Managing Infections After Transplant and CAR T-cell Therapy

Celebrating a Second Chance at Life Survivorship Symposium

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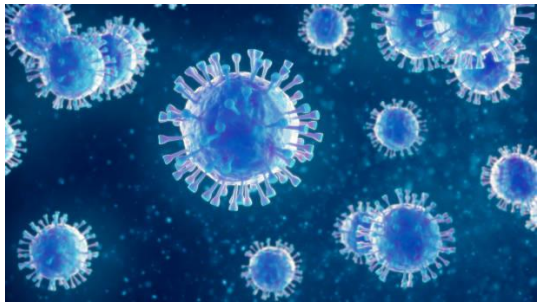
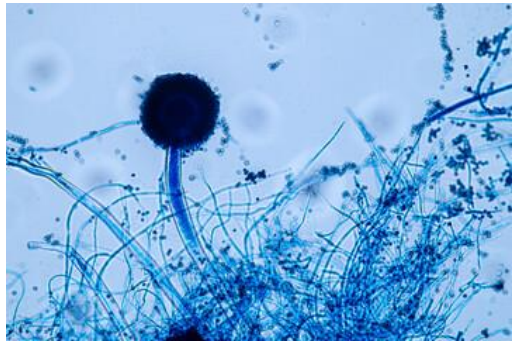
Common Types of Infections

