TR-09 Mesoamerican, Andean and Amazonian healing: curanderismo, temazcal, shamans and plant teachers

HEALING after the FALL, research library, TR-09

Researched 10 October 2026 by Claude Opus agent for THRIVING after the FALL, Book Four. Library document, unverified.

This report covers the healers and their systems, not the plants. The plants of Mesoamerica and the Andes are in PH-04 and those of the Amazon in PH-05. Parteras are in TR-14, bone-setting technique in TR-12, the North American sweat lodge in TR-08, the dangerous-remedies register in TR-15 and the ethics of taking knowledge in SY-04 (THRIVING library, PH-04, PH-05, TR-14, TR-12, TR-08, TR-15, SY-04). Ayahuasca pharmacology and risk belong to MI-11, which was not in the library when this was written. Under the owner's ruling of 12 October 2026, each tradition comes first in its own terms, attributed to its people, with the evidence after it. Ayahuasca, tobacco, San Pedro, psilocybin mushrooms, *Datura* and *Brugmansia* are covered for history, evidence, dose, toxicity and feasibility only, with no preparation, extraction or purification. Restricted content is said to exist and is not reproduced.

Findings by section

1. Whose knowledge this is

This knowledge belongs to many peoples. They include the Nahua of central Mexico, whose sixteenth-century healers spoke to Sahagún's informants and to Martín de la Cruz. They include the Tzeltal and Tzotzil Maya of highland Chiapas, the Kaqchikel and Tz'utujil Maya of Guatemala and the Mexican and Mexican American curanderos of the borderlands. In the Andes there are the Kallawaya of Bautista Saavedra and Muñecas provinces in La Paz, Bolivia. In the Amazon there are the mestizo vegetalistas of the Peruvian lowlands, the Shipibo-Konibo of the Ucayali and the Tsimane of the Bolivian Beni. These systems are not one system. They share three things: a body balanced between hot and cold, illness that can come from people and spirits as well as from food and weather, and a healer whose gift is called a *don* (Spanish for gift) or is learnt from plants.

SY-04's five categories of knowledge govern what is reproduced here (Protocol 1). Three bodies of content in this report are restricted: the vegetalista songs called *icaros*, the Kallawaya healers' ritual language (*machaj juyay*) and the sacred objects of the Guatemalan bonesetters. The report names them and goes no further (THRIVING library, SY-04, PH-04, TR-12).

2. The body and its illnesses, on their own terms

The Mesoamerican body. Nahua thought, as López Austin reconstructed it, placed three animating forces in the body: *tonalli* in the head, *teyolia* in the heart and *ihiyotl* in the liver. Each could be lost, damaged or polluted. Particular gods sent particular illnesses, Tlaloc the cold and rheumatic ones and Xipe Totec those of skin and eyes, and the divinatory calendar (*tonalamatl*) shaped diagnosis and the timing of cure (Wikipedia, Aztec medicine). Foods, herbs, illnesses and states of the body are hot or cold, and a cure restores balance with the opposite quality. Its origin

is disputed. George Foster (1994) argued that the system came from Spain as popular Hippocratic humoralism, keeping hot and cold and losing wet and dry. Alfredo López Austin answered that the native dichotomy is wider and has early forms Spain cannot explain (REAA 2012, search summary). The book should present hot and cold as a living Mesoamerican system with tangled roots.

Curanderismo. Robert Trotter and Juan Antonio Chavira served three-year apprenticeships with south Texas curanderos and describe three levels of work (Trotter and Chavira 1997, contents and catalogue read). The material level uses herbs, foods, massage and ordinary objects such as eggs, lemons and oils. At the spiritual level spirits act through the entranced healer. At the mental level the healer concentrates and directs vital energy. A healer may have the *don* for one, two or all three levels. I could not read the chapters themselves.

The syndromes. Several illnesses recur from Guatemala to the United States. - *Susto* (fright) is soul loss after a shock. Its signs are listlessness, poor sleep, poor appetite and loss of interest. The cure calls the soul back, with prayer and by sweeping the body with an egg or, in the Andes, a guinea pig (Wikipedia, Susto). DSM-5 lists it as a cultural concept of distress. - *Empacho* is food or something else stuck in the stomach or gut, with pain, swelling, loss of appetite and diarrhoea or constipation. It is treated by massaging the belly and back, pulling the skin over the spine, infusions and purges. Beliefs about it are consistent across Guatemala, Mexico, Mexican Americans and Puerto Ricans (Weller et al. 1993, summary only). - *Mal de ojo* (evil eye) affects a child admired by a person whose gaze is strong. The cure is a sweeping, often with an egg, and the admirer touching the child [VERIFY, general summaries only]. Dobkin de Rios found it among the illnesses brought to healers in Iquitos (Dobkin de Rios 1970). - *Caída de mollera* (fallen fontanelle) is blamed on pulling the nipple away too fast, a fall or tossing the baby. The cures are pushing up on the palate, holding the child upside down and sucking on the fontanelle (newstaco 2013, secondary).

In rural Guatemalan households empacho formed a distinct cluster of diarrhoea, vomiting, headache and loss of appetite, in adults as well as children, and was highly prevalent (Weller, Ruebush and Klein 1991, abstract). None of these illnesses maps onto one biomedical disease. Empacho may be indigestion, bowel obstruction or lead poisoning, and *caída de mollera* is most often dehydration.

The Andean body. Joseph Bastien worked with the Kallawaya and described their model of the body as topographical and hydraulic. The body is like the mountain Kaata. Fluids (blood, fat, air, water) circulate and are processed through it as water and soil move up and down the mountain, and illness is a blockage or loss of that flow (Bastien 1987, via PH-04). The Kallawaya healers' ritual language is restricted (THRIVING library, PH-04, SY-04).

