CULTURX

THE SCIENCE OF RECOVERY

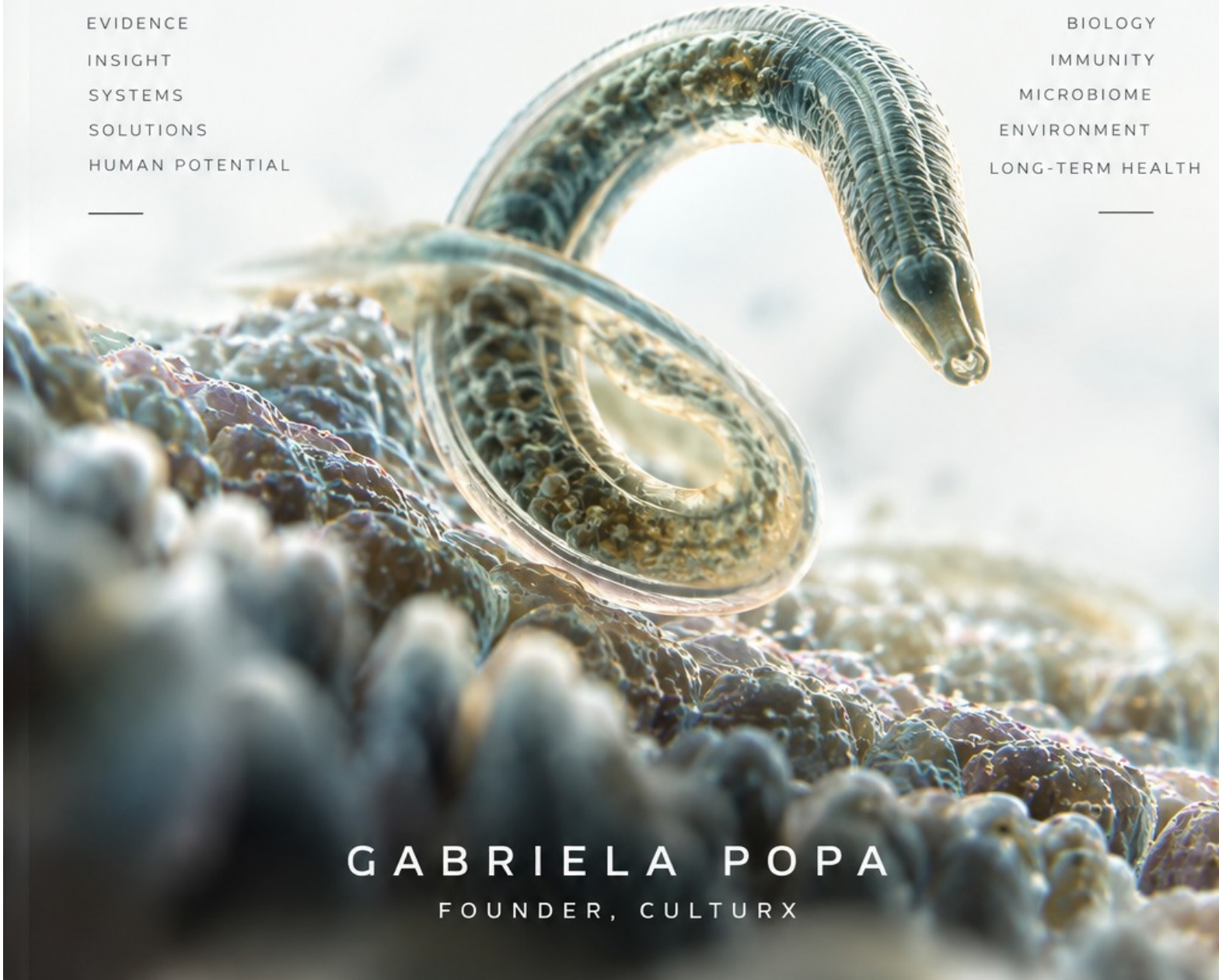
PARASITE ReENGINEERING

A Scientific Systems Guide to Identification, Treatment and Recovery

IDENTIFY • TEST • TREAT • RESTORE

EVIDENCE
INSIGHT
SYSTEMS
SOLUTIONS
HUMAN POTENTIAL

BIOLOGY
IMMUNITY
MICROBIOME
ENVIRONMENT
LONG-TERM HEALTH



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Knowledge is a form of recovery.

