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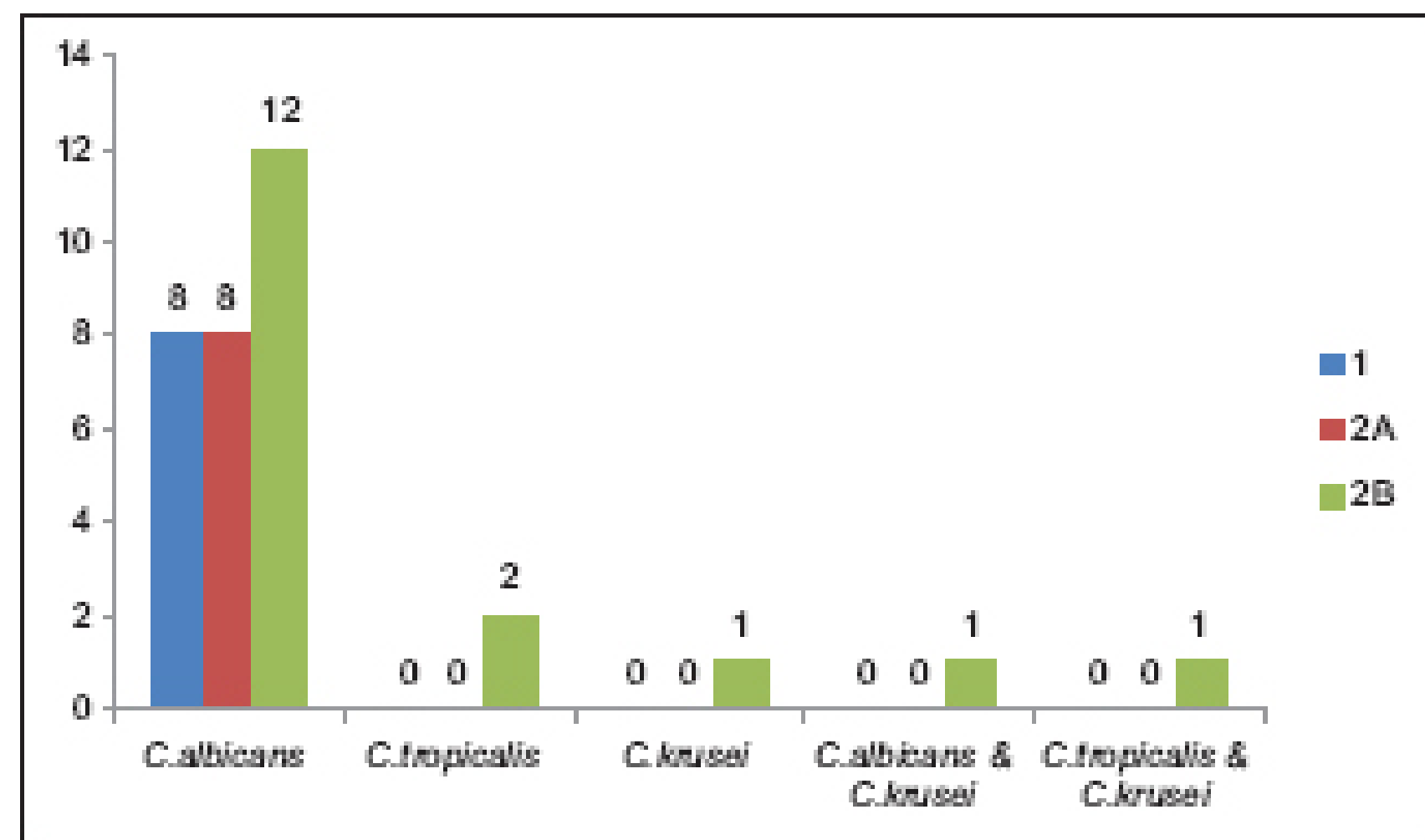
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Candidiasis: A Fungal Infections Link to Antibiotic Overuse