The Amazonian cosmology. For the vegetalistas of the Peruvian Amazon, certain plants are *doctores*, plant teachers whose spirits teach medicine to a person who keeps the *dieta* (Luna 1984, abstract). The *dieta* is isolation, sexual abstinence and food without salt, sugar or fat, for at least six months and sometimes years (Wikipedia, Vegetalismo, summarising Luna 1986). The teaching comes as songs (*icaros*), which are restricted, and as a magical phlegm (*yachay* or *flema*) in the chest, with which the healer sucks out sorcerers' darts (*virotes*, the Shuar *tsentsak*). Serious illness is often *daño*, harm sent by an envious or vengeful person, besides *saladera* (a run of bad luck), *susto* and *mal de ojo* (Dobkin de Rios 1970). The healer finds who sent it and removes or returns it.

3. Aztec medicine: what the documents show

The healer. In the Nahuatl of Sahagún's Florentine Codex, the *ticitl* is a knower of herbs, roots, trees and stones, and a good one has tested remedies (Book 10, folio 20r, via the Wired Humanities Nahuatl dictionary). Women and men were *ticitl*, of ordinary status (Wikipedia, Aztec medicine). Bernard Ortiz de Montellano's *Aztec Medicine, Health, and Nutrition* (1990) is the main synthesis, praised by Richard Evans Schultes (Schultes 1991, read). A 1992 review is reported to have faulted its nutrition chapters for resting on disputed population estimates [VERIFY, search summary only].

Surgery and wounds. Secondary sources describe obsidian blades for abscesses and growths, maguey thorns in eye surgery, wounds classified by kind, splinted fractures, and wounds closed with hair or plant fibre and dressed with

maguey sap and salt (Wikipedia, Aztec medicine). Traction and wooden pegs in the marrow of broken bones appear only in a student thesis [VERIFY]. PH-04 grades maguey sap with salt C (THRIVING library, PH-04).

Obstetrics. Book Six of the Florentine Codex describes the Nahua midwife (*tlamatlquiticitl*). She examined the pregnant woman at home, bathed her in the temazcal and pressed on the belly to turn a malpositioned baby, and stayed for the last four or five days. In labour she gave *cihuapatli* tea and, if the cervix did not open, a piece of opossum tail (*tlacuatzin*). The woman gave birth squatting. If the baby had died inside, the midwife cut it in pieces with an obsidian blade (*itztli*) and removed it, which the text says saved the mother. A woman who died in childbirth was honoured as a fallen warrior (Bueno 2017, summarising Book Six). *Cihuapatli* is *Montanoa tomentosa* (zoapatle), which TR-14 grades X in labour after eight depressed newborns in Tlaxiaco (THRIVING library, TR-14). External version and destructive delivery are real obstetric operations, but the Codex gives no success rates.

Ortiz de Montellano's test. He judged 25 Aztec remedies against what the healers meant them to do, not against modern disease categories: 16 would have worked, 4 might have, and 5 would not (Ortiz de Montellano 1975, via PH-04). The sample was small and chosen by the author, Badianus identifications are uncertain, and only 15 plants appear in both the Badianus and Sahagún, so PH-04 rightly declines the claim that "most Aztec remedies worked" (THRIVING library, PH-04). The fair inference is a partly effective, tested materia medica, a real surgery of wounds and fractures and real midwifery, and no more.

Where it failed. The Mexica had no defence against new epidemics. Smallpox in 1519 to 1520 killed an estimated 5 to 8 million people. The cocoliztli epidemics of 1545 to 1548 killed 5 to 15 million, perhaps 80 per cent of the native population, and the 1545 and 1576 outbreaks together killed 7 to 17 million (Acuna-Soto et al. 2002). Acuna-Soto and colleagues proposed a native haemorrhagic fever driven by megadrought, and that cause is still disputed. No healer of any tradition, Spanish or Nahua, changed those numbers.

4. Peruvian trepanation: the outcome series

For trepanation in Peru, the bone shows whether the patient survived the operation. If the edge of the hole is remodelled and rounded, the patient lived for weeks to years afterwards. If the edge is sharp, the patient died during the operation or soon after it. Kushner, Verano and Titelbaum (Kushner et al. 2018) reviewed more than 800 crania from nearly three decades of work. They give these survival figures: - about 40 per cent in 400 to 200 BC - as high as 91 per cent in some samples from AD 1000 to 1400 - an average of 75 to 83 per cent in the Inca period, the AD 1400s to 1500

For comparison, cranial surgery in the American Civil War had a mortality of 46 to 56 per cent. The surgeons learnt to make smaller holes and to avoid areas that bleed heavily. The successful operations were probably shallow and did not cut through the dura, the membrane over the brain. Most were done for head injuries. Kushner judged that the Andean operators did a good job of preventing infection, whereas nearly every Civil War gunshot wound became infected (ScienceDaily 2018, University of Miami 2018). Valerie Andrushko and John Verano found about 83 per cent healing in 66 individuals with 109 perforations from the Cuzco region (Andrushko and Verano 2008, via WO-07). WO-07 already sets out the modern burr-hole evidence and the four conditions for doing a trephination at district level, and this report does not repeat them (THRIVING library, WO-07).

This is the best archaeological outcome series in the book, but it measures survival of the operation, not benefit. The skulls say nothing of people with the same fractures who were never operated on, so there is no control group. The anaesthetic, if any, is unknown, and coca and maize beer (*chicha*) are guesses. The series shows that a pre-industrial people could open the skull with stone tools and that most patients survived, not that the operation saved lives. The inference that it helped those with a depressed fracture or a clot is plausible, by analogy with the modern series in WO-07, and unproven.