BEFORE YOU BEGIN

This book uses the familiar phrase 'parasite cleanse', but it does not assume that every digestive symptom is caused by a parasite, or that one universal cleanse can eradicate every organism. Parasites include very different organisms, and diagnosis and treatment depend on what is actually present.

Traditional use is treated here as a record of human observation, not automatically as proof of clinical efficacy. Laboratory findings are not presented as if they were human clinical outcomes. Homeopathy is described as a distinct historical therapeutic system and is not presented as a proven method for eradicating parasites.

This is educational material, not an individual treatment protocol. Persistent diarrhoea, blood in stool, severe or recurrent abdominal pain, dehydration, fever, unexplained weight loss, anaemia, persistent vomiting, neurological symptoms, pregnancy, immune suppression, or suspected infection after travel deserve appropriate medical assessment.

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1. NOT SCIENCE FICTION: FROM MYSTERY TO MEASUREMENT

Before there was a laboratory, there was observation. Before there was a clinical trial, there was repetition. Before there was a microscope powerful enough to reveal organisms invisible to the human eye, somebody noticed that something happened when a particular plant was eaten, crushed, steeped, boiled, applied, avoided or given to somebody who was unwell.

Grandmother did not have PubMed. She had memory. She had seasons. She had the garden. She had the body in front of her. That does not make every piece of traditional knowledge correct. Humans can repeat mistakes for generations too. But neither does the absence of a modern scientific paper mean that nothing was known until somebody finally measured it.

Human knowledge did not begin when somebody published it.

Earlier generations observed patterns with the instruments available to them. Modern science can now identify organisms, sequence genomes, measure molecules, map pathways, test causation, quantify dose and toxicity, and reproduce results. Historical observations may generate leads. They do not determine the conclusion.

OBSERVE -> IDENTIFY -> MEASURE -> TEST -> REPLICATE -> MODEL -> OPTIMISE

The historical record remains useful when it generates a testable question. Its evidentiary weight, however, is determined by what happens next: measurement, replication, human data, safety assessment and organism-specific clinical evidence.

2. PARASITE DOES NOT MEAN WORM

A parasite lives in or on a host and benefits at the host's expense. Some human intestinal parasites are worms, or helminths. Others are protozoa. The word parasite therefore covers organisms with different life cycles, routes of transmission, tests and treatments.

Threadworm is the most common worm infection in Australia. Giardia and Cryptosporidium are microscopic parasites associated with diarrhoeal illness. Strongyloides, hookworms, whipworms and tapeworms are helminths with distinct biology. Entamoeba histolytica is a protozoan parasite capable of intestinal and sometimes invasive disease.

This is why parasite cleanse cannot honestly mean one substance for one disease. The organism matters.

3. HOW HUMANS ACQUIRE PARASITES

Transmission depends on the organism. Routes can include swallowing microscopic eggs or cysts from contaminated hands, surfaces, food or water; contact with contaminated soil; consumption of particular undercooked foods; vectors; or travel-related exposures.

The useful question is not simply 'Do I have parasites?' but 'What exposure makes which parasite plausible?'

4. SYMPTOMS ARE CLUES, NOT PROOF

Bloating, fatigue, altered bowel habits, abdominal discomfort and appetite changes occur in many conditions. They can coexist with parasitic infection, but they do not identify one. Nocturnal anal itching is more characteristic of threadworm, while diarrhoeal parasites may cause loose or watery stools, cramps and gas.

CulturX rule: a symptom can justify investigation without being promoted into a diagnosis.

