



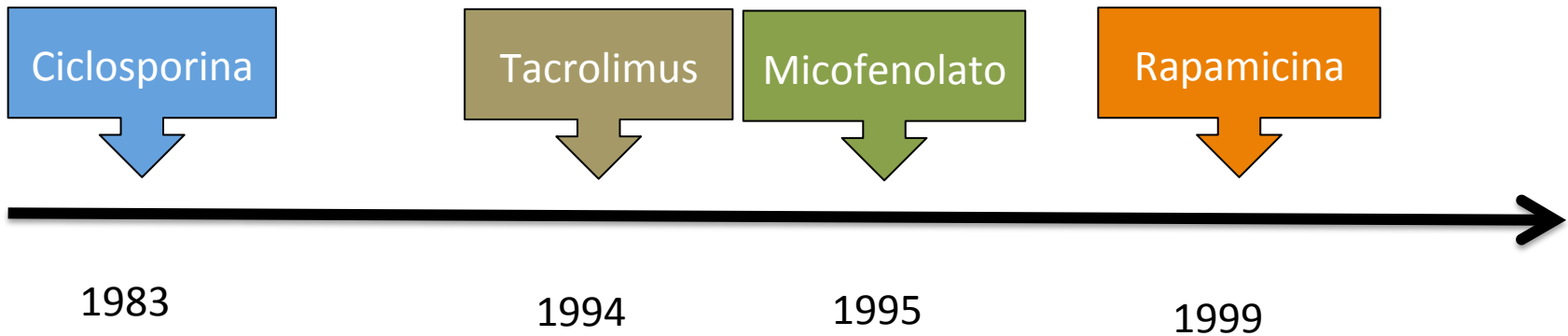
# Infecções em transplantes de órgãos sólidos

Rodrigo de Carvalho Santana

# Plano de aula

- Incidência das infecções
- Principais agentes infecciosos
- Principais agentes infecciosos de acordo com o tempo de transplante
- Agentes infecciosos de acordo com o tipo de transplante
- Principais sítios de infecção

# Terapia immunosoppressora



## Global Activity in Organ Transplantation 2014 Estimates

| Kidney | Liver | Heart | Lung | Pancreas | Small bowel |
|--------|-------|-------|------|----------|-------------|
| 79948  | 26151 | 6542  | 4689 | 2328     | 215         |

≈ 119,873 solid organs reported to be transplanted in 2014

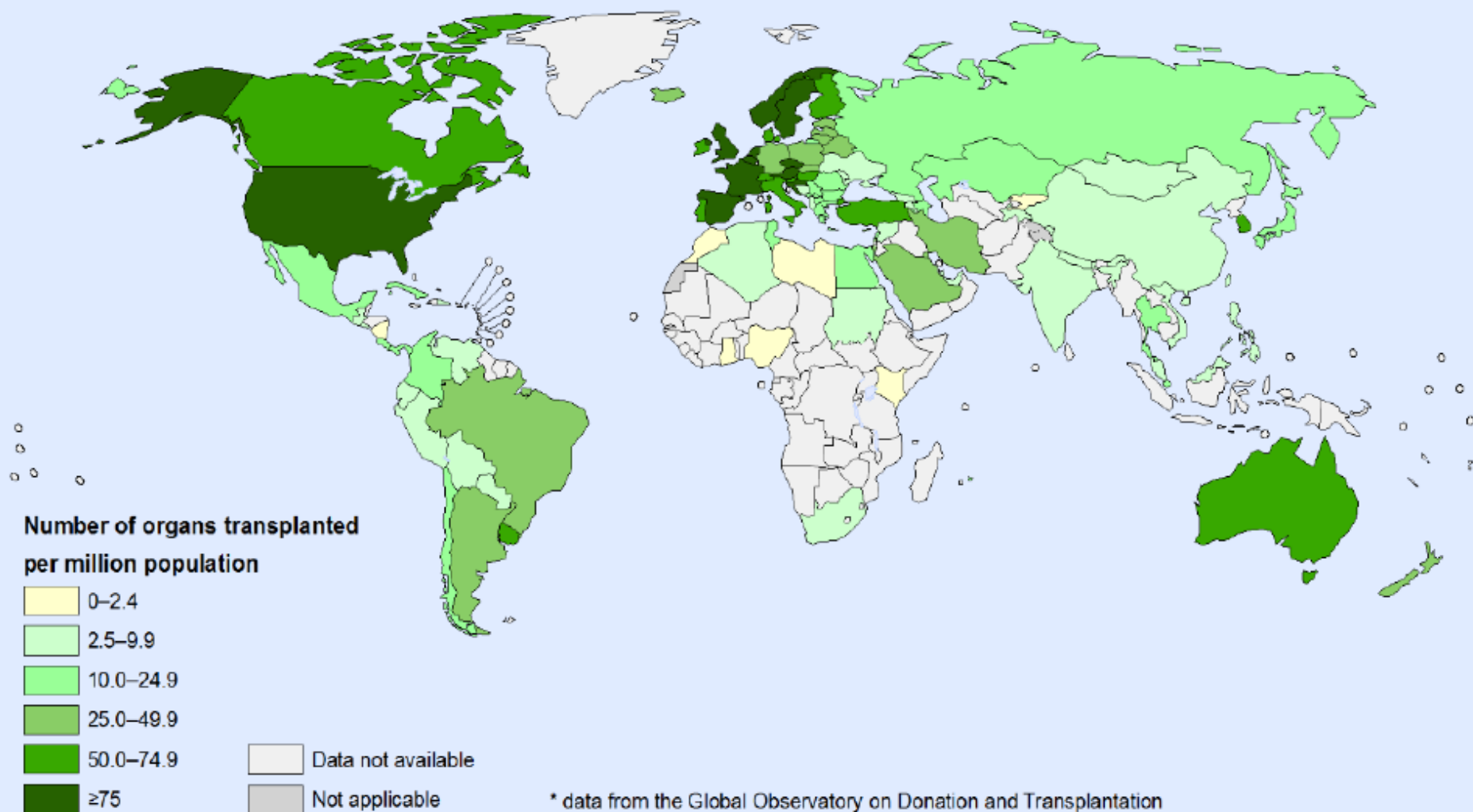
≈ 1.81 % of increase over 2013

≤ 10% of global needs

41.6% of living kidney transplants and 19.8% of living liver  
transplants

Information of 107 Member States on organ transplantation activities is included in the GODT:  
93 of 2014, 6 of 2013, 2 of 2012, 3 of 2011 and 3 of 2010.