5. Curanderismo in practice, and where it poisons

Use. In the Hispanic Health and Nutrition Examination Survey of 1982 to 1984, 4.2 per cent of Mexican American adults aged 18 to 74 had consulted a curandero in the past year. Use was predicted by low income, poor self-rated health, interview in Spanish and dissatisfaction with modern care (Higginbotham, Treviño and Ray 1990, abstract). Among 434 Mexican-born women at migrant clinics in rural eastern Washington, 21.4 per cent had seen a curandero in the past five years. Having received medicine or care from Mexico in that time raised the odds 9.2-fold, and preferring Spanish 2.6-fold (Skaer et al. 1996, abstract). Most empacho is treated at home: in rural Guatemala residents often diagnosed it but rarely consulted folk healers for any illness (Weller, Ruebush and Klein 1991).

What it treats well. Curanderismo is strongest where its theory points: distress, grief, fear, family conflict and ordinary complaints of gut and joints. *Limpias*, prayer and the healer's attention fit FO-10's social cure (THRIVING library, FO-10), and PH-04 grades many of its plants. In Ciudad Juárez, Robert Anderson watched a *sobador* for nine months treat musculoskeletal complaints by massage, mobilisation and manipulation, and on crude measures the work met standards of safety, effectiveness and cost (Anderson 1987, abstract). Rubel, O'Nell and Collado-Ardón studied *susto* in Oaxaca with psychiatric questionnaires and blood, urine and stool tests. Sufferers carried more organic disease than neighbours, and one review says they were more likely to die in follow-up (Rubel et al. 1984, catalogue and secondary review [VERIFY]). If so, *susto* partly marks real illness, and a soul-calling that leaves anaemia and parasites untreated misses what is killing the patient.

Where it poisons: azarcon and greta. The best-documented harm in this report comes from the material level of empacho treatment. Azarcon (lead tetroxide, orange) and greta (lead oxide, yellow) are 70 to more than 90 per cent lead. In May 1982 two children in Mexico, 15 months and 3 years old, were given azarcon for diarrhoea that ampicillin had not cured. The younger had a blood lead of 124 μg/dl, and the 3-year-old died with seizures. The first cases had appeared in summer 1981 in Los Angeles and Colorado, and more followed elsewhere in California and in Michigan and Wisconsin. In June 1982, 7.2 to 12.1 per cent of 545 Mexican Hispanic households surveyed in Los Angeles County admitted use, as did families of 7.0 per cent of 100 migrant children in Colorado. The FDA recalled the products, 25 pounds of greta were seized in south Texas and Mexico ran a recall in Baja California (CDC 1983).

The anthropologist Robert Trotter identified the "unknown orange powder" as one of more than a hundred empacho remedies he catalogued (Trotter 1985, summary only). The poisoning went on. From 1 December 1991 to 31 December 1992, California found 40 children aged 8 months to 5 years with blood lead of 20 to 86 μg/dl (median 33). In 36 the source was azarcon or greta, 24 had no symptoms, and families at first denied use. One mother admitted giving greta to her 2-year-old (83 μg/dl) only when the interviewer said the word "greta" (CDC 1993). Other names include Rueda, Coral, María Luisa, Alarcón and Liga. The powder is given on a spoon in oil or milk, and lead colic, constipation and loss of appetite look like empacho, so the remedy produces the signs it is given for (Washington State Department of Health leaflet, secondary). TR-15 grades azarcon and greta X (THRIVING library, TR-15). I found no case report from 2018 or later, so whether the powders are still sold is [VERIFY]. After the Fall the risk returns in another form. Any orange or yellow mineral powder kept for a child's stomach is suspect, and so is any lead-glazed pot used to cook acid food.

Other harms of empacho treatment. Among 519 families in León, Guanajuato, empacho was most often understood as something stuck in the gut. It was treated by massage and herbal infusions, but 34.7 per cent also gave cooking oil, 36.5 per cent bismuth powder and 7.9 per cent an unknown powder. The authors warned of lipoid pneumonia, from oil breathed into the lungs, and of poisoning (Cortés-Gallo et al. 1993, abstract and summary). Pulling the skin over the spine is safe. Forcing oil into a struggling child is not.

Caída de mollera and delay. A sunken fontanelle in an infant is a sign of dehydration, usually from diarrhoea, and it is an emergency (MedlinePlus, secondary). Pushing on the palate and holding the child upside down do not replace lost fluid. I found no study measuring the delay folk treatment causes, so the harm is inferred [VERIFY]. Give oral rehydration first and the folk treatment beside it if the family wants both.

6. The temazcal

The tradition. The temazcal (Nahuatl *temazcalli*, "house of the bath") is a small masonry or adobe chamber. A wood fire heats stones or a wall, and water thrown on them makes steam. Among the Tzeltal and Tzotzil Maya of highland Chiapas, Kevin Groark found that steambathing belongs to an idiom of "vital warmth". Bathing restores the heat that health requires, and it is used for cold illnesses, after exertion and above all after childbirth. The practice has a history of more than 2,000 years, and it has disappeared from the Maya lowlands (Groark 2005, abstract). In Book Six of the Florentine Codex, the midwife used the bath before and after birth, and was warned to keep it from getting too hot (Bueno 2017). TR-14 describes the postpartum bath of the Tepoztlán partera and grades the benefit of the postpartum temazcal D (THRIVING library, TR-14).

The record. No trial measures any benefit. The harm has been measured, and it is carbon monoxide. In highland Guatemala, Thompson and colleagues measured 288 bathers in 72 wood-fired temazcales. The time-weighted average was 431 ppm of CO (Thompson et al. 2011, abstract). Lam and colleagues found 661 ± 503 ppm during use, about ten times the WHO 15-minute guideline. Carboxyhaemoglobin after bathing averaged 12 to 14 per cent, with a range of 2 to 30 per cent. Children spent about two-thirds less time in the bath but had carboxyhaemoglobin no lower than adults' (Lam et al. 2011, abstract). Long and colleagues followed 19 Maya families, 32 exposed people and 9 controls. After bathing, urinary mutagenicity rose 1.7-fold and exhaled CO was about ten times higher (Long et al. 2014, abstract). TR-08 covers the physiology of heat stress and the Sedona deaths of October 2009 (THRIVING library, TR-08).