5. TEST BEFORE YOU GUESS

Testing depends on symptoms, travel, exposures and the suspected organism. Stool microscopy for ova and parasites may be used in some situations, and multiple samples on separate days can increase the chance of detection. Laboratories may also use antigen tests or molecular assays. Threadworm is often approached differently, including adhesive tape sampling around the anus.

The diagnostic method has to match the organism being sought.

A parasite is not an abstract invader. It is a biochemical system competing for survival inside another biochemical system. It must obtain energy, maintain membranes, synthesize or salvage essential molecules, regulate redox balance, reproduce and evade host defences. Those dependencies create drug targets. In protozoa, glycolytic enzymes and other metabolic pathways have been investigated as therapeutic targets; in helminths, metabolic enzymes can also provide exploitable differences between parasite and host. The scientific objective is selectivity: disrupt something essential to the parasite while limiting damage to the person carrying it.

THE BIOCHEMISTRY OF A PARASITE

The immune system is not scenery around a parasite. It is part of the battlefield. Helminth infections commonly evoke type 2 immune responses involving epithelial alarm signals, innate lymphoid cells, Th2 cells, eosinophils, mast cells, macrophages and cytokines including IL-4, IL-5 and IL-13. Chronic helminths can also drive regulatory pathways, including regulatory T cells and IL-10, that dampen host responses and can facilitate persistence. Different parasites provoke different immune architectures, which is another reason the word parasite cannot be treated as one diagnosis or one cleanse.

THE IMMUNOLOGY: THE HOST IS NOT PASSIVE

Epigenetics does not mean that a parasite magically rewrites destiny. It refers to regulation of gene activity through mechanisms such as DNA methylation, histone modification, chromatin remodelling and non-coding RNAs. Research increasingly shows that host-parasite interactions can alter these regulatory systems. Parasites can influence immune-cell signalling and gene-expression programmes, while parasites themselves also use epigenetic mechanisms to regulate virulence, adaptation and immune evasion. This is an emerging field with potential biomarkers and therapeutic targets, not a licence to claim that every cleanse 'resets your genes'.

EPIGENETICS: INFECTION CAN ALTER GENE REGULATION

Some parasitic infections can affect the nervous system directly; others may influence brain function indirectly through inflammation, immune signalling, microbiome changes and the gut-brain axis. Recent reviews describe pathways involving cytokines, blood-brain-barrier function, microglia, astrocytes and neurotransmitter-related metabolism. Neuroplasticity is the nervous system's capacity to change its structure and function in response to experience, injury and biological signals. It should not be used as a catch-all explanation for vague symptoms. In this book it belongs where evidence supports nervous-system involvement, recovery and adaptation, not as a marketing synonym for healing.

THE NERVOUS SYSTEM AND NEUROPLASTICITY

The gut microbiome, intestinal barrier, immune system and parasites can interact, but they are not interchangeable concepts. Dysbiosis does not prove parasitic infection, and eliminating a parasite is not the same task as 'resetting' the microbiome. Recovery may involve hydration, nutrition and restoration of tolerated dietary diversity, while organism-specific treatment addresses the infection itself.

THE MICROBIOME IS PART OF THE SYSTEM, NOT THE PARASITE

Artificial Intelligence changes the scale at which researchers can search, compare and model information. Computational methods can assist with protein-structure analysis, molecular screening, genomics, multi-omics integration and hypothesis generation. Supercomputing enables calculations and simulations that exceed unaided human capacity. These systems accelerate discovery; they do not eliminate experimental validation. A model prediction becomes scientifically useful when it generates a question that can be tested against reality.

AI, SUPERCOMPUTING AND THE NEW SEARCH SPACE

Quantum mechanics already underpins modern chemistry and our understanding of molecular structure, bonding and spectroscopy. Quantum computing is different: it remains an emerging computational technology with potential applications in chemistry, optimisation and molecular simulation, but it should not be presented as though it has already transformed routine parasite diagnosis or treatment. CulturX does not need to borrow the word quantum as decoration. Where quantum physics genuinely contributes to chemistry or computation, we say precisely how. Where it does not, we leave it out.

