Disulfiram (brand name Antabuse)
not an antibiotic/ it is a generic drug. Has Antiparasitic (malaria/babesia) antiviral (HIV) & antibacterial aspects and has been around since the 1950s.

3 patients, who were previously very ill, have now been symptom free for 21 Months
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It is distributed by Teva in the US. By Ferring (a European company) in Mexico. The tablets are 250 mg. https://www.glowm.com/resources/glowm/cd/pages/drugs/d053.html

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Also, you can look up the basic info on Wikipekia: https://en.wikipedia.org/wiki/Disulfiram

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Here is the elongated version of everything there is to know:
https://pubchem.ncbi.nlm.nih.gov/compound/disulfiram#section=Solubility

The more therapeutic information would be in the PDR, if you have one.

(Dr. Kim Lewis, microbiologist and others.) They discovered Borrelia could not be killed with one round of antibiotics, even in the lab.

Dr. Lewis had been researching persister bacteria, years before he started looking at Borrelia.

This type of drug study should have been conducted in the 80's, when the Yale researchers observed a progression of post-treatment symptoms occurring in some patients.

Steere insisted the treatment was effective and the continuing or re-emergent symptoms were caused by an autoimmune response.

This study revealed a failed round of antibiotic treatment increased the previous population of persister cells present. pre-treatment.

Persister cells are less sensitive than non-persisters to the action of antibiotics.

Additional antibiotic trials may increase the persister population, resulting in increased difficulty of treatment effectiveness of antibiotics in the future.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4505243/

2016—published drug study by Stanford University team, led by Jayakumar Rajadas and conducted by Venkata Raveendra Pothineni.

This study identified **disulfiram, an enzyme inhibitor,** as having antibacterial activity against Borrelia. This chemical was used to process rubber in the 40's. It was licensed by the FDA in 1951. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4827596/

Here's the announcement by Stanford about the above study. Note Rajadas's mention of US patent 62/279,826 they filed on this study:
http://med.stanford.edu/news/all-news/2016/04/new-compounds-have-potential-to-combat-lyme-disease.html

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2016 article from Northeastern about Dr. Kim Lewis working on the four drugs to treat Borrelia persisters:
https://news.northeastern.edu/2016/03/29/researchers-investigate-four-promising-new-treatments-for-lyme-disease/t

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Interview with Dr. Kim Lewis at 1st Annual Lyme Disease in the Era of Precision Medicine Conference. The already-available drug for Borrelia persisters he refers to is disulfiram.

There are additional clips from the conference on YouTube. He remarked about spending a great deal of his time filling out grant requests and getting them rejected.
https://www.youtube.com/watch?v=KCxA0Vmqb2o

2016. Lewis had been saying he needed grant money to conduct mouse/disulfiram studies.
Also, he said human trials could be conducted, but it was best to conduct animal studies first.
He gave a prediction that human use might be able to occur after maybe, six months.
He finally received a $1.5 million grant from the Steven & Alexandra Cohen Foundation to study disulfiram and other drugs.

July 2017. Global Lyme Alliance says Lewis is still working on his research.
https://pubchem.ncbi.nlm.nih.gov/compound/disulfiram#section=Solubility

October 2017—here's an article from the Holtfer medical group about Lewis' conducting research on disulfiram: https://www.holtorfmed.com/new-treatment-options-for-lyme-disease/

January 2018 LDA Scientific Conference--Dr. Lewis presented there. Here is his bio. Go to the bottom and see the info about his work with disulfiram.
https://lymediseaseassociation.org/conference/prior-scientific-conference/2018-conf-summary/2018-conf-faculty/1839-lewis-kim-2018

March 2018--LDA put out a notice on their website about Dr. Lewis' research on disulfiram. I checked on it multiple times, this past Fall. It has since been removed, while many older posts have remained. Here's what comes up when you try to access the March 2018 post:
https://www.lymediseaseassociation.org/conference/faculty/1839-lewis-kim-2018

I have found no information on the results of the mouse studies.
Ordinarily, if the studies were inconclusive or failed, something would be posted.

