BIOMARKER GLYCOSYLATION EVALUATION IN PANCREATIC CANCER UTILISING BIOCHIP ARRAY TECHNOLOGY

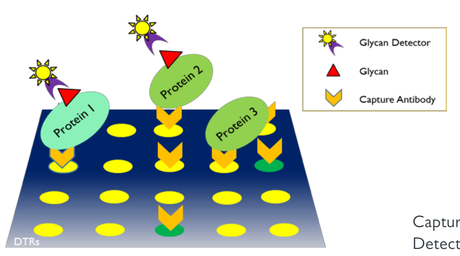
K. Martin[1], P. Dunne[1], A. Connolly[1], C. Richardson[1], R.I. McConnell[2], J.V. Lamont[2], S.P. FitzGerald[2]
[1] Randox Teoranta, Dungloe, Ireland
[2] Randox Laboratories Ltd., Crumlin, United Kingdom
e-mail: scientific.publications@randox.com

INTRODUCTION

To improve the prognosis of patients with pancreatic cancer improved classes of biomarkers for detection are needed. Analysis of serum cancer antigen 19-9 (CA19-9) is currently used for monitoring and management of pancreatic cancer. Aberrant glycosylation of protein biomarkers has emerged as an indicator of cancer development. As detection of pancreatic cancer by single circulating disease biomarkers has proven inadequate, the idea that a multifaceted pathology may be reflected in simultaneous detection of multiple disease markers has arisen. Biochip Array Technology (BAT) enables the simultaneous detection of multiple biomarkers from a single sample and the aim of this study was to evaluate an enzyme-linked lectin multiplex panel of glycosylated serum biomarkers - CA19-9, Carcinoembryonic Antigen (CEA) and Alpha 1-Acid Glycoprotein (A1AG) - with potential for pancreatic cancer discrimination.

METHODOLOGY

BAT was used for specific capture of glycosylated CA19-9, CEA and A1AG at discrete test regions on a biochip surface. Simultaneous glycosylation-based detection of the biomarkers was achieved using a HRP labelled lectin with fucose specificity as shown below.



Capture of multiple biomarkers on Biochip
Detection of Glycosylation using Lectins

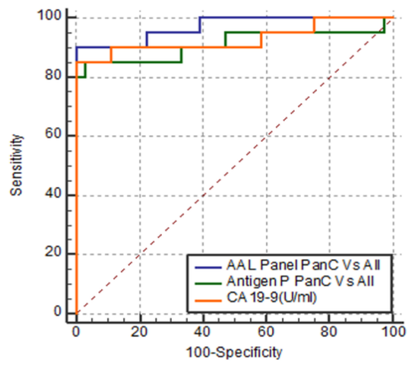
The chemiluminescent simultaneous assays were applied to the semi-automated analyser Evidence Investigator.

RESULTS

SAMPLE ASSESSMENT

Serum samples from pancreatic cancer patients (n=20, 35% female, mean age 66.7 years) and normal samples (n=36, 77.8% female, mean age 53.3 years) were assessed. Area under the curve (AUC), sensitivity and specificity of the presented multiplex application were compared with single measurement of CA19-9 and total antigen measurement of these biomarkers.

	MULTIPLEX GLYCOSYLATION PANEL				ANTIGEN MEASURES			
	Full panel	CA19-9	CEA	A1AG	Total antigen	CA19-9	CEA	A1AG
AUC	0.969	0.964	0.899	0.929	0.910	0.928	0.908	0.672
Sensitivity	90	90	95	90	85	85	90	45
Specificity	100	100	83.33	97.22	97.22	100	88.89	91.67



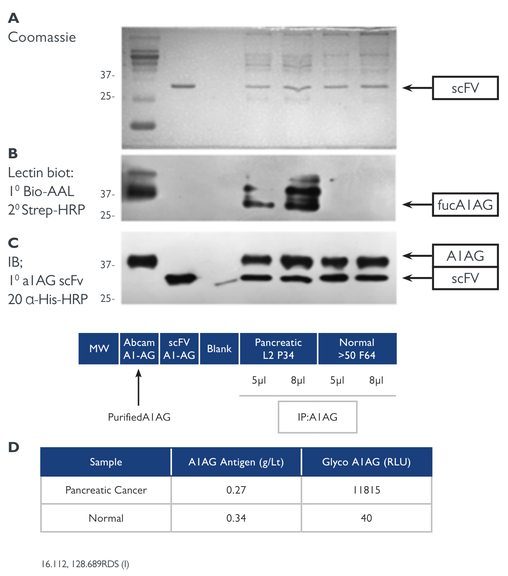
Confirmation of alpha 1-acid glycoprotein fucosylation

A: Coomassie stained SDS-PAGE following immunoprecipitation of A1AG from sera of normal and pancreatic cancer patients.

B: AAL-lectin blotting showing fucosylation of A1AG immunoprecipitated from pancreatic cancer sera but not normal.

C: Confirmation of even immunoprecipitation of A1AG from each serum sample.

D: A1AG antigen measures and biochip-based fucosylation signal from the samples analysed in panel A-C showing equivalent total antigen but differential fucosylation.



D

Sample	A1AG Antigen (g/Lt)	Glyco A1AG (RLU)
Pancreatic Cancer	0.27	11815
Normal	0.34	40

16.112, 128.689RDS (I)

CONCLUSION

Glycosylation-based multiplex detection improved pancreatic cancer detection when compared with measurement of CA19-9 alone or total antigen measurement. The application of the BAT platform for multiplexed glycosylated biomarker analysis offers accessible, low cost options for cancer screening which can be readily translated to a routine clinical laboratory setting.