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Background

- 1847 Charles Philippe Robin classified the fungus as *Oidium albicans* using albicans ("to whiten") to name the fungus causing thrush. Robin Berkhout reclassified it under the current genus *Candida* in 1923.
- Typically, *C. albicans* lives as a harmless commensal in the gastrointestinal and genitourinary tract and is found in over 70% of the population.
- Candida* is a polymorphic or pleomorphic organism, because it has the ability to take on a range of morphologies (different forms).
- The main cause of *C. albicans* infection is the over use of antibiotics. The longer and more often you take them, and the higher dose you take, the greater the risk of an opportunistic Candida infection.
- Candida* forms complex, dynamic, three-dimensional structures called biofilms on the surfaces they colonise, which provides them with a protective shield.
- Candida species commonly cause bloodstream infections in hospitalized patients. About one in four of these patients die.
- Candida species also cause common yeast infections, which can affect the mouth, skin, and vagina, resulting in more than 3.6 million U.S. healthcare visits each year, and \$3 billion estimated direct medical costs
- During 2013–2017, the average incidence was approximately 9 per 100,000 people; however, this number varies substantially by geographic location and patient population. CDC estimates that approximately 25,000 cases of candida overgrowth occur nationwide each year.²



Graph 2: The prevalence of different candidal species on ChromAgar

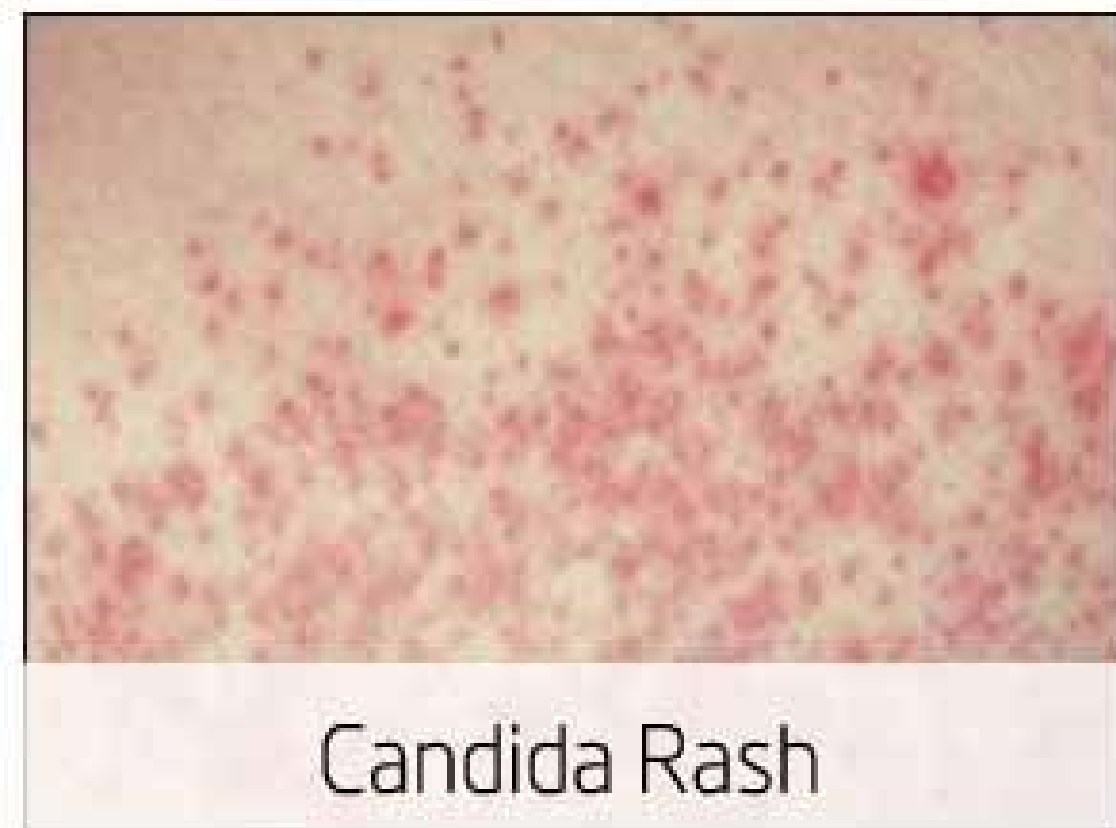
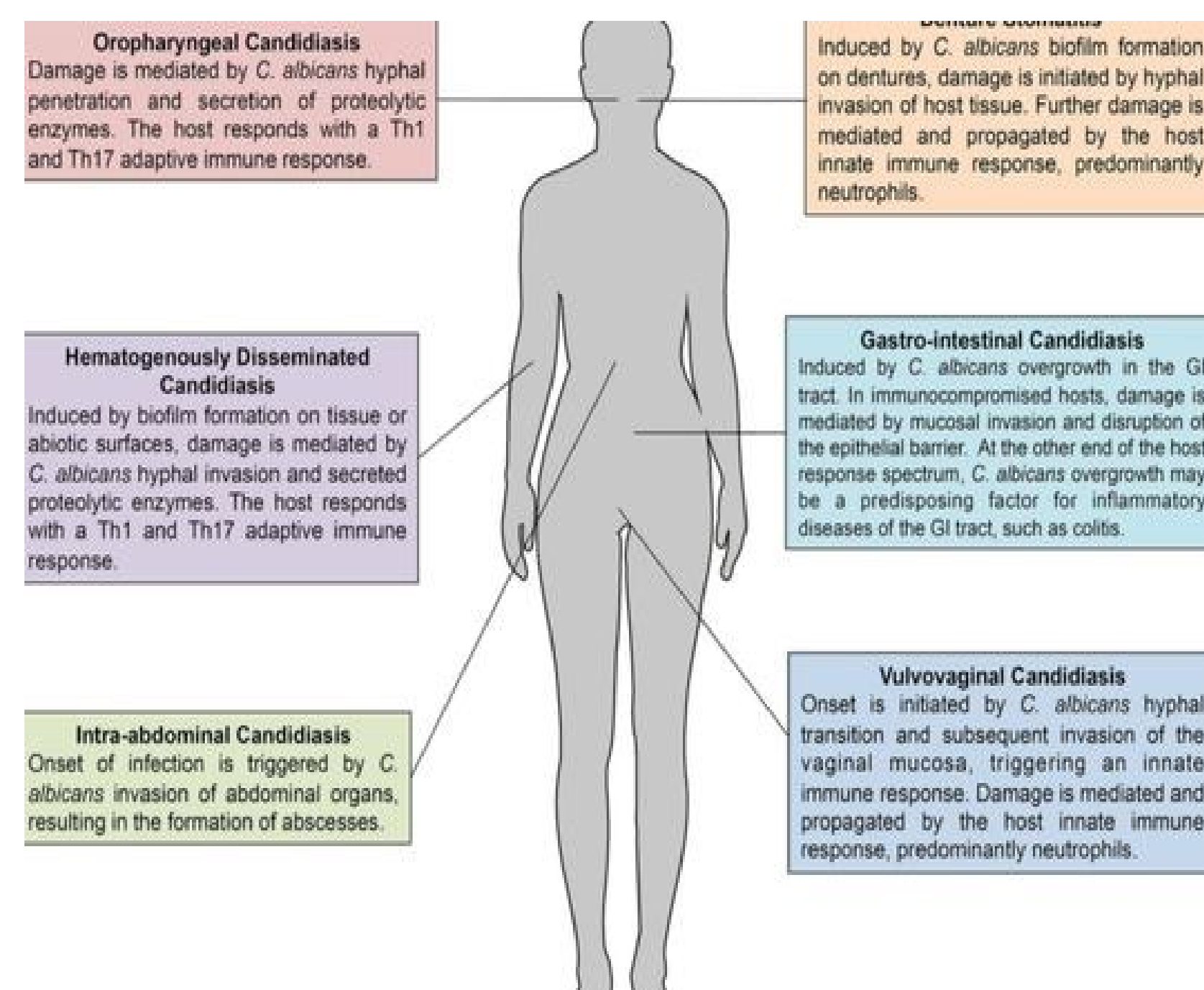
Population health/ at risk groups:

Immunocompromised- Pathogens spread quicker with patients with poor defense, symptoms can spread quicker