There is some chat on one patient site, but it contains stories of patients being unable to tolerate the medicine and giving up after a week or two. There's conjecture that biofilm was a problem, but no proof.

See this old bio LDA had published previously for their 2018 conference. Look at the bottom, where they talk about his work on disulfiram.

The talk about disulfiram for Borrelia persisters has gone dark, with no explanation. There is discussion about his working on an old, never brought to market antibiotic, Hygromycin A.
It is a big molecule and probably will not be effective in the brain.

There is talk about his working on another class of antibiotics for persisters, (Teixobactin) but they are for Gram Positive bacteria.

I contacted Dr. Lewis four months ago. He told me he did not know the mechanism of action against Borrelia. He did not inform me disulfiram was ineffective against Borrelia.
He told me that the molecule is so small and seems to have no problems with distribution. He doubted there would be any problem with biofilm interfering with its action.

There are numerous requirements that must be met for a medication to be a good drug candidate. These include absorption, distribution, required concentration levels, pH, solubility in water vs lipids, peak and duration of action, tolerability, drug-food interactions and effectiveness.

The effects of the body on the drug and also, the response of the microorganism are other concerns.

The good news, disulfiram appears to be as close to an ideal drug, as it can be.

It is rapidly absorbed from the GI tract, is lipid soluble (that's good), it readily passes the blood brain barrier, its two major metabolites are active (for its action on alcohol, at least) and they are very long-acting (good, usually.) For this drug, you want sustained drug levels.

It is not highly protein-bound (good) and it has few adverse reactions.
It has a long history of use and documentation of safety. It is cheap.

Sulfa allergy is not an issue. It contains Sulfur molecules, but 'Sulfa' is a different thing.

It is equally effective against both intact and persister Borrelia.(GREAT!) If it fails to kill all the cells, it prevents Borrelia from reproducing (as long as they were exposed.)

The concentration of any drug is critical to effectiveness. Disulfiram has a low MIC (minimum inhibitory concentration.) In the lab, it did not take much to incapacitate the Borrelia.
Unless Borrelia has a trick we don't know, resistance will not occur. If this is correct, winning the battle is a numbers game—you have to take it long enough and expose all the Borrelia to a high enough concentration.

We need blood levels on patients. Levels on animal subjects would be ideal, but no published data (if it has been done.) We are operating in the dark right now.
I don't know if it can get inside our cells, where Borrelia may be hiding. That's a question to be answered.

Bad things and other thoughts:

From the **Herx's**, disulfiram appears to be very powerful in killing Borrelia. The Herx's from it can be extreme. Lyme symptoms can be bad, as the protein from the killed Borrelia get picked up by the blood and lymph.

The drug and side effects (or die-off effects) have a lag time and can become overwhelming. It's common for people to have to stop and take a drug holiday of days or more.
It is deceiving because it takes at least 5 days to reach steady state. Then, it takes longer to start getting the immune system to respond to the die-off.
People have a tendency to go up on the dose too quickly. **Disulfiram is known to have few side effects—unless, it seems, you have Lyme**.
If you go too fast, you will regret it. Its effects are delayed and it takes many days to get it out of your system.

One must avoid all alcohol. Alcohol is in many products, including topicals, many food products. **Even fumes** containing alcohol (hand sanitizers, aftershave, etc., must be **avoided.**

Disulfiram inhibits enzymes that drive various chemical reactions in living things.
It is marketed to prevent the metabolism of the temporary breakdown substance (acetaldehyde) of alcohol. **The longer you take disulfiram, the more extreme the reaction.**
This could be true for unidentified enzymes targeted by disulfiram in Borrelia. If so, time could accelerate the die-off and increase the body's immune response. (We don't know.)

This alcohol/acetaldehyde mechanism of action is probably not the same, for Borrelia. Dr. Lewis has suggested Borrelia has an enzyme we don't know about (yet.)
However, I have a **theory:** It may involve disulfiram's ability to chelate metals (Manganese, included) and/or the Manganese Superoxide Dismutase system. This enzyme system is unique to Borrelia and just a few other bacteria. The enzyme system protects Borrelia from Reactive Oxygen Species that are by-products of its metabolism. If this system is interfered with, Borrelia will die.

