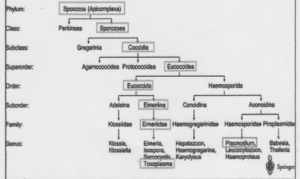


TOXOPLASMA GONDII

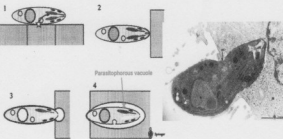
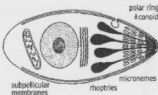
Sukmawati Basuki

Departemen Parasitologi Kedokteran,
FK Unair, Surabaya
2012

- Phylum : Apicomplexa
- Class : Sporozoa
- Subclass : Coccidiasina
- Order : Eucoccidiorida
- Suborder : Eimeriorina
- Family : Eimeriidae
- Genus : Toxoplasma (Nicolle dan Manceaux, 1908)



APICOMPLEXA



TOXOPLASMA GONDII

- Parasit obligat intraseluler.
- Ditemukan I ⇒ Nicolle dan Manceaux, 1908, di hati dan limpa pada rodent di Afrika Utara, kemudian ditemukan dan berhubungan dengan bentuk parasit kista di retina pada anak dengan hydrocephalus dan microphthalmia oleh Wolf dan Weinmann ⇒ toxoplasmosis kongenital (1940).
- Zoonosis
- Penyakit : toxoplasmosis
- Definitive host : family Felidae (*domestic cats and their relatives*)
- Intermediate host : birds and rodents
- Distribusi : seluruh dunia
- Manusia terinfeksi umumnya sedang dan asimtomatik, tapi menjadi *life threatening disease* pada penderita dengan *immunocompromised*
- Sabin dan Fieldman (1948) menemukan tes serologis yang akurat untuk diagnosis : tes dye.

MORFOLOGI

Subrah, 2012

Tachyzoite (trophozoite)

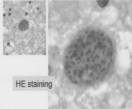
- crescent-shaped
- panjang : 6 μm , lebar : 3 μm
- 1 nukleus



Giemsa staining

Kista

- Berisi bradyzoite (morfologi sama dengan tachyzoite, metabolisme rendah)
- 2 dinding sel (parasit dan host)

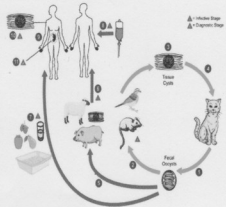


HE staining

<http://www.fgpl.edu.gov>

SIKLUS HIDUP

Subrah, 2012



<http://www.fgpl.edu.gov>

SIKLUS HIDUP

Subrah, 2012

■ Unsporulated oocysts are shed in the cat's feces. Although oocysts are usually only shed for 1-2 weeks, large numbers may be shed. Oocysts take 1-5 days to sporulate in the environment and become infective.
→ Intermediate host : Oocysts transform into tachyzoites shortly after ingestion. These tachyzoites localize in neural and muscle tissue and develop into tissue cyst bradyzoites

■ Cats may also become infected directly by ingestion of sporulated oocysts.

■ In the human host, the parasites form tissue cysts, most commonly in **skeletal muscle, myocardium, brain, and eyes**

PATHOGENESA

Subrah, 2012

- Tachyzoite → invasi sel, tidak fusi dengan organela, binary fission → pseudocyst → disrupti sel → sel lain.
- Kista → excystation → tachyzoite → invasi sel → disrupti dst : respon imun dari host

● Patologi :

- * Nekrosis jaringan : trombosis pembuluh darah
- * Limfadenopati : immunocompeten
- * Kista > : immunocompromised (HIV/AIDS)
- * Kongenital toxoplasmosis : CNS : Kista, nekrosis jaringan, kalsifikasi, Hydrocephalus, jaringan retina : dekstruksi area retina, kadang ditemukan parasit pada daerah margin/tepi

● Klinis :

- * Immunocompeten :
 - Inkubasi : 1-3 minggu
 - asimtomatik
- bila ada simpton : ada limfadenopati daerah leher tanpa nyeri, ± panas, malaise, myalgia → hilang timbul beberapa minggu – bulan.

