Abstract: Glycation is a cause of damage to proteins and is accelerated in diabetes mellitus as a consequence of increase in levels of glucose and other saccharide derivatives in plasma and tissues. This non-enzymatic glycation of proteins is a series of complex and sequential reactions collectively known as ‘Maillard reaction’ and leads to formation of early glycation adducts and subsequently to formation of advanced glycation end-products. There is evidence that these advanced glycation end-products play a role in the pathogenesis of chronic complications associated with diabetes mellitus. Diabetic patients with long term glycaemia are monitored in part by measuring levels of plasma glucose, glycated haemoglobin and of late, research is being carried out to investigate the potential use of advanced glycation end-products measurement in diabetes mellitus. Measurements of the products of non enzymatic glycation provide information on exposure to glucose, glycaemic control and tissue modifications. Some of the advanced glycation products formed as a result of hyper-glycaemia auto-fluoresce but this auto-fluorescence has not been fully characterized and neither has the extent to which it relates to glycaemia and diabetic complications. The auto-fluorescence properties of other glycated metabolites besides proteins are also not clear and neither is how this auto-fluorescence may interfere with measurement of the auto-fluorescence of glycated proteins.

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IN VITRO STUDY OF AUTO-FLUORESCENCE OF PROTEINS INCUBATED WITH MONOSACCHARIDES

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Introduction
Glycation is a cause of damage to proteins and is accelerated in diabetes mellitus as a consequence of increase in levels of glucose and other saccharide derivatives in plasma and tissues. This non-enzymatic glycation of proteins is a series of complex and sequential reactions collectively known as ‘Maillard reaction’ and leads to formation of early glycation adducts and subsequently to formation of advanced glycation end-products. There is evidence that these advanced glycation end-products play a role in the pathogenesis of chronic complications associated with diabetes mellitus.

Diabetic patients with long term glycaemia are monitored in part by measuring levels of plasma glucose, glycated haemoglobin and of late, research is being carried out to investigate the potential use of advanced glycation end-products measurement in diabetes mellitus. Measurements of the products of non enzymatic glycation provide information on exposure to glucose, glycaemic control and tissue modifications. Some of the advanced glycation products formed as a result of hyper-glycaemia auto-fluoresce but this auto-fluorescence has not been fully characterized and neither has the extent to which it relates to glycaemia and diabetic complications. The auto-fluorescence properties of other glycated metabolites besides proteins are also not clear and neither is how this auto-fluorescence may interfere with measurement of the auto-fluorescence of glycated proteins.

Methods
This study looked at the auto-fluorescence property of human collagen IV, human elastin and human albumin during incubation with glucose and fructose in vitro over 12 weeks. The study also investigated at the effects of non-protein nitrogenous waste products (urea and creatinine) on auto-fluorescence of proteins incubated with the monosaccharides.

Results
Auto-fluorescence was observed in human collagen IV after 10 weeks of incubation with 35 mmol/L of glucose at 37°C. No auto-fluorescence was seen in human albumin and human elastin experiments incubated with glucose during 12 weeks. Incubation of each of the three proteins with fructose did not result in auto-fluorescence. Auto-fluorescence intensity increased in the human collagen IV experiments incubated with glucose and nitrogenous wastes when compared to human collagen IV experiments which were incubated with glucose alone.

Conclusion
It appears that products of human collagen IV incubated with glucose have auto-fluorescence properties. These metabolites could be advanced glycation products. Since this auto-fluorescence appears to be dose and time related there could be potential for the use of this auto-fluorescence in long-term monitoring of glycaemic control. The effects of non-
protein nitrogenous wastes products on auto-fluorescent could not be clearly established in this study and therefore further research is required.