The inference. Heat and steam may ease muscle pain and give rest, warmth and company after birth, but a wood-fired temazcal without a chimney gives a heavy dose of CO. A carboxyhaemoglobin of 30 per cent can cause collapse, and the fetus is likely more vulnerable than the mother [VERIFY, CO toxicology not read here]. The book can keep the bath if the fire is moved outside the bathing chamber or the smoke leaves by a flue, the session is short, the door can be opened from inside and someone stays outside. Protocol 4 gives the limits.

7. Hueseros, parteras and the Kallawaya

Hueseros and sobadores. Across Mexico and Central America, *hueseros* (bonesetters) and *sobadores* (masseurs) treat sprains, dislocations and fractures with massage, traction and binding. In Guatemala the Kaqchikel and Tz'utujil bonesetters described by Hinojosa (2003) receive their calling through dreams and hold a sacred object. That object is restricted and is not described here (THRIVING library, TR-12). Anderson's nine months with a Juárez *sobador* are the only direct observation of outcomes I found, and they are favourable on crude measures (Anderson 1987). TR-12 concluded that "the bonesetter's hands are worth keeping, the bindings not". Tight bindings without padding or checks of circulation cause compartment syndrome and gangrene, and in nineteenth-century Britain training reduced gangrene after setting from about 10 to 2.5 per cent (THRIVING library, TR-12). This report agrees.

Parteras. TR-14 covers them in full. Two figures belong here: about 22,500 Guatemalan *comadronas* attend about 31 per cent of births, and maternal mortality was 113 per 100,000 in 2013 (Kühlen 2017, via TR-14). The partera's massage (*sobada*), the *rebozo* and the closing of the hips (*cierre*) are kept, with TR-14's grades. The zoapatle tea of the Codex is not.

The Kallawaya as an itinerant pharmacopoeia. The Kallawaya, about 11,600 people in La Paz department, are itinerant healers. Their healers are men, and travel is central to their learning. A healer uses about 300 plants and a specialist up to 600, and UNESCO recorded about 980 species when it proclaimed their Andean cosmovision in 2003 and inscribed it in 2008 (UNESCO 2008, via PH-04). Women serve as midwives, and their knowledge is less documented. The claim that Kallawaya healers treated canal workers in Panama is unverified (THRIVING library, PH-04). Bastien's *Healers of the Andes* (1987) is the standard ethnography (catalogue only read). Bolivia gave traditional medicine legal standing in Law 459 of 19 December 2013, regulated by Supreme Decree 2436 of 1 July 2015 (Ley 459, DS 2436). For the book, the Kallawaya model shows how specialist knowledge moves: a district can

keep a travelling healer with a dried, labelled kit who visits villages on a circuit. PH-04 holds the plants.

8. The Amazonian shaman and the plant teachers

Don Emilio and the vegetalistas. Luis Eduardo Luna worked in 1981 and 1982 with Don Emilio Andrade Gómez, a vegetalista of 65 near Iquitos (Luna 1984, abstract). Luna separated *vegetalistas* from *oracionistas*, who heal by prayer, and named specialists by their plant: ayahuasqueros (*Banisteriopsis caapi*, vine, usually with *Psychotria viridis*, leaf) and tabaqueros (tobacco). Pharmacology is left to MI-11 and preparation is not taught (THRIVING library, SY-04).

What the healer does, in Iquitos. Marlene Dobkin de Rios spent a year in the Belén slum of Iquitos and gave the clearest account of what the vegetalista actually treats (Dobkin de Rios 1970, full text read). Simple illness is treated with herbs and with medicines bought in shops. The healers do best with illness brought on by social and emotional trouble, and psychosomatic complaints make up their largest clientele. They do not see the vine as curing anything. It lets healer and patient see the cause, usually the person who sent the *daño*. Healers choose patients they think they can reach and do not take psychotic patients. Their techniques include whistling, singing, sucking out thorns and blowing smoke of *mapacho* (strong tobacco, *Nicotiana rustica* [VERIFY]). People also used *sanitarios*, who gave penicillin injections for a fee, and saw the city hospital as "a place one goes to die". A fever that did not yield to an injection was taken as proof of sorcery. Among the Sharanahua, Janet Siskind recorded a shaman in a community of about 80 people who used ayahuasca in 27 cases (via Dobkin de Rios 1970).

The Shipibo. Shipibo-Konibo healers (*onaya*) keep a *dieta* and work with plant spirits. Their designs and recordings are published, and their healing songs fall under SY-04's restriction on *icaros*. Bernd Brabec de Mori argues from Shipibo testimony and music that their ayahuasca shamanism is fairly recent. It came through the Maynas missions and spread with mestizo and Kukama people in the rubber boom, some communities remember adopting it within 50 years, and a "double discourse" of antiquity is offered to tourists (Brabec de Mori 2011, 2021). Recent is not false, but the book should not call it ancient. In April 2018 the Shipibo-Konibo healer Olivia Arévalo, 81, was shot dead in Ucayali. A Canadian, Sebastian Woodroffe, 41, was lynched for it, and prosecutors later said gunpowder residue showed he fired the shot (Global News 2018, CBC 2018).

