jove

Demonstration of Membrane Transport of Histidine using Goat Intestinal Inverted Sacs: An Experiential Pedagogical Tool for Undergraduates

Hiba Haris[1], **Prachi Kumar**[1], **Vivek Bhardwaj**[1], **Sidhartha Taritla**[1], **Vandana Malhotra**[1], **Nandita Narayanasamy**[1]

[1] Department of Biochemistry, Sri Venkateswara College, University of Delhi

Corresponding Authors

Vandana Malhotra
vandana.malhotra@svc.ac.in

Nandita Narayanasamy
nnarayanasamy@svc.ac.in

Citation

Haris, H., Kumar, P., Bhardwaj, V., Taritla, S., Malhotra, V., Narayanasamy, N. Demonstration of Membrane Transport of Histidine using Goat Intestinal Inverted Sacs: An Experiential Pedagogical Tool for Undergraduates. *J. Vis. Exp.* (212), e66882, doi:10.3791/66882 (2024).

Date Published

October 4, 2024

DOI

10.3791/66882

URL

jove.com/video/66882

Abstract

Histidine is an essential amino acid that is also a precursor for metabolites implicated in the immune system, pulmonary ventilation, and vascular circulation. Absorption of dietary histidine relies largely on the sodium-coupled neutral amino acid transport by the Broad neutral amino acid transporter (B^0AT) present on the apical membrane of the enterocyte. Here, we demonstrate the absorption of histidine by the intestinal villus enterocytes from the lumen using goat jejunal inverted sacs. The jejunal sacs exposed to varying concentrations of sodium and histidine were assayed to determine the concentration of histidine inside the sacs as a function of time. The results show active histidine absorption. Increasing the concentration of salt resulted in higher absorption of histidine, suggesting a symport of sodium and histidine absorption in goat intestinal inverted sacs. This protocol may be applied to visualize the intestinal mobility of amino acids or other metabolites with appropriate modifications. We propose this experiment as an experiential pedagogical tool that can help undergraduate students comprehend the concept of membrane transport.

Introduction

Biological cells are surrounded by a membrane lipid bilayer that separates the intracellular cytosol from the extracellular content. The membrane serves as a semipermeable barrier that regulates the movement of solutes[1]. Transport across biological membranes is affected by a solute's permeability coefficient, which depends on several factors, including the concentration and charge of the solute. In general, solutes move through the membrane using three mechanisms (**Figure 1**): Passive diffusion, facilitated diffusion, and active transport[2]. Simple diffusion is the process by which soluble, uncharged, and non-polar solutes pass down their concentration gradient through a semipermeable membrane