Candida albicans, the Yeast Syndrome, and the Auto-Brewery Syndrome

[1]Features
Medical Defenses to DWI
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 Whether blood samples used in forensic science Driving While Intoxicated (DWI) testing can be affected by endogenous ethanol production is a recurrent and yet unresolved defense. The basis of endogenous ethanol production is whether microbial growth can occur to falsely elevate the ethanol concentration in forensic blood samples. At the heart of these defenses is the naturally present yeast: Candida albicans. (C. albicans). When found in levels greater than those of a localized infection, C. albicans readily converts glucose in the gut to ethanol.1 Extensive literature exists and it is widely known that C. albicans may elevate ethanol levels in a forensic sample.2 However, the C. albicans defense may be developed further as the medical community not only becomes more aware, but also becomes accepting of pathologic overgrowth, the Yeast Syndrome, and a rare but recognized variant, the Auto-Brewery Syndrome. Recent cases have made national news resulting from wrongful DWI arrests of individuals who did not consume intoxicating amounts of alcohol, but rather exhibit a rare medical condition that occurs when abnormal amounts of gastrointestinal yeast efficiently convert common food carbohydrates (sugars and starches) into ethanol.3 This article will not only explain the science relating to C. albicans, the Yeast Syndrome, and the Auto-Brewery Syndrome, but will also discuss how to educate the jury, judge, and district attorney on the unsuspected and usually unacknowledged dangers of C. albicans.
The Science of Candida albicans

*C. albicans* is a dimorphic yeast and is believed to be an obligate associate of warm-blooded animals, humans being included.4 *C. albicans* is the ?most common and most serious fungal pathogen of man.?5 Despite this status, there is much that is poorly understood concerning the biology of this yeast.6 It is usually present as a harmless asymptomatic commensal, but can manifest as a pathogen.7 Such infections (candidoses) may be divided into a superficial group (such as oral and vaginal yeast infections) and the deep-seated candidoses (such as the yeast syndrome).8 *C. albicans* is commonly found in man, usually in the oral cavity and digestive tract, and less commonly in the vaginal tract of women.9

It has been shown that several microorganisms occasionally found in blood specimens are capable of producing ethyl alcohol, *C. albicans* being one of these.10 Even though Blume and Lakatua found that sodium fluoride effectively inhibited alcohol production for various microorganisms, *C. albicans* appeared to be unaffected by the addition of fluoride.11 If an organism common to man is capable of producing ethyl alcohol in stored blood, the question arises: Are the results of alcohol analysis reflective on an individual?s level of intoxication or of post-sampling fermentation?12 Chang and Kollman initially posed this question, and their study also supported the same conclusion of Blume and Lakatua.13 Chang and Kollman expanded the research to include any temperature effect common to normal storage conditions on the ethanol formation. Ultimately, they found that the amount of alcohol formed over time is highly dependent upon the temperature of storage.14 In fact, ethanol was detected in preserved sampled within 3 days at 37°C, 5 days at 22°C, and only trace levels after 6 months under refrigerated conditions.15 Fermentation proceeds readily by either direct inoculation or contamination with *C. albicans*.16 However, note that no alcohol formation took place for the first 69 hours even when the sample was kept at body temperature (37°C) and sodium fluoride at 10 mg/mL of blood was used as a preservative.17

The Candida albicans Legal Defense

Some readers may be wondering what to do with the science presented or how to get into the *C. albicans* defense without medical records showing a history of Candidiasis or yeast infections. The wonderful part of *C. albicans* being the ?most common? pathogen of man is that this yeast is literally all over and around us. Almost everyone has *C. albicans* in their gut, and a significant proportion of us may have ?Candidiasis,? or an overgrowth of *Candida*, colloquially termed ?The Yeast Syndrome.?18 Candidiasis manifests itself with sometimes alarming symptoms throughout the body, and they can vary over time in one person and in kind and severity among different people.19 Localized areas of Candida overgrowth cause obvious, recurrent, and persistent infections such as yeast vaginitis, oral thrush, and diaper rash.20 Other examples that suggest the advanced condition of Candidiasis may appear as unresolved vaginal discharge, itching, constipation, excessive gas, abdominal discomfort, headaches, fatigue, diminished sex drive, irritable personality, memory deterioration, acne, asthma, cystitis, bladder inflammation, itchy scalp, jock itch, athlete?s foot, brittle or brown toenails, rectal tickling, skin rashes, white coated tongue, sinusitis, etc.21 It is important to ask the client whether they had any symptoms or infections at the time of arrest or even recurrence of these symptoms before the arrest. While these questions may be embarrassing for both the lawyer and the client, a proper diagnosis of candidiasis may be the answer needed in attacking the blood test result. If medical records exist for these symptoms, make sure to put these on file in admissible form. Alternatively, if no medical records exist specifically diagnosing candidiasis, consider having the client properly tested and diagnosed.

