

Source: Okayama University (JAPAN), Public Relations and Information Strategy

For immediate release: 16 July 2018

Okayama University research: Diabetic kidney disease: new biomarkers improve the prediction of the renal prognosis

(Okayama, 16 July) **Researchers at Okayama University report in the journal *Diabetes Care* their findings on measurements of ion concentration in solutions for clinical and environmental research. The results are expected to improve prognosis of diabetic kidney disease.**

One of the complications of diabetes is diabetic kidney disease (DKD), a condition in which the kidneys do not filter blood correctly and, eventually, fail — DKD is one of the most common causes of kidney failure and affects around 40% of patients with diabetes. DKD is normally diagnosed by checking for proteins, in particular albumin, that leak from the blood into the urine as a consequence of the malfunctioning filtering; these proteins are used as biomarkers to monitor the progression of DKD and predict the renal prognosis at the early stages of disease. However, new biomarkers that could help to identify the onset of DKD earlier and to predict the renal prognosis more accurately would be very beneficial to help patients with a rapid deterioration of renal function.

Recently it has emerged that glycans — complex molecules made of interlocking sugar molecules — and their enzymatic modification (glycosylation) have a role in diabetes and in the progression of DKD. Because of their complicated structure, glycans are technically difficult to quantify in urine samples, and few studies exist about the role of glycosylation in DKD. However, a method previously introduced by Professor Jun Wada, Dr.Koki Mise and colleagues at the University of Okayama in Japan, authors also of the present study, enables high-throughput quantification of the binding of glycan to 45 different proteins, opening up the investigation of the association between the glycosylation profile in the urine and the renal prognosis in patients with diabetes.

The study that the authors report in the newly published paper started in 2012 and involved 688 patients with type 2 diabetes, who were monitored over a period of 4 years, and 134 control patients with neither diabetes nor DKD. The results suggest that levels of glycans are significantly associated with the evolution of renal function, and that changes in the glycosylation of a particular protein occur in the early stages of DKD, before other detectable signs of deterioration of renal function develop. Because the indexes for glycans are associated with the renal prognosis independent of other indicators commonly used, adding

the combined glycan index to other indicators of the progression of disease can significantly improve the prediction of the renal outcome. The results of the current study are also of fundamental interest, as they provide insight in how glycosylation changes in DKD.