PATHOGENESIS

● **Klinis :**

* Toxoplasmosis dan AIDS:

- Panas badan, nyeri kepala yang persisten, gangguan mental, local neurological sign, limfadenopati
- refinochoroiditis
- infeksi meluas: hati, jantung, paru dan otak (post mortem)

* Congenital toxoplasmosis :

- Hydrocephalus, mental retardation, cerebral calcification, retinochoroiditis, skin rash, hepatitis, pneumonia, myocarditis, myositis : mungkin ada

* Toksikosis dan transplantasi :

- **Life-threatening complication**
- panas badan, gangguan kesadaran, distres respirasi, umumnya 3-6 minggu setelah operasi
- Transfusi darah : jarang transmit toxoplasmosis, bila ada umumnya pada transfusi granulocytes.
- Pada transplantasi sumsum tulang : jarang, panas badan, CNS sign, disfungsi respirasi. 50-150 hari setelah transplantasi.

DIAGNOSA

- Observation of parasites in patient specimens, such as bronchoalveolar lavage material from immunocompromised patients, or lymph node biopsy.
- Isolation of parasites from blood or other body fluids, by intraperitoneal inoculation into mice or tissue culture. The mice should be tested for the presence of *Toxoplasma* organisms in the peritoneal fluid 6 to 10 days post inoculation; if no organisms are found, serology can be performed on the animals 4 to 6 weeks post inoculation.
- Detection of parasite genetic material by PCR, especially in detecting congenital infections in utero.
- Serologic testing is the routine method of diagnosis : IFA and EIA tests for IgG and IgM. Newborn infants suspected of congenital toxoplasmosis should be tested by both an IgM- and an IgA-capture EIA.

■ Mikroskopis

■ Serologics

Interpretasi hasil tes serologi

tg2 result	tg1 result	Interpretation for human?
Negative	Negative	No serological evidence of infection with Toxoplasma.
Negative	Equivocal	Possible early infection or false-negative tg1 reaction. Obtain a new specimen for tg1 and tg2. If results for the second specimen are the same, the patient is probably not infected with Toxoplasma.
Negative	Positive	Possible acute infection or false-negative tg1 result. Obtain a new specimen for tg1 and tg2 testing. If results for the second specimen remain the same, the tg1 reaction is probably a false-positive.
Equivocal	Negative	Indeterminate: obtain a new specimen for tg1 and tg2 testing.
Equivocal	Equivocal	Indeterminate: obtain a new specimen for both tg1 and tg2 testing.
Equivocal	Positive	Possible acute infection with Toxoplasma. Obtain a new specimen for tg1 and tg2 testing. If results for the second specimen remain the same, both specimens are positive, both specimens should be used as a reference laboratory with experience in diagnosis of toxoplasmosis for Arvin testing.
Positive	Negative	Infected with Toxoplasma for more than 1 year.
Positive	Equivocal	Infected with Toxoplasma for probably more than 1 year or false-positive tg1 result. Obtain a new specimen for tg1 testing. If results for the second specimen remain the same, both specimens should be used as a reference laboratory with experience in diagnosis of toxoplasmosis for further testing.
Positive	Positive	Recent or recent infection within the last 12 months, or false-positive tg2 reaction. Send the specimen for reference laboratory with experience in the diagnosis of toxoplasmosis for Arvin testing.

*exposed infants

PENGOBATAN

- **Immunocompetent :**
 - Sulfadiazin (2g/hr) dan pyremethamine (25mg/hr) per oral
 - Vit B6 (15 mg/ 2 kali se minggu)
 - Azithromycin (3g/hr – 10 hr)
- **Ibu hamil:**
 - Sulfadiazin (50-100mg/kg BB/hr) dan pyremethamine (0.5-1.0 mg/kg BB/hr) + Vit B6 (15 mg/ 2 kali se minggu) selama 3 minggu, kemudian diikuti selama 3 minggu kemudian dengan spiramycin (3 g/hr)
- **Infeksi kongenital**
 - Pemberian obat hingga umur 1 tahun. Spiramycin (100 mg/kg BB/hr)
- **Ocular disease**
 - Umumnya diketahui pada umur 1 tahun. Observasi saja.
- **Bila ada inflamasi :** sulfadiazin (2 g/hr) atau dincindimyn (1,2 g/hr) + pyremethamine (25 mg/hr) + vit. selama 10 hari
- **Toxoplasmosis dan AIDS**
 - Sulfadiazin (4-8 g/hr) dan pyremethamine (50-75 mg/hr) per oral
 - Vit B6 (15 mg/ 2 kali se minggu) selama 6 minggu.
 - Cindamycin (2,4-4,8 g/hr)
- **Transplantasi**
 - Pyremethamine (25 mo/hr) – prophylaxis, selama 6 minggu setelah operasi