QUANTUM MECHANICS WITHOUT THE MYSTIFICATION

Science does not require mystification. We can preserve curiosity without lowering the standard of proof. A traditional observation can enter the pipeline as a lead. A biochemical mechanism can make the lead more plausible. Laboratory activity can justify further investigation. Human evidence can move confidence higher. Replication, dose-response, safety, standardisation and clinical outcomes determine whether an intervention deserves to become practice. WHERE THE EVIDENCE STOPS, THE CLAIM STOPS.

THE CULTURX RULE

THE ReENGINEERING PROTOCOL

ReENGINEERING does not mean genetically engineering a person or parasite. In this guide it describes a systems process: identify the organism and the host context, select validated diagnostics, map the biological mechanism, choose organism-specific treatment, interrupt reinfection, support recovery, measure the response and refine the plan when the evidence changes.

1. IDENTIFY

Define the organism, exposure history, symptoms, host factors and plausible differential diagnoses before selecting an intervention.

2. TEST

Use diagnostics appropriate to the suspected parasite. Depending on context, this may include stool microscopy, antigen detection, molecular testing such as PCR, serology, blood smear or imaging. One test is not appropriate for every parasite.

3. TREAT

Match treatment to the organism and the individual. Established antiparasitic medicines, supportive care and reinfection control occupy different roles. Experimental botanicals remain experimental until human evidence supports stronger claims.

4. RESTORE

After or alongside appropriate treatment, restore hydration, nutrition, gastrointestinal tolerance, normal dietary diversity and function. Recovery support is not the same thing as parasite eradication.

5. MEASURE

Observe symptoms, clinical findings and relevant test results. Do not confuse feeling different with proof that an organism has been eliminated.

6. REFINE

If the expected response does not occur, reassess the diagnosis, adherence, reinfection risk, test sensitivity, coexisting conditions and treatment choice rather than simply intensifying a generic cleanse.

THE CULTURX EVIDENCE HIERARCHY

Before moving from diagnosis into interventions, we need one rule for judging every claim that follows, whether it comes from a laboratory, a clinical trial, a computational model, a botanical tradition or a commercial product.

ESTABLISHED: validated diagnostics, replicated human evidence, established pharmacology and clinical guidance.

EMERGING: promising human evidence that remains incomplete or uncertain.

EXPERIMENTAL: laboratory, animal, mechanistic or biochemical findings that have not established clinical efficacy in humans.

TRADITIONAL RECORD: historical or ethnobotanical use. A lead worth examining, not a substitute for demonstration.

6. BOTANICAL EVIDENCE: WHAT SURVIVES INVESTIGATION

With the evidence hierarchy established, botanicals can now be examined without either romanticising or dismissing them: the question is simply what survives investigation.

The Apothecary is where we investigate plants without pretending that historical use and clinical proof are the same thing. A 2023 systematic review found 507 medicinal plant species studied against human gastrointestinal parasites, but 78.4% of included studies assessed activity in vitro and only three included studies were randomised clinical trials. That is both interesting and incomplete.

Wormwood: Artemisia species have long histories in traditional medicine, but species matter. Artemisia absinthium should not be treated as interchangeable with Artemisia annua or purified pharmaceutical compounds. Traditional use and experimental activity warrant investigation, while dose, preparation, toxicity and human efficacy remain separate questions.

Black walnut: Black walnut hull appears frequently in contemporary herbal parasite formulas. Its traditional and phytochemical record can be described, but claims that it reliably eradicates human intestinal parasites require organism-specific human evidence.

Clove: Clove has a rich traditional record and biologically active constituents, including eugenol. Laboratory findings are a reason to study the plant, not a reason to convert a culinary spice into an unbounded therapeutic dose.

