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Development of proteomic surface barcodes in cardiomyocyte differentiation from human embryonic stem cells

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Introduction: Differentiation of human embryonic stem cells (hESCs) is an invaluable model for the investigation of molecular events during embryonic development, and supplies functional differentiated cells for regenerative therapies. Cardiomyocyte (CM) differentiation of hESC often yields heterogeneous cell populations, making it difficult to perform systematic, quantitative analyses of the differentiation process. There is also a need for improving differentiation and isolation procedures that generate highly pure populations of CM.

Methods: Surface proteins from hESC, and from differentiated CM were isolated by biotinylating proteins exposed on intact, viable cell population. The cells were lysed under stringent conditions, and the biotinylated proteins were purified by streptavidin affinity purification. The isolated proteins were then analysed by shotgun proteomics.

Results: This approach allows the characterisation of surface proteins that are differentially expressed in hESC and CM.

Conclusion: Combination of these differential expression patterns can be used as 'molecular barcodes' for the defining cell states and for purification of cells at different stages of differentiation.

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The association between glycated haemoglobin and waist circumference in the US population

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Introduction: Glycated haemoglobin (A1C) is now used for the diagnosis of diabetes and pre-diabetes. As these are related to obesity, we studied their relationship with waist circumference.

Methods: We analysed data on 960 men and 1001 women who participated in the United States National Health and Nutrition Examination Survey 2007-08. Participants who were older than 20 years, had overnight fasting, and had not been treated with anti-diabetic medication were included in the analysis.

Results: There was a continuous linear relationship between waist circumference and A1C, which was true both in men ($P=0.01$) and women (both $P<0.001$) after adjusting for age. The change in A1C due to a unit change in waist circumference was larger in men than in women. Moreover, age was an independent predictor of waist circumference in men ($P<0.001$) but not in women. The waist circumference corresponding to an A1C of 5.7% was 96.4, 101.7 and 107.0 cm in men aged 30, 50 and 70 years, compared to 95.1, 95.4, and 95.8 cm in women of the same ages respectively. The waist circumference corresponding to an A1C of 6.5% was 98.5, 103.8 and 109.1 cm in men aged 30, 50 and 70 years, compared to 101, 101.4, and 101.8 cm in women of the same ages respectively.

Conclusions: There is a linear relationship between A1C and waist circumference. A slimmer waist is associated with a lower A1C. Our results generally agree with the current waist circumference criteria of 102 cm and 88 cm for central obesity in American men and women, respectively. Young American men with a circumference even below 100 cm are already at risk from pre-diabetes and diabetes. In older American men, ageing alone confers a risk of diabetes, which means that they should also try to avoid abdominal obesity.