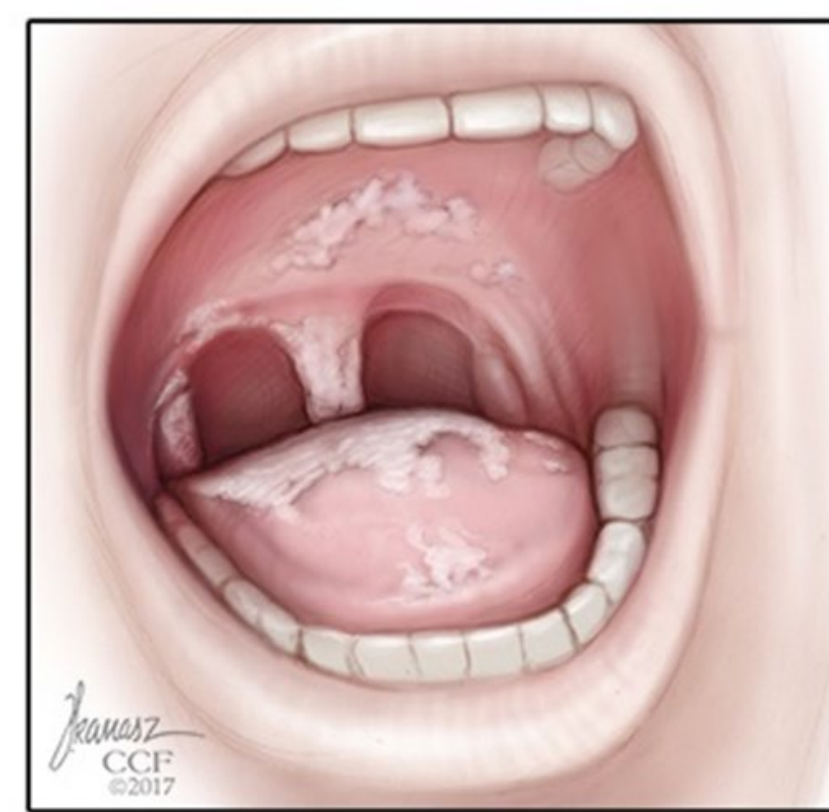
Pregnant women or those on oral contraceptives- Higher Estrogen levels lead to opportunistic Candida overgrowth

Underlying Health Issues- Diseases like diabetes's Mellitus and Hypothyroidism make yeast harder to eradicate due to metabolism

Overgrowth Symptoms/Affected Areas



Candida Rash



Oral Thrush



Candida Toe Fungus

Study Objectives

This research will help shed light on the drawbacks of excessive antibiotic use in patients with underlying health issues. It will detail ways to prevent fungal infections and combat them effectively. Recommendations for lifestyle changes will also be prevalent to this research.

Given the Antibiotics inability to distinguish good from bad bacteria, too long of a dose will replete the body's defense. What is unknown is the particular threshold for overgrowth to occur. This research will dig into the details of gut flora imbalance and attacking biofilm leads to more successful outcomes.

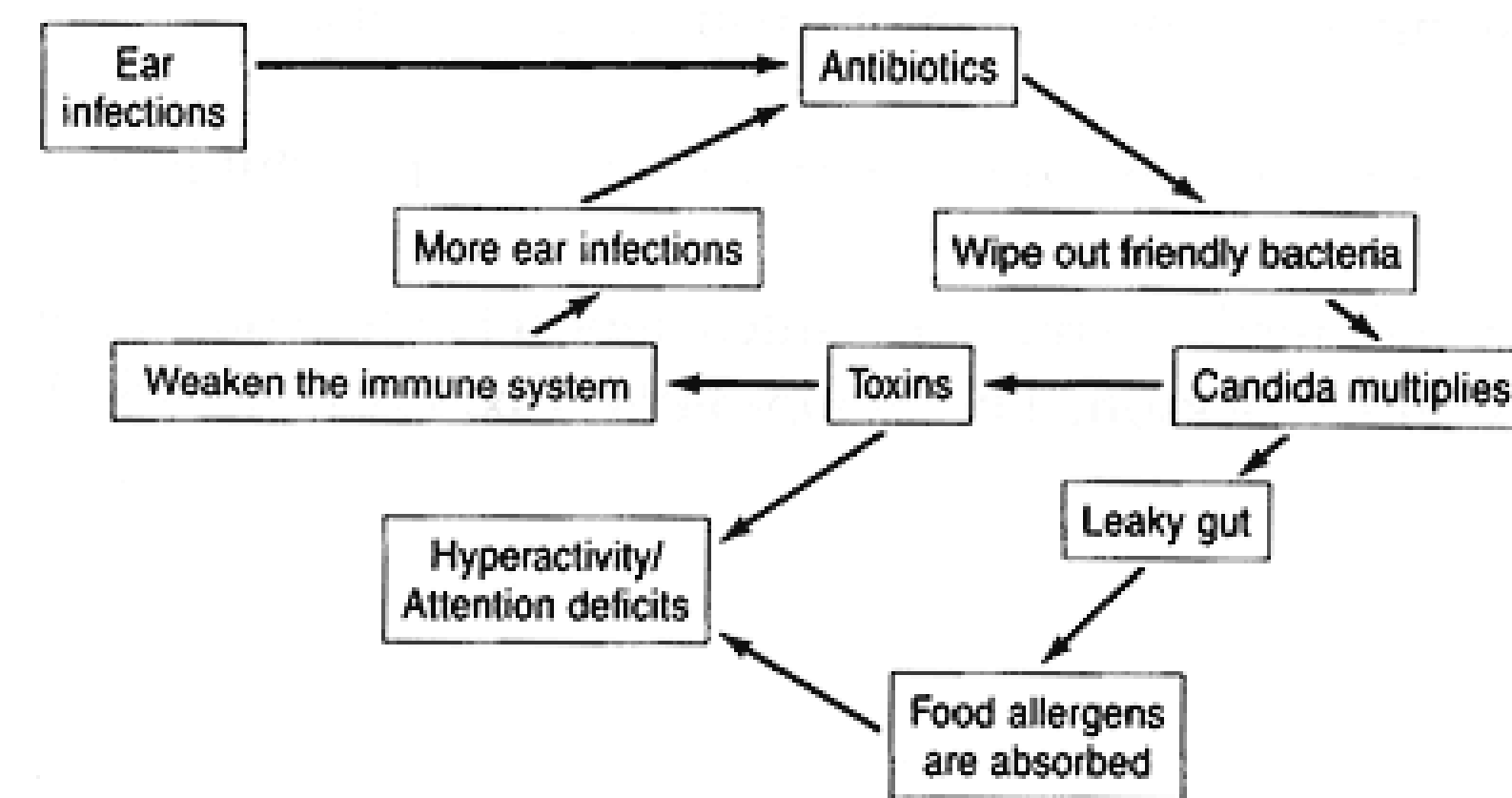
Results

Data analysis proved a direct correlation between Antibiotic use and Candida overgrowth development. Candida Albicans showed slow progression in those with healthy immune systems, while immunosuppressed patients saw more widespread symptoms in a more condensing time frame.

