

## Abstract

# Relationship between oestrus status and water spectral patterns of urine in a female giant panda (*Ailuropoda melanoleuca*)

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## Introduction

We previously showed that NIR spectra of urine have the potential to estimate the oestrus status of female giant pandas. Aquaphotomics based on visible-near infrared spectroscopy and multivariate analysis aims to discover new water hydrogen bonds in biological systems under various perturbations and relates water absorbance patterns to respective biofunctionalities. Therefore, this study tried to evaluate how water spectral behaviour in urine may be related to oestrus status.

## Materials and Methods

Daily urine samples had been collected for three years from a female giant panda (2007; stillbirth, 2008; live birth, 2009; abnormal winter oestrus and got pseudopregnant). Transmittance spectra of samples were analysed from 1300 to 1600 nm (NIR System 6500, Foss NIRSystems, Laurel, USA). Soft-Independent Modeling of Class Analogy (SIMCA) and Moving Window Principal Component analysis (MPCA) methods were applied to examine the tendency of time series when compared to estrone-3-glucuronide (E<sub>1</sub>G) content which is the major oestrogen metabolite excreted in the urine during oestrus of the giant panda. Reference data, i.e. the urinary E<sub>1</sub>G concentrations, were measured by enzyme immunoassay.

## Results and Discussion

The MPCA index showed a drastic change around the day when E<sub>1</sub>G concentration started to increase in 2007 and 2008. Similarly, on the SIMCA classification, the interclass distance calculated from the data consisted of urine spectra showed a similar tendency of E<sub>1</sub>G content time series changes in 2007 and 2008. However in 2009, results of both MPCA and SIMCA were different from the above results. We found that water absorbance at 1464, 1474 and 1492 nm increased while absorbance at others (1398, 1410 and 1438 nm) decreased as the day of ovulation approached. The change of spectral pattern at these wavelengths may represent important information about physiological state.

## Conclusion

MPCA index and SIMCA interclass distance showed changes around the day when oestrogen concentration fluctuated. In addition, water absorbance patterns showed differences before and after ovulation.

Reference paper as:

Kinoshita, K., Miyazaki, M., Morita, H., Kawakami, H., Umemoto, R., Yoshida, K., Kusunoki, H. and Tsenkova, R. (2012). Relationship between oestrus status and water spectral patterns of urine in a female giant panda (*Ailuropoda melanoleuca*) (abstract), in: Proceedings of the 15th International Conference on Near Infrared Spectroscopy, Edited by M. Manley, C.M. McGovern, D.B. Thomas and G. Downey, Cape Town, South Africa, p. 22.