Bacteria



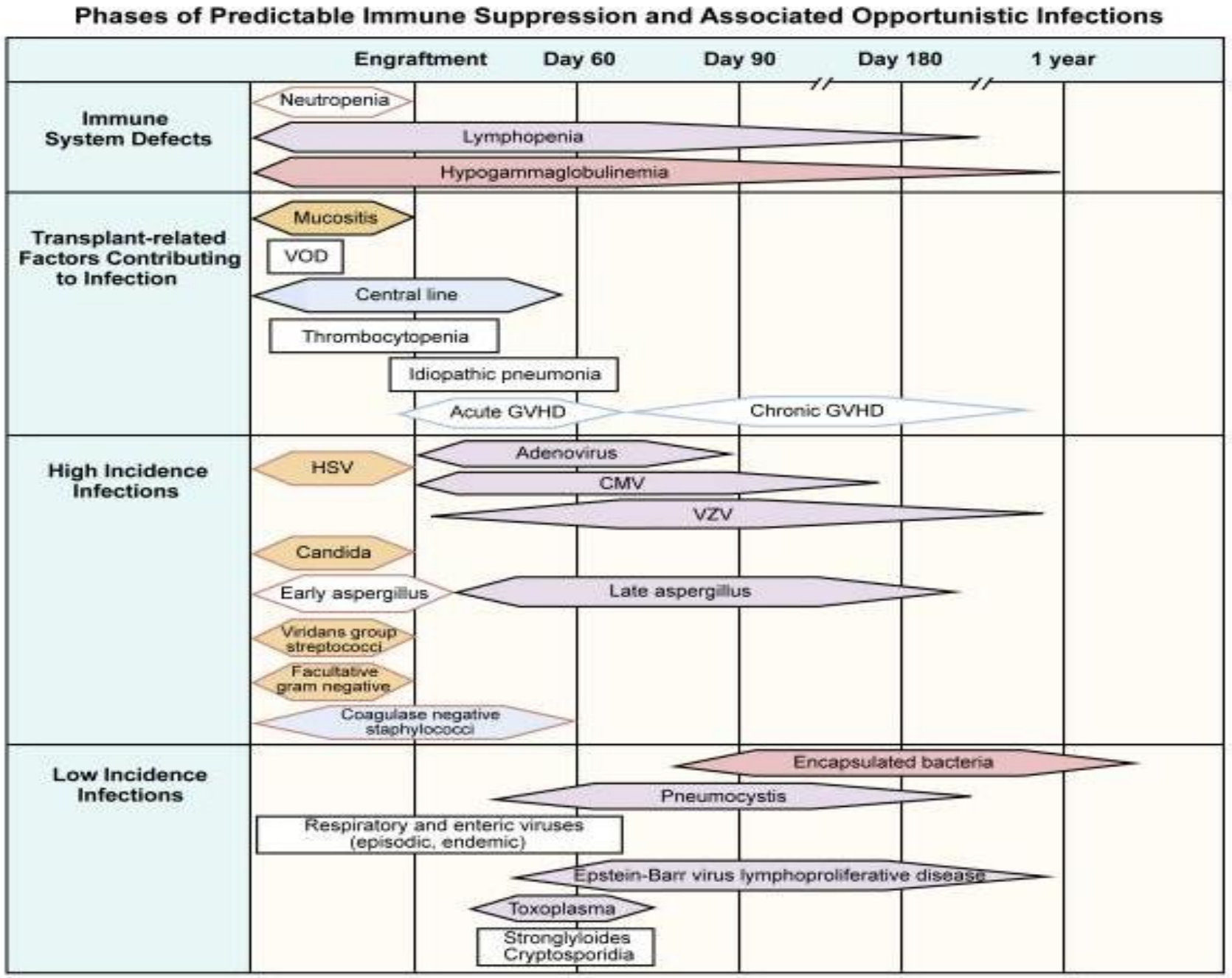
Virus



Fungus

Parasite

Timeline of Infection after Transplant[1]



BMT INFONET

Neutropenic Fever[2]

- Occurs in > 80% of patients with blood cancers
- Neutrophils are a type of white blood cell that is killed by specific chemotherapy you receive
- Neutrophils help control and kill different infections
- Neutrophil count decreases to zero (0) after CAR-T therapy, autologous transplant (transplant using your own cells), and allogeneic transplant (transplant using donor cells) for several days to weeks
- Can be a sign of an infection

What Can Happen During a Neutropenic Fever?

- Temperature > 100.4 ◦ F + absolute neutrophil count < 500
- Chills
- Rigors = shaking chills where you feel cold to the bone
- Low blood pressure
- Confusion
- Changes in your breathing
- Care in the intensive care unit

How is a Neutropenic Fever Treated?

- Blood cultures
- Urine culture
- Chest x-ray
- Scans to look for infection
- Intravenous antibiotics (through the vein) are usually started within an hour
- Sometimes an antifungal medication (tablet or through the vein) is needed to treat the infection

Bacterial Infections

Bacterial Infections

Site of infection	Diagnosis = Physical Exam +
Blood	Blood cultures
Intravenous catheter	Blood cultures
Lungs (pneumonia)	Chest x-ray, Computerized tomography scan (CT scan) Bronchoscopy
Abdomen or pelvis	Most often Computerized tomography scan (CT scan) Esophagogastroduodenoscopy, Colonoscopy
Urine	Urine culture
Skin	Clinical exam
Brain	Spinal fluid exam Computerized tomography scan (CT scan) Magnetic Resonance Imaging (MRI)

Common Bacteria Found in Blood Cultures[3,4]

Gram Positive Bacteria	Gram Negative Bacteria
Streptococcus species	Pseudomonas species
Enterococcus species	Escherichia coli
Staphylococcus aureus	Klebsiella species
Staphylococcus epidermidis	Bacteroides species
Bacillus species	

5-10% Autologous HSCT Recipients
20-30% Allogeneic HSCT Recipients
Wider range in CAR-T Recipients, but most common by Day +30

Clostridium Difficile Infection (CDI)[5]

- Common bacterial infection that causes diarrhea in cancer patients
- Affects 7.9-13% of all transplant recipients
  - Higher rates seen in allogeneic transplant patients
  - Usually happens in the first 100 days post transplant
- 3 or more unformed stools in 24 hours
- Abdominal pain
- Fever
- Stool is tested for the bacteria

How Do I Get Clostridium Difficile Infection?

Chemotherapy
Antibiotics
Hospitalization/s

Clostridium difficile infection grows in the bowel & causes diarrhea

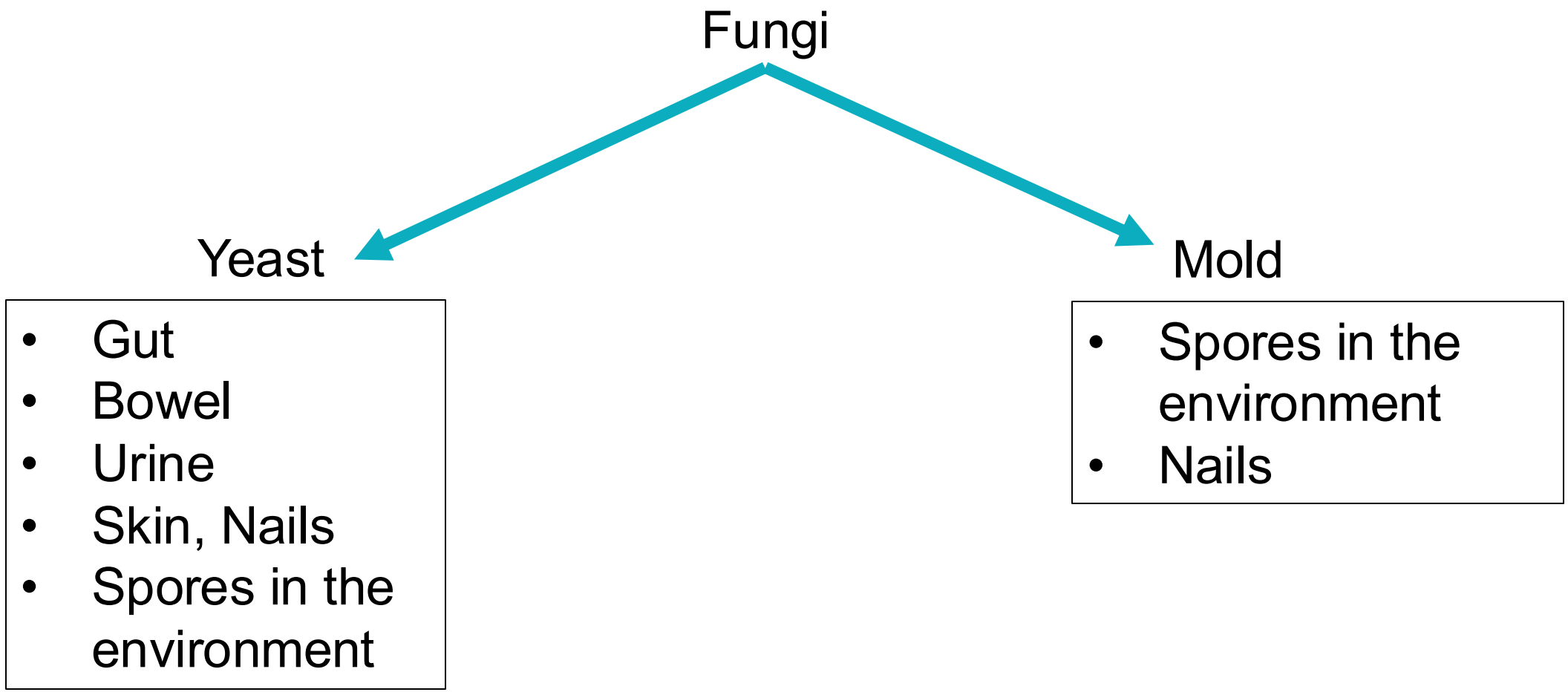
You can get Clostridium difficile infection more than once

How is Clostridium Difficile Infection Treated?

- Oral antibiotic that kills the bacteria
- Severe, recurrent cases – putting healthy donor stool in your bowel
- Your doctor might put you on a low dose oral antibiotic to prevent Clostridium difficile infection if you have had it more than once

Fungal Infections

Fungal Infections – Where Do They Come From?



Learning Objectives

1. Recognize common infections that happen after CAR-T therapy, autologous transplant, and allogeneic transplant
2. Understand where these infections come from
3. Learn how these infections are treated

Common Fungal Infections[3,6]

Yeast	Mold
Candida species	Aspergillus species
Cryptococcus species	Mucor species

Incidence of < 2% in Autologous Recipients
Incidence of 7% in Allogeneic Transplant
Infrequent in CAR T-cell Recipients

Why Do You Get Fungal Infections?

- Chemotherapy
- Low white blood cell count for more than 10 days
- Steroids
- Graft-versus-host disease treatments

Weakens immune system

Fungal Infection

Management of Fungal infections

- Preventive antifungal started before and continued after CAR-T therapy or transplant
- Treatment antifungal – oral tablet or intravenous therapy
- Surgery

Viral Infections

Herpes Simplex and Varicella Zoster

- Exposure before CAR-T or transplant
- Dormant (quiet) in your body
- Start to grow and cause infection after CAR-T or transplant due to changes in immune system
- Skin, genital area, lips, inside of mouth, brain
- Often painful
- Antiviral medication – prevent and treat

Cytomegalovirus (CMV)

Exposure Before Transplant	Symptoms of Infection
Saliva, blood, urine, breast milk Other body fluids	Fever, vomiting, diarrhea, cough vision changes, abnormal labs

Diagnosis	Treatment
Blood test for virus Virus seen in tissue from organs	Oral or intravenous antiviral medications

- Most common after allogeneic transplant
- Prevention = antiviral medication given after allogeneic transplant
- Treatment = antiviral (oral or through the vein) for active infection