Garlic, papaya seeds, pumpkin seeds, neem and numerous region-specific medicinal plants also appear in traditional antiparasitic practices. Each deserves its own evidence and safety assessment.

STARVE THE PARASITE?

Sugar, Glucose, Fasting and the Metabolic War

You see the organism. You understand that it is feeding from a host. Your first thought is almost inevitable.

Fine. Then I'll stop feeding the fucker.

No sugar. No food. Water only. Flush everything out.

Stop.

We haven't identified the organism yet.

Different parasites have different metabolisms, life cycles, tissue environments and dependencies. Removing dietary sugar is not a universal method of starving a parasite out of the human body, and prolonged fasting can deprive the host of energy and nutrients without reliably eradicating the organism.

CulturX does not begin with punishment. It begins with resolution: identify the organism, test the hypothesis, select the intervention, then restore the host.

The objective is not to create the most hostile possible environment inside your body.

The objective is to make the intervention more hostile to the parasite than it is to the host.

THE SUGAR QUESTION

The statement that 'parasites feed on sugar' contains a biochemical idea, but it becomes misleading when applied as a universal treatment rule. Many parasites rely heavily on glucose metabolism and glycolysis, yet the host also requires glucose and tightly regulates its availability. Removing table sugar or dietary carbohydrate does not simply switch circulating glucose off.

During fasting or carbohydrate restriction, the human body can maintain blood glucose through glycogen breakdown and gluconeogenesis, producing glucose from substrates such as lactate, glycerol and amino acids. At the same time, ketone production rises as fat metabolism increases. The metabolic environment changes, but it does not become glucose-free.

PARASITE METABOLISM IS A TARGET, NOT A SLOGAN

The more useful scientific question is not whether a parasite 'likes sugar'. It is which metabolic pathways the organism depends upon, which nutrients it can obtain or salvage from the host, how flexible its metabolism is under nutrient stress, and whether any essential pathway differs enough from human metabolism to be targeted selectively.

That is where parasite metabolism becomes therapeutically interesting. Glycolytic enzymes, redox systems, nutrient transporters and other metabolic dependencies can become potential drug targets when researchers identify vulnerabilities that are sufficiently different from the host.

FASTING CHANGES THE HOST TOO

A water fast does not act only on a parasite. It changes the host's endocrine signalling, glucose handling, glycogen stores, fatty-acid metabolism, ketone production, gastrointestinal activity and nutrient availability. Those changes may be physiologically interesting in other contexts, but they do not establish fasting as a universal parasite-eradication treatment.

The host is also the immune system. Immune responses require energy, amino acids, micronutrients and coordinated cellular metabolism. Severe or prolonged nutritional deprivation can impair immune competence, tissue repair and recovery. An intervention that weakens the host while failing to eliminate the organism is not intelligent selectivity.

IMMUNOMETABOLISM

Immunometabolism describes the relationship between cellular metabolism and immune function. Immune cells change the way they generate and use energy as they activate, differentiate and regulate

inflammation. Infection therefore creates a metabolic contest more complex than 'parasite eats sugar'. Host nutrition, immune activation, parasite metabolism and tissue environment interact.

KETOSIS IS NOT PROOF OF ERADICATION

Fasting and very-low-carbohydrate diets can increase ketone production, but entering ketosis does not demonstrate that a parasite has been killed or cleared. Different organisms possess different metabolic capacities and occupy different biological niches. A metabolic state in the host should never be used as a substitute for organism-specific testing when eradication is the claim.

SELECTIVE PRESSURE, NOT SELF-PUNISHMENT

The engineering objective is selectivity. Identify something the parasite needs, determine whether that dependency can be interrupted safely, and preserve as much host function as possible. That is the same logic underlying modern antimicrobial and antiparasitic drug development: exploit a vulnerability in the organism without creating unacceptable toxicity in the host.

Don't starve the host in an attempt to starve the parasite.

Find the parasite's metabolic dependency and target that.

THE CULTURX DECISION

Reducing excessive added sugar can be a reasonable nutritional choice for broader metabolic and dietary reasons. That is different from claiming that zero sugar or water fasting will eradicate an unidentified parasite. If fasting is being considered for another reason, its risks and suitability belong to that separate clinical question.

In Parasite ReENGINEERING, metabolic restriction becomes a hypothesis to investigate, not a ritual to obey. We ask what organism is present, what its metabolism actually requires, what evidence exists in humans, what happens to host immunity and physiology under the same intervention, and whether eradication can be demonstrated rather than assumed.

Urgency gets your attention. Science determines the action.

7. THE PHARMACY

Once the organism and evidence level are clear, the next jurisdiction is treatment, where modern antiparasitic pharmacology becomes organism-specific rather than generic.

Modern antiparasitic treatment is organism-specific. Threadworm can often be treated with pharmacy medicine in Australia together with hygiene measures and simultaneous household management. Other helminths and protozoal infections may require different prescription medicines, different durations, or supportive care.

The Pharmacy and the Apothecary are not enemies. They answer different evidentiary questions. A purified drug is not automatically equivalent to the whole plant from which an idea originated.

8. HOMEOPATHY: HISTORICAL CONTEXT AND EVIDENCE LIMITS

Homeopathy belongs in a different evidentiary category from pharmacology and phytochemistry, so it is included here as historical context rather than as demonstrated parasite eradication.

Homeopathy is a distinct system from herbal medicine. It developed around principles including 'like cures like' and serial dilution, with remedies selected according to a symptom picture rather than simply by naming an organism.

In this guide, that record is included as history and therapeutic tradition. It is not presented as demonstrated parasite eradication, and it should not replace appropriate diagnostic assessment or organism-specific treatment.

9. THE CLASSIC CLEANSE

The black walnut + wormwood + clove combination has become one of the best-known commercial parasite-cleanse formulas. Some products add zeolite, activated charcoal or other materials described as binders. Popularity is worth documenting, but it is not the same as a clinical trial of the complete combination against a defined human infection.

Activated charcoal is an adsorbent used medically in selected poisoning contexts; it is not itself an antiparasitic drug and can reduce absorption of medicines and other substances. Zeolite products vary in composition and quality. More ingredients can also mean more opportunities for intolerance, interactions and dosing uncertainty.

CulturX therefore treats the classic cleanse as an object of investigation, not as a universal prescription.

10. REINFECTION, HOUSEHOLD AND ENVIRONMENT

For some parasites, reinfection can occur if eggs, contaminated hands, bedding, surfaces, water or other environmental sources remain in the loop. Threadworm is a clear household example: treatment and hygiene work together, and Australian guidance advises treating the whole family at the same time.

Handwashing, short clean fingernails, laundering sleepwear and bedding, avoiding nail biting and organism-appropriate cleaning can matter.

11. FOOD AND WATER SAFETY

Prevention is organism-specific but often unglamorous: safe water, hand hygiene, appropriate food preparation, washing produce, cooking foods adequately where required, and understanding travel risks. Prevention can interrupt the transmission cycle before treatment is needed.

12. SUPPORTING THE GUT DURING RECOVERY

Eradicating or controlling an infection and restoring the host are related but different tasks; recovery begins where organism-specific treatment ends.

Recovery support should not be confused with parasite eradication. Hydration, adequate energy and protein, tolerated fibre, a varied diet and gradual return to normal eating can support recovery from gastrointestinal illness. The goal is not to punish the gut with fasting or an aggressive purge.

If a prescribed antiparasitic medicine is being used, supplements and concentrated herbs should be disclosed to the pharmacist or clinician because interactions and overlapping adverse effects can matter.

13. THE CULTURX 7-DAY RECOVERY FRAMEWORK

This is not a seven-day parasite cure. It is a seven-day framework for reducing noise, documenting symptoms and supporting recovery while appropriate testing or treatment proceeds.

DAY 1 - RECORD

Record symptoms, bowel pattern, recent travel, household exposure, water sources, pets, foods and medicines.

DAY 2 - HYDRATE

Replace ordinary fluid losses and respond promptly to diarrhoea-related dehydration.

DAY 3 - SIMPLIFY

Choose familiar, tolerated meals with adequate protein and energy. Avoid turning the week into a starvation cleanse.

DAY 4 - INVESTIGATE

If symptoms persist or exposure history is meaningful, organise appropriate clinical assessment and testing.

DAY 5 - INTERRUPT REINFECTION

Review hand hygiene, household cleaning, bedding, food and water practices according to the suspected or confirmed organism.

DAY 6 - REBUILD

As tolerated, restore plant variety, fibre and normal meals. Recovery is a return to function, not permanent restriction.

DAY 7 - READ THE DATA

Ask what changed, what persisted, what tests show and what treatment was actually used. Escalate unresolved or concerning symptoms.

14. RED FLAGS AND WHEN TO ESCALATE

- Blood in the stool or black, tarry stool
- Severe, localised or worsening abdominal pain
- Persistent vomiting or inability to keep fluids down
- Signs of dehydration
- High or persistent fever
- Unexplained weight loss or significant weakness
- Persistent diarrhoea, especially after travel
- Known immune suppression

- Pregnancy with significant gastrointestinal illness
- Neurological symptoms

When in doubt, seek professional medical advice rather than escalating a home cleanse.

15. CULTURX QUICK REFERENCE

- Parasite is a category, not a diagnosis.
- Symptoms can justify investigation but do not prove infection.
- Match the test to the organism.
- Traditional knowledge can identify leads worth investigating.
- In vitro evidence is not the same as human clinical efficacy.
- Herbal medicine and homeopathy are different systems.
- A commercial cleanse formula is not automatically a proven treatment.
- Activated charcoal can interfere with absorption of medicines.
- Reinfection control may matter as much as treatment.
- Persistent or concerning symptoms deserve investigation.

16. CLOSING

Grandmother looked. The telescope widened the field. The microscope magnified the invisible. Artificial Intelligence helps us connect the accumulated record.

None deserves absolute authority simply because it came first. None deserves absolute authority simply because it came last. They are lenses.

The purpose of this guide is to keep the doors open while keeping the labels honest.

KNOWLEDGE IS A FORM OF RECOVERY.

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18. GLOSSARY OF TERMS

Activated charcoal: A porous form of carbon that adsorbs some substances in the gastrointestinal tract. It can interfere with absorption of medicines.

Adsorption: Binding of molecules to a surface. This differs from absorption, where a substance enters another material.

Anthelmintic: A substance or medicine used against parasitic worms, or helminths.

Antiparasitic: A broad term for an intervention directed against parasites. Different medicines act against different organisms.

Apothecary: Historically, a person or place preparing medicinal substances. Here it represents the herbal and traditional-medicine lens.

Artificial Intelligence (AI): Computational systems capable of tasks such as language processing, pattern recognition and information retrieval. Here AI is a research aid, not clinical authority.

Binder: A wellness-market term for substances claimed to bind compounds in the gut. The term itself does not establish a clinical benefit.

Clinical efficacy: Evidence that an intervention produces a beneficial health effect in humans under defined clinical conditions.

Cryptosporidium: A microscopic protozoan parasite that can cause gastrointestinal illness, often including watery diarrhoea.

Entamoeba histolytica: A protozoan parasite that can cause amoebic intestinal disease and sometimes invasive disease.

Ethnobotany: The study of relationships between people, cultures and plants, including traditional medicinal uses.

Giardia: A microscopic intestinal parasite that can cause giardiasis.

Helminth: A parasitic worm. Major groups include roundworms, tapeworms and flukes.

Homeopathy: A therapeutic system developed around principles including 'like cures like' and serial dilution. It is distinct from herbal medicine.

Host: An organism in or on which another organism lives.

In vitro: Research performed outside a living organism, commonly in laboratory dishes, tubes or cell systems.

