe.
35. A bioreactor of claim 34, comprising two or more optical probes.
36. A bioreactor of claim 35, with two or more optical probes configured in the lower one third of the reservoir of the bioreactor.
37. A bioreactor of claim 35, with two or more optical probes configured at two different locations along a probe belt.
38. A bioreactor of claim 34, further comprising an agitating element comprising one or more impeller assemblies, wherein an uppermost impeller is positioned below a surface of the initial working volume.