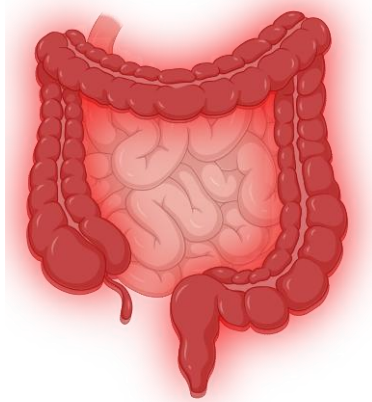


Metal-Organic Framework for Oral Antibody Delivery in Inflammatory Bowel Disease Treatment

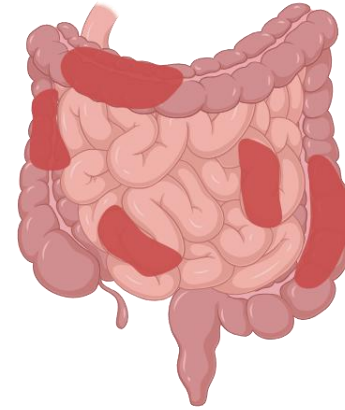
Cheng Chen

Université catholique de Louvain

Supervisors: Prof. Ana Beloqui (Uclouvain)
Prof. Yining Xu (Sichuan Univ.)



Ulcerative Colitis



Chron's disease



Chronic and relapsing inflammation

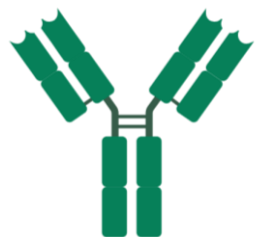


Abdominal pain, diarrhea, rectal bleeding, fatigue

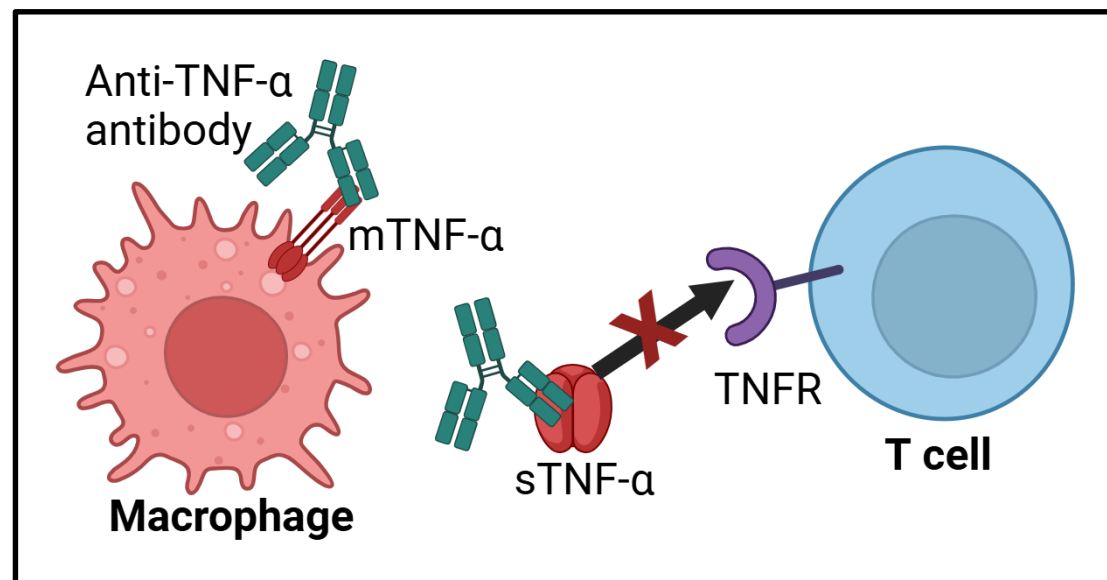
7 million people suffering from IBD

No cure, lifelong treatment burden

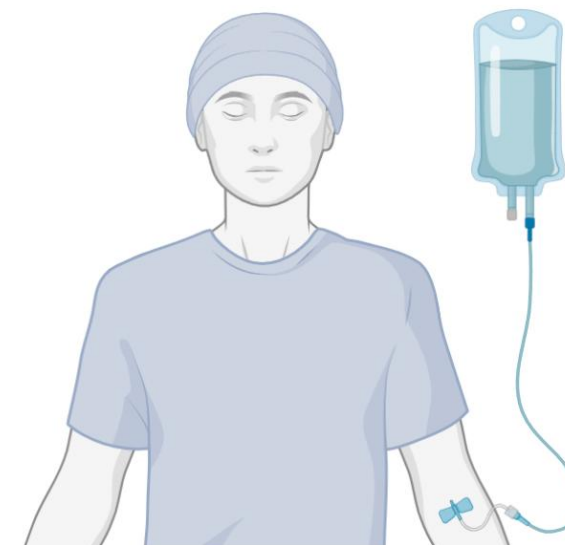
Alatab, Sudabeh, et al. The Lancet gastroenterology & hepatology 5.1 (2020): 17-30.