Tourism harms. These are the facts this report can stand behind. - **The global survey.** Bouso and colleagues surveyed 10,836 ayahuasca users in more than 50 countries. Acute physical effects were reported by 69.9 per cent, mostly vomiting, and 2.3 per cent needed medical attention. Mental effects were reported by 55.9 per cent, and about 12 per cent of those sought support. Risk was higher without supervision (Bouso et al. 2022). - **Named deaths.** Henry Miller died in Colombia in 2014 of a head injury in a motorcycle fall on the way to hospital. Matthew Dawson-Clarke, 24, died near Iquitos in September 2015 of nicotine poisoning after a tobacco purge. Unais Gomez, 26, was stabbed by another participant in December 2015. In 2012 the shaman buried the body of Kyle Nolan. A tabaquero said purges may be unsafe for up to 30 per cent of people (Sinclair 2017). - **The ICEERS review.** ICEERS reviewed 58 deaths attributed to ayahuasca between 2010 and 2022. In nine, a link could be excluded or there was an independent cause. Others involved drowning, violence and a neck fracture after convulsions (ICEERS 2023, summary only). - **Kambo.** The secretion of the frog *Phyllomedusa bicolor* caused fatal hyponatraemia, brain swelling and brain death in a woman of 35 (Tran et al. 2025).

The pattern is that people die of what surrounds the brew: purges, combinations, drowning, violence, untreated medical conditions and the absence of anyone who can call for help.

Tobacco. *Nicotiana rustica* leaf holds about 4 to 9.5 per cent nicotine, against 1 to 3 per cent in commercial *N. tabacum* (THRIVING library, TR-08). Mayer (2014) traced the often-quoted lethal dose of 60 mg to dubious nineteenth-century self-experiments and put the lower limit of a lethal oral dose at 0.5 to 1 g (6.5 to 13 mg/kg), with fatal blood levels from about 2 mg/l. Vomiting often saves the patient. Nicotine also crosses the skin: green tobacco sickness from handling wet leaf affected 23.6 per cent of 17,609 tobacco workers in 17 studies (Jahromi et al. 2026).

The signs are vomiting, sweating, pallor, a fast then slow pulse, weakness, convulsions and failing breath [VERIFY, toxicology texts not read]. A tobacco purge is X for a village: the dose cannot be measured and the vomit can be inhaled.

San Pedro, psilocybin, *Datura* and *Brugmansia*. San Pedro (*Echinopsis pachanoi*, syn. *Trichocereus pachanoi*, stem) belongs to northern Peruvian curanderismo and its ritual table, the *mesa*. Its main alkaloid is mescaline. A 2026 systematic review found ten usable studies, frequent hypertension, headache, nausea and vomiting, and an unknown safety profile (Shaw et al. 2026, abstract). Psilocybin mushrooms (*Psilocybe* spp.) have a Mazatec ceremonial history in Oaxaca and are left to MI-11. *Brugmansia* (*B. arborea*, *B. suaveolens*, *B. sanguinea*, all parts) holds about 0.65 mg of scopolamine and 0.3 mg of atropine per flower, so about ten flowers can kill, and a 19-year-old Peruvian who drank the tea had a fever of 41 °C and seizures (Kim et al. 2014, Flores Mamani 2023, both via PH-04). *Datura stramonium* and *D. inoxia* (toloache) carry the same alkaloids. All are X for village use. Their ceremonial use exists and is not taught (THRIVING library, PH-04, SY-04).

Takiwasi. The Takiwasi centre in Tarapoto (founded 1992) treats addiction with plant diets and ayahuasca beside psychotherapy. In 36 men treated in 2014 and 2015, all repeated measures improved early and stayed improved, with no control group (O'Shaughnessy et al. 2021, abstract). Grade D, and not a village tool.

9. The Tsimane: what a village without doctors looks like

The Tsimane are forager-horticulturalists of the Bolivian lowlands, about 8,000 people in the 2000s, studied by the Tsimane Health and Life History Project since 2002 (Gurven and Kaplan 2007). Only their healers, the *cocojsi*, can cure spiritual illness, and medicine is the largest category of useful plants, 169 species or 41 per cent (Calvet-Mir et al. 2008, full text read). The data are not a pure baseline. A New Tribes Mission clinic has worked there since 1990, national SUMI insurance has covered mothers and children since 2002, and the project's physicians treat patients (Gurven 2012).

Mortality. Life expectancy at birth was 42 to 45 for 1950 to 1989 and rose to about 53 after 1990. Remote villages had two to four times the mortality of more acculturated villages from infancy to middle adulthood. The fall came mostly among adults and was attributed to medical access. More than half of deaths were from infection, especially respiratory and gastrointestinal, and accidents and violence caused about a quarter (Gurven, Kaplan and Supa 2007, abstract). Those who reach adulthood live long: across forager-horticulturalist populations, the most common age at adult death averaged about 72, with a range of 68 to 78 (Gurven and Kaplan 2007). Tsimane hearts are remarkable: 85 per cent of 705 adults had no coronary calcium (Kaplan et al. 2017).

Infants. The total fertility rate is about 9. Infant mortality is about 13 per cent, 8.1 per cent near town and about 15.4 per cent in remote forest and river villages, varying from 8 to 26 per cent by village, and distance explains a quarter of the variation. Infection causes 55 per cent of infant deaths: respiratory 29 per cent, gastrointestinal 15 per cent and other 11 per cent. Forty per cent of infant deaths come in the first month. One third of children are stunted (Gurven 2012, read).

What healers and mothers do. In a sample of 87 villagers, 73.5 per cent had been ill in the previous week. Of those treated for gut complaints, 35.3 per cent used plants only, 17.6 per cent pharmaceuticals only and 47.1 per cent both. In 76.5 per cent of cases plants were the first choice. At a joint workshop doctors, a nurse, healers and health assistants all said they would work together (Calvet-Mir et al. 2008). Each standard deviation of a mother's plant knowledge raised the odds of good child health by more than 1.5, measured by C-reactive protein, skinfold and height for age (McDade et al. 2007, abstract). Reyes-García's work shows the knowledge changing rather than simply disappearing (THRIVING library, SY-04).

What this shows. A village with healers, plant knowledge and occasional medical contact still loses about one baby in eight, and over half of all deaths are infections that antibiotics and rehydration can treat. Medical access added about a decade to life expectancy, mostly among adults. Plant knowledge is worth having: it measurably helps child

growth. But it does not replace the clinic. A village of 300 with a high birth rate might see 10 to 15 births a year and, at Tsimane rates, lose one or two infants a year [VERIFY, my inference].