Viral Infections – Respiratory Viruses

Diagnosis - swab or test on fluid obtained from the lungs

Viral Infection	Treatment
Influenza (Flu)	Oral or through the vein medication
Respiratory Syncytial Virus (RSV)	No proven treatment An oral or inhaled antiviral sometimes used
Parainfluenza (PIV)	No treatment
Human Metapneumovirus	No treatment

Norovirus

- Diarrhea, nausea, vomiting
- Community or in the hospital
- Cause of chronic diarrhea, often in allogeneic transplant patients
- No proven treatment, management of symptoms

Parasitic Infections

Toxoplasma gondii

Exposure	Symptoms
Undercooked/contaminated meat Contact with contaminated soil Food/drink contaminated with cat feces	Headaches Fevers Changes in thinking (mental status)

Diagnosis	Treatment
Blood test for the parasite Spinal fluid test for the parasite Rare – brain biopsy	Oral or intravenous medications Treatment can be 6 months or longer

Most common in patients who receive an allogeneic transplant
Preventive medication is given so this infection does not occur

Infection Prevention

- **You will receive specific guidance and instructions from your center's team**

- **Majority will recommend:**
- Handwashing
- Patient and caregiver masking
- Patient and caregiver vaccination
- No gardening and limiting soil and dust exposure for at least 6-12 months after transplant or CAR T
- No handling of cat litter
- Avoid drinking well water

- **Travel outside the US will be approved by your individual care team**

Prevention – Samples Vaccination Schedule

Patient Name: BMT Date:	3-4 MONTHS Date:____	6 MONTHS Date:____	8 MONTHS Date:____	12 MONTHS Date:____	14 MONTHS Date:____	18 MONTHS Date:____	24 MONTHS Date:____	At 2 years & 4 years Date:____	Every 4-5 years Date:____
Influenza Inactivated[2] – IM (Annually between September and November)		❖							
Hepatitis B Inactivated (Engerix-B)[3] – IM (Vaccination dose for immunocompromised patients is doubled = 40mcg or 2mL of Energix)				❖	❖	❖			
Hepatitis A Inactivated (Havrix)– IM				❖		❖			
Tetanus, Diphtheria, Acellular Pertussis (DTaP)[4,11] – IM				❖	❖	❖			
Heamophilus Influenza B Conjugate Vaccine[11] – IM				❖	❖	❖			
Inactive Polio Vaccine[11] – IM or SQ				❖	❖		❖		
PCV20 (20-valent pneumococcal conjugate) [6] – IM		❖	❖	❖		❖			
Human Papilloma Virus (Gardasil 9) – IM (Adults up to age 45)				❖	❖	❖			
Meningococcal Conjugate Vaccine (MenACWY - Menactra, Menveo, or MenQuadfi)[7] – IM				❖	❖				
Meningococcal Group B Conjugate Vaccine (Bexsero®)[10] – IM						❖	❖		
Shingrix (Zoster Vaccine Recombinant, Adjuvanted)[9]	❖ Auto dose 1	❖ Auto dose 2		❖ Allo dose 1	❖ Allo dose 2				
LIVE ATTENUATED VIRUS (Contraindicated in patients with active GVHD or on immunosuppression)									
Measles, Mumps, Rubella (MMR)[5] – LIVE - SQ							❖		
ANTIBODY LEVEL TESTING									
Pneumococcal antibody level[8]								❖	
Test for maintenance of antibody levels to HBV, & tetanus[8]									❖
SARS-CoV-2 19 (Pfizer, Moderna, Novavax)	Begin at series at 3 months: Give 2-3 injections of the updated vaccine (Moderna – 3 injections, each separated by 4 weeks, Novavax – 2 injections, separated by 3 weeks, Pfizer – 3 injections, dose 1 and 2 separated by 3 weeks, dose 2 and 3 separated by 4 weeks)								

Summary - Key Points

1. Many different infections can occur after CAR-T therapy, autologous transplant, and allogeneic transplant

2. You will be given medications to prevent many of these infections

3. Knowing about the specific infections and their treatment will help if you develop one

References

1. Fundamentals of HCT Training Course eBook. American Society for Transplantation and Cellular Therapy. 2021
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4. Mediterranean Journal of Hematology and Infectious Diseases. Bacterial Infections in Hematopoietic Stem Cell Transplant Recipients. 2015 Jul 1;(7).
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Questions?

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Let Us Know How We Can Help You

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