

# CHRONIC GRANULOMATOUS DISEASE (CGD)



Pathogenesis



Recognition



Next Steps

# The pathogenesis of chronic granulomatous disease (CGD)

CGD is a primary immunodeficiency disorder of neutrophils that results in impaired killing of certain bacteria and fungi and can lead to potentially fatal infections<sup>1,2</sup>

~50%

Approximately 50% of patients with CGD have  $\geq 1$  autoimmune or inflammatory condition.<sup>3</sup>

Deadly infections in CGD are most commonly caused by *Aspergillus* and *Burkholderia*.<sup>2,4</sup>



In the immunocompromised, like patients with CGD, **certain environments can be dangerous, even deadly.**<sup>1,5,6</sup>



CGD can also lead to the formation of **granulomas** throughout the body, a characteristic of this condition that can help point to a diagnosis.<sup>1</sup>



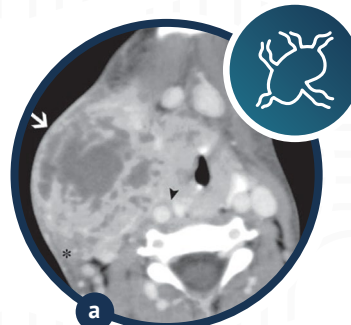
**Is it CGD?** Recognize the signs and symptoms, as patients may present differently.

# CGD manifestations can occur in multiple organ systems<sup>1</sup>



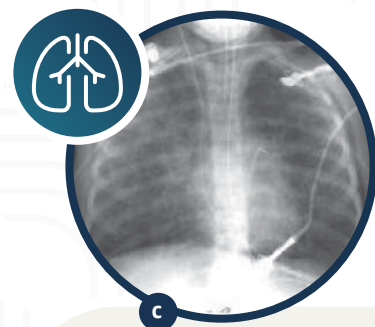
## Brain<sup>1</sup>

abscess  
*Aspergillus* species,  
*Nocardia* species



## Lymph nodes<sup>1,4,7</sup>

lymphadenitis  
*Aspergillus* species,  
*Klebsiella* species,  
*Staphylococcus aureus*



## Lungs<sup>1,2,8</sup>

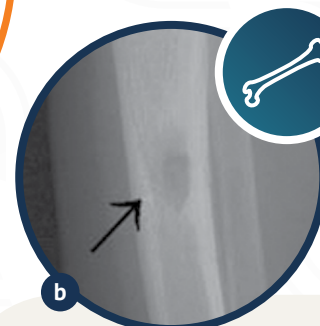
pneumonia, potentially leading to sepsis\*  
*Aspergillus* species, *Candida* species,<sup>†</sup> *Nocardia* species,  
*Klebsiella* species, *Staphylococcus aureus*, *Burkholderia*  
(formerly *Pseudomonas*) *cepacia* complex

~80% of patients with CGD are affected by a pulmonary infection at some time in their life<sup>9</sup>



## Urinary tract<sup>1</sup>

genitourinary granulomas

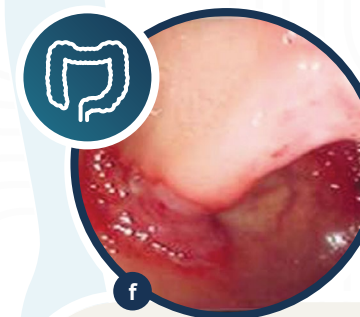


## Bones<sup>1,2,7</sup>

osteomyelitis  
*Aspergillus* species, *Nocardia* species, *Serratia marcescens*,  
*Staphylococcus aureus*

25% of patients with CGD in the US develop a bone infection<sup>10</sup>

Is it CGD? Dusty or damp places can trigger infections (eg, gardens, lakes, rivers, or construction sites).<sup>5,6</sup>



## Gastrointestinal tract<sup>1,2,16</sup>

gastrointestinal granulomas, perirectal abscess, colitis  
*Staphylococcus aureus*

~66% of patients with CGD experience chronic or acute GI inflammation<sup>17</sup>

Is it CGD? Patients with CGD can experience GI symptoms that include diarrhea, abdominal pain, constipation, and/or weight loss.<sup>17</sup>

**Fungal pathogens<sup>1</sup>:**  
*Aspergillus* species, *Candida* species<sup>†</sup>

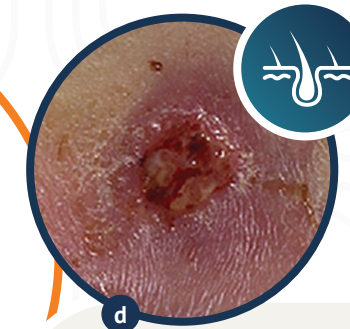
**Bacterial pathogens<sup>1,18</sup>:**  
*Nocardia* species, *Klebsiella* species, *Serratia marcescens*, *Staphylococcus aureus*, *Burkholderia* (formerly *Pseudomonas*) *cepacia* complex

\*Sepsis can occur from any infection and is most commonly caused by *Aspergillus*, *Burkholderia*, and *Candida* species. Septic infections with *G. bethesdensis*, *C. violaceum*, or *Francisella philomiragia* are indicative of CGD.<sup>13</sup>  
<sup>†</sup>*Candida* infections are more commonly reported in Europe.

