# In vivo imaging of mice colon wall using dedicated endorectal coils

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**Introduction**: the overall purpose of this project is to develop and optimize endorectal coils (EC) to assess more precisely the colon wall on a mouse model of colitis(1). Indeed, imaging the colon wall requires a high spatial resolution and SNR(2) to improve the therapeutics responses(3).

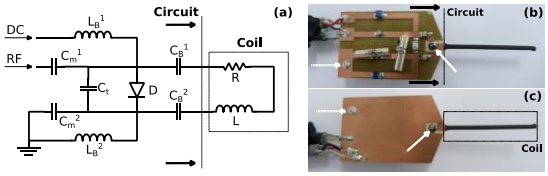


Figure 1 – Electronic scheme (a) and pictures (b and c) of the EC.

**Materials and methods**: an endorectal coil (EC) was designed and built with dimension sized for the mouse colon-rectum anatomy (figure 1). The circuit was mechanically carved on both side of a FR4 epoxy substrate and non-magnetic components were used for 50 Ohm matching and tuning (trimmer capacitors) at 200 MHz resonance frequency. The prototype incorporates a PIN diode to actively decouple the coil during the RF transmission. The prototype was first characterized on two phantoms containing a solution of 1.25g/L NiSO4 and 5g/L of NaCl; one filled with optical fibers of various diameters and one without. Coil SNR profiles were calculated and compared with a 32 mm inner diameter quadrature volume birdcage coil (QVBC). Finally, in-vivo imaging was performed on healthy mouse using the EC. The rectum and colon were investigated using T1-weighted FLASH and T2-weighted RARE sequences.

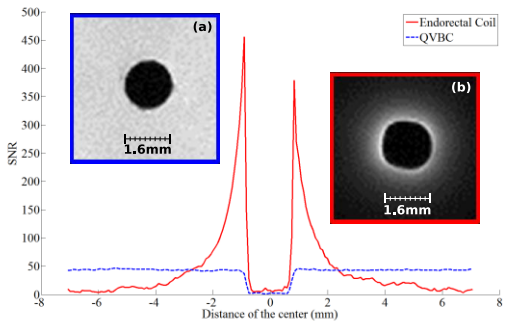


Figure 2 – SNR profiles of the EC (blue) and QVBC (red) obtain on the phantom containing only the solution.

**Results**: It is possible to designed very small coils for in vivo imaging of mouse rectum and colon. The SNR of EC is 10 times greater than the one obtained with a dedicated QVBC (up to 3mm from the EC center – figure 2). Then, using the phantom containing optical fibers gives information of the structure potentially detectable (~100µm) in the EC FOV. Finally, in vivo this gain in SNR can be used to increase the spatial resolution up to 39µm in-plane pixel size. When colon wall layers cannot be distinguish with QVBC, the improved spatial resolution using the EC allows evaluating colon wall layers and thickness (white arrows on figure 3).

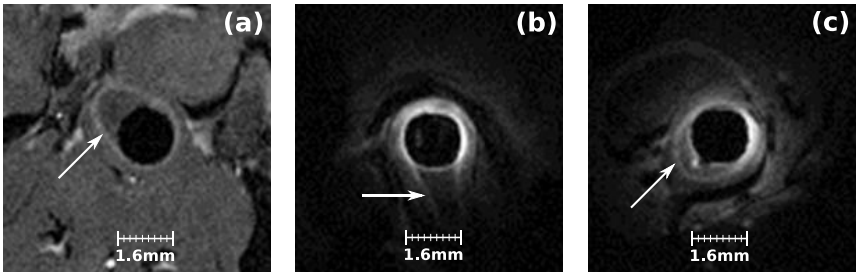


Figure 3 – In vivo imaging of the mouse colon wall; (a) image obtained with the QVBC, (b) and (c) are obtained with the EC. White arrows locate the wall.

**Conclusion**: ECs provide a better SNR up to 3mm from the center of the coil compared with a QVBC and can be very useful in the diagnosis and staging of colorectal cancer.

**References**: **1.** Tanaka et al. Cancer Science. 2003 **2.** Inui K, et al. Endoscopy. 1995 **3.** Beaumont C, et al. Curr Probl Diagn Radiol. 2013

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