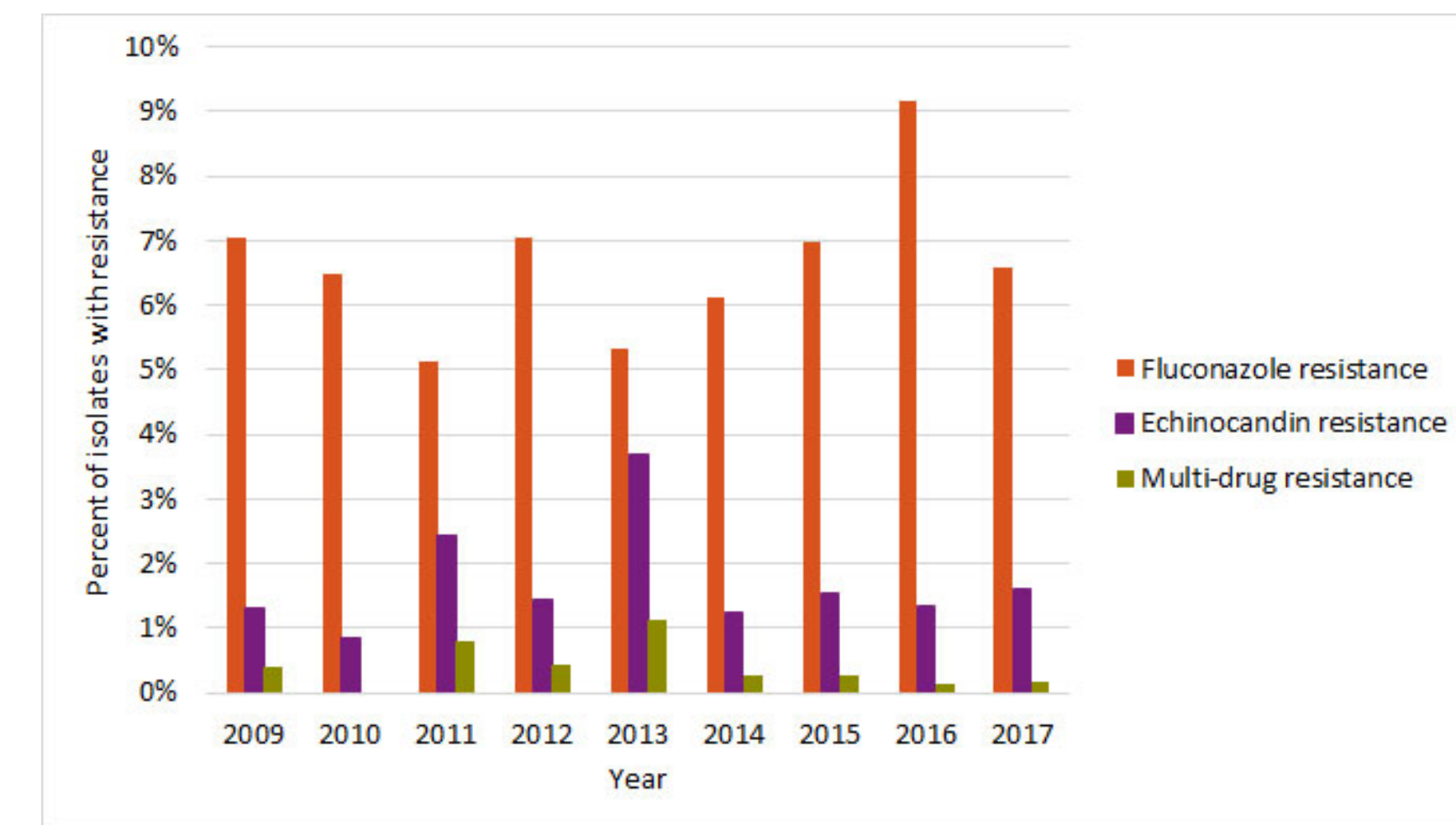
Subsequent recovery for those who took rounds of Fluconazole, followed a low sugar diet, and took Probiotics were significantly higher than those with a single minded approach. Some factors which potentially could have skewed the data and prolong the infection are as listed:

- High Stress lifestyle
- Age
- Skin disorders
- Metabolic dysregulation
- Liver Disease

