# Press Release

## How *E. coli* passes safely through stomach acid

**Tübingen researchers investigate infection mechanisms used by bacteria causing severe diarrhea**

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In some parts of the world, many small children become infected with severe diarrhea which often proves fatal. The condition is usually caused by strains of *Escherichia coli* (commonly known as *E. coli*) bacteria, and bacteria of the genus *Yersinia*. These bacteria attach themselves to the wall of the small intestine and use a needle-like apparatus to inject toxins into the tissue. Yet these bacteria usually enter the human body via the mouth – and you would expect them to be killed off by the strong acid in the stomach, which provides a barrier against infection.

Members of the collaborative research center “The Bacterial Cell Envelope” at the University of Tübingen including researchers from the Tübingen University Hospitals as well as Jack C. Leo and Professor Dirk Linke of the Max Planck Institute for Developmental Biology investigated this phenomenon and discovered how these bacteria can protect themselves from acid and mechanical stress as they pass through the stomach. The results were published in the latest issue of *Molecular Microbiology*.

*E. coli* and *Yersinia* bacteria attack cells in the small intestine which absorb nutrients. They use adhesins such as intimin (a protein; the name comes from “intimate adherence”) to stick to intestinal epithelial cells and to subsequently form tiny channels between the bacteria and the intestinal cells. In this way they are able to introduce diarrhea-causing toxins into the intestine.

The intimin is inserted into the bacterial cell envelope, where it binds with the bacteria´s stabilizing structure, peptidoglycan, a mesh-like molecule consisting of sugars and amino acids. "But the binding of intimin with peptidoglycan only works under acid conditions,” says Dirk Linke. “We assume that this mechanism protects against acidic and mechanical stress and that *E. coli* bacteria can pass through the stomach unharmed.” Intimin therefore supports the infection process by bacteria which would otherwise have difficulty reaching the small intestine. The researchers suspect that intimin boosts the bacteria’s virulence.

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**Publication:**

Jack C. Leo, Philipp Oberhettinger, Manish Chaubey, Monika Schütz, Daniel Kühner, Ute Bertsche, Heinz Schwarz, Friedrich Götz, Ingo B. Autenrieth, Murray Coles, Dirk Linke: The Intimin periplasmic domain mediates dimerisation and binding to peptidoglycan. *Molecular Microbiology*, DOI 10.1111/mmi.12840

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Our core research areas include: integrative neuroscience, clinical imaging, translational immunology and cancer research, microbiology and infection research, biochemistry and pharmaceuticals research, the molecular biology of plants, geo-environment research, astro- and elementary particle physics, quantum physics and nanotechnology, archeology and prehistory, history, religion and culture, language and cognition, media and education research.

The excellence of our research provides optimal conditions for students and academics from all over the world. 28,500 students are currently enrolled at the University of Tübingen. As a comprehensive research University, we offer more than 280 subjects. Our courses combine teaching and research, promoting a deeper understanding of the material while encouraging students to share their own knowledge and ideas. This philosophy gives Tübingen students strength and confidence in their fields and a solid foundation for interdisciplinary research.

**The Max Planck Institute for Developmental Biology**

The Max Planck Institute for Developmental Biology conducts basic research in the fields of biochemistry, genetics and evolutionary biology. It employs about 350 people and is located at the Max Planck Campus in Tübingen. The Max Planck Institute for Developmental Biology is one of 80 research institutes that the Max Planck Society for the Advancement of Science maintains in Germany.