ウェブサイト公開用

（様式 10）
（海外特別研究員事業）

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海 外 特 別 研 究 員 最 終 報 告 書

独立行政法人 日本学術振興会 理事長　殿

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氏　　名　

（氏名は必ず自署すること）

海外特別研究員としての派遣期間を終了しましたので、下記のとおり報告いたします。
なお、下記及び別紙記載の内容については相違ありません。

記

1. 用務地（派遣先国名）用務地：ニューヨーク （国名：アメリカ）

2. 研究課題名（和文）※研究課題名は申請時のものと違わないように記載すること。
　蚊の吸血行動の基盤となる宿主体温検知メカニズムの解明

3. 派遣期間：平成　29　年　8 月　　15 日　～　令和　　元年　　8 月　　14　日

4. 受入機関名及び部局名
　The Rockefeller University,　Laboratory of Neurogenetics and Behavior

5. 所期の目的の遂行状況及び成果…書式任意　**書式任意（A4 判相当 3 ページ以上、英語で記入も可）**

（研究・調査実施状況及びその成果の発表・関係学会への参加状況等）
（注）「6. 研究発表」以降については様式 10－別紙 1～4 に記入の上、併せて提出すること。

Research update

Mosquitoes are effective vectors for infectious diseases because of their strong drive for blood-feeding behavior. Both female and male mosquitoes seek and feed on nectar as their main nutrient source. However, sexually mature females switch their food source to vertebrate blood, which is absolutely required for egg production and completion of the reproductive cycle[1]. In their pursuit of an ideal blood meal, female mosquitoes use multiple cues that are emitted from the host, including CO_2,

odor, and heat[2]. Even though heat is a robust inducer for host-seeking and feeding behavior, how mosquitoes detect thermal cues, and neuronal mechanisms guiding these behaviors have remained a mystery.

To date, the molecular thermosensors guiding animal behavior identified have been temperature-sensitive ion channels. The most well characterized temperature detectors are the transient receptor potential (TRP) family of ion channels. Each TRP channel is tuned to detect a specific temperature range, and acts primarily to initiate avoidance behavior in response to noxious heat, warmth, and cold in both vertebrates and invertebrates[3,4]. Mosquitoes are unusual in showing innate attraction towards heat. A recent study by the Vosshall lab demonstrated that the thermosensitive cation channel, *TRPA1*, is required for detection of temperatures that are very hot (> 50°C), which helps mosquitoes avoid potentially harmful temperature and fine-tune their thermal preference towards host temperature[5]. However, *TRPA1* knockouts displayed normal warmth detection and preference for host physiological temperature, suggesting that mosquitoes have adapted other thermosensors for heat-seeking behavior. Among the candidates could be additional TRP channels, insect chemosensory receptors of the GR or IR families, or even novel classes of receptors and ion channels unique to mosquitoes that are yet to be determined.

I am continuing to address two questions: (1) What are the mosquito thermosensors that are required for heat detection? (2) What is the neuronal circuit underlying host-seeking and feeding behavior at host skin surface? By answering these questions, we will have a better understanding of how mosquitoes target

humans as a source for blood and will further help generate strategies to fight off mosquito-based infectious diseases.

References

1. Attardo, G. M., Hansen, I. A. & Raikhel, A. S. Nutritional regulation of vitellogenesis in mosquitoes: implications for anautogeny. *Insect Biochemistry and Molecular Biology* **35,** 661–675 (2005).
2. McMeniman, C. J., Corfas, R. A., Matthews, B. J., Ritchie, S. A. & Vosshall, L. B. Multimodal integration of carbon dioxide and other sensory cues drives mosquito attraction to humans. *Cell* **156,** 1060–1071 (2014).
3. Palkar, R., Lippoldt, E. K. & McKemy, D. D. The molecular and cellular basis of thermosensation in mammals. *Curr. Opin. Neurobiol.* **34,** 14–19 (2015).
4. Barbagallo, B. & Garrity, P. A. Temperature sensation in Drosophila. *Curr. Opin. Neurobiol.* **34,** 8–13 (2015).
5. Corfas, R. A. & Vosshall, L. B. The cation channel TRPA1 tunes mosquito thermotaxis to host temperatures. *eLife Sciences* **4,** (2015).