10. What the shaman's role does, and where it fails

The healers in this report do four useful things. They diagnose in a social sense, naming a cause (often a broken relationship) that patient and family can act on. They gather the family round the patient and let conflicts surface and settle. They triage, as Dobkin de Rios saw Iquitos healers choose patients they could reach. And they keep real pharmacopoeias, Kallawaya, Tsimane and Nahua. FO-10 grades a trusted healer's presence C for reducing fear and distress (THRIVING library, FO-10).

They fail in three places, and there the record is plain. - **Infection.** Tsimane infants die of pneumonia and diarrhoea despite healers and plant knowledge (Gurven 2012). In Iquitos a fever that does not respond to an injection is put down to sorcery, which turns a failure of treatment into a social accusation (Dobkin de Rios 1970). - **Obstructed labour.** The Codex midwife had only the destructive operation for a dead baby. FO-10 grades the Guna birth song D for resolving an obstruction (THRIVING library, FO-10). TR-14 holds the red flags. - **Epidemics.** The cocoliztli killed up to 80 per cent of the native population (Acuna-Soto et al. 2002). After contact in 1984 the Yora (Nahua) of Peru lost 114 of about 240 people to respiratory infection in the first year (Peruvian Ministry of Health, via Mongabay 2019), and other sources give 30 to 40 per cent [VERIFY]. A cosmology that reads illness as sent by an enemy can turn an epidemic into a hunt for sorcerers [my inference].

11. Claim, record and inference

Practice	The tradition says	The record shows	The inference
Trepanation	Relieves the head	40 to 91% survival of the operation, Inca average 75 to 83% (Kushner 2018)	Skilled surgery, benefit unknown without a control group
Aztec remedies	Restore balance and expel	16 of 25 would work by the healers' own goals (Ortiz de Montellano 1975)	A partly effective materia medica, small and selected test
Empacho cure	Unsticks the gut	Massage harmless, oil causes lipoid pneumonia, azarcon and greta lead poisoning	Keep the massage, ban the powders and oil
Susto cure	Returns the soul	People with *susto* carry more organic disease (Rubel 1984 [VERIFY])	Treat the distress and look for the disease
Temazcal	Restores vital warmth	CO about 431 to 661 ppm, COHb up to 30%	Keep the bath, remove the smoke
Huesero	Puts bone and sinew back	Favourable on crude measures (Anderson 1987)	Keep, with TR-12's checks of circulation
Plant teacher	Teaches medicine	Uncontrolled addiction series (O'Shaughnessy 2021)	Not a village tool
Tsimane plant knowledge	Keeps children well	Odds ratio above 1.5 per SD for child health (McDade 2007)	Worth keeping, does not replace a clinic

Evidence grades

Practice or remedy	Grade	Basis
Pre-Columbian trepanation (survival of operation)	B	Large osteological series, replicated across sites
Trepanation (benefit to patient)	D	No control group, WO-07 holds the modern series
Aztec materia medica as a whole	C	Ortiz de Montellano's test, small selected sample
Codex external version and destructive delivery	D	Documentary, no outcomes
Zoapatle (*Montanoa tomentosa*) in labour	X	TR-14
Huesero or sobador massage and manipulation for soft-tissue injury	C	Anderson 1987, convergent across cultures
Huesero tight binding of fractures	X	TR-12
Empacho massage and skin-pulling	D	Harmless, no outcome data
Azarcon and greta	X	CDC 1983, 1993
Oil by mouth for empacho	X	Lipoid pneumonia (Cortés-Gallo 1993)
Limpia and soul-calling for distress	C	Convergent use, FO-10 social cure
Susto or *mal de ojo* cure as the only treatment of a sick child	X	Delay, Rubel 1984 [VERIFY]
Caída de mollera folk cure instead of fluid	X	Dehydration untreated
Temazcal for well-being	D	Groark 2005, no measured benefit
Wood-fired temazcal in pregnancy or for children	X	CO data (Lam 2011, Thompson 2011)
Kallawaya itinerant kit model	C	Long record, plants graded in PH-04
Vegetalista diagnosis of *daño* for social illness	D	Ethnography only
Ayahuasca retreat for addiction	D	Uncontrolled series, MI-11
Tobacco purge	X	Deaths, Mayer 2014
Brugmansia, *Datura*	X	PH-04
San Pedro	D	Shaw 2026, safety unknown
Kambo	X	Tran 2025
Maternal plant knowledge for child health	B	McDade 2007, observational

Means ledger

Practice	Hands	Hearth	Garden and still	Village dispensary	District infirmary	Hospital reference
Distress, *susto*, *mal de ojo*	Listening, *limpia* with egg, prayer	Warm food, rest	Mild infusions from PH-04	Lay healer screens for fever, pallor, weight loss	Stool and blood smear for parasites and anaemia	Psychiatric and medical work-up
Empacho and child diarrhoea	Belly massage	ORS, feeding	Plant infusions from PH-04, no purges	ORS, zinc if held, weighing	IV fluids, microscopy	Imaging for obstruction, surgery
Caída de mollera	Recognise sunken fontanelle	ORS by spoon at once	As hearth	Nasogastric ORS at 20 ml/kg/h	IV fluids	Paediatric ward
Temazcal	None	Bath with external firebox or flue	Build to Protocol 4	Keep a pregnancy rule	CO poisoning: oxygen if held	Hyperbaric oxygen
Bonesetting	Reduction by traction, massage	Padded splint, cloth sling	Plaster or splint wood, check circulation	Trained setter, a log of outcomes	X-ray if any, open reduction	Orthopaedic surgery
Trepanation	None	None	None	None, transfer	Only under WO-07's four conditions	Neurosurgery and CT
Itinerant pharma-copoeia	Knowledge of local plants	Dried labelled store	Garden, drying shed, scale	Kit carried on a circuit	Formulary, record of use	Pharmacy
Plant teacher and visionary plants	Do not	Do not	Do not grow *Brugmansia* or *Datura* near children	Recognise poisoning	Supportive care, physostig-mine if held (WO-11)	Intensive care

What each rung changes: the hearth adds ORS, the most valuable step on the ladder for the gut illnesses in this report. The dispensary adds weighing, records and recognition of red flags. The infirmary adds IV fluids and microscopy, which turns *susto* with anaemia and parasites into a treatable diagnosis.

