Research Article

Revealing Glycoproteins in the Secretome of MCF-7 Human Breast Cancer Cells

Aik-Aun Tan, 1 Wai-Mei Phang, 2 Subash C. B. Gopinath, 3 Onn H. Hashim, 4 Lik Voon Kiew, 5 and Yeng Chen 2, 6

1 Institute for Research in Molecular Medicine (INFORMM), Universiti Sains Malaysia, 11800 Penang, Malaysia
2 Department of Oral Biology & Biomedical Sciences, Faculty of Dentistry, University of Malaya, 50603 Kuala Lumpur, Malaysia
3 Institute of Nano Electronic Engineering (INEE) and School of Bioprocess Engineering, Universiti Malaysia Perlis, 02000 Kangar, Perlis, Malaysia
4 Department of Molecular Medicine, Faculty of Medicine, University of Malaya, 50603 Kuala Lumpur, Malaysia
5 Department of Pharmacology, Faculty of Medicine, University of Malaya, 50603 Kuala Lumpur, Malaysia
6 Oral Cancer Research and Coordinating Centre, Faculty of Dentistry, University of Malaya, 50603 Kuala Lumpur, Malaysia

Correspondence should be addressed to Yeng Chen; chen�eng@um.edu.my

Received 13 April 2015; Accepted 7 June 2015

Academic Editor: Marko Pesu

Copyright © 2015 Aik-Aun Tan et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Breast cancer is one of the major issues in the field of oncology, reported with a higher prevalence rate in women worldwide. In attempt to reveal the potential biomarkers for breast cancer, the findings of differentially glycosylated haptoglobin and osteonectin in previous study have drawn our attention towards glycoproteins of secretome from the MCF-7 cancer cell line. In the present study, further analyses were performed on the medium of MCF-7 cells by subjecting it to two-dimensional analyses followed by image analysis in contrast to the medium of human mammary epithelial cells (HMEpC) as a negative control. Carboxypeptidase A4 (CPA4), alpha 1-antitrypsin (AAAT), haptoglobin (HP), and HSC70 were detected in the medium of MCF-7, while only CPA4 and osteonectin (ON) were detected in HMEpC medium. In addition, CPA4 was detected as upregulated in the MCF-7 medium. Further analysis by lectin showed that CPA4, AAAT, HP and HSC70 were secreted as N-glycan in the medium of MCF-7, with HP also showing differentially N-glycosylated isoforms. For the HMEpC, only CPA4 was detected as N-glycan. No O-glycan was detected in the medium of HMEpC but MCF-7 expressed O-glycosylated CPA4 and HSC70. All these revealed that glycoproteins could be used as glycan-based biomarkers for the prognosis of breast cancer.

1. Introduction

Breast cancer occurs predominantly in the female population. A few cases of breast cancer were reported in males, increasing the deaths reported worldwide. Breast cancer is a type of carcinoma formed in milk ducts and glands. If untreated, the cancer tissues will grow abnormally and spread to surrounding tissues. Different causes have been proposed for the development of breast cancer [1, 2]. Of all the factors involved, older women and those with a family history of breast cancer have a higher chance of being affected by breast cancer. Apart from these factors, the involvement of noncoding RNA and micro-RNA in cancer progression has also been reported [3–5]. Gopinath et al. [4] have revealed that noncoding RNA resides in the vault particles of cancer cells responsible for multidrug resistance. Meanwhile, Isebo et al. [5] demonstrated the regulation of tumorigenicity in breast cancer stem cells by the miR-142 micro-RNA through the canonical WNT signaling pathway. For different reasons, breast cancer has accounted for over 25% of all cancers diagnosed and causes death in a significant proportion of cases [6–8]. Based on the statistical reports of the American Cancer Society, estimated 231,840 new invasive breast cancer cases are expected to be diagnosed among the female population in the US in 2015 and it is estimated that 40,290 deaths from the disease will be reported in the same period.

The higher incidence rate for breast cancer is mainly due to a failure to detect it in the early stages. Breast tomosynthesis, 3D imaging techniques, and digital mammography