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# Disulfiram as experimental treatment for Lyme disease

Disclaimer - The information given below is for informational purposes only and is not a substitute for consultation with a Lyme disease specialist. "The Right to be Cured" society cannot be held responsible for the misuse that could be done. This page aims to gather and synthesize in one place recent and scattered data on this experimental treatment for patients and Lyme specialists. The use of disulfiram should be done only with the assistance of an LLMD. It has been brought to our attention that some doctors prescribe disulfiram for Lyme, not knowing the protocol very well, giving high doses right from the beginning without any ramp-up, sometimes without the appropriate supplements, and without regular blood work. Some doctors even add drugs or tinctures (alcohol) that are not supposed to be prescribed with disulfiram. It is your responsibility to have a critical eye on their prescription.

## Introduction

Disulfiram (pronunciation \ ˌdaɪ-ˈsəl-fə-ram \), is the generic name of an old drug (70 years old), trade name: Antabuse, used for treatment of alcoholism. It is cheap, and has been used extensively. It is not an antibiotic. It has a low MIC (minimal inhibitory concentration). It works by blocking the metabolism of acetaldehyde. When a person consumes alcohol, it is converted into a toxic byproduct, acetaldehyde, through an enzyme, alcohol dehydrogenase. Then this acetaldehyde is in turn converted to acetic acid (vinegar) through another enzyme, aldehyde dehydrogenase. By inhibiting the production of aldehyde dehydrogenase by the liver, disulfiram produces a strong hangover sensation by accumulating acetaldehyde in the body. Recently, Dr. Jayakumar Rajadas, a scientist from Stanford University, with his team, discovered that an alternate use of disulfiram can eradicate all forms borrelia can take. Disulfiram also has anticancer and antifungal properties, it belongs to a general group of HIV drugs called latency-reversing agents, and it is effective against parasites such as malaria and babesia. Dr. Daniel Kinderlehrer does not exclude, according to his recent experience with disulfiram, efficacy against bartonella. A clinical study on a small group of chronic Lyme patients is quite interesting since these patients have become asymptomatic (if not cured) for 21 months. Many thanks to Dr. Jayakumar Rajadas and his team for the discovery of disulfiram as a novel drug candidate against *Borrelia burgdorferi*. If you support their excellent work of research, please donate. This synthesis on disulfiram would not have been possible without Kristina Petterson Bauer and Coco Lake who are the

ones who built a community around disulfiram for Lyme. Thanks to [Joseph Kulandai](#) for his expertise. Thanks to [Beverley Murphy](#) for her explanations on neuropathy and liposomal / enteric capsules.

## Dosage

Caveat - The dosage described in this section has not been proven nor even studied. These doses are what people are doing. They are by no means recommendations. This is only what is being done right now. It's important to stress the research is not available yet.

Dr. Kinderlehrer wants his patients to go low and slow: 62.5mg, or even 31.25mg every 3rd day, every 4th day, or even every week. For his sickest patients, he has them go to a compounding pharmacy to start with 25mg capsules once a week. For him, the usual starting dose for his patients is 62.5 mg to 125 mg every 3rd day; he occasionally recommends lower doses with fragile patients. The dose is progressed every two weeks based on tolerance; the dose is decreased if a Herxheimer reaction is severe or prolonged. The maintenance dose he set for his patients is 250-375 mg daily for patients 100-180 lbs, and 500mg daily for patients over 180 lbs. Maintenance doses are continued for about eight weeks, then the drug is stopped.

Regular tablets are ok, but spread out the doses as much as you can (e.g. 3 times a day). If you can, ask a compounding pharmacy such as [Hopkington](#) for a liposomal or enteric version of disulfiram, i.e. a formulation that bypasses the stomach, releases the disulfiram in the small intestine maybe as close to the colon as possible and to do it in a slow or sustained delivery to slow down the breakdown of the disulfiram into metabolites as much as possible. Such a formulation and spreading the dose throughout the day help mitigate the copper complexing in the stomach, thus reducing the risks of developing neuropathy. Some patients order enteric capsules on the Internet and manage by themselves.