There are only two ways *C. albicans* can be in the blood sample. One, as discussed above, it already resides in or on surfaces of organs in many of our systems. Or two, it exists on the outside of your skin where the open needle will pierce and thereby allow *C. albicans* to flow up the needle and into the vacutainer. If the blood-drawer does not clean the site properly with a non-alcoholic solution, the possibility of contamination by *C. albicans* always exists. This is why proper site cleansing is imperative. If the site is not properly
cleansed, *C. albicans* can contaminate the sample, and the sodium fluoride preservative may not prevent fermentation. And while the analyst may argue that it is highly unlikely, they never test the sample for presence of *C. albicans.* Remind the jury during closing argument: The prosecution must not prove the case beyond all possible doubt, but they must exclude any reasonable doubt. How can the State or government lab exclude the *C. albicans* defense if they are unwilling to even test for the presence of it?

Most analysts readily admit that *C. albicans* actively growing in the sample is a yeast that can produce falsely elevated ethanol levels in blood. The analyst may then try to combat the defense by asserting the reason the BD Vacutainer contains sodium fluoride is to preserve the sample and prevent fermentation. That argument is flawed in two ways. First, they assume the nurse or officer properly mixed the powder homogenously throughout the sample by conducting the 8?10 inversions. Also note that if the blood is clotted, obviously the potassium oxalate (anti-coagulant) wasn’t working or wasn’t mixed through sufficiently. And if the anti-coagulant wasn’t properly mixed into the sample, how can they assure the preservative was in order to allegedly prevent fermentation? Second, both Blume & Lakatua and Chang & Kollman published peer-reviewed articles that found sodium fluoride was not effective against ethanol production by *C. albicans*.

Remember, the trial lawyer must start weaving the theory of the case beginning in voir dire and continue throughout the entire trial. In voir dire, it is helpful to get the jury to start discussing how the body can affect medical testing. For example, has anyone ever had a false positive pregnancy test? But those are 99% accurate? Or has anyone heard of people that can test positive on breath testing but are just suffering from diabetes? Encourage discussion by the jury to help them lay the theory of the case early. You may even ask a jury who has heard about *C. albicans?* Most people in the medical field are aware of this yeast and the need for proper cleansing for forensic testing.

The Science of the Yeast Syndrome and Its Extreme Variant, the Auto-Brewery Syndrome

The Yeast Syndrome provides a broader understanding of how *C. albicans* can affect the body. Essentially, it explains how humans are born with yeast in their system and that certain yeasts are useful for our bodies. When a baby is born, that baby will come into contact with *C. albicans* almost immediately through the mother’s birth canal. If arriving by Caesarian section, they will certainly be exposed and colonized within the first days or weeks of living in the everyday normal world. This is the usual condition and not a bad thing. The human body receives benefits from some yeasts for digestion and to maintain health. However, problems arise with unrestrained yeast overgrowth. Certain dietary habits like eating lots of carbohydrates, starches, or sugars (including those in fruits) can fuel yeast growth within the gut or other parts of the body. Moreover, taking antibiotics disrupts the needed bacterial balance that assists the immune system, thus allowing yeasts to grow out of control. Any female analyst or juror will know that if she is on antibiotics she stands a higher risk of having a yeast infection. This occurs because the antibiotics are indiscriminately attacking the normal bacterial cells that are usually helping to keep the yeast at bay.

The fact that a client has a yeast infection, itchy scalp, or nail fungus may just be a common and limited infection. However, if it is a reoccurring or persistent and distressing problem, it may be a sign or symptom that the body is full of yeast and these complaints represent worrisome overgrowth. Not being properly diagnosed, as is the usual situation since the condition is rarely recognized in modern medical practice, can lead to further strengthening of the Syndrome. For example, a woman has a yeast infection and she goes to the doctor. The doctor prescribes antibiotics or an over-the-counter medicine that will temporarily relieve the overgrowth in that location. But that medicine may simply allow the yeast to grow even more and reside deeper in the gut to manifest itself somewhere later. Without the proper dietary and medical solution, any yeast problem can develop into a cycle and create the Yeast Syndrome.

From the Yeast Syndrome, we can transition further into the variant described as Auto-Brewery Syndrome.
While very rare, it’s becoming more known through news articles making their way around, due largely to the alarming appearance of the Syndrome. For years, scientists have discounted the Auto-Brewery Syndrome, thinking the patient must be a closet alcoholic. However, with advancements in world news, many more patients suffering from this disease are making international news. The Auto-Brewery Syndrome occurs when the subject has a tremendous amount of yeast already existing in the body, specifically within the lumen of the gut. Then when the subject consumes fruits, sugars, or starches, which are all an excellent source of glucose, the yeast in their body devours the glucose and creates ethanol as a byproduct. This is also known as auto-generated alcohol. Since the body usually can’t metabolize the alcohol at a faster rate than it’s being produced and absorbed, intoxication occurs. The intoxication suffered as a result of Auto-Brewery Syndrome appears no different than the intoxication from the consumption of alcohol. The sole difference, with such an episode, is there was never a consumption of alcohol to a level of intoxication.

