Review Article

An Annotated Checklist of the Human and Animal Entamoeba (Amoebida: Endamoebidae) Species- A Review Article

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Abstract

Background: The number of valid of pathogen and non-pathogen species of Entamoeba has continuously increased in human and animals. This review is performed to provide an update list and some summarized information on Entamoeba species, which were identified up to the 2014.

Methods: We evaluated the Entamoeba genus with a broad systematic review of the literature, books and electronic databases until February 2014. The synonyms, hosts, pathogenicity and geographical distribution of valid species were considered and recorded. Repeated and unrelated cases were excluded.

Results: Totally 51 defined species of Entamoeba were found and arranged by the number of nuclei in mature cyst according to Levin's grouping. Seven of these species within the 4 nucleate mature cysts group and 1 species with one nucleate mature cyst are pathogen. E. histolytica, E. invadence, E. ranarum and E. anatis causes lethal infection in human, reptiles, amphibians and brides respectively, four species causes non-lethal mild dysentery. The other species were non-pathogen and are important to differential diagnosis of amoebiasis.

Conclusion: There are some unknown true species of Entamoeba that available information on the morphology, hosts, pathogenicity and distribution of them are still very limited and more considerable investigation will be needed in order to clarify the status of them.
Introduction

The family Endamoebidae was originally established by Calkins (1926). The all member of Endamoebidae family (order: Amoebida) including: Endamoeba, Entamoeba, Iodamoeba and Endolimax are obligate symbiotic forms exception a species of Entamoeba, namely E. moshkovski found in sewage as free living amoeba but occasionally hosted by man (1, 2).

The term of Entamoeba was applied by Casagrandi and Barbagallo (1895), for Entamoeba coli and Entamoeba histolytica in human that known formerly as Endamoeba coli. Entamoeba is a genus of Endamoebidae amoebas that infecting invertebrates. The genus of Entamoeba (Casagrandi & Barbagallo, 1895) has adapted to live as parasite or commensal in digestive tract of human and other mammals, amphibian, brides, fishes, reptiles, and some invertebrate animals (3, 4). The genus of Entamoeba has applied and stable by the International Commission on Zoological Nomenclature in the late 1950s.

Only some species of Entamoeba are known to be potential pathogen and harmful, for example: E. histolytica (Schaudinn, 1903) sometimes invade the tissue of man and cause about 50 million cases of infections up to 100000 deaths per year worldwide (5, 6).

The correct identification of Entamoeba from other genus of Endamoebidae family including: Endamoeba, Iodamoeba and Endolimax, is on the basis of nuclear structure of trophozoite and cyst. Species of Entamoeba possess a vesicular nucleus that has a small or large accumulated endosome (karyosome) at or near the center. The rest space of nucleus appears empty. Chromatin granules are arranged regular or irregular around internal membrane of nucleus. Exception E. gingivalis like group, almost the all member of Entamoeba, have produce cyst. The cysts contain of one to eight and rarely more nuclei, a few of chromatoidal bar are visible in cyst of some species by light microscopy.

Species of the genus Entamoeba have been divided to five groups based on the number of nuclei willing in mature cyst by Levin (3).this groups are as follows:

A: species without cyst or E. gingivalis –like group.
B: species with one nucleate mature cyst or E. bovis –like group.
C: species with four nucleate mature cyst or E. histolytica –like group.
D: species with eight nucleate mature cyst or E. coli- like group.
E: inadequately known species.

The validity of this category was confirmed by using riboprinting method by Clark and Diamond in 1997 (5).

This review is performed to provide an update list and some summarized information on Entamoeba species, which was identified by Levin's grouping.

The aim of this review article is introduction of Entamoeba species to medical and veterinary parasitologists.

Methods

Electronic and manual searches in international electronic databases and journals were conducted to find the related data reporting on human and animal Entamoeba species. The search covered the articles published up to the 2014. Electronic searching was performed in the international databases covering: ISI Web of Science, PubMed, Scirus, EMBASE, Scopus, Science Direct and Google Scholar.

The following key words: "Entamoeba" and "Endamoebidae" were used as a panel of key words. For more accuracy, the references of selected articles were checked.