<sup>a,b</sup>Adapted with permission from Khanna G, et al; (2005).<sup>7</sup>  
<sup>c</sup>Adapted with permission from Siddiqui S, et al; (2007).<sup>8</sup>  
<sup>d</sup>Adapted with permission from Friend JC, et al; 2009.<sup>11</sup>  
<sup>e</sup>Adapted with permission from Leiding JW, et al; 2012.<sup>14</sup>  
<sup>f</sup>Adapted with permission from Marks DJ, et al; 2009.<sup>16</sup>

This is not a complete review of possible infections and associated pathogens. Other infections could occur that may also be caused by other species of bacteria and fungi not covered here.

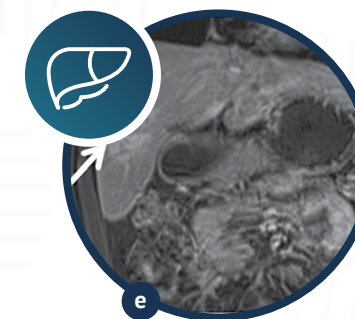
Is it CGD?  
The most common abscesses seen in patients with CGD are subcutaneous.<sup>13</sup>



## Skin<sup>1,2,4,11</sup>

abscess, cellulitis, granulomas, soft tissue infection  
*Candida* species,<sup>†</sup> *Klebsiella* species, *Serratia marcescens*,  
*Staphylococcus aureus*

~53% of patients with CGD are affected by dermatological complications<sup>12</sup>



## Liver<sup>1,2,14,15</sup>

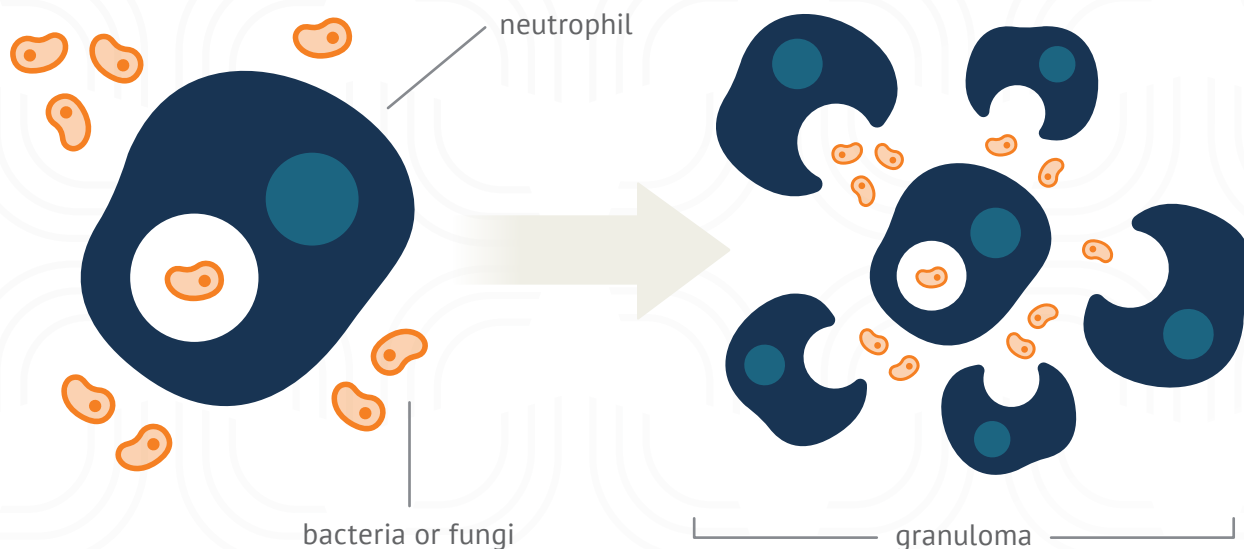
abscess, potentially leading to sepsis\*  
*Candida* species,<sup>†</sup> *Staphylococcus aureus*

# Defective immune response and outcomes in CGD

The inability to contain and eliminate bacterial and fungal pathogens leads to severe,\* recurrent infection and the potential to form granulomas<sup>1</sup>

When neutrophils can't destroy bacteria and fungi, certain pathogens can evade host defenses and cause infection.<sup>1,2</sup>

As neutrophils accumulate at the site of infection, they build up and form painful granulomas.<sup>1,2</sup>



**The genetic connection.** CGD can be inherited in an X-linked or autosomal recessive pattern and/or rarely occurs spontaneously.<sup>1,19,20</sup>

\*Serious infection is defined as a clinical event requiring hospitalization and/or intravenous antibiotics.<sup>21</sup>

# Identify or rule out. Prevent their next infection: Test for CGD

## DHR test

The dihydrorhodamine (DHR) test is the **most widely used method** for detecting CGD. A DHR test evaluates neutrophil function and can show a patient's risk of infection.<sup>1,22</sup>



[Watch a video](#) to learn more about the DHR testing process



[Request](#) a DHR Test Kit



## Not ready to test? Refer.



Use the [Specialist Finder](#) to help connect your patient with a CGD expert in their area



Once a CGD diagnosis is confirmed, family testing is recommended

# More resources available for information about CGD medical management:



Visit [CGDPathways.com](https://CGDPathways.com) for more information about CGD, including management, testing, and support resources.

## References:

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