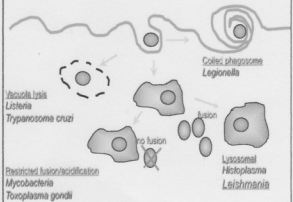
Humans can become infected by any of several routes:

- eating undercooked meat of animals harboring tissue cysts .
- consuming food or water contaminated with cat feces or by contaminated environmental samples (such as fecal-contaminated soil or changing the litter box of a pet cat) .
- blood transfusion or organ transplantation
- transplacentally from mother to fetus .

PENCEGAHAN

- ❖ Health education :
 - * Ibu hamil, immunocompromised patient
 - * Pengolahan makanan : dibersihkan dan dimasak dengan baik
 - * menggunakan sarung tangan - berkebun
- ❖ Skreening antenatal

MACROPHAGE INVASION AND SURVIVAL STRATEGIES OF INTRACELLULAR MICROBE



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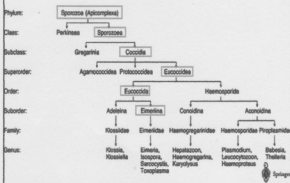
TERIMAKASIH

CRYPTOSPORIDIUM

Sukmawati Basuki

Departemen Parasitologi, FK
Unair
2012

- Phylum : Apicomplexa (Levine, 1970)
- Class : Sporozoa (Levine, 1988)
- Subclass : Coccidiasina (Leuckart, 1879)
- Order : Eucoccidiorida (Leger and Duboscq, 1910)
- Suborder : Elimeriorina (Leger, 1911)
- Family : Cryptosporidiidae (Leger, 1911)
- Genus : Cryptosporidium (Tyzzer, 1907)



CRYPTOSPORIDIUM

■ Protozoa usus, obligate, intraseluler → infeksi → epitel sel terletak pada permukaan daerah lumen: mikrovillus (ekstrasitoplasma) di saluran pencernaan dan saluran pemapasan di tubuh host.

■ Ditemukan I → Tyzzer, 1907, di kript lambung/gaster tikus (*C. muris*), kemudian ditemukan di tubuh ayam, rat, kuda, babi, sapi, kera 'rhesus', anjing, kucing, dan manusia.

■ 22 spesies:

C. parvum (*C. parvum* genotip I = *C. hominis*; *C. parvum* genotip II = *C. parvum*), *C. wairi*, *C. felis*, *C. muris*, *C. canis*, *C. andersoni* ⇒ mamalia, *C. baileyi*, *C. meleagridis*, *C. galli* ⇒ burung, *C. serpentis*, *C. saurophilum* ⇒ reptil, *C. molnari* ⇒ ikan

■ Zoonosis

■ Penyakit : cryptosporidiosis, transmisi ⇒ faecal-oral

■ Distribusi :

Seluruh dunia, KLB (kejadian luar biasa): Amerika Serikat (Wisconsin, 1993), Kanada, Jepang, Inggris → waterborne, Denmark → makanan, nosokomial

TABLE 1. *Cryptosporidium* spp. of human, domestic animals, and some wildlife

Host	Major parasite(s)	Minor parasite(s)
Human	<i>C. hominis</i> , <i>C. parvum</i>	<i>C. meleagridis</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Cattle	<i>C. parvum</i> , <i>C. andersoni</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Sheep	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Goat	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Goat	<i>C. parvum</i> , <i>C. andersoni</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Pig	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Wild	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Dog	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Cat	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Mouse	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Guinea pig	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Deer	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Mustelid	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Opportunistic	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Fox	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Ochotona	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Turkey	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Goose and duck	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Snake	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Lizard	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>
Turtle	<i>C. parvum</i>	<i>C. baileyi</i> , <i>C. felis</i> , <i>C. canis</i> , <i>C. muris</i> , <i>C. serpentis</i> , <i>C. galli</i>