The manual search was carried out in articles published in scientific journals, abstracts of scientific articles related to this topic presented at scientific congresses as well as two textbooks: "Amoebas" (7) and "Veterinary
Protozoology” (3). The search restricted to English and Persian languages, repeated and unrelated cases were excluded. Taxonomy study, phylogeny data and new reports articles about *Entamoeba* were inclusion to study. Data were recorded and arranged based on the mature cyst morphology as the Levine grouping (3). The hosts, geographical distribution, habitat, pathogenicity of the all species and synonyms for some species were recorded.

**Results**

There are 5 valid species within the group of *Entamoeba* without cyst, 12 valid species within the group of one nucleated cyst producing *Entamoeba*, 19 valid species within the 4 nucleate mature cyst or *E. histolytica* –like group and 15 valid species were found within the group of 8 nucleated cyst producing *Entamoeba*. The others were invalid species or synonyms of accepted and reliable species exception 8 inadequately known species.

Totally 51 defined species of *Entamoeba* were found and recorded by the Levine grouping as the following list:

**A: species without cyst or E. gingivalis – like group.**

1- *Entamoeba gingivalis* (Gros, 1849)
   **Synonyms:** *Amoeba buccalis* (Steinberg, 1862), *Amoeba dentalis* (Grassi, 1879), *Amoeba kartulis* (Doflein, 1901), *Entamoeba buccalis* (Prowazek, 1904), *Entamoeba maxillaris* (Kartulis, 1906), *Amoeba pyogenes* (Verdun & Bruyant, 1907), *Endamoeba gingivalis* (Smith & Barrett, 1915), *Endamoeba buccalis* (Bass & Johns, 1915), *Endamoeba canibuccalis* (Smith, 1938), *Endamoeba confusa* (Craig, 1916), *Entamoeba equibuccalis* (Simitch, 1938), *Entamoeba suigingivalis* (Tumka, 1959).
   **Hosts:** Human, Dog, Horse, Pig, Cat, Monkey.
   **Habitat:** Oral cavity
   **Pathogenicity:** None
   **Distribution:** Worldwide
   Ref: (7, 8, 9)

2- *Entamoeba barreti* (Taliaferro & Holmes, 1924)
   **Synonyms:** None
   **Hosts:** Snapping turtle
   **Habitat:** Colon
   **Pathogenicity:** None
   **Distribution:** Unknown
   Ref: (9, 10)

3- *Entamoeba gedoelsti* (Husing, 1930)
   **Synonyms:** *Entamoeba intestinalis*
   **Hosts:** Horse
   **Habitat:** Colon and caecum, large intestine
   **Pathogenicity:** None
   **Distribution:** Unknown
   Ref: (3, 7, 9)

4- *Entamoeba caprae* (Fantham, 1923)
   **Synonyms:** None
   **Hosts:** Goat
   **Habitat:** Large intestine
   **Pathogenicity:** None
   **Distribution:** Unknown
   Ref: (1, 11, 12)

5- *Entamoeba molae* (Noble E & Noble G, 1966)
   **Synonyms:** None
   **Hosts:** Fish (Ocean sunfish)
   **Habitat:** Hindgut
   **Pathogenicity:** None
   **Distribution:** Southern California
   Ref: (7, 13)

**B: species with one nucleate mature cyst or E. bovis – like group.**

1- *Entamoeba polecki* (Von Prowazek, 1912)
   **Synonyms:** *Entamoeba debliecki*
   **Hosts:** Pig, Human, Monkey.
   **Habitat:** Colon and caecum, large intestine
   **Pathogenicity:** None
   **Distribution:** southeast Asian, France, United state, Venezuela, Guinea, Iran
   Ref: (3, 14, 15)

