

# Global Summit on Steroids

July 13-15, 2015 Baltimore, USA

## Steroid hormone 20-hydroxyecdysone via. G-protein-coupled-receptor transmits signal in insects

Xiao-Fan Zhao, Wen Liu, Mei-Juan Cai and Jin-Xing Wang  
Shandong University, China

In addition to the classical nuclear receptor pathway, there is a non-genomic pathway in the cell membrane that regulates gene expression in animal steroid hormone signaling; however, this mechanism is unclear. We report that the insect steroid hormone 20-hydroxyecdysone (20E) via G-protein-coupled-receptor (GPCR), G protein alpha q (Gaq) and phospholipase C gamma 1 (PLCG1) regulates calcium influx to modulate the protein kinase C (PKC) phosphorylation of the transcription factor ultraspiracle (USP1) in the lepidopteran insect *Helicoverpa armigera*. The *PLCG1* mRNA levels are increased during the molting and metamorphic stages. The depletion of *PLCG1* by RNA interference can block 20E-enhanced pupation, cause larvae death and pupation defects, and represses 20E-induced gene expression. 20E may induce the tyrosine phosphorylation of PLCG1 at the cytosolic tyrosine kinase (Src) homology (SH) 2 domains, and then determine the migration of PLCG1 toward the plasma membrane. The G-protein-coupled-receptor (GPCR) inhibitor suramin, Src-family kinases inhibitor PP2, and the depletions of *ecdysone-responsible GPCR* (*ErGPCR*) and *Gaq* restrain the 20E-induced tyrosine phosphorylation of PLCG1. PLCG1 participates in the 20E-induced  $Ca^{2+}$  influx. The inhibition of GPCR, PLC, inositol 1,4,5-trisphosphate receptor, and calcium channels represses the 20E-induced  $Ca^{2+}$  influx. Through calcium signaling, PLCG1 mediates the transcriptional activation driven by the ecdysone response element (EcRE). Through PLCG1 and calcium signaling, 20E regulates PKC phosphorylation of USP1 at Ser21 to determine its EcRE binding activity. These results suggest that 20E activates PLCG1 via *ErGPCR* and Src-family kinases to regulate  $Ca^{2+}$  influx and PKC phosphorylation of USP1 to subsequently modulate gene transcription.

### Biography

Xiao-Fan Zhao is a Professor at School of Life Sciences, Shandong University, Jinan, China. Her scientific work focuses on steroid hormone 20-hydroxyecdysone (20E) signalling in insect development. 20E is produced either in plant and insect. 20E promotes insect molting and metamorphosis. It has been known that 20E via genomic pathway regulates gene transcription, which is 20E binds to the ecdysone nuclear receptor and forms a heterodimeric transcription complex with ultraspiracle to bind to the ecdysone response element for gene transcription. 20E is also known to transmit a signal via the G-protein-coupled receptor (GPCR)-regulated non-genomic pathway; however, the cell membrane receptor and the pathway are unclear. The goal of her ongoing research is to identify the GPCR-regulated non-genomic 20E pathway and the proteins involved in it.

[xzfzhao@sdu.edu.cn](mailto:xzfzhao@sdu.edu.cn)

### Notes: