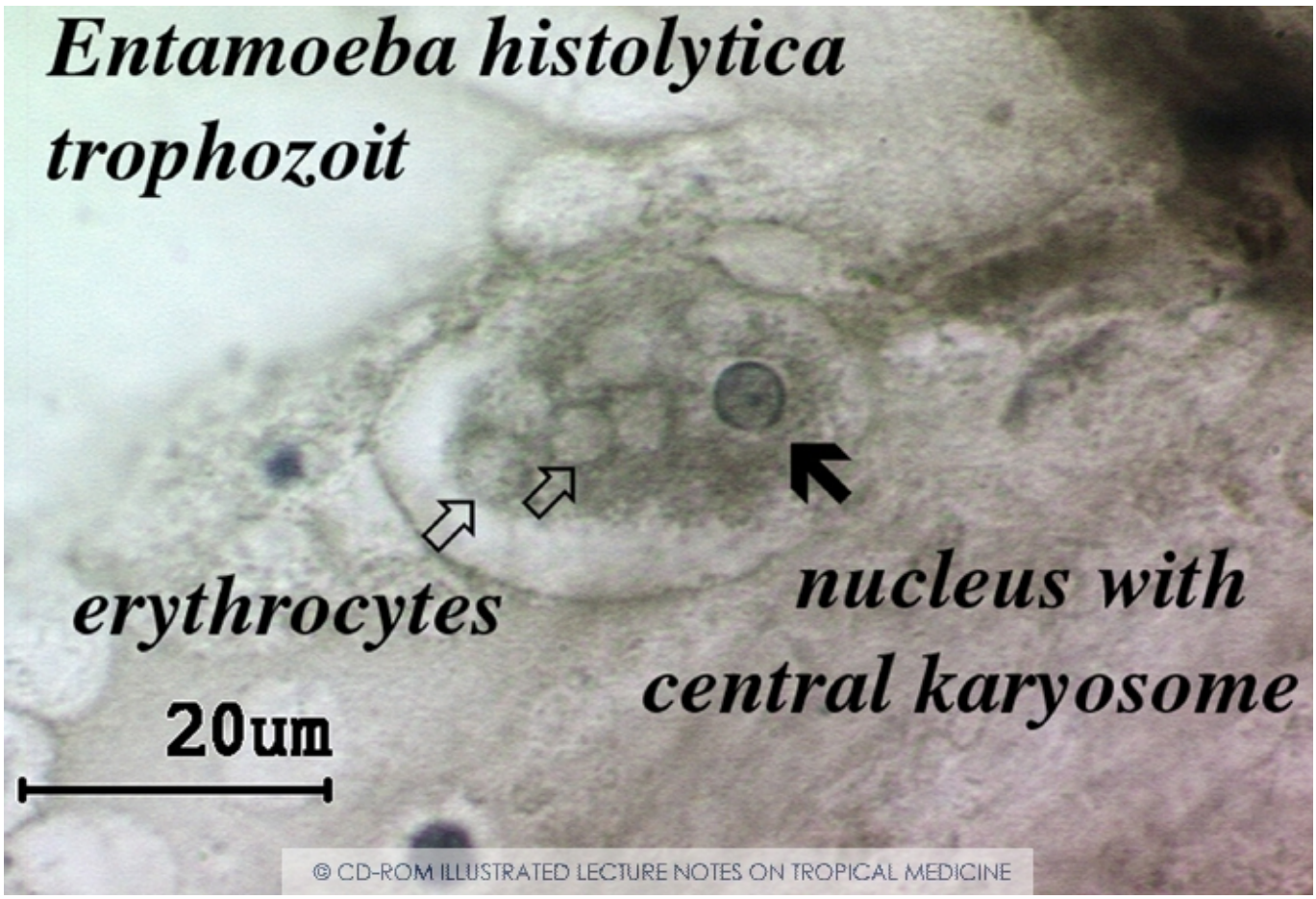
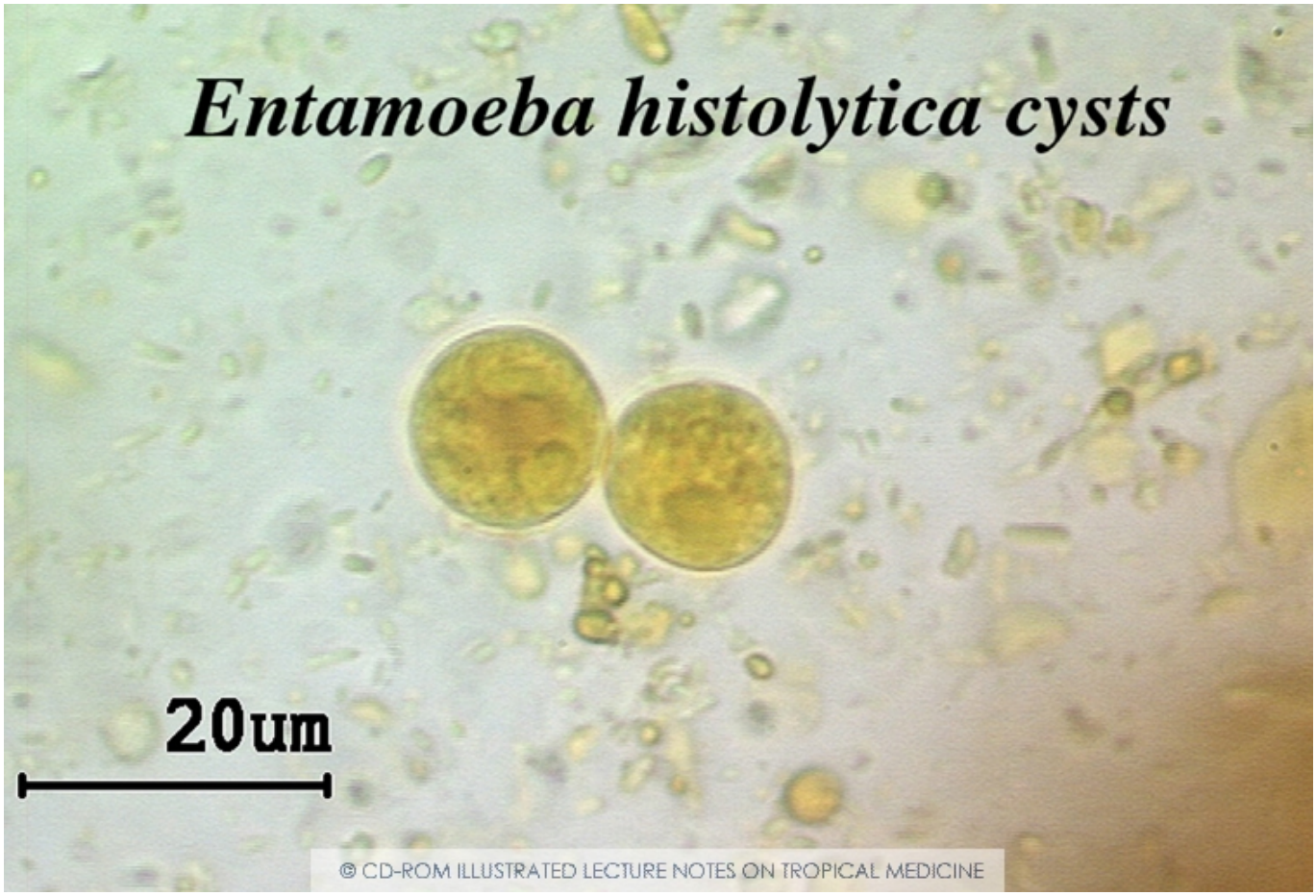
Amoebiasis – General

