Abstract.

BACKGROUND AND AIMS: Bacterial swarming, a collective movement on a surface, has rarely been associated with hu- man pathophysiology. This study aims to define a role for bacterial swarmers in amelioration of intestinal stress.

METHODS: We developed a polymicrobial plate agar assay to detect swarming and screened mice and humans with intes- tinal stress and inflammation. From chemically induced colitis in mice, as well as humans with inflammatory bowel disease, we developed techniques to isolate the dominant swarmers. We developed swarm-deficient but growth and swim- competent mutant bacteria as isogenic controls. We per- formed bacterial reinoculation studies in mice with colitis, fecal 16S, and meta-transcriptomic analyses, as well as in vitro microbial interaction studies.

RESULTS: We show that bacte- rial swarmers are highly predictive of intestinal stress in mice and humans. We isolated a novel Enterobacter swarming strain, SM3, from mouse feces. SM3 and other known commensal swarmers, in contrast to their mutant strains, abrogated in- testinal inflammation in mice. Treatment of colitic mice with SM3, but not its mutants, enriched beneficial fecal anaerobes belonging to the family of Bacteroidales S24-7. We observed SM3 swarming associated pathways in the in vivo fecal meta-transcriptomes. In vitro growth of S24-7 was enriched in presence of SM3 or its mutants; however, because SM3, but not mutants, induced S24-7 in vivo, we concluded that swarming plays an essential role in disseminating SM3 in vivo.

CONCLUSIONS: Overall, our work identified a new but coun- terintuitive paradigm in which intestinal stress allows for the emergence of swarming bacteria; however, these bacteria act to heal intestinal inflammation.