International Mini-Symposium

Frontiers in Swallowing Science:

From Neural Mechanisms to Clinical Dysphagia

Bridging Basic Science and Clinical Practice
To Advance Swallowing Health Worldwide

2026年9月14日（月）
13:00～17:00

新潟大学歯学部講堂

摂食嚥下の基礎神経科学・生理学・医工学から
臨床評価・歯科的介入に至るまで，
各分野の第一線で活躍する研究者・臨床家が
最新の知見を共有します．
国際的な視点から，未来の嚥下科学を
ともに考える貴重な機会です．

Speakers






A premotor circuit that controls swallowing in the mouse; Prof Simon McMullan; Macquarie Medical School, Australia
Generative Artificial Intelligence in Dysphagia; Prof Byung-Mo; Seoul National University College of Medicine, Korea
The Neuroscience of Ingestive Reward: Insights from Rodent Studies; Prof Yoshikazu Isomura; Institute of Science Tokyo, Japan
AI-Based Swallowing Monitoring: From Physiological Signals to Aspiration Risk; Prof Kenji Suzuki; University of Tsukuba, Japan
Tongue movement during mastication and swallowing; Prof Kazuhiro Hori; Niigata University, Japan
Purinergic sensory neurons mediate swallowing; Prof Takanori Tsujimura; Niigata University, Japan

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参加無料
事前申し込み不要
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All are welcome!

アクセス
JR新潟駅からバスで15分
JR白山駅から徒歩で15分

真の強さを学ぶ。
新潟大學
NIIGATA UNIVERSITY

Time schedule

13:00	Opening remark
13:05-13:40	A premotor circuit that controls swallowing in the mouse *Prof Simon McMullan*
13:40-14:15	Generative Artificial Intelligence in Dysphagia: Implications for Future Clinical Practice *Prof Byung-Mo Oh*
14:15-14:50	The Neuroscience of Ingestive Reward: Insights from Rodent Studies *Prof Yoshikazu Isomura*
14:50-15:05	Break
15:05-15:40	AI-Based Swallowing Monitoring: From Physiological Signals to Aspiration Risk *Prof Kenji Suzuki*
15:40-16:15	Tongue movement during mastication and swallowing *Prof Kazuhiro Hori*
16:15-16:50	Purinergic sensory neurons mediate swallowing initiation evoked by diverse laryngeal stimuli *Prof Takanori Tsujimura*
16:50-17:00	Discussion
17:00	Closing remark

A premotor circuit that controls swallowing in the mouse
Prof Simon McMullan; Macquarie Medical School, Australia
Swallowing is coordinated by a brainstem central pattern generator (CPG) that manages efficient bolus transport and protects the airway. The specific interneuron populations that coordinate swallowing remain poorly defined: emerging evidence suggests that ingestive motor circuits express a shared visceral genetic signature, paired-like homeobox 2b (Phox2b). Here, we investigate whether Phox2b$^+$ interneurons contribute to the swallow CPG.
Retrograde viral tracing was used to map premotor networks that control cardinal swallowing muscles in neonatal mice. Tracing revealed a genetically diverse premotor network that spanned the brainstem and cervical spinal cord. We identified a key population in the nucleus tractus solitarius (nTS), many of which expressed Phox2b, which overlapped with the anatomical distribution of central terminals of sensory neurons that innervate the vallecular space. Anterograde tracing of NTS Phox2b$^+$ neurons revealed axon collaterals that innervate diverse swallowing motor pools, suggesting coordinated control of multiple swallowing effectors. The function of NTS neurons was assessed by *in vivo* recordings of neuronal activity during swallows evoked by oral water stimuli in urethane anaesthetized mice. We observed distinct functional profiles of swallowing neurons which were arrayed in and around the NTS. Juxtacellular labelling confirmed that swallow neurons included NTS Phox2b$^+$ neurons, although such neurons represented a minority of recovered cells.
These findings demonstrate swallowing is supported by an anatomically, functionally and molecularly diverse premotor network. nTS Phox2b$^+$ neurons likely contribute to this, although their precise role remains to be fully resolved.

Generative Artificial Intelligence in Dysphagia: Implications for Future Clinical Practice
Prof Byung-Mo Oh; Seoul National University College of Medicine, Korea
Videofluoroscopic swallowing study (VFSS) remains the instrumental gold standard for swallowing evaluation, yet its interpretation is resource-intensive and subject to well-documented inter-rater variability. Artificial intelligence research in dysphagia has advanced substantially, primarily through discriminative models that effectively perceive isolated findings. These models have performed well in specialized tasks, such as automated detection of penetration and aspiration events or kinematic tracking of hyoid displacement. However, these perceptual outputs remain fragmented data points that still require significant manual synthesis to become a clinically actionable report. Generative artificial intelligence (GAI) serves as the critical interpretive layer that bridges this gap. This technology, encompassing large language models and multimodal foundation models, shifts the focus from mere detection to information synthesis. By integrating these specialized perception outputs into its framework, GAI produces new, coherent content such as structured text, clinical summaries, and standardized report drafts. This lecture provides medical professionals with a practical understanding of GAI technologies relevant to clinical practice. Specifically, it explores how these technologies may be deployed within a VFSS-centered reporting system. This talk also explores potential applications across the dysphagia care continuum, including a conceptual two-stage pipeline for automated VFSS report generation. Lastly, following this logical progression, we propose the most readily applicable pathway for integrating GAI into VFSS clinical workflows in the near term.

