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Initiating and monitoring natural infection of mice by bioluminescent *Citrobacter rodentium*

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Keywords: biophotonic imaging, BPI, BLI, bioluminescence, oral gavage, in vivo, mouse, mouse infection, CFU, luminometry, faecal-oral, fecal-oral, ICC180, bioluminescent strain of the mouse enteropathogen *Citrobacter rodentium*, bioluminescent *Citrobacter rodentium*, *Citrobacter rodentium* through the host gastrointestinal tract, mouse enteropathogen *Citrobacter rodentium*, *Citrobacter rodentium*, natural infection of mice, monitoring natural infection, infected mice, enteropathogenic *Escherichia coli*, bacterial state after passage, experimental infection, establishing infection, laboratory mice, infection dynamic, bacterial state, infection by natural transmission, cellular microbiology, bacteria, uninfected animal, grown bacteria, infectious than laboratory, bioluminescent strain, microbe, using biophotonic imaging, negative bacterium, biophotonic imaging, mice, infectivity, infectivity of host, bioluminescent derivative, host gastrointestinal tract, vivo effect

Abstract

Citrobacter rodentium is a Gram-negative bacterium that infects laboratory mice in a similar way to how enteropathogenic *Escherichia coli* (EPEC) and enterohaemorrhagic *E. coli* (EHEC) infect humans. We routinely use a bioluminescent derivative of *C. rodentium* called ICC180 so that we can monitor infection dynamics non-invasively using biophotonic imaging.

Experimental infection is typically initiated via oral gavage but we have previously shown that *C. rodentium* rapidly spreads between infected and uninfected animals and that bacteria shed from infected mice are 1000 times more infectious than laboratory-grown bacteria with a different tissue tropism.^{1,2}

In this collection of protocols, we describe the different methods for establishing infection by natural transmission and how to monitor infection dynamics using biophotonic imaging, viable counts, and luminometry.³

1. Wiles, S., Dougan, G., & Frankel, G. (2005). Emergence of a 'hyperinfectious' bacterial state after passage of *Citrobacter rodentium* through the host gastrointestinal tract. *Cellular microbiology*, 7(8), 1163–1172.
<https://doi.org/10.1111/j.1462-5822.2005.00544.x>
2. Bishop, A. L., Wiles, S., Dougan, G., & Frankel, G. (2007). Cell attachment properties and infectivity of host-adapted and environmentally adapted *Citrobacter rodentium*. *Microbes and infection*, 9(11), 1316–1324.
<https://doi.org/10.1016/j.micinf.2007.06.006>
3. Read, H. M., Mills, G., Johnson, S., Tsai, P., Dalton, J., Barquist, L., Print, C. G., Patrick, W. M., & Wiles, S. (2016). The in vitro and in vivo effects of constitutive light expression on a bioluminescent strain of the mouse enteropathogen *Citrobacter rodentium*. *PeerJ*, 4, e2130. <https://doi.org/10.7717/peerj.2130>

Troubleshooting

Files

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Protocol

NAME

↗ Infection of mice with Citrobacter rodentium ICC180 by natural transmission

VERSION 1

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Monitoring Citrobacter rodentium infection dynamics in vivo using biophotonic imaging

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Monitoring of Citrobacter rodentium shed from infected mice using luminometry and viable counts

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