

An immortalized adult human erythroid line facilitates sustainable and scalable generation of functional red cells

Kongtana Trakarnsanga^{1,2}, Rebecca E. Griffiths^{*3,4}, Marieangela C. Wilson¹, Allison Blair^{3,4,5}, Timothy J. Satchwell^{1,4}, Marjolein Meinders¹, Nicola Cogan^{3,4}, Sabine Kupzig^{3,4}, Ryo Kurita⁶, Yukio Nakamura⁷, Ashley M. Toye^{1,3,4}, David J. Anstee^{3,4}, & Jan Frayne^{1,4}.

***Stem Cell Ageing and Regenerative Engineering (UQ-StemCARE),**

Australian Institute for Bioengineering and Nanotechnology (AIBN) (Bldg75), Room 411, The University of Queensland, Brisbane, Qld, 4072, Australia

1 School of Biochemistry, University of Bristol, Bristol BS8 1TD, UK.

2 Department of Biochemistry, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.

3 Bristol Institute for Transfusion Sciences, National Health Service Blood and Transplant (NHSBT), Bristol BS34 7QH, UK.

4 NIHR Blood and Transplant Research Unit, University of Bristol, Bristol BS8 1TD, UK.

5 School of Cellular and Molecular Medicine, University of Bristol, Bristol BS8 1TD, UK.

6 Department of Research and Development, Central Blood Institute, Japanese Red Cross Society, Tokyo 135-8521, Japan.

7 Cell Engineering Division, RIKEN BioResource Center, Ibaraki 305-0074, Japan.

With increasing worldwide demand for safe blood, there is much interest in generating red blood cells *in vitro* as an alternative clinical product. However, available methods for *in vitro* generation of red cells from adult and cord blood progenitors do not yet provide a sustainable supply, and current systems using pluripotent stem cells as progenitors do not generate viable red cells. We have taken an alternative approach, immortalizing early adult erythroblasts generating a stable line, which provides a continuous supply of red cells. The immortalized cells differentiate efficiently into mature, functional reticulocytes that can be isolated by filtration. Extensive characterization has not revealed any differences between these reticulocytes and *in vitro*-cultured adult reticulocytes functionally or at the molecular level, and importantly no aberrant protein expression. We demonstrate a feasible approach to the manufacture of red cells for clinical use from *in vitro* culture.

Biographic Details

Name: Rebecca Griffiths

Title: Dr

Affiliation, Country: StemCARE, AIBN, UQ, Australia

Phone: +61 7 3346 3188 E-mail: rebecca.griffiths@uq.edu.au

Research interests: Haematopoietic stem cells, ageing