Disulfiram easily produces a hangover sensation in Lyme patients and generally exacerbates the symptoms of Lyme ("herx"). For this reason, it is important to slowly start the treatment by gradually increasing the doses for at least 2 weeks before reaching the prescribed dose. One can start for example at 62.5mg every third day and then, depending on the lack of reaction, increase gradually until reaching the recommended dose after several weeks. Reaching steady state takes a long time.

According to Dr. Kenneth Liegner's initial experience, the treatment should last for about 4 months, at the recommended dose, and according to the first patients that have tried this treatment, it is not uncommon for 6 months to be necessary for the sickest patients. This duration probably varies according to the patients, how long they've been sick, and the bacterial load. Over the course of a day, the more you spread out the intake, the better (ref.), e.g. instead of one dose of 250mg, take two doses of 125mg. If you take disulfiram in the effervescent form, you increase its bioavailability by 2.6, which means you need less for the same effect. To increase its bioavailability, take disulfiram right after a light meal.

Beware, according to Pr. Kim Lewis, taking antibiotics can be counterproductive because they take the bacteria into dormant phase. A study shows that taking antibiotics to treat Lyme produces persistent forms of borrelia, which

are difficult to eradicate.

## Examples of gradual disulfiram intakes

### Example #1

For a 68kg (150lbs) patient:

| Week #     | Dosage  |
|------------|---|
| Week 1     | 62.5mg every 3rd day  |
| Week 2     | 62.5mg every other day  |
| Week 3     | 62.5mg every day  |
| Week 4     | Every other day, alternate: <ul style="list-style-type: none"> <li>• 62.5mg twice a day</li> <li>• 62.5mg once a day</li> </ul>           |
| Week 5     | 62.5mg twice a day, everyday  |
| Week 6     | Every other day, alternate: <ul style="list-style-type: none"> <li>• 3×62.5mg</li> <li>• 2×62.5mg</li> </ul>                              |
| Week 7     | 62.5mg 3 times a day, everyday  |
| Week 8     | Every other day, alternate: <ul style="list-style-type: none"> <li>• 62.5mg + 62.5mg + 125mg</li> <li>• 3×62.5mg</li> </ul>               |
| Week 9     | 62.5mg + 62.5mg + 125mg per day, everyday   |
| Week 10    | Every other day, alternate: <ul style="list-style-type: none"> <li>• 125mg + 62.5mg + 125mg</li> <li>• 62.5mg + 62.5mg + 125mg</li> </ul> |
| Week 11    | 125mg + 62.5mg + 125mg per day, everyday  |
| Week 12    | Every other day, alternate: <ul style="list-style-type: none"> <li>• 3×125mg</li> <li>• 125mg + 62.5mg + 125mg</li> </ul>                 |
| Week 13-20 | 125mg three times a day, everyday (target dose for 8 weeks)   |

## Example #2

1st week: 62.5mg or 125mg/day every 3rd day, the first weeks

Do not increase the dose if the symptoms are out of control; if they are really unbearable, stop the treatment and proceed with the elimination of toxins (see below)

If you feel a little better, increase the dose every 14 days:

- 3rd week: 125mg + 62.50mg per day
- 5th week: 125mg+2×62.50mg per day
- 7th week: 125mg+3×62.50mg per day
- 9th week: 125mg+4×62.50mg per day

You get the picture. Gradually increase the dose for at least 2 weeks, up to the recommended dose while symptoms are bearable, or stay on course or even pause in treatment if they are too difficult to bear.

## Precautions

Any trace of alcohol in the body can quickly cause hangover and cause vomiting, headache and feeling of unwellness. It is essential to keep in mind, throughout the course of treatment, that the body is unable to metabolize and evacuate any type of alcohol, not just alcoholic beverages. Deodorants containing alcohol cannot be used during the treatment, beware: "alcohol-free" deodorants *do* have alcohol (check the ingredients), as well as balms, mouthwashes, some toothpastes, fragrances, aftershaves, shampoos, shaving foams, essential oils, hydroalcoholic gels, and other cosmetics or household products that contain alcohol. Please note that some food has acetaldehyde but the serving is so small, that it is not to be bothered with (micrograms or sometimes less). Avoid vaping, it releases aldehydes.

