Effects of food additive guar gum on colonic inflammation in murine models of inflammatory bowel disease

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High fiber intake may not be beneficial in all aspects

- Dietary fiber rich foods consumption has been regarded as beneficial for human health. However, this notion might not be true for everyone.

- A subset of IBD patients develop intestinal side effects to dietary soluble fibers with similar doses consumed by healthy subjects.
Guar gum

- Soluble dietary fiber used as thickener, stabilizer in different food items
- Also used in pharmaceuticals, papers, textiles, oil drilling and cosmetics
- It has been approved by European Food safety authority (EFSA) and Food and Drug Administration (FDA) to include safely in food

References
Research aims

Assess the effect of guar gum on the experimental inflammatory bowel disease (IBD)

Experimental IBD models

1) IL-10 receptor neutralization-induced colitis
2) DSS-induced colitis
3) *Citrobacter rodentium*-induced colitis
Experimental design

Control diet
- Cellulose diet (CCD)

Test diet
- Guar gum diet (GuD)

Wild-type (WT, C57BL/6) mice
- 21 days post infection
- DSS intervention for 7 days
- Anti-IL10R injections
- 4 weekly inj
- Colitis

Colitis
- Citrobacter rodentium: $2 \times 10^9$ CFU

Dextran sulfate sodium salt (DSS, 1.4%)
Guar gum lowered the levels of colonic inflammation markers in healthy mice

**CCD:** Cellulose containing diet; number of mice per group 10 (n=10)

**GuD:** Guar gum containing diet; number of mice per group 10 (n=9)
Guar gum showed detrimental effect on DSS-induced colitis

DSS: Dextran sulfate sodium (1.4% w/v)
Guar gum aggravated colonic inflammation in IL-10 receptor neutralization model

A

Gross colon

B

Spleen wt. [%]

C

Fecal Lcn2 [ng/g feces]

D

Serum Lcn2 [ng/mL]

αIL-10R mAb

CD 0.0

0.1

0.2

0.3

0.4

0.5 *

0.0

200

400

600

800

1000

200

400

600

800

1000

*
E

H&E stained colonic sections

CCD

GuD

αIL-10R mAb
Guar gum increased colonic IL-1β in both acute and chronic colitis model

**DSS-induced colitis model**

**Colonic IL-1β [ng/mL]**

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**IL-10R-induced colitis model**

**Colonic IL-1β [ng/mL]**

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**CR** fecal shedding and internal organ dissemination were comparable between control and guar gum fed mice

**Fecal shedding**

**Dissemination to internal organs**

**CR**: *Citrobacter rodentium* (2 × 10^9 CFU)

dpi: days post infection
Guar gum failed to protect against CR-induced colonic inflammation in mice

A

Spleen wt [%]

B

H&E stained colonic sections

C

Serum Lcn2 [μg/mL]

CR infection
Summary

• Guar gum showed detrimental effect colonic inflammation in both DSS and IL-R receptor models

• Guar gum failed to protect against CR-induced colonic inflammation
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