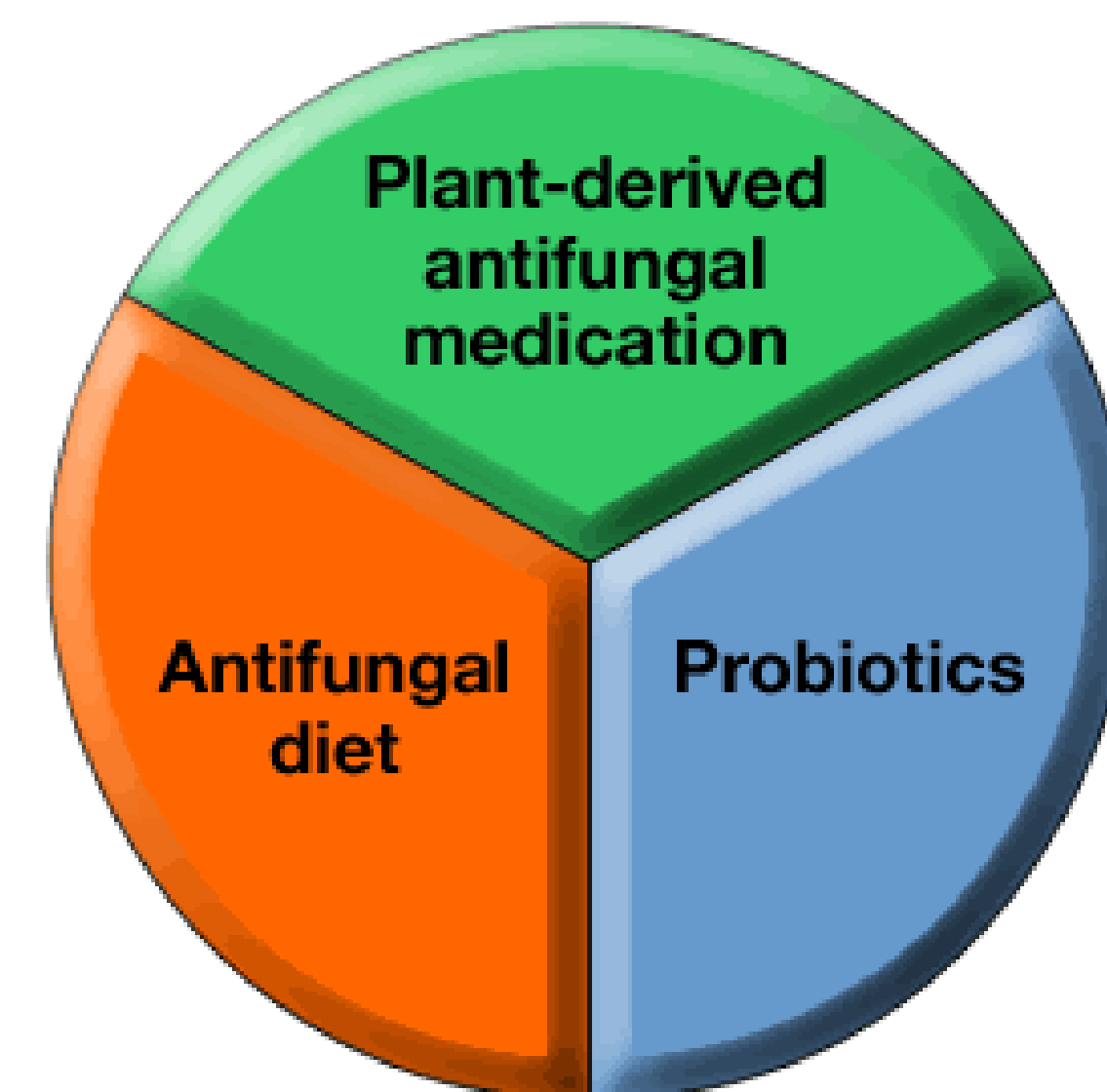
Conclusion



As mentioned in the background section, Candida is a complex infection with various causes a wide array of symptoms. In the figure above it visualizes the connection of these dysfunctions and its link to antibiotics. As it can be daunting for providers to see the progression of this disorder and instead see a snapshot it is no wonder it can be difficult to diagnose. Toxins within the body is at the forefront of any widespread disorder and is a vicious negative feedback loop for Candida overgrowth. As medication attempts to destroy the fungi, toxins can often be released in response of Candida "die off" which leads to temporary working of symptoms. This is one reason that a standard Anti-fungal medication is unable to completely eradicate overgrowth on its own.

