

Production and Scale-up of a Monoclonal Antibody Against 17-Hydroxyprogesterone

Gek Kee Chua^a, Badarulhisam Abdul-Rahman^b, Yusuf Chisti^c

^aFaculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Kuantan, Pahang, Malaysia

^bPharmaniaga Manufacturing Berhad, 11A Jalan P/1, Kawasan Perusahaan Bangi, 43650 Bandar Baru Bangi, Selangor, Malaysia

^cSchool of Engineering, PN 456, Massey University, Palmerston North, New Zealand

ABSTRACT

The hybridoma 192 was used to produce a monoclonal antibody (MAb) against 17-hydroxyprogesterone (17-OHP), for possible use in screening for congenital adrenal hyperplasia (CAH). The factors influencing the MAb production were screened and optimized in a 2 L stirred bioreactor. The production was then scaled up to a 20 L bioreactor. All of the screened factors (aeration rate, stirring speed, dissolved oxygen concentration, pH, and temperature) were found to significantly affect production. Optimization using the response surface methodology identified the following optimal production conditions: 36.8°C, pH 7.4, stirring speed of 100 rpm, 30% dissolved oxygen concentration, and an aeration rate of 0.09 vvm. Under these conditions, the maximum viable cell density achieved was $1.34 \pm 0.21 \times 10^6$ cells mL⁻¹ and the specific growth rate was 0.036 ± 0.004 h⁻¹. The maximum MAb titer was 11.94 ± 4.81 µg mL⁻¹ with an average specific MAb production rate of 0.273 ± 0.135 pg cell⁻¹ h⁻¹. A constant impeller tip speed criterion was used for the scale-up. The specific growth rate (0.040 h⁻¹) and the maximum viable cell density (1.89×10^6 cells mL⁻¹) at the larger scale were better than the values achieved at the small scale, but the MAb titer in the 20 L bioreactor was 18% lower than in the smaller bioreactor. A change in the culture environment from the static conditions of a T-flask to the stirred bioreactor culture did not affect the specificity of the MAb toward its antigen (17-OHP) and did not compromise the structural integrity of the MAb.

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