

Report for Joint/Usage Research Program for Endocrine/Metabolism (Fiscal Year 2019)

Date: (2020)/(03)/(27)

To Director of Institute for Molecular and Cellular Regulation, Gunma University

Principal Applicant	
Institution	Endocrinology department, Beijing Tongren Hospital, Capital Medical University
Position	Professor and Director
Name	Jinkui Yang

We report on the results of joint research in fiscal 2019 as below.

(Program No. 19003)

1. Research Title	Berberine improves insulin secretion through hERG2 potassium channel				
2. Purpose and Significance of the research project	Human Ether-a-go-go Related Gene (hERG) is a gene that codes for a protein known as Kv11.1, the alpha subunit of a potassium ion channel. This ion channel is also called hERG potassium ion channel. So far, there are 3 subtypes of hERG channel, hERG1-3. Berberine (BBR), one kind of Chinese traditional medicine, has applications as a drug in treating type 2 diabetes mellitus and hyperlipidemia (1). BBR promotes insulin secretion might through its function on hERG channel (2). Although we previously found that hERG protein was expressed in pancreatic beta cells and regulated insulin secretion (3), however, which subtype of hERG was regulated by BBR is still unknown. The purpose of this study is to investigate the effect of BBR on which subtype of hERG channel proteins and how to regulate insulin exocytosis through this pathway.				
3. Period of The Program	April 1, 2019 ~ March 31, 2020				
4. Project Members					
Name	Age	Gender	Institution/Department	Position	Role
(Principal Applicant) Jin-kui Yang	56	M	Endocrinology department, Beijing Tongren Hospital, Capital Medical University	Professor	Project director
(Research Collaborators) Miao-miao Zhao	26	F	Endocrinology department, Beijing Tongren Hospital, Capital Medical University	Graduate student	Experimental executor
Jing Lu	36	F	Endocrinology lab, Beijing Tongren Hospital, Capital Medical University	Associate professor	Experimental executor
Hao Wang	36	M	Molecular endocrinology and metabolism, IMCR, Gunma University	Assistant professor	Experimental guider



※If additional space is required, attach a separate sheet.

5. Collaborative Researcher of IMCR	Name of the Laboratory	Molecular Endocrinology and Metabolism	Name	Tetsuro Izumi
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6. Research Plans

- 1) Check blood glucose and serum insulin concentrations in wild type (WT), hERG1 or hERG2 knockout mice that underwent a glucose tolerance test after treatment with NS or BBR.
- 2) Detect insulin secretion ability of WT, hERG1 knockout or hERG2 knockout islets that were stimulated with glucose plus NS or BBR.
- 3) TIRF microscopic analysis for exocytosis of insulin granules by using MIN6 cells after overexpression of hERG1 or hERG2.
- 4) TIRF microscopic analysis for exocytosis of insulin granules by using primary pancreatic beta cells of WT, hERG1 knockout or hERG2 knockout mice.

7. Research results:

- 1) BBR enhances high-glucose-dependent insulin secretion
- 2) BBR can regulate the function of hERG2 potassium channel in pancreatic beta cells.
- 3) BBR promoted insulin secretion through mediating hERG2 potassium channel.



8. Publications and/or Presentations resulting from Joint Research Program with IMCR.
Exchange of information on joint research with faculty members.

①Please describe a list of publications in which the name of the collaborative researcher of IMCR appears and send one paper reprints of each publication to IMCR.

Berberine: a Chinese herb extract as a novel class of insulinotropic drug via targeting KCNH6 potassium channel. Miao-Miao Zhao, Sen Li, Jing Lu, Hao Wang, Xi Cao, Qi Li, Ting-Ting Shi, Kohichi Matsunaga, Chen Chen, Testuro Izumi, and Jin-Kui Yang. Manuscript in preparation.

②Please describe a list of publications which include the description that the research is supported by Joint Research Program with IMCR and send one copy of each publication to IMCR.

Not yet

③Enter the name of the conference, the date of the conference, and the title of the presentation of the conference.(up to 3 cases)

Not yet

④Implementation status of information exchange with faculty members in charge of joint research.

We often discussed with Professor. Izumi and Dr. Wang about our collaborative research. We recently asked Professor Izumi for helping us revising the manuscript of this project by email.