**Monoclonal antibodies
mAbs**



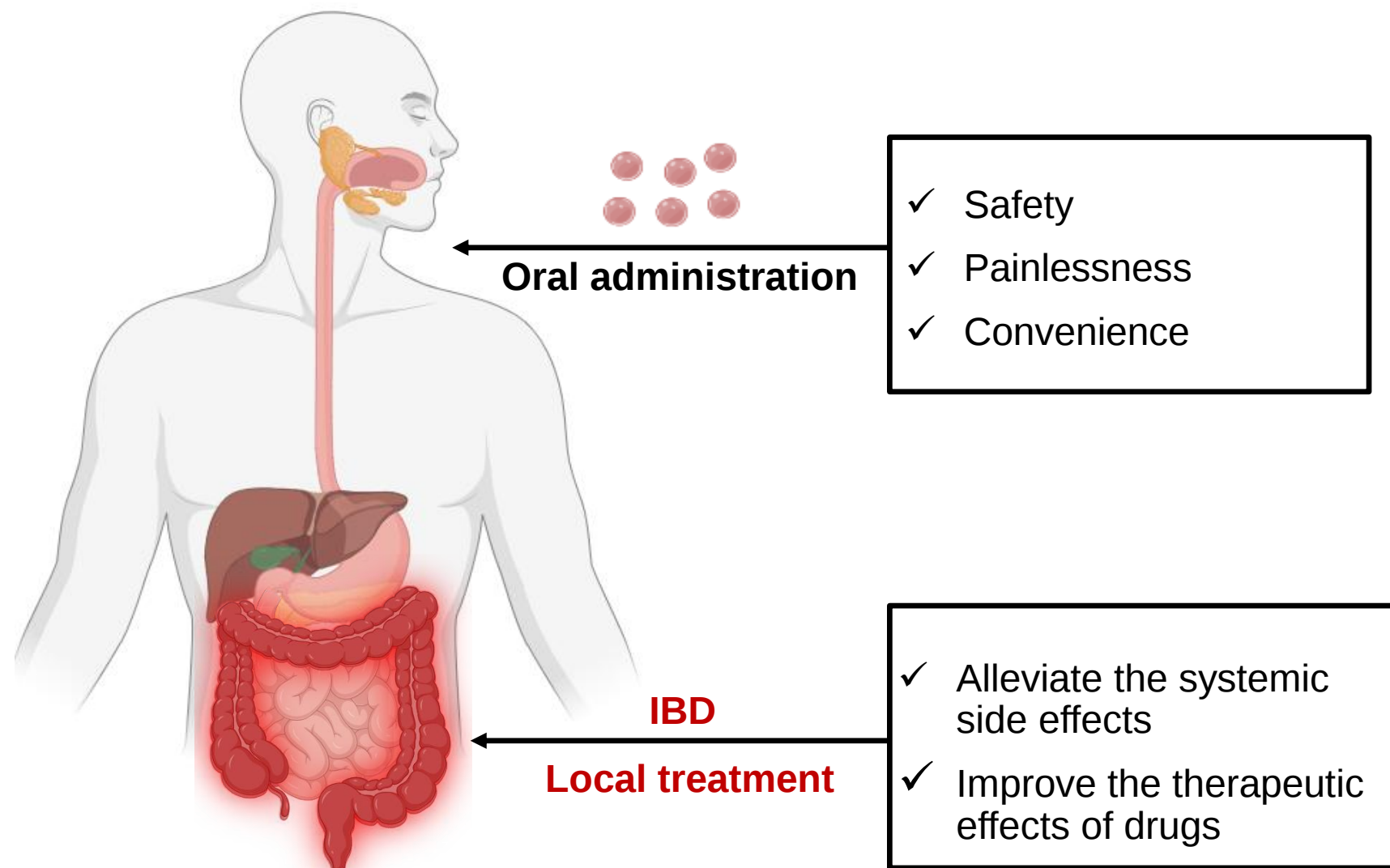
Anti-TNF- α antibody



☹ Patient burden
Reduced compliance
Systemic side effects

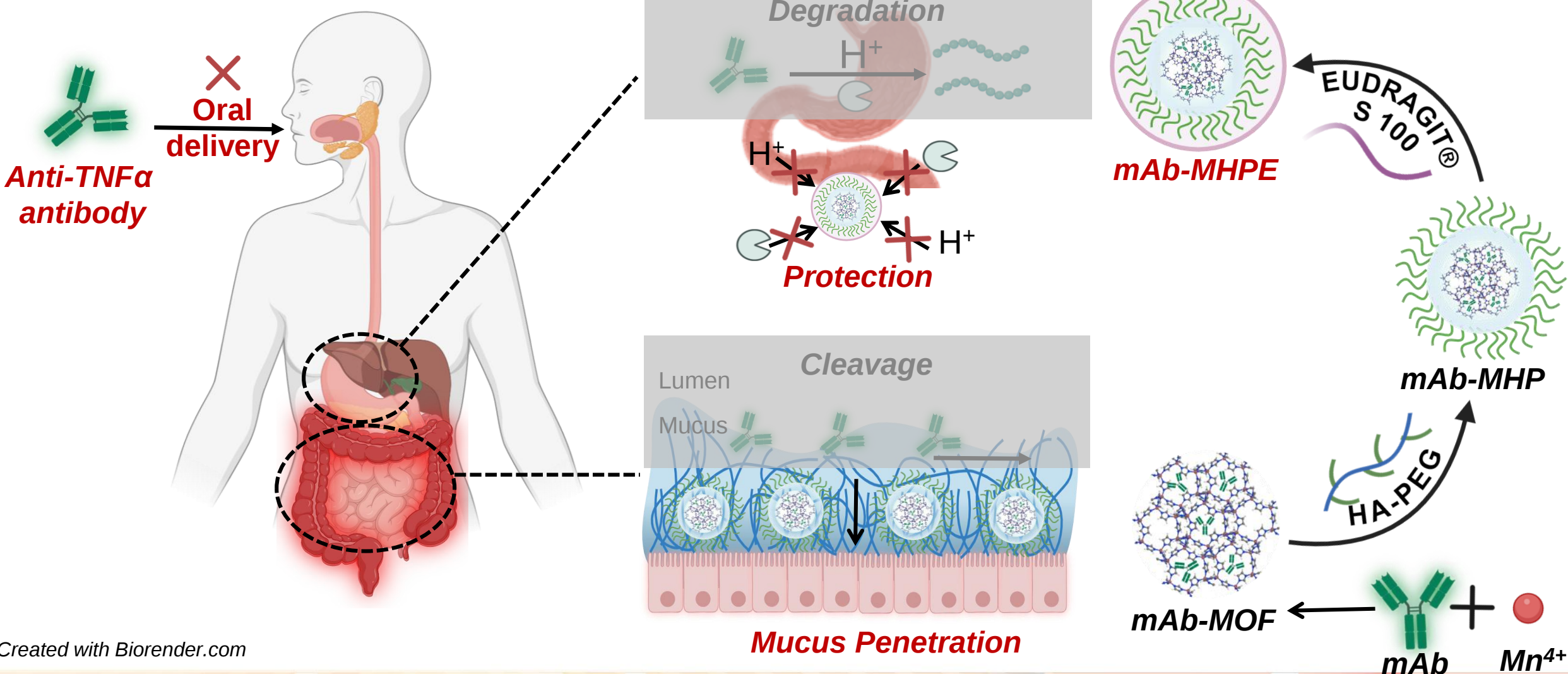
X ***Invasive injections***

Zhang, Wunan, et al, *Frontiers in Bioengineering and Biotechnology* 9 (2021): 675194.



Lee, Yonghyun, et al. *Advanced drug delivery reviews* 179 (2021): 114021.

