

AKIYAMA, Hisako
MURAKAMI-MUROFUSHI, Kimiko

Graduate School of Humanities and Sciences

<http://bios.cc.ocha.ac.jp/data/murofushi/top.html>

■ Researcher information

Contact

Email: akiyama.hisako2@ocha.ac.jp / TEL: 03-5978-2695 / FAX: 03-5978-2568

Major

Cell biology, Lipid biochemistry, Heat-stress-sensing mechanism

■ Research topics

Analysis of the initial perception mechanism of heat stress response in animal cell mediated by membrane glycolipid cholesteryl glucoside

Keywords

Cholesteryl glucoside (CG), Cholesterol, Glucosylceramide, Glucosyltransferase, Initial perception mechanism of heat stress response

Contents

■ Overview (background, goal, detail)

To clarify the initial perception mechanism of heat stress response in animal cell, I am focusing on a membrane glycolipid "cholesteryl glucoside (CG)".

CG is a glycolipid in which the glucose residue is linked by a β -glycosidic bond to cholesterol, and was first discovered by our research group as a key molecule of heat stress response (Kunimoto *et al.*, 2000, 2003). CG is rapidly induced by heat shock in animal cell membrane before the occurrence of heat shock transcription factor 1 (HSF1) activation and heat shock protein (HSP) production, and the addition of CG induces HSF1 activation and HSP production to the culture of human fibroblasts and rat gastric mucosa (Kunimoto *et al.*, 2002, 2003). It is highly conceivable that CG functions as a crucial lipid mediator in the stress responses in the animal (see above figure).

The glucosyltransferase that takes charge of CG-synthesis reaction has not yet been identified in animals, therefore, it has not been clarified how CG is synthesized in heat stress dependent manner. Moreover, HSF1 activation mechanism mediated by CG is not clarified yet. In the present study, I address these challenges, and am aiming at the clarification of the initial perception mechanism of heat stress response in animal cell.

■ Process, case study

(1) Analysis of CG-synthesis mechanism in animal cell :

Thus far, it had been thought that CG was synthesized from cholesterol and UDP-glucose. However, in the present study, it was clarified that CG was synthesized by membrane-localized glucosyltransferase from cholesterol and membrane glycolipid glucosylceramide (Akiyama *et al.*, 2011).

→ It is expected to become a strong clue about the clarification of the initial perception mechanism of heat stress response.

(2) Identification of animal CG-synthesizing enzyme : Purification of the enzyme from hog stomach and identification of human enzyme gene

(3) Analysis of HSF1 activation mechanism mediated by CG

■ Potential (applications, future goals)

It is thought that the involvement of CG-synthesizing enzyme in heat stress response is animal cell specific. Therefore, the present study which clarifies the initial perception mechanism of heat stress response mediated by CG might become a breakthrough for the clarification of the homeostatic mechanism in animal cell. Because heat stress response is involved in various diseases, CG-synthesis mechanism that might be the basis of a lot of diseases will be able to be used as a drug discovery target.

Intellectual properties (Patents, computer programs), productization, publications and social/industrial contributions

Akiyama H, Sasaki N, Hanazawa S, Gotoh M, Kobayashi S, Hirabayashi Y, Murakami-Murofushi K. *Biochim. Biophys. Acta*, 1811 (2011) 314-322.

Akiyama H, Hamada T, Nagatsuka Y, Kobayashi S, Hirabayashi Y, Murakami-Murofushi K. *Cytologia*, 76 (2011) 19-25.

Potential of social/industrial contribution

■ Joint research / Knowledge sharing

HUMANITIES
AND
SCIENCES

Lipid

Stress