2- *Entamoeba chattoni* (Swellengrebel, 1914)
   **Synonyms:** None
   **Hosts:** Monkey, Human
   **Habitat:** Colon and caecum, large intestine
   **Pathogenicity:** None
   **Distribution:** Africa
   Ref: (9, 16, 17)
3- **Entamoeba bovis** (Liebetanz, 1905)
- **Synonyms**: None
- **Hosts**: Buffalo
- **Habitat**: Large intestine
- **Pathogenicity**: None
- **Distribution**: Africa
- **Ref**: (3, 7, 18)
- **4- Entamoeba antiocapra** (Noble, 1953)
- **Synonyms**: None
- **Hosts**: Antelope
- **Habitat**: Large intestine
- **Pathogenicity**: None
- **Distribution**: America
- **Ref**: (19)
- **5- Entamoeba ovis** (Swellengrbel, 1914)
- **Synonyms**: *Entamoeba debliecki*
- **Hosts**: Sheep, Goat
- **Habitat**: Large intestine
- **Pathogenicity**: None
- **Distribution**: World wide
- **Ref**: (3, 5, 9)
- **6- Entamoeba dilimani** (Noble, 1954)
- **Synonyms**: *Entamoeba debliecki*
- **Hosts**: Goat
- **Habitat**: Large intestine
- **Pathogenicity**: None
- **Distribution**: Philippines
- **Ref**: (3, 5, 9)
- **7- Entamoeba struthionis** (Martínez-Díaz RA et al, 2000)
- **Synonyms**: None
- **Hosts**: Ostrich
- **Habitat**: Large intestine
- **Pathogenicity**: None
- **Distribution**: Spain
- **Ref**: (4, 20)
- **8- Entamoeba suis** (Hartmann, 1913)
- **Synonyms**: *Entamoeba debliecki*
- **Hosts**: Pig
- **Habitat**: Colon and caecum, large intestine
- **Pathogenicity**: None
- **Distribution**: China, Bulgaria, France, Yugoslavia, England, United State
- **Ref**: (5, 14, 15)
- **9- Entamoeba bubalis** (Noble, 1955)
- **Synonyms**: None
- **Hosts**: Cattle, Buffalo
- **Habitat**: Large intestine
- **Pathogenicity**: None
- **Distribution**: Philippines
- **Ref**: (1, 5, 7)
- **10- Entamoeba paulista** (Carini, 1933)
- **Synonyms**: *Brumptina paulista*
- **Hosts**: Opalinata
- **Habitat**: Cytoplasm of Opalinata
- **Pathogenicity**: None
- **Distribution**: United State, Africa, Chili, Uruguay
- **Ref**: (21, 22)
- **11- Entamoeba gadi** (Bullock, 1966)
- **Synonyms**: None
- **Hosts**: Pollock fish
- **Habitat**: Rectum
- **Pathogenicity**: None
- **Distribution**: North America
- **Ref**: (23)
- **12- Entamoeba nezumia** (Orias & Noble, 1971)
- **Synonyms**: None
- **Hosts**: Macourbid fish
- **Habitat**: Stomach, Intestine
- **Pathogenicity**: None
- **Distribution**: North Atlantic
- **Ref**: (24)

C: species with four nucleate mature cyst or *E. histolytica* –like group
- **1- Entamoeba histolytica** (Schaudinn, 1903)
- **Synonyms**: *Amoeba coli* (Losch, 1875), *Amoeba dysenteriae* (Councilman &LaFleur1891), *Amoeba lobosa var.coli* (Celli & Fiocca, 1894), *Entamoeba africana* (Hartmann & Prowazek1907), *Entamoeba tetragena* (Viereck, 1907), *Entamoeba schaudinni* (Lesage, 1908), *Pomerantseva histolytica* (Lühe, 1908), *Entamoeba minuta* (Elmassian, 1909), *Entamoeba nipponica* (Koizumi, 1909), *Entamoeba braziliensis* (Aragao, 1912), *Laschia histolytica* (Mathis, 1913), *Entamoeba venaticum* (Darling, 1915), *Entamoeba caudata* (Carini & Reichenow 1949), *Entamoeba dysenteriae* (Kofoid, 1920).
- **Hosts**: Human
- **Habitat**: Colon and caecum, large intestine
- **Pathogenicity**: Intestinal and extra intestinal amoebiasis

Available at: [http://ijpa.tums.ac.ir](http://ijpa.tums.ac.ir)
**Entamoeba dispar** (Brumpt, 1925)  
**Synonyms:** Non-pathogenic *E. histolytica*  
**Hosts:** Human, Chimpanzees, Baboon, Macaques  
**Habitat:** Colon and caecum, large intestine  
**Pathogenicity:** None  
**Distribution:** Worldwide  
Ref: (1, 25, 26, 27, 28)  

2- **Entamoeba hartmanni** (Von Prowazek, 1912)  
**Synonyms:** Small race *E. histolytica*, *Entamoeba minuta* (Woodeck & Penfold, 1916), *Entamoeba minutissima* (Brug, 1918), *Entamoeba tenuis* (Kuenen & Swellengrebel, 1917)  
**Hosts:** Human  
**Habitat:** Colon and caecum, large intestine  
**Pathogenicity:** None  
**Distribution:** Worldwide  
Ref: (5, 27, 29, 30, 31)  