General

Amoebiasis in our context means infection with *Entamoeba histolytica*. This is a unicellular cosmopolitan parasite. The first description of the parasite was in 1875 by Fedor Lösch in St Petersburg. This concerned an infection in a young Russian farmer in Arkhangelsk, 150 km from the Arctic circle. This illustrates the fact that the infection is not restricted to the tropics. Transmission depends on the level of sanitation and faecal hygiene in a country or region.



Entamoeba histolytica trophozoite in rectal mucosa. Copyright ITM



Entamoeba histolytica cysts. Cysts never contain red blood cells. Copyright ITM

Pathogenicity of Entamoeba histolytica

There was considerable confusion concerning the nomenclature and pathogenic properties of *Entamoeba histolytica*. It is now recognized that there are morphologically identical amoebae, some of which are non-pathogenic and some of which are pathogenic. This concept was introduced in 1925 by the French parasitologist Emile Brumpt. The non-pathogenic amoebae are called *Entamoeba dispar*. This should also not be confused with other completely non-pathogenic species, including *Entamoeba hartmanni* (previously sometimes called “small race” *E. histolytica).* In 1978 it was discovered in London that the two kinds of amoebae could be differentiated using isoenzymatic electrophoresis. Pathogenic amoebae always belong to one group and non-pathogenic amoebae always

belong to the other group. In 1989 it was discovered that *E. dispar* always differs from *Entamoeba histolytica* by well-determined genetic (DNA) markers. Non-pathogenic *Entamoeba dispar* never changes into pathogenic *Entamoeba histolytica*. Earlier reports of this appear to be due to laboratory errors: mixed cultures and/or contamination of cultures in the lab. In pathogenic *Entamoeba histolytica* isolates with low virulence and with high virulence can be seen (virulence is a measure of the severity of illness which certain strains can cause in certain circumstances). The degree of virulence is variable, because this is determined by several parameters, including the environment (in contrast to properties which are genetically determined). Isolates with low virulence are non-invasive, while isolates with a high degree of virulence are invasive.

Motility of Entamoeba histolytica

E. histolytica trophozoites are highly motile. The fuel for this constant motion comes from the anaerobic conversion of glucose and pyruvate to ethanol. *E. histolytica* has no mitochondria (probably through secondary loss). Many of its metabolic enzymes seem to be of prokaryotic origin, possibly acquired from the lateral transfer of genes from bacteria.