# Global transplantation activities of solid organs, 2014\*



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: Global Observatory on Donation & Transplantation. Map Production: Information Evidence and Research (IER)  
World Health Organization

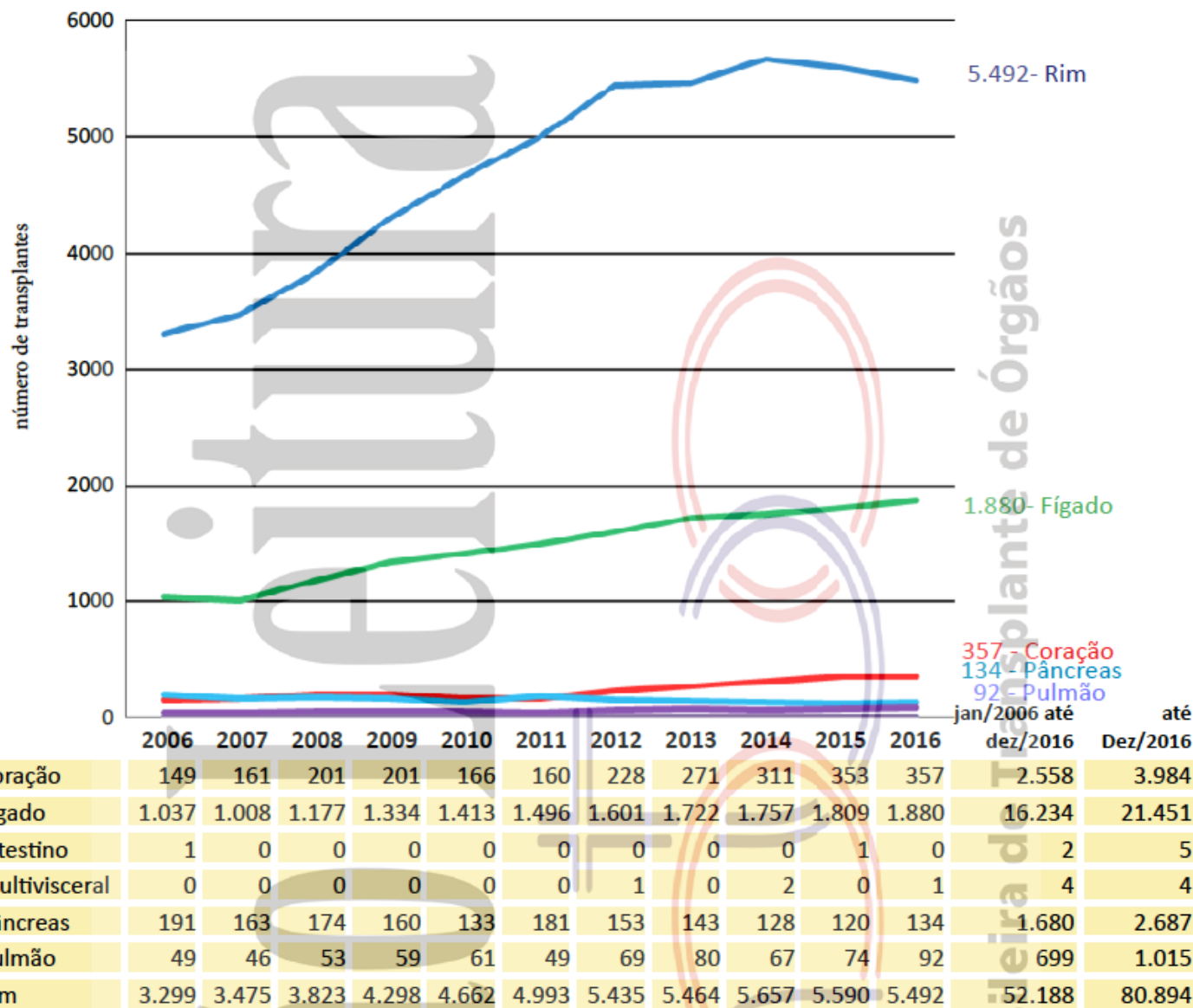


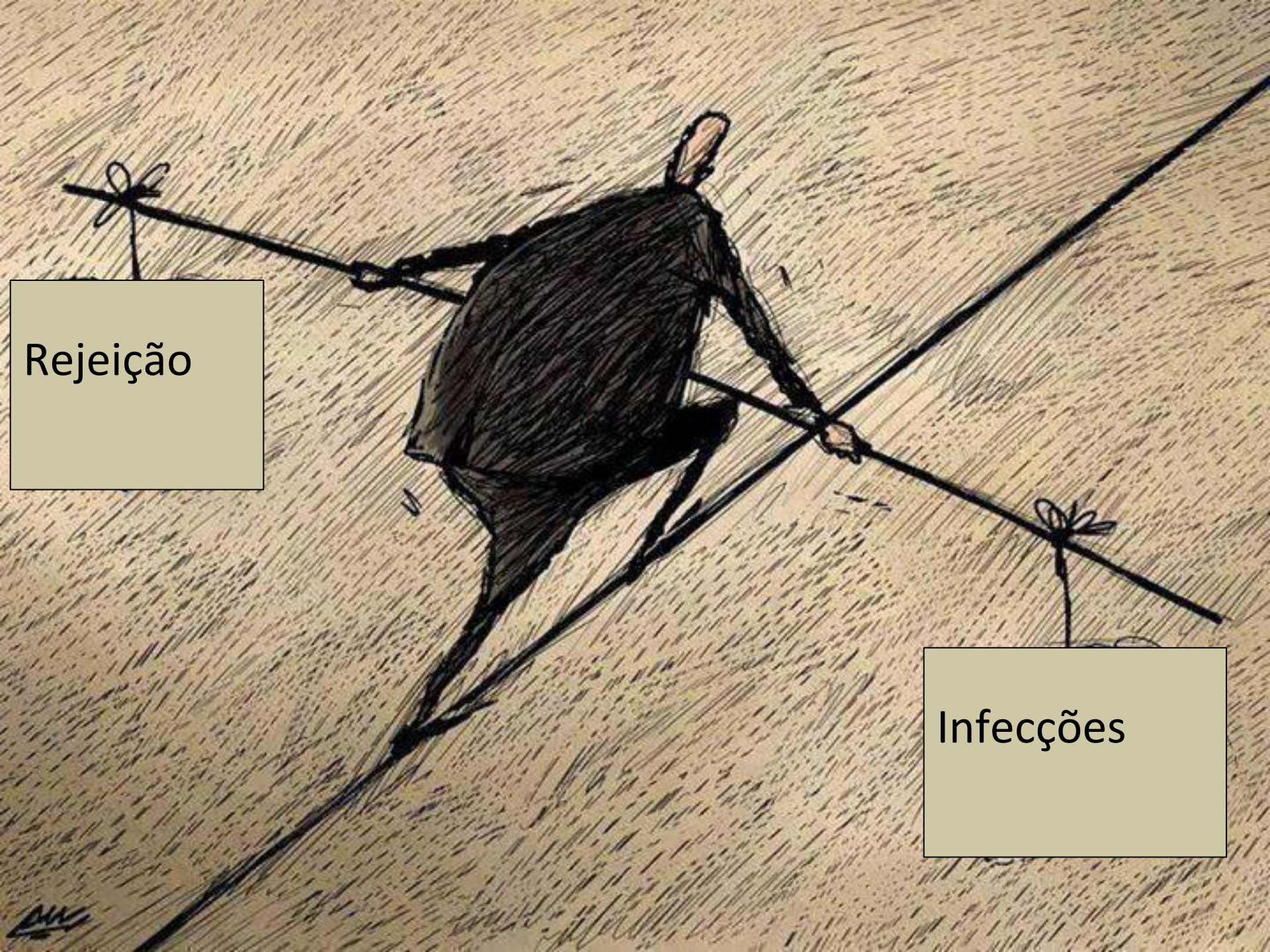
**World Health Organization**

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# NÚMERO ANUAL DE TRANSPLANTES DE 2006 ATÉ 2016

Número absoluto de transplantes (anual)





Rejeição

Infecções

## Leading Causes of Death in Organ Transplant Recipients 10 Years after Transplantation

| TYPE OF TRANSPLANT | PERCENTAGE OF DEATHS DUE TO: |           |            |               |                   |
|--------------------|------------------------------|-----------|------------|---------------|-------------------|
|                    | Vascular Events*             | Infection | Malignancy | Graft Failure | Other             |
| Kidney             | 22.4                         | 15.4      | 8          | —             | —                 |
| Liver              | 12.5                         | 15.5      | 11.8       | —             | 11.3 <sup>†</sup> |
| Heart              | 20                           | 13        | 7.4        | 16.7          | 9.3 <sup>†</sup>  |
| Lung               | 9.4                          | 21.4      | —          | 20.5          | 18.4 <sup>†</sup> |

# Agentes infecciosos

## Bactérias

Gram-negative bacteria:

Enteric bacteria (*Escherichia coli*, other Enterobacteriaceae)

*Pseudomonas*

*Acinetobacter*

*Serratia*

*Bacteroides* and other anaerobes

*Legionella*

Gram-positive aerobes:

*Staphylococcus aureus*

*Staphylococcus epidermidis*

*Streptococcus* spp.

*Enterococcus* spp.

*Pneumococcus*

*Listeria monocytogenes*

*Nocardia* spp.

Gram-positive anaerobe:

*Clostridium difficile*

Gram-negative coccobacilli:

*Haemophilus influenzae*

*Moraxella* spp.

# Agentes infecciosos

## Fungos

*Candida* spp.

*Aspergillus* spp.

*Cryptococcus* spp.

Agents of mucormycosis:

*Histoplasma capsulatum*

*Coccidioides* spp.