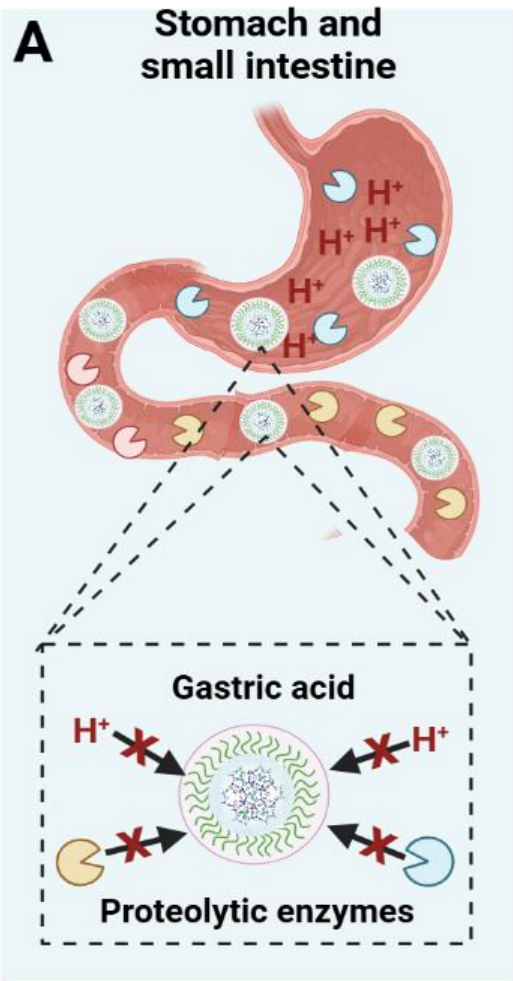
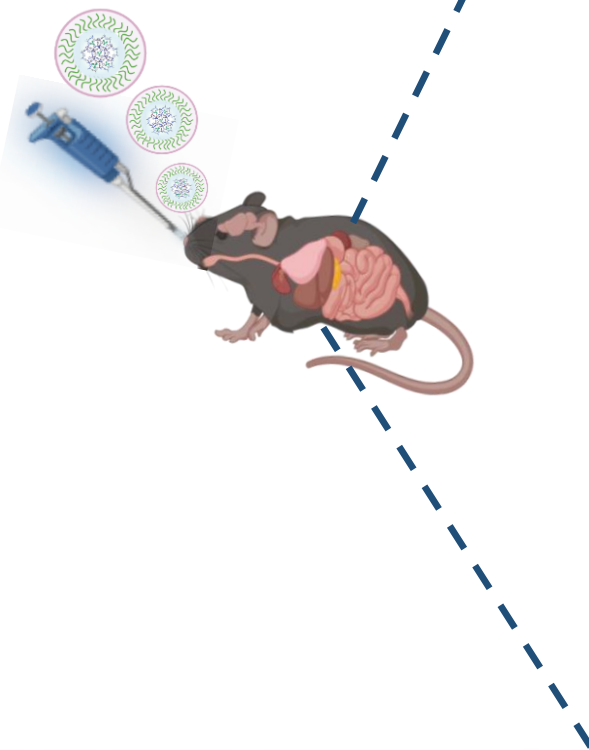
Challenges of oral mAb delivery



