UNIVERSITY OF LIFE SCIENCES "KING MIHAI I" FROM TIMISOARA
"YOUNG PEOPLE AND MULTIDISCIPLINARY RESEARCH IN APPLIED LIFE SCIENCES"
5-6 November 2026



Dietary Adaptation of Intestinal SGLT1 in Rodent Models

Diana Petra Matei, Eugenia Dumitrescu and Alina Duşanca Ghişe
University of Life Sciences „King Mihai I" from Timisoara

Abstract: *The sodium-glucose cotransporter 1 (SGLT1) is the primary transporter responsible for active glucose absorption across the intestinal epithelium. As a key regulator of nutrient uptake, SGLT1 exhibits adaptive plasticity in response to dietary changes. Rodent models have been extensively used to investigate how variations in diet influence intestinal glucose transport mechanisms and the expression of nutrient transporters. This review examines current evidence regarding the effects of dietary interventions and fasting regimens, on intestinal SGLT1 expression and activity in rodent models. Studies consistently demonstrate that dietary composition can alter SGLT1 gene expression, protein abundance, and transport capacity through complex interactions involving nutrient sensing pathways and hormonal regulation. These adaptive responses enable the intestine to adjust glucose absorption according to feed composition, nutrient availability and metabolic demands. Furthermore, diet-induced modulation of SGLT1 has been involved in metabolic disorders such as obesity and type 2 diabetes. Understanding the mechanisms underlying dietary regulation of intestinal SGLT1 may provide valuable insights into metabolic disease and identify potential therapeutic targets for improving glucose homeostasis. Future studies integrating molecular and physiological approaches are essential for clarifying the relationship between dietary factors and intestinal glucose transport.*

• Introduction

The small intestine exhibits a high capacity to adapt nutrient absorption to variations in dietary composition. This adaptive plasticity is essential for maintaining energy homeostasis, while simultaneously it allows the gastrointestinal tract to optimize intestinal transport according to nutrient availability and metabolic demands.

Interest in the adaptive regulation of intestinal glucose transport has grown substantially following observations that dietary composition can greatly influence transporter activity.

• Results and discussions

Evidence from rodent models indicates that dietary carbohydrates, feeding patterns, and endogenous biological rhythms can influence intestinal glucose handling through changes in SGLT1 expression, transporter activity, and also epithelial architecture.Table 1 shows an overview of dietary and physiological factors driving intestinal SGLT1 adaptation and glucose absorptive capacity in rodent models.

Table 1.

Overview of dietary and physiological factors driving intestinal SGLT1 adaptation and glucose absorptive capacity in rodent models

Factor / Intervention	Rodent model	Main finding	SGLT1 implication	Evidence type	Reference
High-glucose diet (60% glucose)	Mice	• Suppressed proximal intestinal glucose transport despite previous reports of increased SGLT1 transcripts	• Evidence for post-transcriptional regulation of SGLT1 activity	Direct SGLT1 functional adaptation	[Nakamura et al., 2023]
High-fructose corn syrup (HFCS)	Mice	• Increased villus length and nutrient absorption	• Increased total absorptive surface area; no direct evidence of specific SGLT1 upregulation.	Indirect structural adaptation	[Taylor et al., 2021]
High-potassium diet	Rats	• Increased jejunal glucose transfer and altered amiloride sensitivity	• Suggests modification of glucose transport mechanisms at the brush-border membrane; SGLT1 not directly identified	Indirect evidence (glucose transport measurements)	[Capurro et al., 1991]
Circadian rhythm	Rats	• Increased phloridzin-sensitive glucose transport before feeding period • Increase in SGLT1 Vmax with no change in Km • Increased SGLT1 mRNA abundance along the villus axis • Peak SGLT1 activity occurred before major food intake	• Increase in SGLT1-mediated transport activity • Transcriptional upregulation of SGLT1 • Indicates anticipatory regulation independent of immediate luminal carbohydrate exposure	Direct SGLT1 functional evidence	[Tavakkolizadeh et al., 2001]
Intestinal sweet taste receptor activation (T1R2/T1R3)	Rats	• SGLT1 upregulation was induced by glucose, fructose, and saccharin (strongest in the duodenum and proximal jejunum)	• Identifies a proximal intestinal nutrient-sensing pathway that directly regulates SGLT1 protein expression through sweet taste receptor and vagal signaling mechanisms	Direct evidence for SGLT1 regulation	[Stearns et al., 2010]

Conclusions

Intestinal glucose transport is regulated by circadian rhythms, reproductive hormones, sweet taste receptors, and hormonal signals such as GLP-2 to meet metabolic demands. Intestinal sugar absorption is driven not just by SGLT1 expression, but by an integrated combination of internal biological cycles, gut-brain signaling, surface area expansion, and underlying sodium gradients.