*Pneumocystis jirovecii*

# Agentes infecciosos

## Virus

Herpesvirus group:

Herpes simplex virus (HSV)

Cytomegalovirus (CMV)

Varicella-zoster virus

Epstein-Barr virus (EBV)

Human herpesvirus 6 and 7

Human herpesvirus 8

Human immunodeficiency virus type 1 (HIV-1)

Adenovirus

Rotavirus

Respiratory syncytial virus

Influenza A and B viruses

Parainfluenza viruses

West Nile virus

Hepatitis B virus

Hepatitis C virus

Hepatitis E virus

Polyomavirus

Papillomavirus

Parvovirus

Norovirus

# Agentes infecciosos

## Protozoários

---

*Toxoplasma gondii*

*Trypanosoma cruzi*

*Strongyloides stercoralis*

# Mortalidade por infecção



# Apresentação clínica das infecções relacionadas aos transplantes

|                                                                                              |                          |
|----------------------------------------------------------------------------------------------|--------------------------|
| Agente infeccioso                                                                            | Tipo de transplante      |
| Estado imunológico <ul style="list-style-type: none"><li>• tipo de imunossupressão</li></ul> | Tempo após o transplante |
| Doenças e infecções subjacentes                                                              | Colonização prévia       |
| Imunidade subjacente contra agentes específicos                                              | Medicações em uso        |

Hospedeiro  
susceptível

Agente infeccioso  
disponível

Infecções

```
graph TD; A[Hospedeiro susceptível] --> C((Infecções)); B[Agente infeccioso disponível] --> C;
```

The diagram illustrates the two essential components for an infection to occur. On the left, a dark blue rounded rectangle contains the text 'Hospedeiro susceptível'. On the right, a light blue rounded rectangle contains the text 'Agente infeccioso disponível'. Arrows from both rectangles point towards a central dark blue circle labeled 'Infecções'.

# Agentes infecciosos e o tempo de transplante

Bactérias  
*Candida*  
*Aspergillus*  
*Clostridium difficile*  
HSV

Infecções comunitárias  
Herpes zoster  
EBV  
verruca vulgaris  
*Criptococcus*  
*Histoplasma*

30 dias

6 meses

*Pneumocystis jirovecii*  
Fungos  
*Toxoplasma gondii*  
*Nocardia*  
CMV



# Infecções conforme o tipo de transplante

| Frequency, Types of Infections, and Sources of Infections Occurring in the First Year after Transplantation |                                |                |                  |                       |                           |
|-------------------------------------------------------------------------------------------------------------|--------------------------------|----------------|------------------|-----------------------|---------------------------|
| TYPE OF TRANSPLANT                                                                                          | INFECTION EPISODES PER PATIENT | BACTEREMIA (%) | CMV DISEASE* (%) | FUNGAL INFECTIONS (%) | MOST COMMON SOURCE        |
| Kidney                                                                                                      | 0.98                           | 5-10           | 8                | 0.7                   | Urinary tract             |
| Heart                                                                                                       | 1.36                           | 8-11           | 25               | 8                     | Lung                      |
| Heart-lung                                                                                                  | 3.19                           | 8-25           | 39               | 23                    | Lung                      |
| Liver                                                                                                       | 1.86                           | 10-23          | 29               | 16                    | Abdomen and biliary tract |

# Transplante de rim

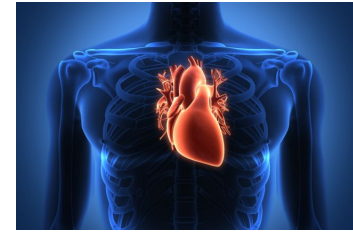


- Infecção do trato urinário
  - Bactérias
  - *Mycoplasma hominis*
  - Adenovirus
  - Vírus BK
- Pneumonia
  - Bactérias
  - CMV
  - fungos
  - *Pneumocystis jirovecii*
  - *Nocardia*
- Infecções cirúrgicas
  - infrequentes (4% -5%)



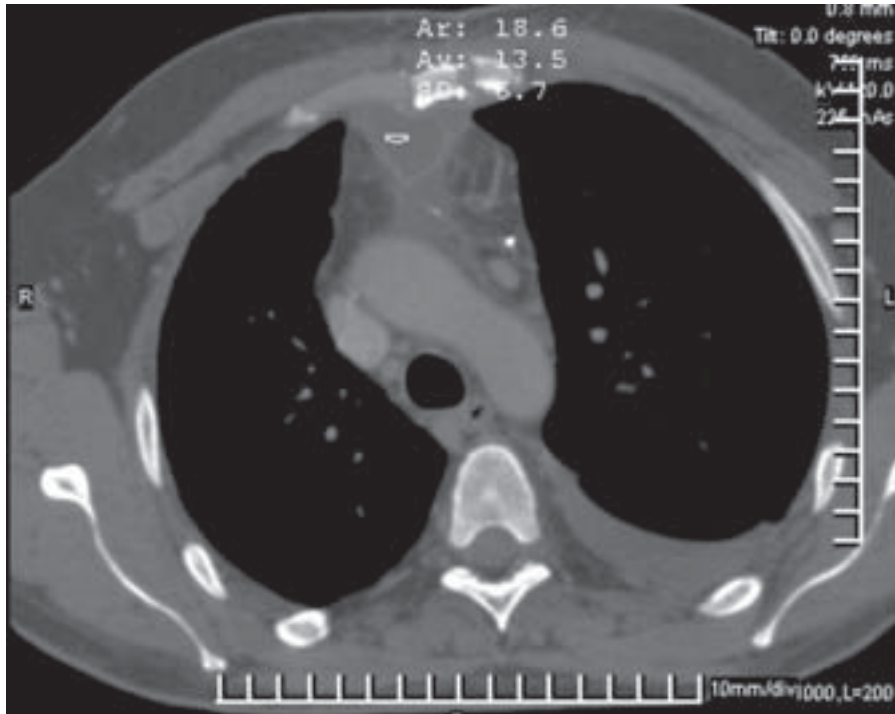


# Transplante de coração

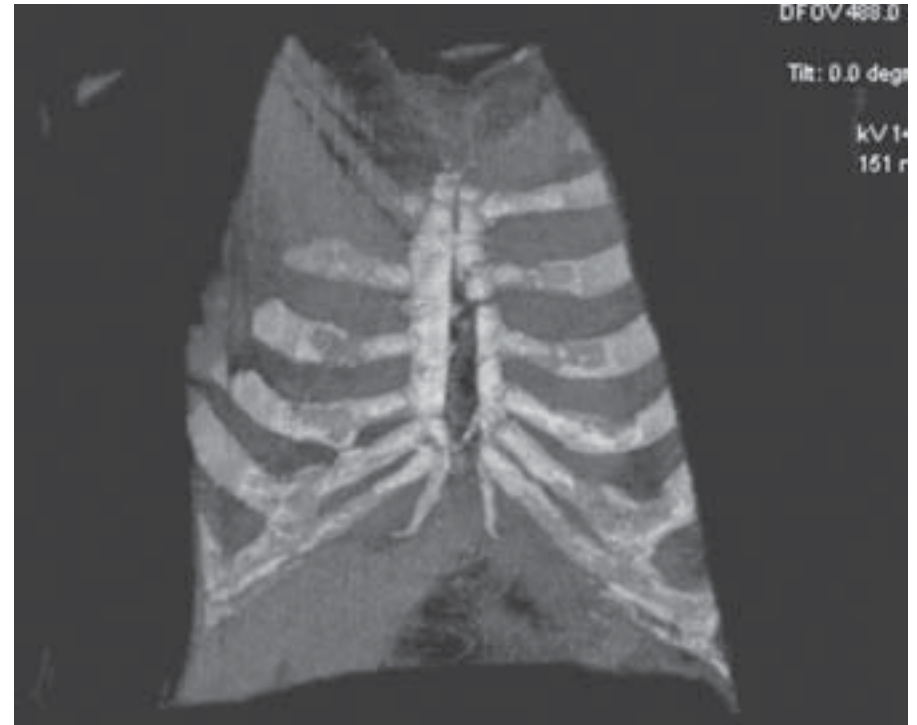


- Pneumonias bacterianas
- Endocardite infecciosa
- Infecções do trato urinário
- Herpes-vírus
- Infecções fúngicas invasivas
- Infecções cirúrgicas
  - Mediastino
  - Esterno
- Toxoplasmose
- Nocardiose
- Doença de Chagas

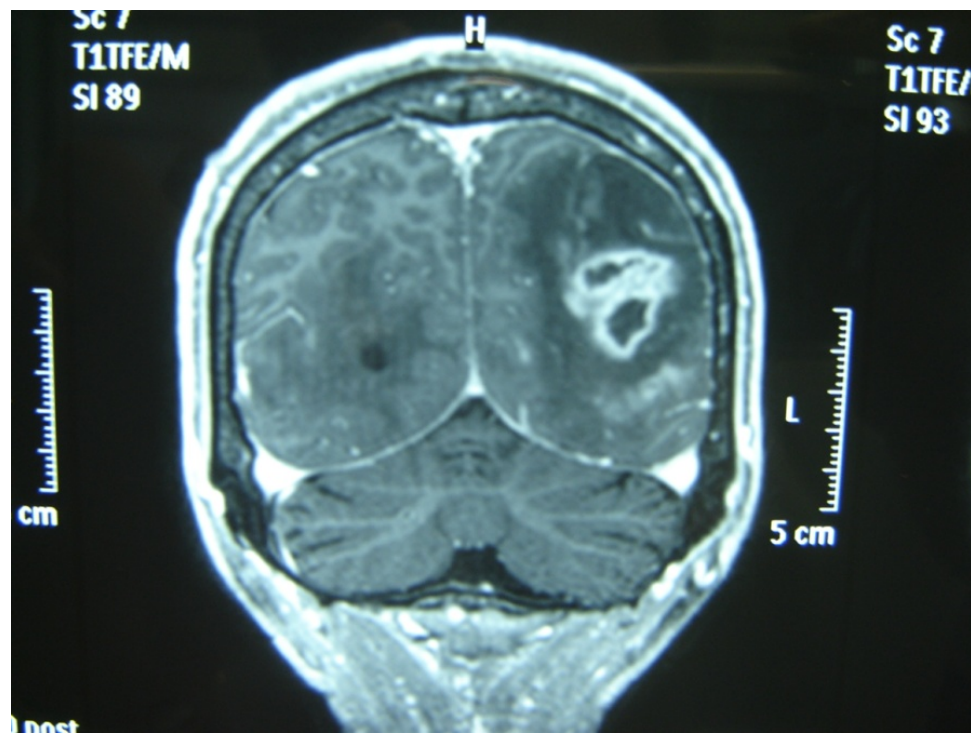
# Mediastinite



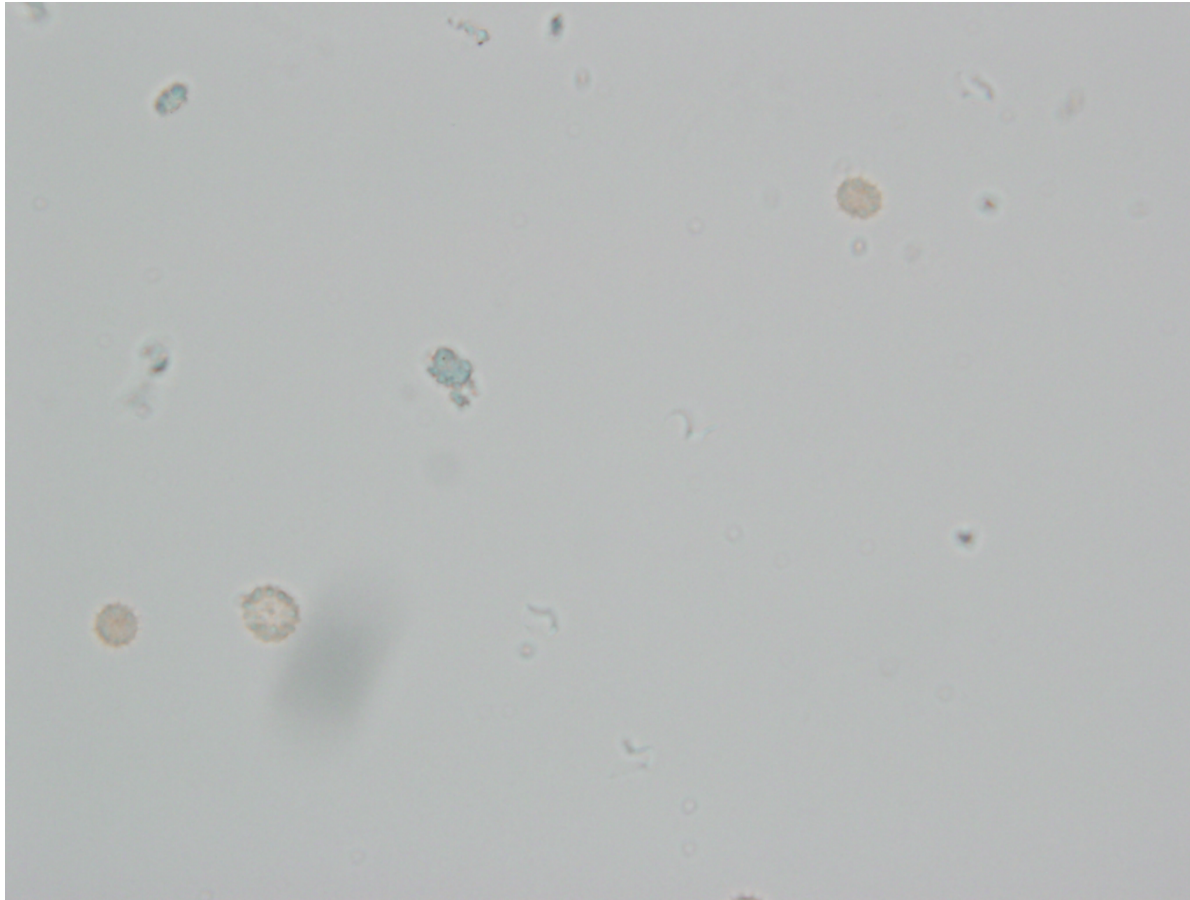
Coleção retroesternal com densidade líquida



Deiscência esternal



## Pesquisa direta a fresco no líquido



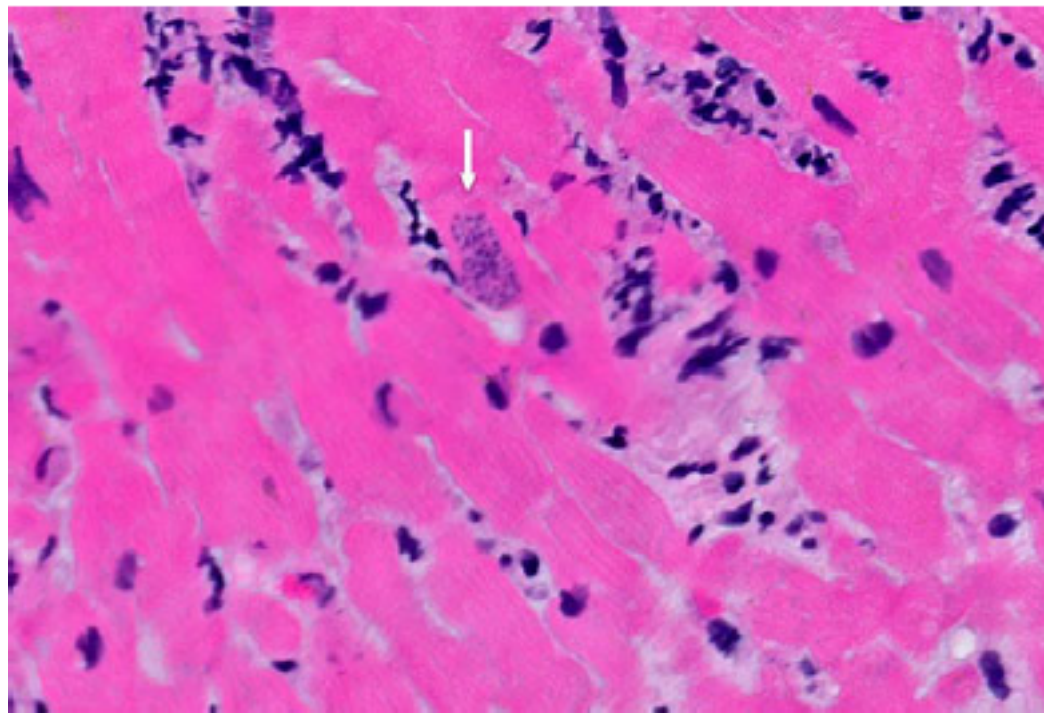
# Caso Clínico

Receptor : Homem, 30 anos . Cardiomiopatia familiar

- CMV negativo
- Toxoplamose negativo

Doador:

- CMV negativo
- Toxoplamose desconhecido

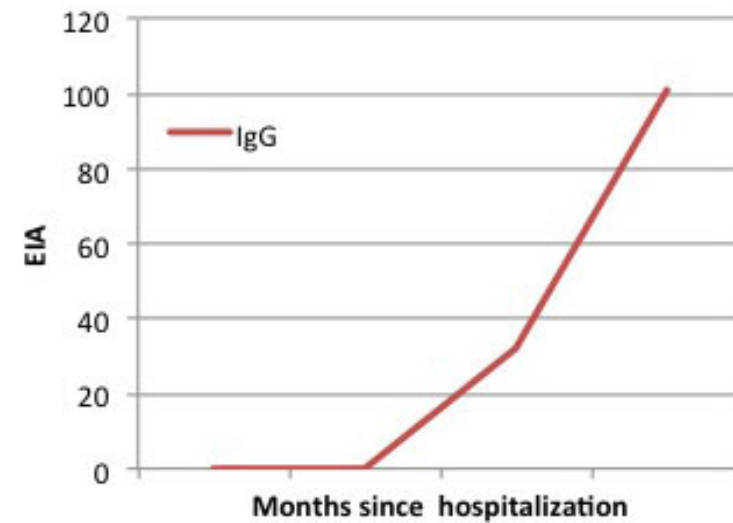


Biópsia endomiocárdica

**IgM**



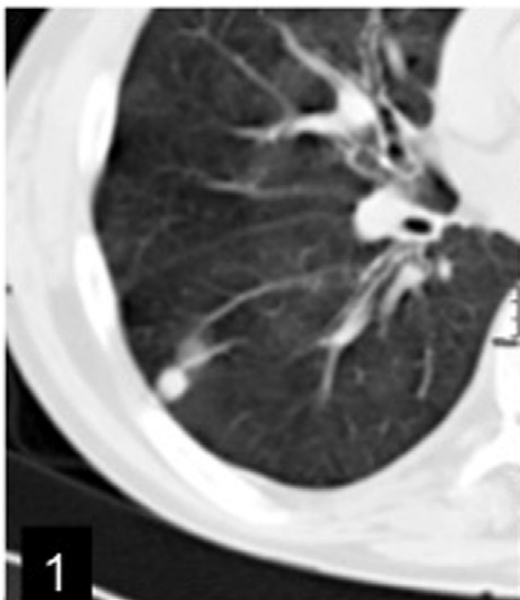
**IgG**



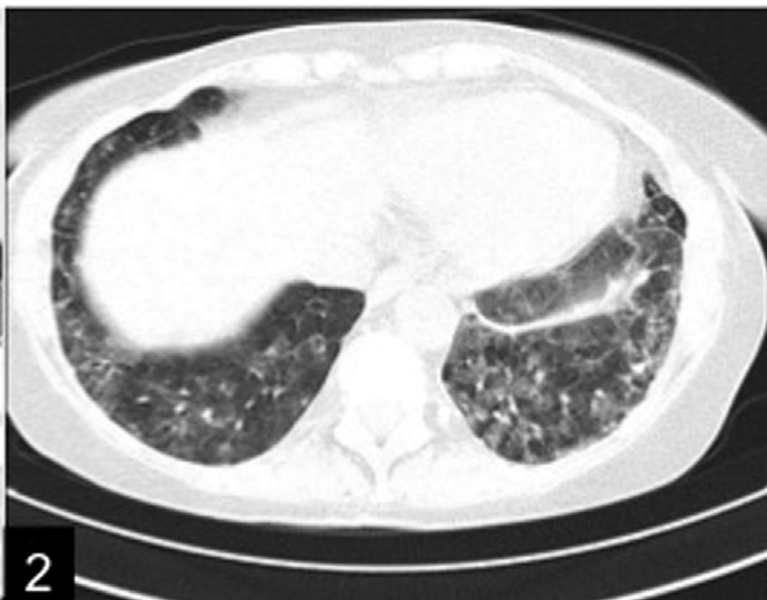
# Transplante de pulmão



- Pneumonias bacterianas
- Mediastinite
- Infecções fúngicas invasivas
  - Aspergilose
- Pneumonia viral
  - CMV
  - HSV
  - influenza,
  - parainfluenza
  - VSR
  - metapneumovirus,
  - coronavirus
  - rinovirus
  - adenovirus
- Micobactérias



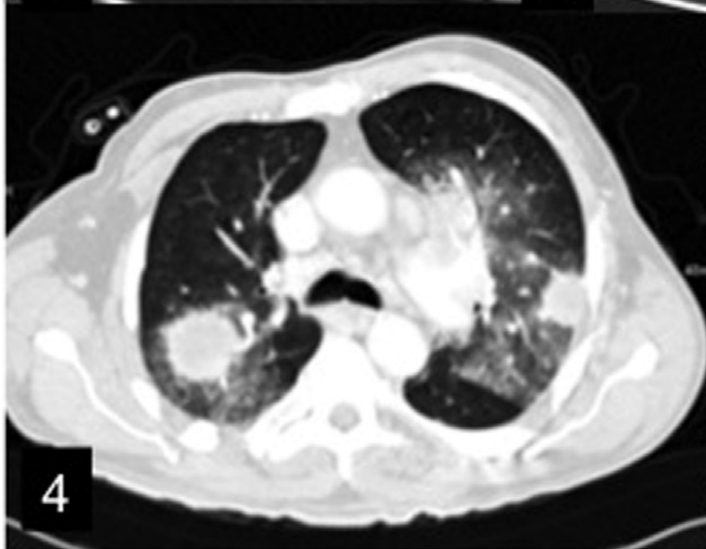
1



2



3



4



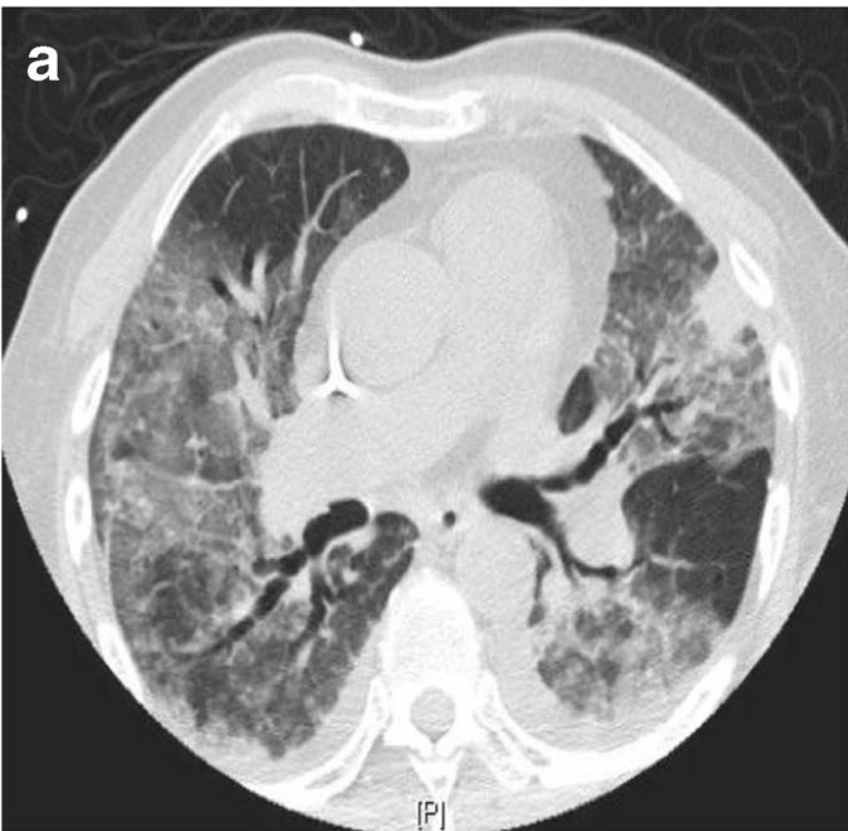
5

- 1 Invasive Aspergillosis – coin lesion
- 2 IA after bilateral lung transplant
- 3 Bronchoscopy of necrotizing bronchitis
- 4 IA – halo sign
- 5 IA – air crescent sign

# Toxoplamose



# Legionella



# Transplante de fígado



- Infecções bacterianas
  - Corrente sanguínea
  - Abdome e vias biliares
  - Sítio cirúrgico
  - Pulmão
- Infecções fúngicas
  - *Candida*
  - *Aspergillus*
  - *Cryptococcus*

Se:4  
Im:27

[A]

Study Date:27-04-2016  
Study Time:23:19:45  
MRN:



## Sítios de infecção em transplantes de órgãos sólidos

|                        |                        |
|------------------------|------------------------|
| Pele e sítio cirúrgico | Tórax                  |
| Trato urinário         | Abdome e vias biliares |
| Corrente sanguínea     | SNC                    |

# Causas de pneumonia em pacientes transplantados

## Early Pneumonia ( $\leq 30$ Days)

### Common Causes

Gram-negative bacilli

*Staphylococcus aureus*

Aspiration

### Less Common Causes

*Aspergillus*

Herpes simplex virus

*Legionella*

*Toxoplasma gondii*

## Late Pneumonia ( $>30$ Days)

### Common Causes

Pneumococcus

*Hemophilus influenzae*

Influenza

No cause identified

### Less Common Causes

*Pneumocystis*

*Nocardia*

*Legionella*

*Aspergillus*

Gram-negative bacilli

*Staphylococcus aureus*

Aspiration

*Cytomegalovirus*

Varicella zoster virus

Paramyxoviruses

Tuberculosis

Coccidioidomycosis

Histoplasmosis

*Cryptococcus*

Respiratory viruses\*

## Etiologia de nódulos pulmonares em pacientes transplantados

### **Infectious**

#### **Bacterial**

*Nocardia*

*Mycobacteria*

*Legionella*

*Staphylococcus aureus* (septic emboli)

#### **Fungal**

*Aspergillus*

*Cryptococcus*

*Mucormycosis*

Endemic fungi (histoplasmosis and coccidioidomycosis)

Other non-*Aspergillus* molds

#### **Viral**

*Cytomegalovirus*

### **Noninfectious**

#### **Malignancies**

Post-transplantation lymphoproliferative disorder and other lymphomas

Carcinomas (typically lung neoplasms and hepatocellular carcinoma)

## Agentes envolvidos em infecções do SNC em pacientes transplantados

### **Bacteria**

*Listeria monocytogenes*

*Nocardia* spp.

### **Viruses**

Varicella-zoster virus

Polyomavirus (JC virus)

Human herpesvirus 6

West Nile virus

### **Fungi**

*Cryptococcus neoformans*

*Aspergillus* spp.

Agents of mucormycosis

Dematiaceous fungi

### **Other Pathogens**

*Toxoplasma gondii*

# Agentes potencialmente transmissíveis do doador para o receptor

## Viruses

Viral hepatitis (B, C, and E)

Herpes viruses (cytomegalovirus, Epstein-Barr virus, herpes simplex virus)

Human immunodeficiency virus

Human T lymphocytic virus-I/II

West Nile virus

Lymphocytic choriomeningitis virus

Rabies

Creutzfeldt-Jakob disease

JC virus infection (progressive multifocal leukoencephalopathy)

## Bacteria

Bacteremia

Bacterial meningitis (*Neisseria meningitidis*, *Streptococcus pneumoniae*)

Bacterial pneumonia or donor colonization (lung transplants)

Tuberculosis

## Fungi

Candidiasis

Cryptococcosis

Endemic mycosis (histoplasmosis, coccidioidomycosis)

Filamentous fungi (aspergillosis, mucormycosis, scedosporiosis)

## Other Agents

*Toxoplasma gondii*

*Trypanosoma cruzi* (Chagas' disease)

*Leishmania* spp.

*Strongyloides stercoralis*

*Balamuthia mandrillaris*

*Naegleria fowleri*

*Treponema pallidum* (syphilis)

Meningoencephalitis of unknown cause

Obrigado