3- **Entamoeba moshkovskii** (Tshalaia, 1941)  
**Synonyms:** Laredo strain of *E. histolytica*, Huff strain  
**Hosts:** Sewage, Human  
**Habitat:** Colon and caecum, large intestine  
**Pathogenicity:** None  
**Distribution:** Worldwide  
Ref: (5, 7, 9)  

4- **Entamoeba moshkovskii** (Tshalaia, 1941)  
**Synonyms:** None (It is very similar to *E. moshkovskii, E. histolytica, E. dispar*)  
**Hosts:** Sewage  
**Habitat:** Sewage  
**Pathogenicity:** None  
**Distribution:** Ecudor  
Ref: (5, 9, 35)  

5- **Entamoeba ecuadoriensis** (Clark and Diamond, 1997)  
**Synonyms:** None (It is very similar to *E. moshkovskii, E. histolytica, E. dispar*)  
**Hosts:** Sewage  
**Habitat:** Sewage  
**Pathogenicity:** None  
**Distribution:** Unknown, Probably World wide  
Ref: (2, 30, 32, 33, 34)  

6- **Entamoeba bangladashi** (Royer et al, 2012)  
**Synonyms:** None (It is very similar to *E. moshkovskii, E. histolytica*)  
**Hosts:** Human  
**Habitat:** Colon and caecum, large intestine  
**Pathogenicity:** None  
**Distribution:** Bangladesh  
Ref: (36, 37)  

7- **Entamoeba invadens** (Rodhaim, 1934)  
**Synonyms:** *Entamoeba serpents* (Cunha and Fonseca, 1917)  
**Hosts:** Reptiles: snake, lizard, turtle, crocodile  
**Habitat:** Colon and caecum, large intestine  
**Pathogenicity:** Intestinal and extra intestinal amoebiasis  
**Distribution:** Worldwide  
Ref: (22, 38, 39)  

8- **Entamoeba insolita** (Geiman and Wichterman 1937)  
**Synonyms:** None  
**Hosts:** Turtle  
**Habitat:** Large intestine  
**Pathogenicity:** Potential pathogen, intestinal amoebiasis  
**Distribution:** Unknown  
Ref: (22, 40)  

9- **Entamoeba terrapinae** (Sanders and Cleveland, 1930)  
**Synonyms:** None  
**Hosts:** Turtle  
**Habitat:** Colon  
**Pathogenicity:** None  
**Distribution:** Unknown, probably world wide  
Ref: (3, 22)  

10- **Entamoeba knowlesi** (Rodhain and Hoof, 1947)  
**Synonyms:** None  
**Hosts:** Turtle  
**Habitat:** Large intestine  
**Pathogenicity:** None  
**Distribution:** Unknown  
Ref: (22, 41)  

11- **Entamoeba ranarum** (Grassi, 1879)  
**Synonyms:** None  
**Hosts:** Frog, Toad  
**Habitat:** Large intestine  
**Pathogenicity:** Intestinal and extra intestinal amoebiasis  
**Distribution:** Unknown, probably world wide  
Ref: (5, 40, 42)  

12- **Entamoeba pyrrhogaster** (Löbeck, 1940)  
**Synonyms:** None  
**Hosts:** Frog, Toad, Salamander  
**Habitat:** Large intestine  
**Pathogenicity:** None  
**Distribution:** Unknown  
Ref: (21, 43)  

13- **Entamoeba aulastomi** (Noller, 1919)
Synonyms: None
Hosts: Leech specially *Haemopis sanguiigna*
Habitat: Intestine
Pathogenicity: None
Distribution: Unknown
Ref: (44, 45)

14- *Entamoeba ctenopharyngodonii* (Chen, 1955)
Synonyms: None
Hosts: Carp Fish
Habitat: Rectum
Pathogenicity: None
Distribution: China
Ref: (13, 46)

15- *Entamoeba anatis* (Fantham, 1921)
Synonyms: None
Hosts: Duck, Bustard
Habitat: Caecum
Pathogenicity: Intestinal amoebiasis
Distribution: South Africa, Asia, United state
Ref: (4, 47)