To identify what compound is an alcohol and what is not, searching for "~ol" in the name is not the correct method. Many non-alcohol ingredients end with ~ol and many with alcohol do not. Here's what to avoid: Vinegar, alcohol, methyl, ethyl (ethanol) propyl, butyl, cetyl, stearyl, cetearyl, lanolin, propylene glycol. You can also search for "*Is...an alcohol?*" to find out more.

Although it contains sulfur, disulfiram is not a sulfonamide, i.e. it is not a sulfa drug, so sulfonamide allergy problems do not apply to this drug.

If you have candidiasis or any fungal infection, treat it first. Those produce acetaldehyde, and need to be taken care of prior to disulfiram treatment.

Disulfiram induces high blood pressure in some patients. It can cause blurry vision. It can also increase neuropathy and dementia.

## Blood work

It is necessary to perform regular blood tests :

- Before treatment starts:
  - Liver: Alanine aminotransferase, aspartate aminotransferase, gamma glutamyltransferase, alkaline phosphatase, lactate dehydrogenase, bilirubin, total protein, albumin, prothrombin time
  - Kidney: Routine blood urea nitrogen (BUN), creatinine
  - Complete blood count, routine chemistries (if clinically indicated)
  - Pregnancy test (women of childbearing age)
- 10–14 days after initiation of therapy and then monthly (or more frequently) for first 6 months of therapy; every 3 months thereafter:
  - Liver: Alanine aminotransferase, aspartate aminotransferase, gamma glutamyltransferase, bilirubin
- As clinically indicated during therapy:
  - Kidney: BUN, creatinine

According to Dr. Jaller, therapy can continue if AST/ALT numbers don't exceed 2-3 times the normal limit. When getting your blood drawn, ask the nurse preferably not to wipe with alcohol but with either betadine, hydrogen peroxide or iodine. As with most drugs, disulfiram offers both advantages and disadvantages. Regarding the liver, there may be a risk of hypersensitivity to the drug, an allergic-type response, as with other drugs. There are medications that should not be taken with disulfiram:

## Moderate drug interactions

- Valium (diazepam)
- Rivotril, Klonopin (clonazepam)
- Naltrexone (LDN is ok)
- Fasigyne, Tindamax, Simplotan (tinidazole)
- Xanax (alprazolam): Concomitant use with a patient already stabilized on Xanax may require medication adjustment due to potentially increased Xanax blood levels and resultant sedation.

## Important drug interactions

- Flagyl (metronidazole)
- Zoloft (sertraline): The only problem with Zoloft is with the oral concentrate (alcohol), and that is not a commonly used preparation. Sometimes concentrates are used in hospitals because of non-compliance. Just tell the doctor to crush the Zoloft and put it in jam or applesauce, etc.

## Contraindications

- Alcohol toxicity
- Cardiovascular illnesses
- Reaction to disulfiram
- History of stroke, heart attack
- Epilepsy

- Risk of suicide
- Pregnancy or breastfeeding
- Kidney or liver disease
- Diabetes

## Side effects

- Psychosis
- Hepatotoxicity
- High blood pressure
- Neuropathy
- Optic neuritis

## Preventing and treating neuropathy

Patients who take disulfiram to treat alcoholism rarely develop neuropathy. However, experience shows that neuropathy is very common among patients who take it for Lyme. This could be due to disulfiram chelating copper, then released in the nervous system where the myelin sheath is already in poor condition, copper promotes lipid oxidation within myelin membranes, causing even more inflammation. It is important to prevent neuropathy while on disulfiram. Signs of neuropathy include: tingling, numbness, extreme fatigue, muscle weakness/heaviness, burning. These symptoms are associated with neuropathy, they are not a herx. Here's a list of measures you can take to prevent or relieve symptoms of neuropathy:

- Reduce the dose of disulfiram to  $.6$  to  $.8 \times$  your weight in pounds, e.g. if you weigh 150 lbs, you should lower the dose to 90-120mg disulfiram a day. Still, even at that dose, you may experience neuropathy, reduce the dose even more till you get better.
- Stop the treatment and call your LLMD if your symptoms of neuropathy get worse.
- Take 100-150mg of zinc a day (doses spread out throughout the day, on an empty stomach for better absorption if possible). Zinc may affect copper levels in your body (which is what we want), so you may want to monitor ceruloplasmin in blood to make sure your copper level doesn't go too low, keep ceruloplasmin within the 50 to 90% range. If you can't test for ceruloplasmin, you can at least test your red blood cells (RBCs).
- Divide the doses of disulfiram throughout the day: This is suspected to reduce the amount of copper available for the disulfiram complex
- Take liposomal disulfiram: This should mitigate the disulfiram complexing going on in the stomach. Best taken 30 minutes after meals.
- Take chelating agents (EDTA suppositories are superior to DMSA pills and DMPS injections when it comes to chelating copper), only in case of flares, as these chelators also bind to zinc, nullify its effects. Thiomolybdate also effectively reduces copper. In any case, monitor ceruloplasmin. Disclaimer: People with heavy metals should consult with their doctor about using a chelating agent (or don't chelate at all).
- Avoid foods that may exacerbate neuropathy, esp. those containing polyphenols such as cinnamon
- Detox as much as possible (see next section)

- Ask your LLMD for short-term corticosteroids. They are normally not indicated for Lyme, but taken short-term, with antibiotics, they should be safe, and they effectively reduce autoimmune peripheral neuropathy related pain.
- Taking thiamine, curcumin and glutathione supplements may help.

## Elimination of toxins

Toxins (acetaldehyde, quinolinic acid, etc.) must be eliminated throughout the treatment. Here are some suggestions to eliminate toxins:

- NAC + glycine
- Glutathione
- Vitamin C
- Desmodium
- Taurine
- Dihydromyricetin (600mg/day)
- Lots of water
- Activated charcoal, taken 3hrs away from meals and medication, daily
- Molybdenum (dosage)
- Selenium
- Pantethine (dosage, water soluble)
- Pantothenic acid (dosage, water soluble)
- Cholestyramine (i.e. CSM, Questran), 9g 4 times a day, not taken with food
- Bentonite Clay
- Castor Oil (external use)
- Chlorella
- Lemon Water
- LOLA (L-Ornithine L-Aspartate), 3 to 6g/day
- Milk Thistle or silymarin
- Turmeric
- Zeolites
- Cruciferous Vegetables
- Diatomaceous Earth (100% food grade)
- Baths with Epsom salts
- Sauna (attention, increase of herx)
- Mild exercise (walking, swimming, etc ...) to evacuate toxins through perspiration
- Methylsulfonylmethane (MSM)
- Alka Seltzer Gold (or 1g anhydrous citric acid + 344mg potassium bicarbonate + 1.05g sodium bicarbonate)
- Dandelion
- Black radish

- Artichoke
- Nicotinamide

Take a look at [Dr. Richard Horowitz, M.D.'S Herx-Reducing Protocol](#)

Stock up the products listed above before starting disulfiram treatment.

Note, during treatment, the patient has an unpleasant sulfur smell, which is normal. This smell only appears at a certain dose, apparently above 250mg/day. It is possible to control it with 2 showers per day, with impeccable armpit hygiene (no hair, washing with insistence), and by the application of a alcohol-free pasty deodorant twice a day.

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## Other supplements and medicines

To counter the dizzy spell feeling (vertigo, dizziness, or nausea), meclizine is indicated (Antivert or Bonine), as well as ondansetron (Zofran) for nausea.

Taking biofilm busters is a good idea, to name a few of them: Lumbrokinase, serrapeptase (serrapeptidase), nattokinase, stevia, lactoferrin + xylitol, NAC, eugenol, etc...For a more thorough list of biofilm busters, take a look at [this article](#) and at [this book](#).