MORFOLOGI :

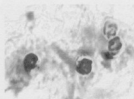
Oocyst



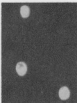
- Ukuran : 4-6 µm (diameter)
- Bentuk : spheris
- Isi : 4 sporozoites, sporogoni berlangsung dalam tubuh host
- Dinding : tebal, 2 lapis



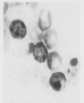
Sediaan basah



Modified acid-fast stain

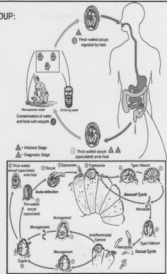
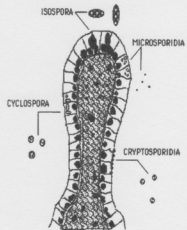
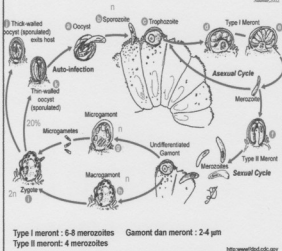


Direct fluorescent antibody



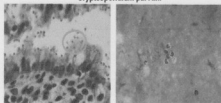
Safranin stain

SIKLUS HIDUP:

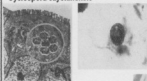

<http://www.tidp.cdc.gov>


Goodfellow, R. W. Ann Intern Med 1995;123:629-631

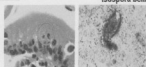
Cryptosporidium parvum



Cyclospora cayentanensis



Isospora belli



Coudreau, R. W. Ann Intern Med 1986;104:429-441

TABLE 4.1. Coccidia

Species	Stage and size	Other features
<i>Cryptosporidium</i> spp.	Oocyst generally round, 4-12 µm, each mature oocyst containing sporozoites	Oocyst stage diagnostic stage in stool; various other stages in life cycle can be seen in biopsy specimens taken from gastrointestinal tract (small intestine of cryptid enteritis, intestinal tract) and possibly other tissues (large intestine, biliary tract)
<i>Cyclospora cayentanensis</i>	Oocysts generally round, 8-12 µm; they stain; <i>Cryptosporidium</i> spp. (acid-fast) but not larger	In wet mount they look like roundish spheres; they will also autofluoresce with cytofluorescence; we would have visible lines or color in light stain in dry mount; these do not stain may appear wrinkled, in a trichrome stained and cover; they will appear in their round, somewhat wrinkled shape; they cause diarrhea in both immunocompetent and immunosuppressed patients
<i>Isospora belli</i>	Ellipsoidal oocyst; oval shape, 10-15 µm long and 10-15 µm wide; oocysts rarely seen outside of oocyst but measure 9-11 µm	Mature oocyst contains 2 sporozoites with 4 sporozoites each; oocyst diagnostic stage in stool is immature oocyst containing spherical mass of sporozoites (diarrhea, intestinal tract)
<i>Isospora hominis</i> , <i>I. suis</i> , <i>I. felis</i>	Oocyst thin-walled and contains 2 mature sporozoites, each containing 4 sporozoites; this oocyst will frequently rupture; oocyst sporozoites each measure 9-10 µm long and 7.5-12 µm wide	Thin-walled oocyst or oocyst sporozoites occur in stool (intestinal tract)
<i>I. "belli"</i>	Stage and size of oocyst and oocyst mature sporozoites vary considerably	Sporozoites contain several hundred to several thousand sporozoites, each of which measure 4-6 µm in width and 12-18 µm in length; the sporozoites may also be divided into compartments by septa, not seen in <i>Isospora</i> type (diarrhea)

PATHOGENESIS

Cryptosporidium sp. melekat dan berkembang di mikrovilli saluran pencernaan dan saluran pematasan

Oocyst resisten terhadap: chlorine, gagal sistem filtrasi → air terkontaminasi → infeksi pada host (10 -1000 oocyst). Makanan dapat terkontaminasi melalui ingesti ataupun penyempitan oleh air yang terkontaminasi

Oocyst dapat bertahan pada pH 3-10; bir, carbonated beverages, orange juices, > 24 jam

