

**Division of Physiology**  
**Department of Oral Biology**

**Outline**

We study the autonomic regulation of the orofacial blood flow that is important for maintaining orofacial functions such as mastication, salivation and swallowing.

We focus on

- 1) peripheral and central mechanisms neurally-mediated vasomotor responses, especially the parasympathetic vasodilation
- 2) interaction between neural (autonomic nerves) and humoral responses (sympathoadrenal system)
- 3) physiological roles of neurally-mediated vasomotor response in the control of hemodynamics in the orofacial area.

We directly observe the effect of sensory inputs (trigeminal afferent), neurotransmitters or hormones on the blood flow in the orofacial tissues (facial skin, submandibular gland and jaw muscles etc.) and systemic hemodynamics (heart rate and blood pressure) in the anesthetized animals or human. Our new results are helping us to understand how autonomic nervous system operate effectively in a wide range of conditions associated with health and disease. In addition, they can provide a strong framework to identify and investigate new avenues for therapeutic treatments of orofacial dysfunctions associated with disturbances in the autonomic nervous system.

**Faculty members**



Professor; Hisayoshi Ishii, DDS, PhD



Research associate; Toshiya Sato, DDS, PhD

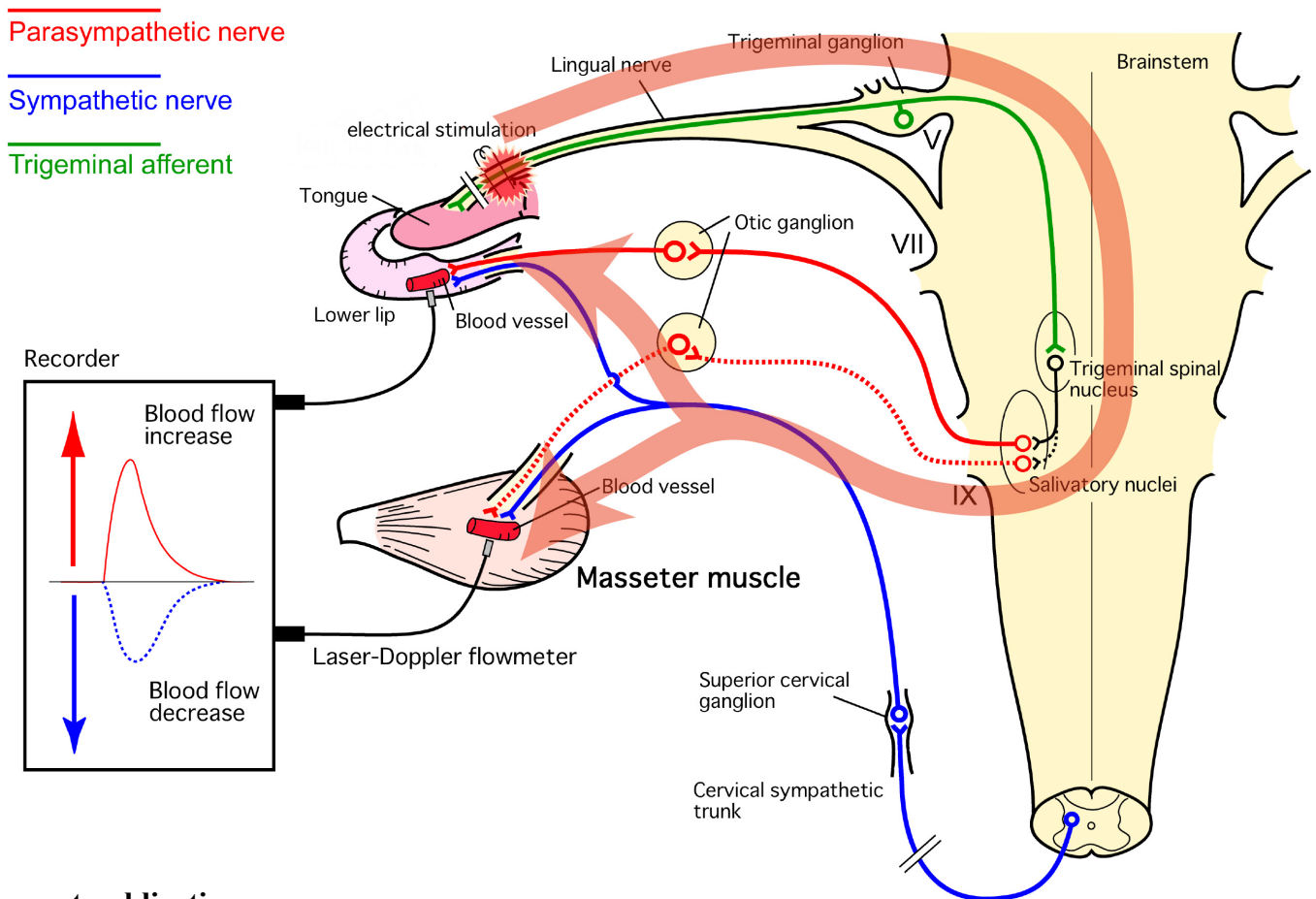


Assistant professor; Mari Shimatani, DDS, PhD

## Main research in progress

- 1) Interaction between cervical sympathetic nerves and sympathoadrenal system in the regulation of hemodynamics in the orofacial area
- 2) Parasympathetic reflex vasodilation in the cerebral hemodynamics
- 3) Modulation of parasympathetic reflex vasodilation mediated by GABAergic system in the orofacial tissues
- 4) Relationship between parasympathetic reflex vasodilation and salivation
- 5) Age-related modulation of autonomic vasomotor responses during trigeminal afferent inputs

## Schematic representation of activation of parasympathetic vasodilator fibers by trigeminal mediated reflex



## Current publications

- \* Okada Y, Sato T, Islam ST, Ohke H, Saitoh M, Ishii H. Site-specific autonomic vasomotor responses and their interactions in rat gingiva. *Microvasc Res* 152: 104646, 2024.
- \* Ramadhani R, Sato T, Okada Y, Ohke H, Ishii H. Differences in the regulatory mechanism of blood flow in the orofacial area mediated by neural and humoral systems. *J Comp Physiol B* 193: 109-124, 2023.
- \* Mito K, Sato T, Ishikawa R, Ramadhani R, Okada Y, Hirohata Y, Saito T and Ishii H. Age-related decrease of cholinergic parasympathetic reflex vasodilation in the rat masseter muscle. *Microvasc Res* 138: 104214, 2021.
- \* Sato T, Mito K and Ishii H. Relationship between impaired parasympathetic vasodilation and hyposalivation in parotid glands associated with type 2 diabetes mellitus. *Am J Physiol Regul Integr Comp Physiol* 318: R940-R949, 2020.