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N6-methyladenosine (m6A) is a kind of widespread and abundant RNA modification in eukaryotes. *Nosema ceranae* exclusively infects adult bees and results in nosemosis, giving rise to severe losses for apicultural industry. In this work, *N. ceranae* methyltransferase-like protein 5 encoding gene NcMettl5, with an expected size of 600 bp, was for the first time cloned. The molecular weight of NcMettl5 was approximately 22.64 kDa, with the molecular formula of C1039H1645N269O284S6, theoretical isoelectric point of 9.37, the fat-soluble coefficient of 98.98, the unstable coefficient of 13.96, and the average hydrophilic coefficient of -0.230. There were 20 phosphorylation sites, a superfamily structural domain (AdoMet_MTases superfamily), and seven same conserved motifs included in NcMettl5, but no transmembrane domain and signal peptide were detected. NcMettl5 was simultaneously located in cytoskeleton, cyto_nucl, nucleus, mitochondria and peroxisome. The Mettl5 had high sequence identity and close evolutionary distance among *Nosema ceranae*, *Nosema bombycis* CQ1 and *Nosema granulosis*. The expression of NcMettl5 in the *Nosema ceranae* infection of *Apis mellifera ligustica* workers' midguts was down-regulated ($P>0.05$) at 2 days post inoculation (dpi) and 3 dpi without significant difference, while significant down-regulated ($P<0.05$) at 4 dpi, as compared with that at 1 dpi. These findings suggested that NcMettl5 may be a hydrophilic, non-transmembrane, and intracellular protein, Mettl5 in *Nosema* species are highly conservative, NcMettl5 is likely to be involved in the *Nosema ceranae* infection of *A. m. ligustica* worker.