Oocyst sensitif terhadap: kering (drying), pasteurisasi, temperature >65°C-30 menit, temperature dibawah 0°C, freeze-drying, ozone, UV, amonia, 10% formalin dalam salin,

Infeksi terjadi akibat:

- Kontak langsung secara tidak sengaja dengan makanan yang terinfeksi
- Minum secara tidak sengaja air yang terinfeksi (kolam renang, danau, sungai)
- Makan makanan yang terkontaminasi dan tidak dimasak

KLB (outbreaks) terjadi akibat:

- Air minum terkontaminasi
- Pasteurisasi yang tidak adekuat
- Makanan yang terkontaminasi dan tidak dimasak: salad

Gejala/klinis tergantung pada host:

1. Immunocompetence → asimtomatik atau simptomatik (intestinal cryptosporidiosis): diare (profuse and watery), disertai berat badan menurun, nyeri perut, mual, muntah, subfebris, gejala klinis dapat menghilang setelah 3-12 hari (self limiting disease). Rekrudensi: umum. Inkubasi: 2-10 hari (rata-rata 7 hari). Lokasi infeksi pada saluran pencernaan: jejunum, ileum. Klinis batuk kronis/ bronchitis (Respiratory cryptosporidiosis), pada saat sedang, akut dan campak/measles. Batuk dan diare: anak-anak dengan malnutrisi

- ♦ Imun respons proteksi terhadap cryptosporidiosis: IFN γ , TNF α , IL-12
- ♦ Asimtomatik dapat terjadi pada penderita HIV dengan sel CD4+ T > 200 / μ l

2. Immunodeficiency

- Kegagalan - immunosupresant
- AIDS (Sel CD4+ T < 200 / μ l)
- ♦ Lokasi infeksi pada saluran pencernaan: meluas → duodenum, kolon, lambung, saluran empedu
- ♦ Diare: severe, kronis: bulan-tahun, life-threatening, cholera-like illness
- ♦ Infeksi pada saluran empedu → sclerosing cholangitis-type lesion – progresif – irregular, obstruksi, dilatasi intra dan ekstra hepatic duktus empedu → nyeri perut kanan, serum alkalik fosfatase ↑. Sindroma acalculous cholecystitis: infeksi pada dinding gallbladder.
- ♦ Respiratory cryptosporidiosis → severe

DIAGNOSIS:

- Dikemukakan ookista *Cryptosporidium* dalam tinja dengan
- 1. Teknik konvensional: sedian basah yang terfiksasi dengan 10% formalin, pengecatan (modified acid-fast – ookista: merah, yeasts: hijau; methylene blue – ookista: red, yeasts: blue; iodine – ookista: tidak berwarna, yeasts: coklat, safranin – ookista merah, yeasts: biru, methanol fiksasi - giemsa)
- 2. Serologi: ELISA, IFA
- 3. Molekuler: PCR, DNA sekuensing
- Dikemukakan *Cryptosporidium* dalam jaringan → PA dengan pengecatan HE

PENGOBATAN:

1. Nitazoxanide, 500 mg, 2 kali/hari, selama 3-14 hari
2. Alternatif terapi:
 - * Albendazole, 400 mg, 2 kali/hari, selama 7-14 hari
 - * Paromomycin, 500 mg, 4 kali/hari, selama 7-14 hari
3. Terapi suportif: cairan elektrolit, nutrisi, anti-diare – AIDS, malnutrisi, bayi-anak-anak

PROGNOZA: Baik - immunocompetence

EPIDEMIOLOGI :

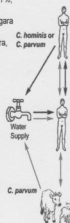
Cryptosporidiosis pada anak-anak (di negara berkembang: 4-17%, di negara maju: 1-3%, usia 4 bl - 1 th) hingga dewasa
Prevalensi pada kasus diare: 2,2% di negara maju, 8,5% di negara berkembang
Prevalensi pada sedian tinja: 1-3% di Eropa dan Amerika Utara, 5-10% di Asia dan Afrika, 10-20% dengan AIDS

Risk populasi:

