Invited critical review

Current aspects in hemoglobin A1c detection: A review

Shu Hwang Ang, M. Thevarajah, Yatimah Alias, Sook Mei Khor

Department of Chemistry, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia
Department of Pathology, Faculty of Medicine, University of Malaya, 50603 Kuala Lumpur, Malaysia

A R T I C L E   I N F O

Article history:
Received 22 July 2014
Received in revised form 9 October 2014
Accepted 11 October 2014
Available online 22 October 2014

Keywords:
Type 2 diabetes mellitus
Glycated hemoglobin (HbA1c)
POC technology
Biosensors

A B S TR A C T

Type 2 diabetes mellitus (T2DM) is a pressing health issue that threatens global health and the productivity of populations worldwide. Despite its long-recognized role in diabetes management, glycated hemoglobin (HbA1c) only received WHO endorsement as a T2DM diagnostic tool in 2011. Although conventional plasma-specific tests have long been utilized to diagnose T2DM, the public should be informed that plasma-specific tests are not markedly better than HbA1c tests, particularly in terms of variability and convenience for diagnosing diabetes. In the midst of the debates associated with establishing HbA1c as the preeminent diabetes diagnostic tool, unceasing efforts to standardize HbA1c tests have played an integral part in achieving more efficient communication from laboratory to clinical practice and thus better diabetes care. This review discusses the current status of HbA1c tests in the diagnosis, prevention, treatment and management of T2DM across the globe, focusing on increasing the recognition of glycated hemoglobin variants with effective utilization of different HbA1c methods, updating the current status of HbA1c standardization programs, tapping into the potential of POC analyzers to establish a cost-effective HbA1c test for diabetes care, and inspiring the advancement of HbA1c biosensors for future clinical usage.

1. Introduction: significance of the study

Type 2 diabetes mellitus (T2DM) is a global epidemic health issue. Approximately 439 million adults (7.7% of the world’s adult population aged 20–79 years) are estimated to be afflicted with diabetes by 2030 [1]. As a consequence of population growth, longer life expectancy, and lifestyle changes, the estimated 54% increase in T2DM incidence worldwide by 2030 is concerning [1]. Although the spreading of the chronic disease itself is worrisome, the medical complications and socioeconomic impacts associated with diabetes are as fearful as the disease itself. Individuals with diabetes are at increased risk of developing
With the effort to standardize the test and the advancement of technology, it is only a matter of time for the mobile analyzers to be recognized as effective and accurate tools for the diagnosis and management of diabetes in situ. HbA1c biosensor development should be encouraged to produce more efficient miniaturized devices that may be potentially useful POC analyzers. To tackle the implementation cost for HbA1c tests, attention should be paid to the use of cost-effective materials while fabricating HbA1c biosensors. HbA1c tests have the potential to be more convenient, user-friendly, accurate, and cost-effective in order to aid world-wide diabetes care.

Conflict of interest

The authors have no conflict of interest on the work.

Acknowledgments

This work was financially supported by the University of Malaya Research Grant (UMRG) (RG159–12SUS, RP012C–14SUS), the Fundamental Research Grant Scheme (FRGS) from the Ministry of Higher Education of Malaysia (MOHE) (FP014–2013A), a High Impact Research Grant from the Ministry of Higher Education of Malaysia (HIR-MoHE F000004-21001), and the University of Malaya Postgraduate Research Grant (PG058-2013A). Shu Hwang Ang thanks UM Bright Spark unit for the awarded scholarship.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.cca.2014.10.019.

References