The Neuroscience of Ingestive Reward: Insights from Rodent Studies
Prof Yoshikazu Isomura; Institute of Science Tokyo, Japan
In neuroscience, learning task paradigms such as classical (Pavlovian) conditioning and operant conditioning are widely used to investigate the neural mechanisms underlying diverse brain functions, including cognition, decision-making, and goal-directed behavior. In a typical operant conditioning task, animals learn that pressing a lever immediately after an auditory cue leads to a reward, such as food or water. This approach allows us to observe neural activity in the brain, while animals engage cognitive processes, perform goal-directed actions, and consume rewards. Reward consumption also provides an excellent opportunity to observe mastication and swallowing behaviors in detail. Our research has focused on elucidating the cortical and basal ganglia mechanisms that enable rats to efficiently obtain rewards. In the course of these studies, we have developed experimental paradigms and devices that facilitate detailed analyses of mastication and swallowing during reward consumption. In this presentation, I will introduce our findings on the neural mechanisms of reward learning and discuss how these experimental approaches and insights may contribute to future research on mastication and swallowing.

AI-Based Swallowing Monitoring: From Physiological Signals to Aspiration Risk
Prof Kenji Suzuki; University of Tsukuba, Japan
Swallowing and mastication are complex physiological processes that vary across individuals, foods, and daily conditions. While instrumental examinations remain essential for diagnosing dysphagia, non-invasive monitoring during actual eating may provide complementary information on changes in swallowing function and associated risks.
We have been developing GOKURI, an AI-assisted swallowing monitoring platform based primarily on a neck-worn electronic stethoscope certified as a medical device in Japan, to quantify swallowing-related physiological signals in clinical and real-world settings. Our recent studies span multiple levels of assessment: validation of the Guided Oral-Intake and Swallowing Test (GOST) for DOSS classification and food texture recommendation; automated analysis of swallowing sounds to estimate pharyngeal clearance time; monitoring of spontaneous swallowing after tracheostomy; AI-assisted evaluation of age- and sex-related decline in swallowing function; and automated assessment of solid-food mastication and swallowing. We are further extending these approaches to AI-based analysis of chewing behavior during actual meals.
Together, these studies illustrate a progression from individual physiological signals and standardized tests toward continuous, multimodal assessment of eating behavior. This talk will discuss how AI-assisted sensing may complement conventional dysphagia assessment and ultimately enable longitudinal monitoring of swallowing health and changes associated with aspiration risk.

Tongue movement during mastication and swallowing; methodology and bio-mechanical significance
Prof Kazuhiro Hori; Niigata University, Japan
Tongue plays an important role in ingestive behaviors including chewing and swallowing. During chewing, tongue mixes comminuted food pieces with saliva to make a bolus, resulting in propelling it into the esophagus through the pharynx during swallowing. Therefore, tongue dysfunction or deficits after oral tumor resection or stroke may result in a critical situation such as aspiration and choking. While biological movements and signals related to chewing and swallowing have been measured, observing the tongue's movement during function is difficult due to its location within the oral cavity. We quantitatively analyzed the contact pressure between the tongue and palate using a tongue pressure sensor sheet, clarifying the relationship between food texture and oral functions such as mastication and swallowing. In this presentation, I would like to talk about the devices for tongue pressure measurement and the aspect of tongue pressure production during swallowing from the results of our research including simultaneous measurement with other devices.

Purinergic sensory neurons mediate swallowing initiation evoked by diverse laryngeal stimuli
Prof Takanori Tsujimura; Niigata University, Japan
Purinergic P2X receptors expressed in a subset of vagal neurons are involved in laryngeal water- and acid-evoked swallowing. We investigated whether purinergic sensory neurons mediate swallowing initiation evoked by diverse laryngeal stimuli.
Urethane-anesthetized male Sprague-Dawley rats were used. Swallowing was identified by electromyographic bursts of the digastric and thyrohyoid muscles. The effects of the non-selective P2X antagonist 10 mM PPADS and 1 mM P2X3 antagonist AF353 on swallowing initiation evoked by laryngeal chemical stimulation with distilled water (DW), carbonated water (CW), 160 mM potassium chloride (KCl), 1 μM capsaicin or mechanical stimulation with von Frey filament were examined. ATP release from an ex vivo laryngeal preparation was also measured during chemical and mechanical stimulation.
PPADS and AF353 significantly reduced DW-, CW-, and capsaicin-evoked swallows, but not KCl-evoked swallows. Both antagonists slightly increased the swallowing threshold evoked by von Frey stimulation. DW, CW, capsaicin, and von Frey stimulation significantly increased ATP release from the ex vivo laryngeal preparation, whereas KCl did not.
These findings suggest that purinergic sensory neurons mediate swallowing initiation evoked by chemical and mechanical laryngeal stimulation.