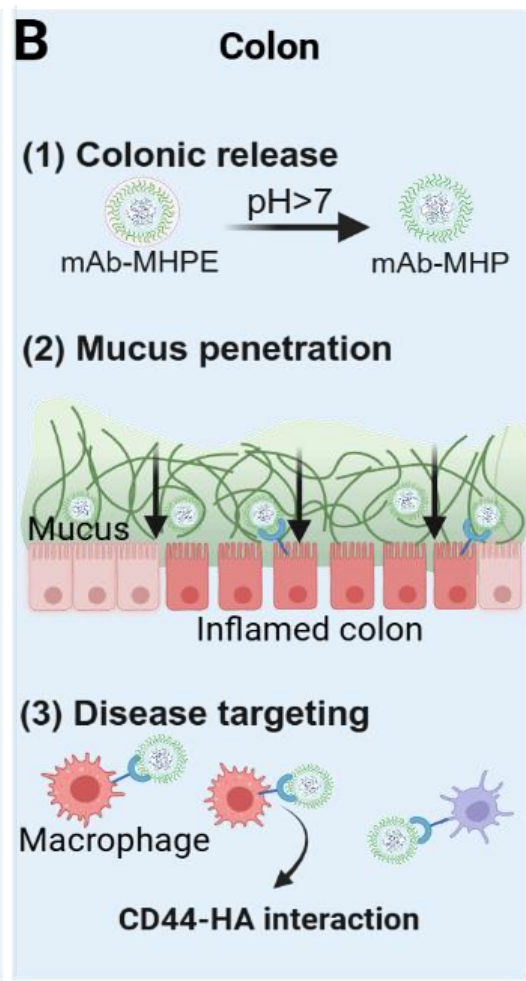
Created with Biorender.com

Hypothesis of oral mAb-MHPE for IBD treatment

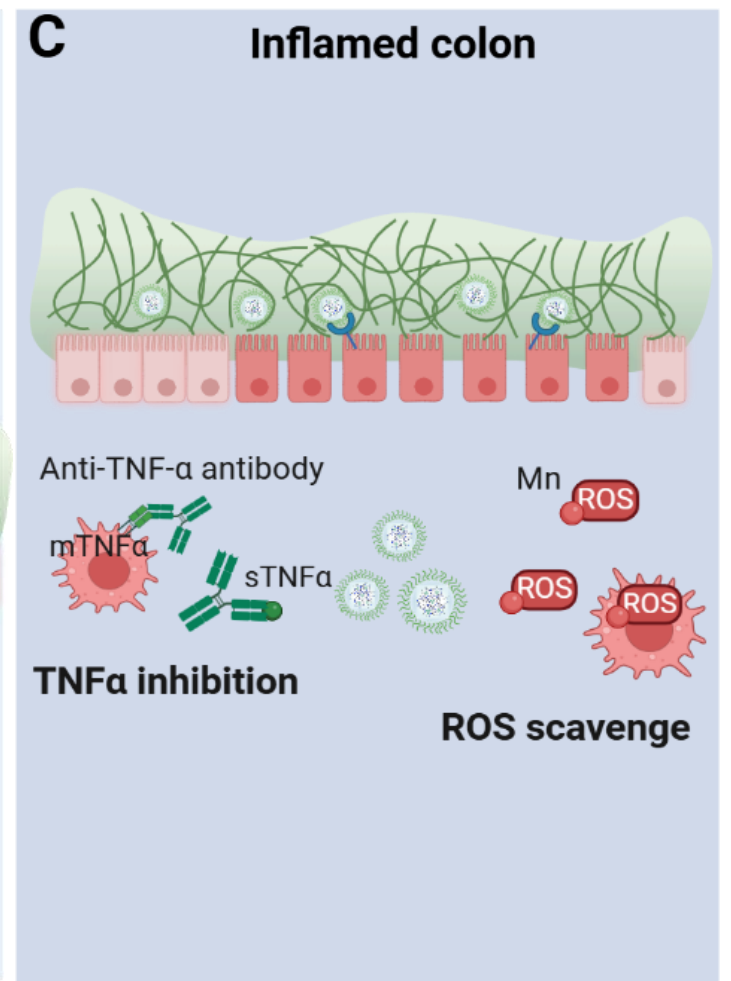
mAb-MHPE



1. Protection against gastric acid and enzyme



2. Mucus penetration and disease targeting



3. Enhanced anti-inflammatory efficacy against IBD

Characterization of colon targeting mAb-MHPE

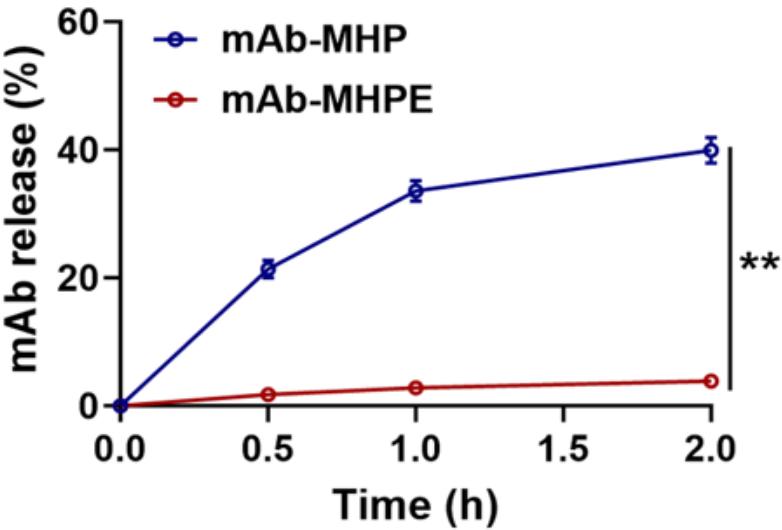


Formulation	Size (nm)	PDI	Zeta potential (mV)	Encapsulation efficiency (%)
mAb-MHP	180.5 ± 14.7	0.20 ± 0.05	-16.69 ± 1.10	96.97 ± 2.38
mAb-MHPE	243.4 ± 13.8	0.13 ± 0.08	-22.79 ± 2.18	99.69 ± 0.11