Disulfiram can cause extreme sleepiness, dizziness, a headache that comes and eventually goes, increased appetite, amongst other things.
It can cause psychiatric symptoms (rare), via increasing Dopamine in the brain. Often, Lyme patients report feeling 'weird.'
It causes old symptoms to resurface for a while.

A few days of a **low-dose oral steroid** may help alleviate severe symptoms, but NOT for psychosis, as steroids can promote psychosis.
If the disulfiram is onboard and is killing the Borrelia, the low-dose oral steroid is probably just fine. (Giving steroids along with an antibiotic is common practice for some infections, like pneumonia.)

One should get **liver function tests** and CBC's done periodically, but we've had almost seventy years of giving disulfiram to alcoholics with burned-out livers. It has a long history of a low side-effect profile.

A great deal of the symptoms of feeling sick with Lyme is the body's immune system's reaction to the foreign proteins of Borrelia. This creates inflammation and it is the inflammatory response that makes us feel sick.

No one knows if disulfiram completely eradicates Borrelia. If it doesn't, it may lower the bacterial load to a level that the person will not feel sick.

If disulfiram cannot get rid of all the Borrelia, periodic doses may need to be given to control its numbers. This is done (using other drugs) as prophylaxis, for HIV patients.

Last thing—it makes a person STINK, because of all the Sulfur molecules breathed out from the lungs. ………………
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private Notizen von Frau Jenna Luché-Thayer zu Disulfiram. (Hinweis J.L-T. Mail 15.3.2019)
https://sizanenhlanhla.academia.edu/JennaLucheThayer   *https://twitter.com/jennaluche*
Reine Information. Es wird weder Werbung gemacht, noch Therapien ohne therapeutische Begleitung empfohlen. Alle Angaben ohne Gewähr.
https://de.wikipedia.org/wiki/Disulfiram   (Wikipedia)
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Antabus^R : (Produktion eingestellt) …„Beendigung der Produktion und des Vertriebs des Medikamentes Antabus® durch die Firma Nycomed Verschreibung von Disulfiram-Präparaten aus anderen europäischen Staaten zu Lasten der gesetzlichen Krankenversicherung
..“https://www.dhs.de/fileadmin/user_upload/pdf/dhs_stellungnahmen/Antabus_-_Stellungnahme_des_Wissenschaftlichen_Kuratoriums_der_DHS.pdf

Auch **gg Krebszellen aktiv**? „Stockholm – Disulfiram, das als „Antabus“ seit Jahrzehnten zur Unterstützung der Abstinenz bei Alkoholabhängigkeit angewendet wird, könnte auch bei Krebserkrankungen wirksam sein. Ein Forscherteam beschreibt in *Nature* (**2017**; doi: 10.1038/nature25016) den möglichen Wirkungsmechanismus………… „
https://www.aerzteblatt.de/nachrichten/86948/Disulfiram-Wie-ein-Alkoholismus-Medikament-Krebszellen-angreift
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NB: Anmerkung von Dr. Armin Schwarzbach zu Disulfiram:
Dr Schwarzbach warnt vor den Nebenwirkungen (NW) und insbesondere vor Alkohol-Gebrauch bei Disulfiram-Therapie. Die NW seien beachtlich und es "sollte nur vom Arzt unter Beobachtung des Patienten im Verlauf eingesetzt werden, Stichwort Leber! ", wie es auch Frau Luché in ihrem englischen Text schreibt.
https://www.pharmawiki.ch/wiki/index.php?wiki=Disulfiram
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Hinweis Herr D.D. zu Kosten: Zitat:
„hier die Kosten bzgl: Disulfuram. (in Deutschland nicht zugelassen)

Antabus^R	200mg BTA 100 St.	VK 105,73 Euro aus Dänemark
Antabus^R	400mg Dispergetten 50 ST.	VK 63,20 Euro aus der Schweiz
Esperal^R	500mg Tbl. 20 St.	VK 15,40 Euro aus Frankreich
Etiltox^R	200mg Tbl. 30 St.	VK 19,75 Euro aus Italien „

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