Magnesium has been reported by patients to be apparently safe and can reasonably be taken with disulfiram. CBD also is reported to be safe with disulfiram, provided it was not extracted with alcohol, it decreases brain inflammation, so do: ashwagandha, alpha lipoic acid (fat and water soluble), curcumin, fish oil, and boswellia. There's no need to take probiotics with disulfiram (unless you take antibiotics), but there's no harm taking some. Copaiba oil (alcohol free) helps with its systemic anti-inflammatory properties and is reputed to be good at improving cognition.

To solve constipation problems, these were reported to help: Macrogol (polyethylene glycol), SAMethylate Plus, Linzess (linaclotide), Saccromyces Boulardii probiotics, Trulance (plecanatide).

## Diet to follow

Any food containing alcohol is to be banned, for example:

- Alcoholic beverages
- Tinctures
- Fermented foods such as sauerkraut, kombucha, kefir, canned goods, kimchi, fermented mushrooms, etc.
- Food supplements containing alcohol (bottles, vials, ampoules)
- Rum flavored desserts
- Mustard (traces of alcohol)
- Vinegar (traces of alcohol)
- Stevia (liquid form)



- Ketchup
- Soy sauce
- Probiotics (for the most sensitive people)

Based on patient feedback, polyol type sweeteners (e.g. erythritol, xylitol, sorbitol) are completely fine. Also, decaffeinated coffee is acceptable, at least in small quantities. It is also important to select foods based on their acetaldehyde levels. Avoid: Melons, pineapples, oranges, lemon, coffee, sodas, black tea, yogurts, sugar (metabolized to acetaldehyde by *candida albicans*). Avoid ripe fruits, especially ripe watermelon and obviously ripe bananas, they contain too much ethanol. Check all that you have to consume and sort it out before starting treatment. Consuming alcohol, even in small amounts, with disulfiram can make you very sick for long hours. If you tend to have fungal infections, following the FODMAP diet is a good idea. Avoid fish, it has mercury that doesn't go well with disulfiram. Avoid Asian food that usually has fermented products, alcohol and vinegar. Avoid cinnamon, black and green tea, as well as L-Theanine.

## Approved cosmetics

The following cosmetics were tested and approved by Lyme patients following the disulfiram treatment.

### Deodorants

- Schmidt's Natural Deodorant - Charcoal and Magnesium
- Schmidt's Deodorant - Natural Deodorant Lavender + Sage
- Crystal Body Deodorant, Rock
- Rose Natural Deodorant with Magnesium
- Life-flo, Pure Magnesium Oil

### Soap

- Castile Soap Organic Unscented by Sky Organics
- Mother Dirt Biome-Friendly Face & Body Cleanser, Makeup Remover
- Dr. Bronner's - Pure-Castile Liquid Soap

### Toothpaste

- Redmond Earthpaste - Natural Non-Fluoride Charcoal Toothpaste

### Haircare

- Argan Oil Deep Hair Conditioner
- Mother Dirt Sulfate Free Shampoo

- [Puracy Natural Daily Shampoo](#)

## Sunscreen

- [Banana Boat Baby Sunscreen Tear-Free Sting-Free Broad Spectrum Sun Care Sunscreen Lotion - SPF 50](#)

## Dishwashing

- [Seventh Generation - Dish Liquid - Free and Clear](#)

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## In case of accidental ingestion of alcohol

In case of accidental ingestion of alcohol (lack of information or inattention), the symptoms do not take long to appear: Headache and vomiting. Stop the treatment immediately, talk to your doctor, and in the meantime extract as much acetaldehyde as possible, as detailed above, in the "Elimination of toxins" section.

