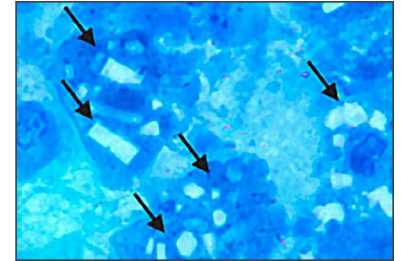


CYSTINOSIS FUNDAMENTALS

MANAGEMENT CONSIDERATIONS FOR GASTROINTESTINAL EFFECTS

Cystinosis *and* its treatments contribute to a significant burden of GI complications¹⁻⁴

- ◆ Cystine crystals accumulate along the GI tract, which may result in cellular inflammation and GI sequelae²⁻⁴
- ◆ Cystine crystals may not be fully depleted in gastric and intestinal mucosa with cystine-depleting therapy⁴
- ◆ Almost all patients with cystinosis experience GI symptoms and/or adverse treatment effects, including those who are adherent to cystine-depleting therapy^{1-3,6,7}
 - Common symptoms include nausea, vomiting, abdominal pain, acid reflux, anorexia, and dysphagia and can contribute to suboptimal nutrition and growth, reduced treatment adherence/outcomes, and school/work absenteeism^{1,2,6}



Cystine crystals (arrows) are visible inside interstitial macrophages in gastric mucosa (toluidine blue).^{5*}

Cystine accumulation and medicine side effects have overlapping GI consequences^{2,6}

	Cystine accumulation ^{1,2,6,7}	Cystine-depleting therapy ^{2,6-8}	Immunosuppressants ⁹	Supplements/other medicines ^{6,10,11,†}
Halitosis		◆		
Dysphagia	◆			
Nausea/vomiting	◆	◆	◆	◆
Anorexia/poor appetite	◆	◆	◆	
Early satiety	◆			
Delayed gastric emptying		◆	◆	
GERD/esophagitis		◆	◆	◆
Ulceration		◆	◆	◆
Intestinal bleeding		◆	◆	◆
Abdominal pain/distension		◆	◆	◆
Dysmotility‡	◆	◆	◆	◆
Diarrhea		◆	◆	◆
Hepatomegaly	◆			
Portal hypertension	◆			
Splenomegaly	◆			

*Figure adapted from Elmonem MA, Veys KRP, Prencipe G. Nephropathic cystinosis: pathogenic roles of inflammation and potential for new therapies. *Cells*. 2022;11(2):190. CC BY 4.0. <https://creativecommons.org/licenses/by/4.0/>. †Such as citrate, bicarbonate, phosphate, vitamin D, and NSAIDs. ‡Including pseudo-obstruction/obstruction and constipation.

GERD, gastroesophageal reflux disease; GI, gastrointestinal; NSAID, nonsteroidal anti-inflammatory drug.

Considerations for GI symptom management in patients with cystinosis



Monitor GI symptoms frequently^{1,6}

- ◆ **Consider enteral tube placement** in patients with poor appetite and/or frequent vomiting^{12,13}
- ◆ **Monitor for dysphagia** by patient report and swallowing studies every 2 years if indicated^{11,12}
- ◆ **Consider PPIs, H2RAs, and/or antinausea medicines** as indicated^{12,13}
- ◆ **Consider referral to GI specialists and/or dietitians** as appropriate¹¹
- ◆ **Assess liver function** annually, unless new symptoms emerge¹¹
- ◆ **Monitor cystine control** and cystine-depleting therapy adherence with regular WBC cystine level testing¹¹⁻¹³

Assess patients regularly for the following GI complications to determine if further evaluation by a gastroenterologist or hepatologist is warranted^{1,11}



UPPER GI TRACT^{1-3,6-8}

- Dysphagia
- Nausea/vomiting
- Anorexia and/or early satiety
- Abdominal/gastric pain
- GERD
- GI ulceration and/or bleeding
- Gastroparesis
- Feeding tube concerns



LIVER^{1,7,11}

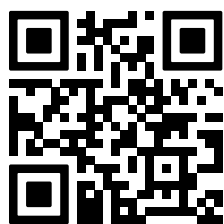
- Abnormal liver function test results
- Hepatomegaly
- Splenomegaly
- Portal hypertension



LOWER GI TRACT^{2,6,7,14,15}

- Bloating/abdominal distension
- Intestinal dysmotility/altered peristalsis
- Diarrhea
- Constipation
- Bowel obstruction/pseudo-obstruction
- Irritable bowel syndrome
- Inflammatory bowel disease

Clinician resources are available



Contact Amgen

to schedule a **peer-to-peer** educational program with a cystinosis expert

Visit

UnderstandingCystinosis.com
for more information
and resources

H2RA, H2 receptor antagonist; PPI, proton pump inhibitor; WBC, white blood cell.

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