Harm test

Azarcon and greta (lead). Harm: colic, anaemia and lasting cognitive damage from about 10 µg/dl, and encephalopathy, fits and death from as low as 70 µg/dl (CDC 1993). Never for anyone, above all infants, children and pregnant women. Signs: colic, constipation, poor appetite, pallor, irritability, then drowsiness, vomiting and fits, though most poisoned children look well. Action: stop all powders, remove the source, feed well and send anyone with neurological signs to the highest rung. Cases: Mexico 1982, California 1991 to 1992.

Oil and purges for empacho. Harm: lipoid pneumonia from oil inhaled by a struggling child, dehydration from purges. Never for infants, a vomiting child or a child with a tense swollen belly. Signs: cough, fast breathing and fever after the dose. Action: stop, sit the child up, treat as pneumonia (Cortés-Gallo et al. 1993).

Temazcal. Harm: carbon monoxide poisoning, heat illness, burns, collapse. Never for pregnant women or children

in a smoky bath, or anyone with heart disease, epilepsy or fever, drunk or alone. Signs: headache, nausea, dizziness, confusion, fainting. Action: out into fresh air, on the side, cool if hot, oxygen if held. Cases: Guatemala CO series (Lam et al. 2011), Sedona 2009 (TR-08).

Bonesetting. Harm: tight binding causes compartment syndrome and gangrene, and manipulating an unrecognised fracture or the neck can paralyse. Never bind tight while swelling is rising. Signs: pain out of proportion, pale, blue, cold or numb fingers or toes. Action: cut the binding, raise the limb (TR-12).

Delay to effective care. Harm: infection or dehydration progresses while the folk cure is given. Most at risk: infants, the dehydrated, women in obstructed labour. Action: do both, the effective treatment first. Cases: alternative medicine alone for curable cancer carried about 2.5 times the risk of death (THRIVING library, SY-02, via TR-15), and Iquitos fevers were read as sorcery (Dobkin de Rios 1970).

Visionary and purgative plants (tobacco, *Brugmansia*, *Datura*, ayahuasca, San Pedro, kambo). Harm: nicotine poisoning with failed breathing, anticholinergic delirium with fever and fits, aspiration of vomit, drowning, falls, violence, and hyponatraemia from kambo. Never for anyone in village use, above all children, pregnant women, the old, and anyone with heart disease, epilepsy, past psychosis or other medicines [VERIFY: interactions for MI-11]. Misidentification: *Brugmansia* (hanging trumpet flowers, a shrub or small tree) and *Datura* (upright flowers, spiny capsules) are confused with each other and grown as ornamentals (PH-04). Signs: for nicotine, vomiting, sweating, slow pulse, weakness. For the nightshades, hot dry red skin, wide pupils, delirium, fever above 40 °C. Action: on the side, cool if hot, never alone, away from water and heights. Cases: Dawson-Clarke 2015, Peru 2023, kambo 2025.

Red flags

These signs mean the village alone cannot save the patient. Move them up the ladder at once, and give honest comfort if that cannot be done. - A sunken fontanelle, no tears, no urine for 6 hours or more, or a child too drowsy to drink. Give ORS by spoon or tube while moving. - Fast breathing or chest indrawing in a child, or fever with stiff neck or rash. Treat as pneumonia or meningitis, not *susto*. - A child given any orange or yellow powder, or with stomach colic, pallor and drowsiness. Think lead. - A swollen, tense belly with vomiting and no stool. Empacho massage must stop, as this may be obstruction. - Active labour beyond 12 hours in a first birth or 10 in later ones, no descent after 1 hour of good pushing, or heavy bleeding (THRIVING library, TR-14, MA-01). - Anyone confused, vomiting or with headache after the temazcal. Get them out. - Blue, cold or numb fingers or toes after a binding. Cut it. - After any visionary or purging plant: seizures, temperature above 40 °C, a slow pulse or loss of consciousness. - After a head blow: worsening drowsiness, one pupil wider than the other, or weakness on one side. Only the district can consider WO-07's operation. - In an epidemic, a cluster of deaths. Isolate and do not seek a sorcerer.

Honest comfort, when no rung can help, means staying, warmth, fluids by mouth if the patient can swallow, the family close and the healer's prayers and songs if the patient wants them. This is where the shaman's art works best.

The case against

The strongest case against comes from within anthropology. Brabec de Mori shows that the ancient Shipibo ayahuasca shamanism sold to tourists is partly recent and partly made for them, and the romance has killed visitors in Peru and Colombia (Brabec de Mori 2011, ICEERS 2023). Foster argues that much presented as indigenous theory came from Spain (Foster 1994, via REAA 2012). The Aztec-sophistication literature reads Ortiz de Montellano's 16 of 25 as a verdict on a whole medicine, though his test was small and selected (THRIVING library, PH-04). The trepanation series has no controls. Curanderismo's material level poisoned children with lead, unnoticed until an anthropologist linked the powder to empacho, because lead's signs looked like the illness (CDC 1983, Trotter 1985). And among the Tsimane, healers and plants coexist with one infant in eight dying.