Life Cycle and transmission

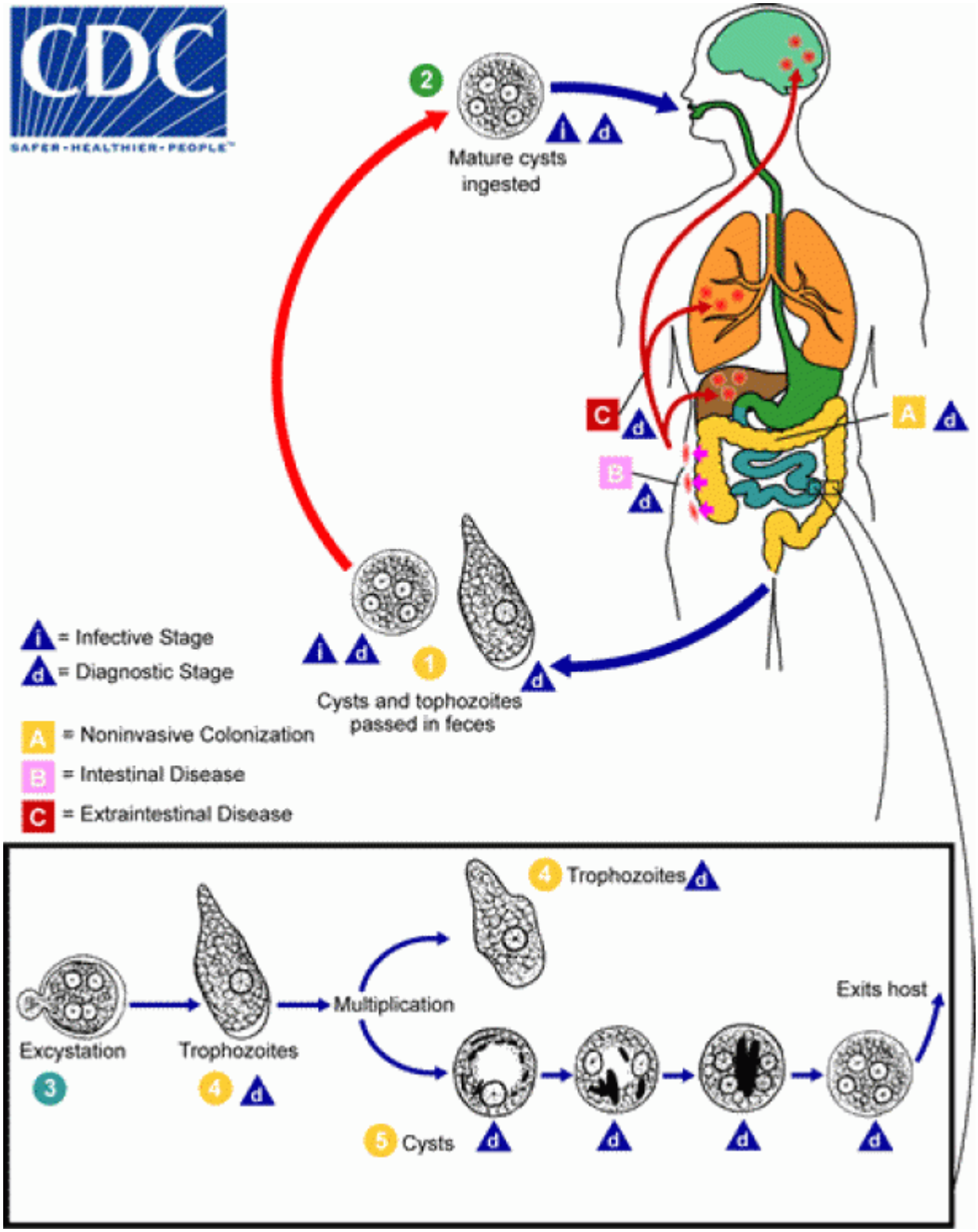
Infection is caused by ingestion of *E. histolytica* cysts. One cyst develops in the small intestine into 8 motile trophozoites (one trophozoite with 4 nuclei divides 3 times and each nucleus divides once to produce 8 trophozoites from each cyst) which then find their way into the colon. The trophozoites multiply by asexual reproduction and in turn produce cysts, which are then excreted with the faeces. The cyst is quite resistant and can survive for a long time in the outside world. Excreted trophozoites die quickly and therefore are not responsible for transmission. Cysts of *E. histolytica* are never found in tissues. The parasite is transmitted feco-orally as a cyst, usually from person to person. Transmission via water also occurs. Dogs, cats, rats, pigs and monkeys may become infected but do not form a significant animal reservoir (Note: kittens were used by E. Brumpt as a very susceptible animal model to test the pathogenicity of amoebae). Flies and cockroaches may carry cysts. Their role in transmission has not been properly investigated but is probably of minor importance. The main source of infection is humans. Amoebiasis is thus not a zoonosis. Infection via sexual

intercourse is rare (via anal contact). The latter method of transmission may result in severe and mutilating lesions of the genitals.

Entamoeba histolytica is considered to be an asexual organism, but many mysteries persist. Some pieces of evidence don't fit with this asexual idea, such as the appearance of putative heterozygous populations after mixing homozygotic populations for certain isoenzym classes. Also, *E. histolytica* has the full complement of meoisis genes, which one would expect to have decayed over time if the organism abandoned the sexual life cycle.

Prevention

Amoebic cysts are resistant to normal chlorination of drinking water. Boiling and filtering drinking water eliminates the parasite. Large scale prevention depends mainly on improved sanitation and hygiene. No vaccine is available. Amoebiasis is not an opportunistic infection in HIV patients.



Entamoeba histolytica Life Cycle (courtesy of CDC)

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