Laboratory diagnosis of human ciliate protozoan parasites: *Balantidium coli* and beyond

**Keywords**
balantidiasis; extra-intestinal infections

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I read with interest an article recently published in the *Journal of Medical Microbiology Case Reports* describing a rare case of urinary tract infection due to *Balantidium coli* in a female patient from Iran (Soleimanpour et al., 2016). I agree with the authors that balantidiasis is considered a neglected disease and that extra-intestinal infections, in particular, are uncommon in humans despite the high prevalence of *B. coli* in tropical and subtropical areas (Schuster & Ramirez-Avila, 2008). Recently, more extra-intestinal cases of ‘balantidiasis’, mainly in the urinary tract, have been reported in the medical literature (Bandyopadhyay et al., 2013; Karuna & Khadanga, 2014; Khanduri et al., 2014), perhaps reflecting the role of ciliate protozoan parasites in immunocompromised hosts. One very important missing feature in almost all published cases is molecular confirmation of *B. coli*. Identifications were solely based on the morphological characteristics of ciliate trophozoites seen in direct microscopic examination of urine samples (Bandyopadhyay et al., 2013; Karuna & Khadanga, 2014; Khanduri et al., 2014).

Microscopic images provided in the published report (Soleimanpour et al., 2016) demonstrate a high similarity to *Balantidium* species. However, careful examination of Fig. 1 in the report also provides another vital piece of information on the structure of observed trophozoites: length of cilia. Although lack of a scale bar makes precise measurement impossible, the elongated and profound cilia with uneven distribution captured in Fig. 1 (Soleimanpour et al., 2016) are in sharp contrast to the classic ‘short’ and ‘fine’ cilia ‘covering the entire body’ of *Balantidium* spp. (Garcia, 2007) and those clearly depicted in the *Atlas of Human Parasitology* (Ash & Orihel, 2007). Notably, due to the delicate nature of cilia in *B. coli*, they can even be missed on light microscopic examination and techniques such as phase-contrast may be required to enhance their visualization. Moreover, from a taxonomy point of view, the nomenclature ‘*Balantiothecia coli*’ is neither formally approved nor commonly applied by parasitologists and hence should be avoided to prevent further confusion.

More importantly, a different ciliate soil protozoan with a wide distribution in nature, namely *Colpoda* species, has previously been observed in human urinary samples (Costache et al., 2011). In the absence of DNA-based confirmatory methods, morphological similarities between *Balantidium* and *Colpoda*, in addition to their characteristic motility, make their accurate identification troublesome. Recently, an extensive evaluation of genetic diversity in *B. coli* based on the polymorphism of small subunit rDNA sequences confirmed the diversity of cyst-forming ciliates among non-human primates. The presence of novel *Buxtonella*-like ciliates in primates raises the question about the possible occurrence of these pathogens in humans and highlights the need for the application of broad molecular-based diagnostics for ciliate infections in man (Pomajbíková et al., 2013).

Currently, very few *Balantidium* sequences are available in GenBank and most represent the small subunit rDNA or internal transcribed spacer regions of *B. coli* (Verweij & Stensvold, 2014). The application of general, broad-specificity primers targeting non-human eukaryotic small subunit rDNA may be of significant utility in efforts to correctly identify ciliate protozoa detected in human and animal clinical samples. This, in turn, will provide a better understanding of the epidemiology, pathophysiology and genetic diversity of these micro-organisms.

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DOI 10.1099/jmmcr.0.005028
http://jmmcr.microbiologyresearch.org