In vivo: Research performed in a living organism.

Microbiome: The microorganisms, their genes and surrounding biological environment associated with a habitat such as the gut.

Ova and parasite test (O&P): A stool examination used to look for parasite eggs, organisms or other evidence of parasitic infection.

Parasite: An organism that lives in or on another organism and obtains benefit at the host's expense.

Pharmacology: The study of how drugs and biologically active substances interact with living systems.

Phytochemistry: The study of chemical compounds produced by plants.

Protozoan: A microscopic single-celled organism. Some protozoa are human parasites.

Randomised clinical trial: A human study in which participants are assigned by chance to different interventions to compare outcomes.

Reinfection: A new infection occurring after treatment or clearance, often because exposure to the source continues.

Threadworm / pinworm: A small intestinal worm, Enterobius vermicularis, commonly associated with anal itching and household spread.

Traditional medicine: Knowledge, skills and practices originating in historical and cultural systems that pre-date modern biomedicine.

Zeolite: A group of porous minerals used in industrial and some consumer products. Product composition and evidence for health claims vary.

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Biochemistry: The study of chemical processes in living organisms, including metabolism, enzymes, signalling and molecular interactions.

Cytokine: A signalling protein used by cells, especially immune cells, to coordinate inflammation, defence and regulation.

DNA methylation: An epigenetic modification involving chemical tags on DNA that can influence gene activity without changing the DNA sequence.

Epigenetics: Regulation of gene activity that does not require changing the underlying DNA sequence; mechanisms include DNA methylation, histone modification and chromatin remodelling.

Eosinophil: A white blood cell involved in type 2 immune responses and defence against some parasites.

Genomics: The study of an organism's complete genetic material and its organisation, variation and function.

Histone modification: Chemical modification of proteins around which DNA is packaged; these changes can influence access to genes and their activity.

Immunology: The study of the immune system, including how the body detects, responds to and remembers biological threats.

Metabolomics: Large-scale measurement of small molecules produced or used in metabolism.

Neuroinflammation: Inflammatory signalling within the nervous system involving cells such as microglia and astrocytes.

Neuroplasticity: The capacity of the nervous system to alter connections, activity and function in response to experience, biological signals, learning or injury.

PCR: Polymerase chain reaction, a molecular technique used to amplify genetic material so that specific DNA or RNA targets can be detected.

Proteomics: Large-scale study of proteins, including their abundance, structure, modification and interactions.

Quantum mechanics: The physical framework describing matter and energy at atomic and subatomic scales; it underpins much of modern chemistry.

Regulatory T cell (Treg): A T-cell population that helps restrain immune responses and maintain immune tolerance.

Th2 cell: A type of helper T cell central to type 2 immunity, including responses to many helminths and allergic stimuli.

Transcriptomics: Large-scale study of RNA molecules produced by cells or organisms, providing a view of gene-expression activity.

ADDITIONAL GLOSSARY TERMS: METABOLISM

Gluconeogenesis: The production of glucose from non-carbohydrate substrates, including lactate, glycerol and some amino acids, particularly during fasting or carbohydrate restriction.

Glycogen: A stored form of glucose found mainly in the liver and skeletal muscle.

Glycolysis: A metabolic pathway that converts glucose into smaller molecules while generating usable cellular energy.

Immunometabolism: The study of how metabolic pathways influence immune-cell function and how immune activation changes cellular metabolism.

Ketone bodies: Energy-containing molecules produced largely by the liver from fatty acids when carbohydrate availability and insulin signalling are reduced.

Ketosis: A metabolic state in which circulating ketone bodies are elevated because fat-derived fuels are being used more extensively.

Metabolic plasticity: The ability of a cell or organism to alter fuel use or metabolic pathways when environmental conditions change.

Nutrient salvage: The acquisition and reuse of nutrients or molecular building blocks from the host or surrounding environment rather than synthesising them independently.

Selective toxicity: The principle of damaging or inhibiting a pathogen or parasite more than the host.

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