16- *Entamoeba lagopodis* (Fantham, 1910)
Synonyms: None
Hosts: Duck, Lagopus
Habitat: Caecum
Pathogenicity: None
Distribution: Unknown
Ref: (7, 20)

17- *Entamoeba equi* (Fantham, 1921)
Synonyms: None
Hosts: Horse
Habitat: Large intestine
Pathogenicity: Potential pathogen, intestinal amoebiasis
Distribution: South America
Ref: (7, 9, 11)

18- *Entamoeba nuttali* (Castellani, 1908)
Synonyms: *Entamoeba duboscqi* (Mathis1913), *Entamoeba cynomoligi* (Brug, 1923), *Entamoeba ateles* (Eichhorn and Gallagher, 1916), EHMfas1, NASA6, P19-061405
Hosts: Baboon, Macaques, Chimpanzees
Habitat: Large intestine
Pathogenicity: Potential pathogen, intestinal and extra intestinal amoebiasis
Distribution: Japan, Nepal, southwest China.
Ref: (31, 48, 49)

19- *Entamoeba philippinensis* (Kidder, 1937)
Synonyms: None
Hosts: Termite, Cockroaches
Habitat: Hindgut
Pathogenicity: None
Distribution: Unknown
Ref: (3, 7)

D: species with eight nucleate mature cyst or E. coli- like group

1- *Entamoeba coli* (Grassi, 1879)
Synonyms: *Entamoeba hominis* (Casagrandi & Barbagallo, 1897), *Entamoeba Loschii* (Lesage, 1908), *Loschia coli* (Chatton & Lalung-Bonnaire, 1912), *Endamoeba coli* (Craig, 1917), *Endamoeba hominis* (Pestana, 1917), *Councilmania lafleuri* (Kofoid & swezy, 1921)
Hosts: Human
Habitat: Colon and caecum, large intestine
Pathogenicity: None
Distribution: Worldwide
Ref: (1, 3, 7, 25, 26)

2- *Entamoeba muris* (Grassi, 1879)
Synonyms: *Councilmania decunami* (Rudovsky, 1921), *Entamoeba coli Var ratti*, *Endamoeba ratti* (Kessel, 1923), *Amoeba muris*, *Councilmania muris*.
Hosts: Rats, mice, Hamster, Wild and domestic rodent
Habitat: Colon and caecum, large intestine
Pathogenicity: None
Distribution: Worldwide
Ref: (3, 50, 51)

3- *Entamoeba citelli* (Becker, 1926)
Synonyms: None
Hosts: Ground squirrel
Habitat: Colon and caecum, large intestine
Pathogenicity: None
Distribution: Unknown
Ref: (52, 53)

4- *Entamoeba cobayae* (Walker, 1908)
Synonyms: *Entamoeba caviae* (Chatton, 1918)
Hosts: Guinea pig
Habitat: Large intestine
Pathogenicity: None
Distribution: Worldwide
Ref: (7, 54)
5- *Entamoeba criceti* (Starkoff, 1942)  
**Synonyms:** None  
**Hosts:** Hamster  
**Habitat:** Large intestine  
**Pathogenicity:** None  
**Distribution:** Unknown  
Ref: (50, 55)  
6- *Entamoeba cuniculi* (Brug, 1918)  
**Synonyms:** None  
**Hosts:** Rabbits  
**Habitat:** Large bowel  
**Pathogenicity:** None  
**Distribution:** Korea, Russia  
Ref: (3, 7)  
7- *Entamoeba dipodomysi* (Hegner, 1926)  
**Synonyms:** *Endamoeba dipodimysi*  
**Hosts:** Kangaroo rats  
**Habitat:** Large bowel  
**Pathogenicity:** None  
**Distribution:** Mexico, United state  
Ref: (3, 56)  
8- *Entamoeba funambulae* (Ray & Bunik 1966)  
**Synonyms:** None  
**Hosts:** Indian palm squirrel  
**Habitat:** Large intestine  
**Pathogenicity:** None  
**Distribution:** India  
Ref: (57)  
9- *Entamoeba marmotae* (Crouch, 1936)  
**Synonyms:** None  
**Hosts:** Marmot  
**Habitat:** Large intestine  
**Pathogenicity:** None  
**Distribution:** Unknown  
Ref: (58, 59)  
10- *Entamoeba chiropteris* (Mandal and Choudhury, 1988)  
**Synonyms:** None  
**Hosts:** Bats  
**Habitat:** Large bowel  
**Pathogenicity:** None  
**Distribution:** India, Bengal  
Ref: (7)  
11- *Entamoeba gallinarum* (Tyzzer, 1920)  
**Synonyms:** None  
**Hosts:** Fowl  
**Habitat:** Caecum  
**Pathogenicity:** None  
**Distribution:** Worldwide  
Ref: (1, 3, 60)  
12- *Entamoeba wenyoni* (Galli-Valerio, 1935)  
**Synonyms:** None  
**Hosts:** Goat, Camel  
**Habitat:** Large intestine  
**Pathogenicity:** None  
**Distribution:** Unknown  
Ref: (3, 11, 12)  
13- *Entamoeba flaviviridis* (Knowles & Das Gupta, 1935)  
**Synonyms:** None  
**Hosts:** Lizard  
**Habitat:** Intestine  
**Pathogenicity:** None  
**Distribution:** Sudan  
Ref: (61)  
14- *Entamoeba apis* (Fantram and Porter, 1911)  
**Synonyms:** None  
**Hosts:** Bee (*Apis mellifica*)  
**Habitat:** Intestine  
**Pathogenicity:** None  
**Distribution:** Unknown  
Ref: (7)  
15- *Entamoeba polypodia* (Schultze, 1954)  
**Synonyms:** None  
**Hosts:** Bug (*Leptocoris trivitalus*)  
**Habitat:** Ventricle, Intestine and rectum  
**Pathogenicity:** None  
**Distribution:** Unknown  
Ref: (62)  

