Divergent nuclear 18S rDNA paralogs in a turkey coccidium, Eimeria meleagrimitis, complicate molecular systematics and identification

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Abstract:

a b s t r a c t Multiple 18S rDNA sequences were obtained from two single-oocyst-derived lines of each of Eimeria meleagrimitis and Eimeria adenoeides. After analysing the 15 new 18S rDNA sequences from two lines of E. meleagrimitis and 17 new sequences from two lines of E. adenoeides, there were clear indications that divergent, paralogous 18S rDNA copies existed within the nuclear genome of E. meleagrimitis. In contrast, mitochondrial cytochrome c oxidase subunit I (COI) partial sequences from all lines of a particular Eimeria sp. were identical and, in phylogenetic analyses, COI sequences clustered unambiguously in monophyletic and highly-supported clades specific to individual Eimeria sp. Phylogenetic analysis of the new 18S rDNA sequences from E. meleagrimitis showed that they formed two distinct clades: Type A with four new sequences; and Type B with nine new sequences; both Types A and B sequences were obtained from each of the single-oocyst-derived lines of E. meleagrimitis. Together these rDNA types formed a wellsupported E. meleagrimitis clade. Types A and B 18S rDNA sequences from E. meleagrimitis had a mean sequence identity of only 97.4% whereas mean sequence identity within types was 99.1–99.3%. The observed intraspecific sequence divergence among E. meleagrimitis 18S rDNA sequence types was even higher (approximately 2.6%) than the interspecific sequence divergence present between some wellrecognized species such as Eimeria tenella and Eimeria necatrix (1.1%). Our observations suggest that, unlike COI sequences, 18S rDNA sequences are not reliable molecular markers to be used alone for species identification with coccidia, although 18S rDNA sequences have clear utility for phylogenetic reconstruction of apicomplexan parasites at the genus and higher taxonomic ranks.

Keywords:

Coccidiosis Eimeria meleagrimitis turkey Ribosomal DNA 18S rDNA Cytochrome c oxidase subunit I (COI) DNA barcoding Molecular taxonomy Gene duplication Diagnostics Phylogeny

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