A blood-bud barrier. Focus on “A permeability barrier surrounds taste buds in lingual epithelia”

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The sense of taste is critical for the decision to ingest or reject the contents of the oral cavity. The functional unit of the taste system is the taste bud, an onion-shaped structure containing ~100 taste cells. The taste sensation is initiated when tastants, for example, a molecule of sucrose, bind to and activate taste receptors expressed at the surface of microvilli at the apical side of the taste cell membrane. The microvilli extend into the oral cavity through a taste pore (Fig. 1).

Much attention has been given to the seal of the taste pore. The claudins that contribute to the barrier at the pore have been identified (4), and we know that the barrier is selectively permeable to some molecules. Yet not much attention has been given to the basolateral side. In this issue of American Journal of Physiology-Cell Physiology, Dando et al. (1) show that the entire taste bud is actually encapsulated. Using fluorescent dyes, they show a barrier at the basolateral side of the taste buds that creates a protected environment within the taste bud by preventing access of molecules from the surrounding tissue to the taste sensory cells.

Mounting evidence indicates that the taste bud cells do not function in isolation but, rather, work as a functional unit and that a microenvironment exists within the bud (5). There is evidence of cell-to-cell communication through neurotransmitters and peptide hormones (2, 5). Therefore, total encapsulation of the buds is a way to preserve this privileged microenvironment.

This blood-bud barrier cannot, however, be absolutely tight and could function in a manner akin to the blood-brain barrier, allowing selective access to the taste sensory cells for some molecules. A number of studies have shown that taste perception is modulated by circulating hormones (3), which would need access to the taste bud through the barrier to exert their modulatory function. How those hormones permeate the barrier and access their receptors on taste bud cells remains to be elucidated.

The findings of Dando et al. (1) are relevant to a rare phenomenon, intravascular taste. Some molecules, for example, saccharin, can be tasted after intravascular injection. As pointed out by Dando et al., the commonly accepted explanation is that the tastant diffuses out of the blood vessels, reaches the taste buds, and activates taste receptors expressed at the basolateral side of the gustatory sensory cells. Then why is this a rare phenomenon? The answer comes from the presence of the perigemmal barrier. Because of this barrier, it is difficult for the tastant to reach its receptor on the taste bud cell, either through the perigemmal barrier or, alternately, as proposed by Dando et al., by diffusing through the lingual epithelium and reaching the taste pore.

Most importantly, the findings imply that the blood-bud barrier must be considered in settings that involve systemic pharmacological intervention on taste cells. Very similar to interventions in the brain, molecules must be able to cross the bud barrier to be effective on gustatory sensory cells. Also, taste disturbances are common in cancer patients undergoing chemotherapy. In this case, selecting drugs that do not enter the taste bud or finding ways to strengthen the barrier may help minimize injury to the taste cells following treatment.

DISCLOSURES
No conflicts of interest, financial or otherwise, are declared by the author.

AUTHOR CONTRIBUTIONS
S.D. prepared the figure; S.D. drafted the manuscript; S.D. edited and revised the manuscript; S.D. approved the final version of the manuscript.

REFERENCES