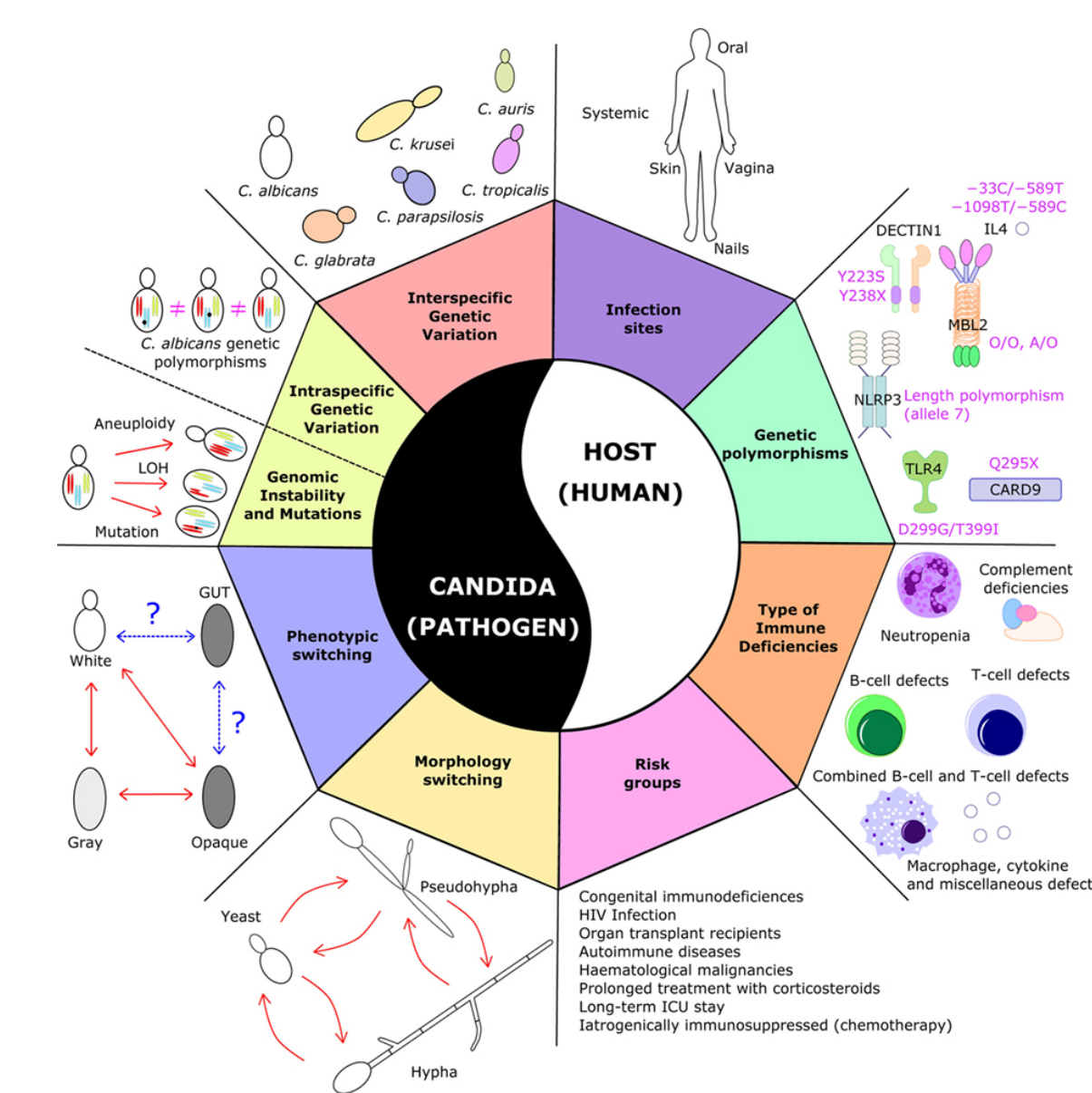


Anti-Fungal medications such as the ones in the chart above have drawbacks to effectively treat Candida overgrowth. This is primarily due to the resistance that Candida builds within the body. Candida has a unique adaptability in its structure called biofilm which prevents penetration into the fungi. In addition it is an pleomorphic organism which means it is able to morph into several different forms to avoid being wiped out. Another pitfall of these medications are the strong side effects. Those with an already compromised immune system can feel the physical effects of fatigue and brain fog more intensely, leading to even more health problems. To be able to treat overgrowth and keep it away further measures must be taken. Given how yeast thrive on sugar and carbs, it is recommended those recovering adapt a Paleo diet to avoid feeding yeast. Lastly, to properly rebalance the gut from the lack of good vs bad bacteria, patients are highly encouraged to take a daily Probiotic supplement. These contain active bacteria like L. Plantarum and L. Salivarius which are both proven to restore gut flora and help boost the immune system.



Future Implications

Treating Candida overgrowth is complicated and presents challenges to keep it from resurging back stronger. Given the prevalence of its existence advancement of treatment should be available. However, just avoiding risk factors like not taking antibiotics and having a low sugar diet is often unrealistic if not impossible. A better solution is a vaccine to candida in the pathogenic forms. Although this is a tricky concept since candida is a necessary fungi at healthy levels and only becomes problematic with overgrowth. A cure as shown in the visual below is a maze with lots of variables.



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