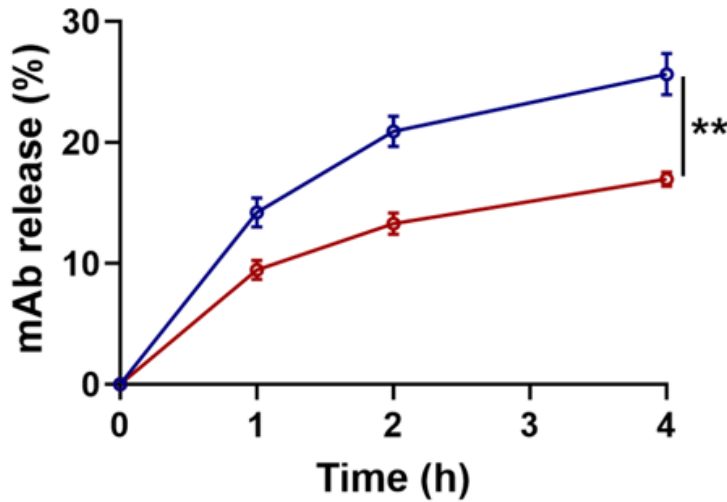
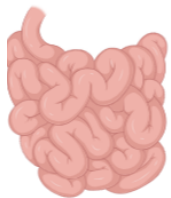
Data: mean ± SEM; n = 9.