The Yeast Syndrome and Auto-Brewery Syndrome Defense

Until the 1920s, the medical community did not properly understand diabetes and thought many diabetics were drunks. The isolation and development of insulin by Canadian surgeon Frederick Banting, for which he was awarded the Nobel Prize in Physiology or Medicine in 1923, finally allowed physicians to appreciate and control the puzzling biochemical changes that distorted the behavior and degenerated the organs of people with what was described as diabetes. It has taken years of careful observation and research to understand human blood sugar issues and recognize how to properly diagnose and effectively treat diabetes. Just like diabetes as late as the early 1900s, the Yeast Syndrome is far from being understood. Part of the confusion is that the symptoms of yeast overgrowth have been demonstrated to affect virtually any functions in our body, ranging from very apparent physical outgrowths to depression or lack of sexual drive. These affects will vary dramatically based on their personal characteristics, degree of rest or stress, diet, specific health issues, nutritional deficiencies, and other toxic exposures.

Nevertheless, it will be an uphill battle for the trial attorney to educate the jury, Court, and district attorney about the complex nature of the Yeast Syndrome. However, the trial attorney’s best friend when discussing this Syndrome is common sense. Most analysts will not be educated on the science of yeast, let alone the Syndrome. Yeast infections can occur on any orifice in the human body and the entire epidermis. While these are localized and frustrating “minor” problems, often they evolve into, or result from, the more ominous metabolic distortions in all organs associated with the toxins. This includes auto-production of ethanol in the gut, elaborated by uncontrolled, unsuspected, and untreated overgrowth of yeast in the body, leading to the medical condition identified now as the Yeast Syndrome. Most juries will have a female on the panel or someone married to a female. The most common type of yeast overgrowth is a vaginal yeast infection. Most women know that taking antibiotics or eating too many sugars or starches (carbohydrates) can cause a yeast infection.

While the Court may sustain relevancy objections due to a lack of awareness of a possible underlying disease every bit as important as diabetes, it’s important then to begin this discussion in voir dire. Again, asking about candidiasis or the Auto-Brewery Syndrome to the jury panel may evoke a conversation important to the defense. Most in the medical community know about localized yeast infections (candidiasis), but the vast majority have no appreciation for the significance of deeper metabolic disruptions associated with the Yeast Syndrome. Although some may have read the occasional sensationalized articles on the Auto-Brewery Syndrome, very likely they will have misunderstood this to be a “very rare” and probably genetic-based condition. Encourage a discussion on the validity of the defense.

Obviously, some jurors may think it’s just a legal ploy, but you may have other jurors fighting your case for you. Remind them how people thought diabetics were drunks or suffering with mysterious mental impairments, but now more-educated patrol officers must ask about diabetes because of its mimicry of
intoxication. Caveat: Most people suffering with the Yeast Syndrome will have absolutely no idea that a medical condition?toxic changes associated with internal yeast overgrowth?can explain bizarre behavior; more likely, they will insist that they have imbibed minimal alcohol, or none at all, in the preceding hours, a denial easily disregarded because they clearly ?look? or ?behave? drunk beyond their claims.

Unsuspected and rare forensic sample changes related to C. albicans, or metabolic distortions commonly created by an underlying but untreated Yeast Syndrome (including coordination, balance, speech, and perceptual difficulties), and outright mimicry of ?irresponsible over-drinking? by the (almost) never diagnosed medical condition, Auto-Brewery Syndrome, are new defenses that should be available to the trial lawyer for the right client and case. Either: 1) the client doesn?t look intoxicated, but the blood result says they are very intoxicated, which could mean the sample was contaminated with C. albicans; or: 2) the client didn?t start out looking intoxicated and, depending on the elapsed time since ingestion of sugars or starches, possibly became progressively more intoxicated as the night went on, suggesting Auto-Brewery syndrome. Perhaps more difficult to explain to the prosecutor, court, or jury is the person who ?looked? intoxicated when arrested, perhaps even exceeding per se limits on the breath or blood test, but who persistently denied sufficient alcohol intake. Clients whose stories ?don?t fit? the classic DWI scenario deserve evaluation for an unsuspected and untreated medical condition like the Yeast Syndrome or the Auto-Brewery Syndrome, which could explain the puzzling discrepancy. In the end, it?s the State?s burden to exclude any reasonable doubt. Only a defense attorney aware of these alternative explanations is in a position to raise these questions. Further, the client who is inexplicably suffering deserves to have these issues brought forward. Lastly, each of these defenses are scientifically and medically valid and reasonable.

Endnotes


5. Id.

6. Id.

7. Id.


12. *Id.*

13. *Id.* at 108.

14. *Id.*

15. *Id.*

16. *Id.*

17. *Id.*


20. *Id.*

21. *Id.* at 1.


23. [8]http://www.bd.com/vacutainer/pdfs/plus_plastic_tubes_wallchart_orderofdr...


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