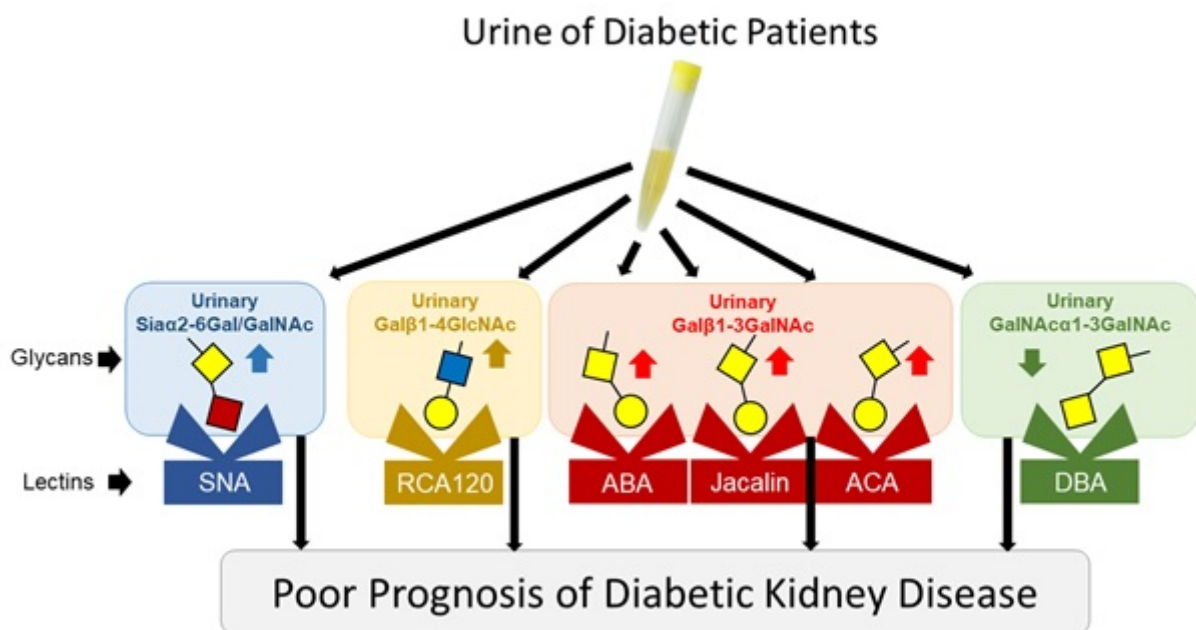
Background

Diabetic kidney disease

Diabetic kidney disease is a complication of diabetes (both type 1 and type 2), arising because the high blood glucose can damage the blood vessels in the kidneys. As a result, the kidneys become unable to filter blood in a normal way, wastes accumulate in the body and proteins such as albumin are found in the urine. The presence of albumin in urine is a common way of diagnosing DKD, as normally the disease causes no clear symptoms before reaching the advanced stages.

Glycans and glycosylation

Glycans are complex molecules consisting of a large number of sugar molecules linked in a particular way; they can attach to a variety of biological molecules, in particular proteins, through an enzymatic process called glycosylation.



Caption

4 types of promising glycans which could be useful prognostic indicators of DKD. Our results suggest that higher levels of urinary excretion of Sia α 2-6Gal/GalNAc, Gal β 1-4GlcNAc, and Gal β 1-3GalNAc and lower levels of urinary excretion of GalNAc α 1-3GalNAc could indicate poor renal prognosis in patients with type 2 diabetes.

Reference

Koki Mise, Mariko Imamura, Satoshi Yamaguchi, Sanae Teshigawara, Atsuhito Tone, Haruhito A. Uchida, Jun Eguchi, Atsuko Nakatsuka, Daisuke Ogawa, Michihiro Yoshida, Masao Yamada, Kenichi Shikata and Jun Wada. Identification of novel urinary biomarkers for predicting the renal prognosis in patients with type 2 diabetes by glycan profiling in a multicenter prospective cohort study: U-CARE Study 1. *Diabetes Care*, 2018 Jun ; dc180030.

DOI: <https://doi.org/10.2337/dc18-0030>

<http://care.diabetesjournals.org/content/early/2018/06/04/dc18-0030>

Reference (Okayama Univ. e-Bulletin): Professor Wada's team

e-Bulletin Vol.2 : [Inflammation and diabetic nephropathy](#)

OU-MRU Vol.18 : [Therapeutic protein targets liver disease](#)

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Correspondence to

Professor Jun Wada, M.D., Ph.D.

Department of Medicine and Clinical Science,
Okayama University Graduate School of Medicine,
Dentistry, and Pharmaceutical Sciences, 2-5-1,
Shikata-cho, Kita-ku, Okayama 700-8558, Japan.

E-mail: junwada@okayama-u.ac.jp

<http://daisan.med.okayama-u.ac.jp/message>



Professor
Jun Wada



Dr.
Koki Mise

Further information

Okayama University

1-1-1 Tsushima-naka , Kita-ku , Okayama 700-8530, Japan

Public Relations and Information Strategy

E-mail: www-adm@adm.okayama-u.ac.jp

Website: http://www.okayama-u.ac.jp/index_e.html

Okayama Univ. e-Bulletin: <http://www.okayama-u.ac.jp/user/kouhou/ebulletin/>

About Okayama University (YouTube):

<https://www.youtube.com/watch?v=iDL1coqPRYI>

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Okayama University is one of the largest comprehensive universities in Japan with roots going back to the Medical Training Place sponsored by the Lord of Okayama and established in 1870. Now with 1,300 faculty and 13,000 students, the University offers courses in specialties ranging from medicine and pharmacy to humanities and physical sciences.

Okayama University is located in the heart of Japan approximately 3 hours west of Tokyo by Shinkansen.

Website: http://www.okayama-u.ac.jp/index_e.html



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Hirofumi Makino, M.D., Ph.D.
President, Okayama University

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