Release of mAb-MHPE in biomimetic GI fluids

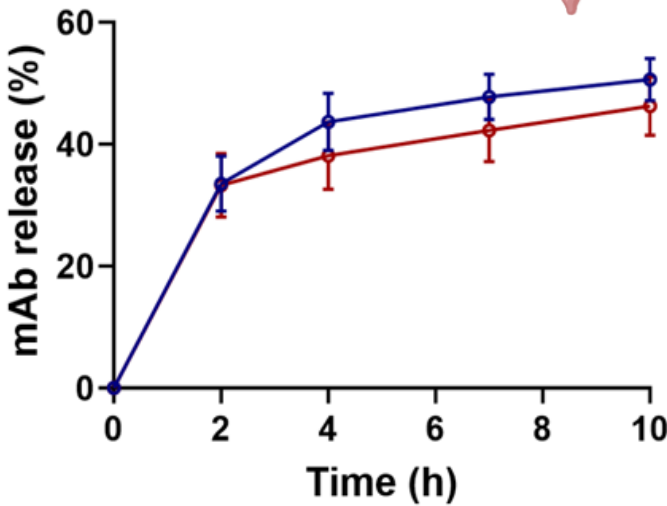
FaSSGF



FaSSIF



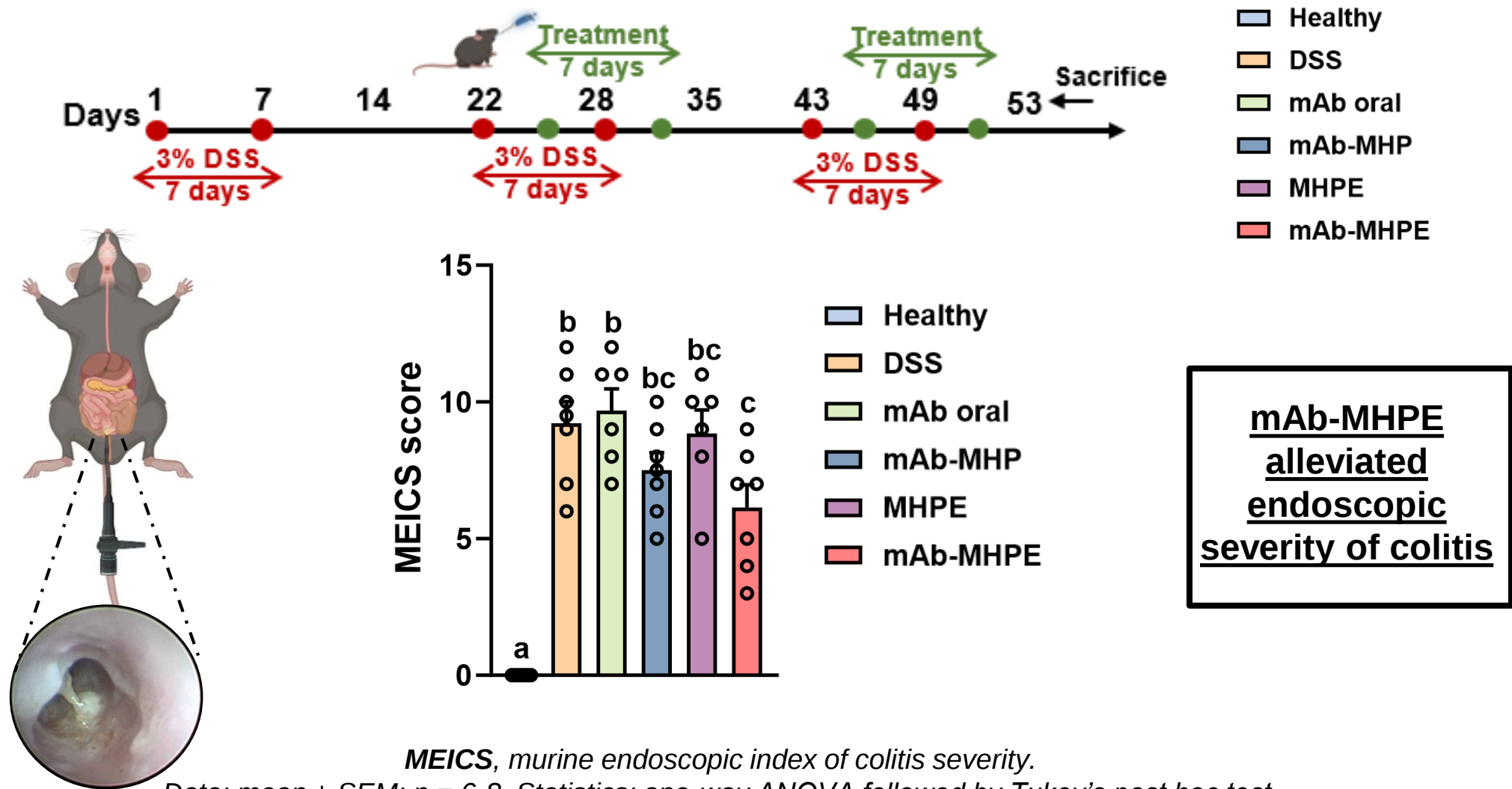
FaSSCF



Successful development of colon targeting mAb-MHPE

FaSSGF: fasted stated simulated gastric fluid; FaSSIF: fasted stated simulated intestinal fluid; FaSSCF: fasted stated simulated colonic fluid.