**E: inadequately known species**  
The members of this group are not well studied. The life cycle, hosts and morphology of cysts are still incompletely known. Additional surveys for new data are needed to define the correct position and classification of these amoebas.  

Some of these *Entamoeba* species are: *Entamoeba testudinis* (Hartmann, 1910), *Entamoeba varani* (Lavier, 1928), *Entamoeba michini*, *Entamoeba phallusae*, *Entamoeba cervum* (Jian Han & Yang, 1989), *Entamoeba celestini* (Froilano de Mello, 1946), *Entamoeba bobaci* (Li Yuan Po, 1928), *Entamoeba blustomae* (Brug, 1922).
Discussion

The number of nuclei in the mature Entamoeba cyst is a reliable criterion for Entamoeba taxonomy based on the morphological feature. The validity of this grouping was supported by molecular methods such as riboprinting and comparisons of full-length 16S-like rDNA sequences (5, 63). Among all of the known Entamoeba species, only E. antilocapra in the Entamoeba species with one nucleate mature cyst group and 7 members of the Entamoeba with four nucleate mature cyst (E. histolytica, E. invadence, E. insolita, E. ranarum, E. anatis, E. equi, E. nutalli) are pathogen (1, 3, 7, 9, 11, 21) and the others are commensals. E. histolytica, E. invadence, E. ranarum and E. anatis causes lethal infection in human, reptiles, amphibians and brides respectively and all of them belong to the Entamoeba species group with 4 nucleus per mature cyst. They have significant important to medicine and veterinary and economy world-wide. E. insolita, E. equi, E. nutalli, E. antilocapra causes non-lethal mild dysentery.

There are no evidence for pathogenicity of the member of E. bovis and E. gingivalis-like groups, but these species are important to differential diagnosis. Entamoeba gingivalis, E. polecki, E. chattoni and E. dispar are zoonosis (5, 9, 15, 16, 48). Some of the Entamoeba species with uncertain or doubtful status have been reported from human and animal infections. Many of them have not been generally accepted as a distinct species and may be atypical form or a synonym of known species, for example there are up to 14 synonyms for E. histolytica (26). The members of other genus of amoeba have been misdiagnose as Entamoeba species for instance: E. williamsi after further studies was placed in other genera as "Toxamoeba butschili" (7). Nevertheless, there are some unknown true species of Entamoeba that available information on the morphology, hosts, pathogenicity and distribution of them are still very limited and more considerable investigation will be needed in order to clarify the status of them.

Conclusion

At least eight species of Entamoeba are known as human commensal or parasite. The number of Entamoeba species has continuously increased. The most recent species is E. bangladeshi that identified in human in 2012. Using of molecular tools can increase our knowledge about member of Endamoebidae family.

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