If the situation is serious, contact the emergencies which will be directed towards this type of care:

- Oxygen therapy
- Glucose 5% IV
- Sodium ascorbate 1g IV

## Mode of action of disulfiram in Lyme

Disulfiram is well absorbed, it is fat-soluble (very good), penetrates into all tissues and passes the blood-brain barrier. It destroys all persistent forms of borrelia and seems to have an intracellular action. The small size of the molecule allows it to pass through biofilms. No antibiotic seems to meet all these conditions. Disulfiram acts on the Mn-SOD system (manganese superoxide dismutase) and inhibits LDH (lactate dehydrogenase), different from ALDH (aldehyde dehydrogenase), itself responsible for the oxidation of aldehydes to carboxylic acids. These enzymes are found in *Borrelia burgdorferi*; other enzymatic systems may be involved in the mode of action of disulfiram on this bacterium. The bacterium is known to need zinc and manganese for some of its vital cell processes, and disulfiram cuts food to the bacteria that dies. The concentration needed to eradicate the bacteria or prevent it from replicating is low, which is a good thing. Dr Rajadas from Stanford University explains that borrelia increases ALDH levels, which increases acetate levels in the nucleus. Ongoing inflammation and pain come from apparent signaling process problems and epigenic transition in the nucleus because of highly acetylated proteins. The NF- $\kappa$ B pathway is also upregulated by the borrelia. As soon as disulfiram inhibits the ALDH and NF- $\kappa$ B pathway upregulation, inflammation stops.

## Appendices

[BioNeoMed](#) - Non-profit foundation that gathers donations to support research on disulfiram lead by Dr Rajadas  
[Disulfiram – Breakthrough drug for Lyme and other tick-borne diseases?](#)

[Many patients find disulfiram a “game-changing” Lyme treatment](#)

Case study : [Disulfiram \(Tetraethylthiuram Disulfide\) in the Treatment of Lyme Disease and Babesiosis: Report of Experience in Three Cases](#)

Facebook groups : [Disulfiram for Lyme](#), [Disulfiram for Lyme Support Group \(Antabuse\)](#), [Disulfiram for Lyme Group](#)  
[Disulfiram datasheet](#)

[All about disulfiram](#)

[Short presentation of disulfiram](#) by Dr Marty Ross (video)

[Wikipedia page](#) on disulfiram

[Disulfiram \(Antabuse\) on Lyme borreliosis](#) - Notes from Jenna Luché-Thayer

[Disulfiram Papers](#) (Draft)

[The Drugbank page](#) of disulfiram

[Dr Jayakumar Rajadas's speech on disulfiram](#) at LivLyme conference

[Dr Kenneth Liegner Interview with Disulfiram](#)

[Dr Daniel Kinderlehrer's experience treating Lyme patients with Disulfiram](#)

[Dr Liegner Interview conducted by Harrison Schoneau \(Disulfiram for Lyme Support Group\)](#) edit Sept 17.2

[Kim Lewis - Presentation of findings at medical conference](#)

[Bay Area Lyme - In search of a cure for Lyme disease: The disulfiram story](#)

[Dr Jill - This Classic Anti-Alcohol Drug May be Part of the Solution to Lyme Disease](#)

[Stanford Medicine - New compounds have potential to combat Lyme disease](#)

[Interview with Dr. Jayakumar Rajadas on Disulfiram for Lyme](#)

Dr. Daniel Kinderlehrer's [summary](#) of disulfiram for Lyme

Dr. Liegner & Dr. Rajadas [discuss side effects](#) of disulfiram

[N,N-diethyldithiocarbamate produces copper accumulation](#), lipid peroxidation, and myelin injury in rat peripheral nerve (PDF)

[Outcome of Dr Liegner's patients](#), summer 2019

[Disulfiram protocol according to Dr Horowitz](#), fall 2019

[Father bedbound by Lyme disease is back on his feet due to a drug for alcoholism](#)

[BioNeoMed Fundraiser](#) - Conference given 11/23/2019, Drs. Rajadas and Liegner discuss new therapeutic possibilities for the treatment in persistent lyme

[Repurposing disulfiram \(Tetraethylthiuram Disulfide\) as a potential drug candidate against Borrelia burgdorferi in vitro and in vivo](#)

[Identification of new drug candidates against Borrelia burgdorferi using high-throughput screening](#)

[Father bedbound by Lyme disease is back on his feet due to a drug for alcoholism](#)

Dr Rajadas's 2nd series of interviews, January 2020 [1, 2, 3, 4, 5]

[Disulfiram update with Dr. Daniel Kinderlehrer in treating Chronic Lyme Complex](#)