Data: mean $\pm$ SEM; n = 9. Statistics: two-way ANOVA followed by Tukey's post hoc test.

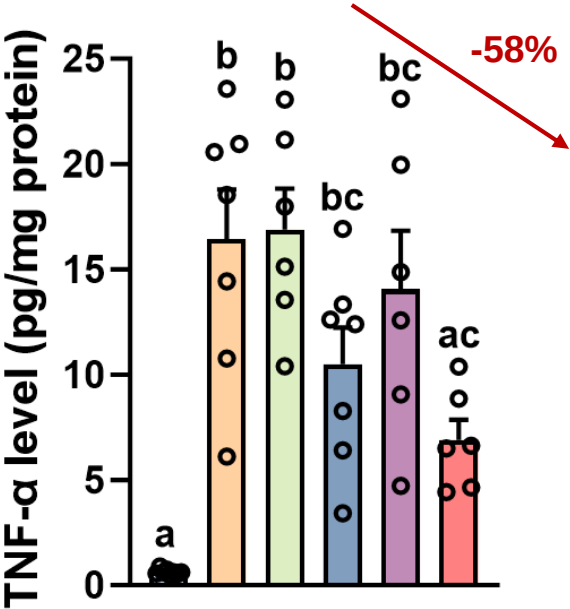
In vivo efficacy of mAb-MHPE in a chronic colitis mouse model



mAb-MHPE in vivo efficacy – Colon Proinflammatory cytokines



- Healthy
- DSS
- mAb oral
- mAb-MHP
- MHPE
- mAb-MHPE



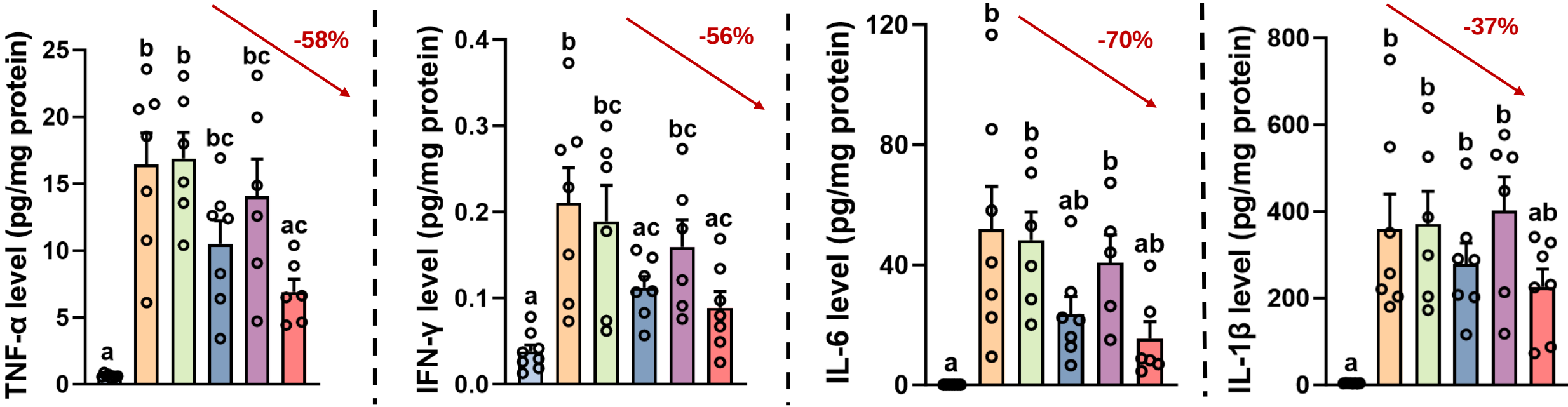
mAb-MHPE treatment
decreased TNF-α level in colon