- Anak-anak
- Pekerja untuk anak-anak
- Orang tua dengan anak yang terinfeksi
- Wisatawan
- Perenang
- Anak-anak usia < 5 th, ibu hamil, immunocompromised

Manusia terinfeksi akibat dari

- Transmisi tidak langsung
- Adanya air minum dan makanan yang terkontaminasi
- Makan makanan yang terkontaminasi dan tidak dimasak
- Transmisi langsung
- Hubungan seksual: kontak oral-oral

TABLE 1. Prevalence of the common *Cryptosporidium* spp. in humans^a

Location	Type of patient	Total no. of patients	No. of patients infected with:					Reference(s)
			<i>C. hominis</i>	<i>C. parvum</i>	<i>C. andersoni</i>	<i>C. felis</i>	<i>C. canis</i>	
Portugal	HSV†	29	7	16	3	3	0	8
Switzerland	HSV†	13	2	7	1	3	0	127
France	HSV†	46	14	22	3	6	0	82
Thailand	HSV†	29	24	0	3	1	0	236
Thailand	HSV†	24	17	5	7	3	2	71
Adjuata	HSV†	10	5	1	0	3	1	157
New Orleans	HSV†	29	18	9	0	3	0	349
Pers	HSV†	118	76	29	10	4	9	349
Pers	Children	83	45	1	7	1	2	348
Kenya	AD	33	23	8	1	0	0	39
Japan	AD	22	16	3	3	0	0	256
United Kingdom	AD	1,080-2,857	855	1,367	19	4	1	177, 178, 180

^a Only data from studies using PCR that amplify all the *Cryptosporidium* spp. are reported.

PENCEGAHAN / KONTROL PENYAKIT:

- Pembuangan tinja yang benar dan hygiene
- Menggunakan filtrasi - 1 µm (diameter) untuk air minum
- Air minum dimasak hingga mendidih - 1-3 menit
- Makanan dimasak dengan adekuat
- Pasteurisasi: 71,7°C - min. 15 detik
- Cuci tangan dengan sabun

Table 1. AIDS-defining opportunistic diseases: Prevalence in six countries^a

Opportunistic disease or myopathy	Qatar d'haire	Brazil	Mexico	Thailand	USA	Zaire	Infectious agent ^b
<i>Isosporiasis</i>	3%	3-7%					advanced
<i>Isosporiasis</i>	4%	5-8%	2%	4%			advanced
<i>Candida</i>	24%	3%	30%	11%	17%	10%	normal
<i>CMV</i>	20%	3%	65-69%	4%	5%	13%	advanced
<i>Cryptosporidiosis</i>	1%	1%	3-11%	2%	7%	10%	medium
<i>Cryptosporidiosis - hominis</i>	4%	1-4%	0%	4%	6-2%	<2%	advanced
<i>Isosporiasis</i>	12%						normal
<i>Isosporiasis</i>	0%		0%	10%	4%		normal
<i>Isosporiasis</i>	3%		3-10%	8%		<2%	advanced
<i>Isosporiasis</i>	12%	1%	30-43%		21%	10%	medium
<i>Isosporiasis</i>	4%	4%	10%		0.7%		advanced
<i>Isosporiasis</i>	1%		<2%				advanced
<i>Isosporiasis</i>				4-23%			advanced
<i>Isosporiasis</i>	0%	11%		7%	0.8%		advanced
<i>Isosporiasis</i>	4%	22%	24%	26%	64%	<2%	medium
<i>Isosporiasis</i>	1%	10%				34%	advanced
<i>Isosporiasis</i>	21%	14-24%	17%	2%	3%	11%	advanced
<i>Isosporiasis</i>	14%	41%	28%	25%	3%	41%	medium
<i>Isosporiasis</i>	0%			0%			

Source: Perkins J. Clinical aspects of HIV-related opportunistic diseases in Africa: tuberculosis and candidiasis. University of Guelph, 1994.

^a Data from autopsy studies, except Brazil (one autopsy and one clinical series), Thailand (two clinical series) and USA (one clinical series).

^b Democratic Republic of Congo.

^c Infectious agent needed to diagnosis, treat.

^d Clinical diagnosis for non-specific opportunistic does not identify the cause. It permits treatment to be carried out, but not necessarily the most effective one.

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TERIMAKASIH