Black arrows represented the reduction of mAb-MHPE group with respect to the DSS group.
Data: mean ± SEM; n = 6-8. Statistics: one-way ANOVA followed by Tukey's post hoc test.

mAb-MHPE in vivo efficacy – Colon proinflammatory cytokines



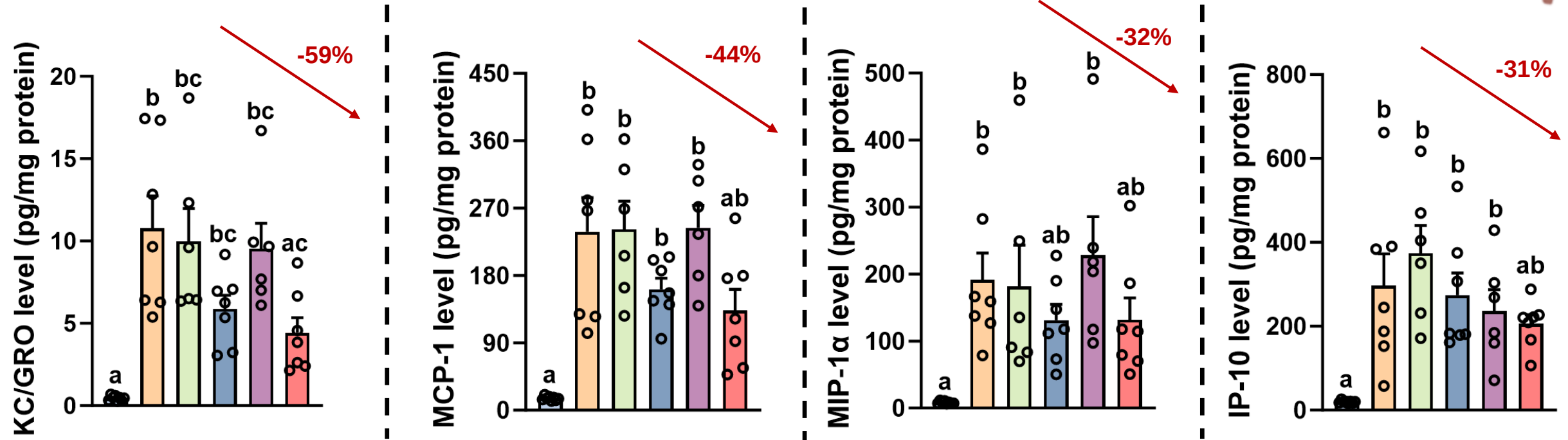
- Healthy
- DSS
- mAb oral
- mAb-MHP
- MHPE
- mAb-MHPE



Red arrows represented the reduction of mAb-MHPE group with respect to the DSS group.
Data: mean ± SEM; n = 6-8. Statistics: one-way ANOVA followed by Tukey's post hoc test.

mAb-MHPE in vivo efficacy – Colon proinflammatory chemokines

Healthy mAb-MHP
DSS MHPE
mAb oral mAb-MHPE



Red arrows represented the reduction of mAb-MHPE group with respect to the DSS group.
Data: mean $\pm$ SEM; n = 6-8. Statistics: one-way ANOVA followed by Tukey's post hoc test.

Conclusion



- **Successful development of colon-targeting anti-TNF-α-antibody loaded mAb-MHPE.**
- **It showed anti-inflammatory efficacy in the chronic colitis murine model.**
- **Oral free mAb administration barely had therapeutic efficacy.**
- **It proves that mAb-MHPE system is a promising platform for oral antibody delivery.**

Thank you!

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