The case against the hospital is as strong in its place. Families in Iquitos called it "a place one goes to die" (Dobkin de Rios 1970). Mexican Americans used curanderos more when dissatisfied with modern care (Higginbotham et

al. 1990). Comadronas still attend about a third of Guatemalan births (TR-14), and Groark shows the temazcal as trusted household medicine. A book that removes all this loses its reach. Keep the hands, the warmth, the presence and the plant knowledge, attach the evidence and red flags, and never let in the powder, the purge or the delay.

10-line summary

1. Peruvian trepanation survival rose from about 40 per cent to 75 to 83 per cent by the Inca period, with no data on those not operated (Kushner et al. 2018).
2. Ortiz de Montellano judged 16 of 25 Aztec remedies effective by the healers' own goals, a small selected test (PH-04).
3. The Florentine Codex describes real midwifery, including turning and destructive delivery, without outcome figures.
4. Azarcon and greta are 70 to more than 90 per cent lead and killed and poisoned children in Mexico and California from 1981 (CDC 1983, 1993).
5. Empacho massage is harmless, but oil and powders given by mouth injure.
6. Wood-fired temazcales give 431 to 661 ppm CO and carboxyhaemoglobin up to 30 per cent, children included.
7. A Juárez sobador's work met standards of safety and effectiveness on crude measures (Anderson 1987).
8. Ayahuasca tourism deaths come mostly from purges, combinations, drowning and violence, not the brew alone.
9. Tsimane infants die at about 13 per cent, over half from infection, despite healers and plants, and medical access raised life expectancy by about a decade.
10. Maternal plant knowledge raised Tsimane child health odds by more than 1.5 per SD (McDade et al. 2007): keep it, and keep the clinic too.

Open questions

- Did trepanation help those with depressed fractures, against untreated people with the same injury? Only osteology with untreated controls could say.
- Do people with *susto* die more, as Rubel and colleagues are reported to have found? I could not read the book.
- Is azarcon still sold in Mexico or the United States? I found no case report after 2018.
- Does the postpartum temazcal with a clean flue give measurable benefit? No study exists.
- How much delay does *caída de mollera* folk treatment cause? No study found.
- How much of the hot and cold system is Hippocratic and how much Mesoamerican (Foster against López Austin)?
- What is the true adverse-event rate of ceremonial ayahuasca in its traditional settings, as against tourism? MI-11 must answer.
- What fraction of Tsimane plant remedies have measurable activity?

Sources to read in full

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5. Bastien 1987, *Healers of the Andes*, University of Utah Press.
6. Luna 1986, *Vegetalismo*, Almqvist and Wiksell.
7. Dobkin de Rios 1972, *Visionary Vine*, Chandler, reprinted Waveland 1984.
8. Gurven 2012 and Gurven, Kaplan and Supa 2007 on Tsimane mortality.

9. Kushner, Verano and Titelbaum 2018, World Neurosurgery, and Verano's *Holes in the Head* (Dumbarton Oaks, 2016 [VERIFY]).
10. Labate and Cavnar (eds) on ayahuasca, not reached for this report.

At the bedside after the Fall

Household. Keep belly massage for a child's gut ache, a *limpia* or prayer if wanted, and the mother's warm bath after birth with the fire outside. Make ORS first for any diarrhoea or sunken fontanelle. Never give a child a mineral powder, oil or purge. Needs: clean water, salt, sugar, a 1 litre measure, a teaspoon, a pot without lead glaze, and a scale if one exists. First failure to expect: a grandmother gives the old orange powder or a spoon of oil for empacho, because it was always done.

Village of 300. A lay healer works beside the curandero, partera and huesero under Protocol 5. The bath is rebuilt to Protocol 4. Keep a bonesetting log (limb, method, gangrene or not) and a labelled plant store from PH-04 and PH-05, and remove *Brugmansia* and *Datura* from where children play. Needs: a scale, a measure, padding cloth, a ledger. Expect 10 to 15 births a year [VERIFY, my inference]. First failure to expect: a febrile child kept at home for a *susto* or *mal de ojo* cure until too late.

District of 3,000. A nurse or doctor, a microscope for parasites and blood films, IV fluids and ten beds. A travelling herbalist with a Kallawaya-style dried kit on a circuit of villages, using a written formulary from PH-04 and PH-05. Any orange or yellow remedy powder treated as lead until shown otherwise. The only rung where WO-07's head operation could be considered. A written agreement with healers on referral, and on sharing knowledge only as SY-04 permits. First failure to expect: an epidemic read as sorcery, with accusations against a supposed sender of *daño*.

Protocols

Protocol 1. What the book keeps and what it must not take (SY-04)

1. Before writing down any healer's knowledge, ask the healer and the community, by name, whether it may be recorded and shared, and how.
2. Record name, people, place, date and the healer's own words for the illness and the cure.
3. Classify the item by SY-04: widely published (publish with credit), narrowly held (only what the holder published), outsider-published without consent (do not republish), restricted or initiated (say it exists, nothing more), ceremonial psychoactive (do not teach).
4. Never record or reproduce *icaros*, the Kallawaya ritual language, bonesetters' sacred objects, initiation content or ceremonial preparation of any visionary plant.
5. Warnings about a dangerous plant are always allowed and are not a disclosure.
6. Keep: massage, warmth, presence, plant knowledge graded C or better, the travelling-kit model, the diagnostic attention to social trouble.
7. Do not take: lead powders, oil and purges for children, smoky baths, tight bindings, visionary plants, tobacco purges, any claim that a healer can cure infection or obstructed labour.
8. Return what you write down to the community in their language.

Protocol 2. Child with empacho, diarrhoea or a sunken fontanelle

1. Ask what has been given already. Say the names: azarcon, greta, Rueda, Coral, María Luisa, Alarcón, Liga, oil, purge. Parents often deny use until a name is spoken (CDC 1993).
2. If any powder was given, stop it, keep the packet, treat as lead (Protocol 3).
3. Look: sunken fontanelle, sunken eyes, no tears, dry mouth, no urine for 6 hours. Any of these is dehydration.
4. Make ORS: 1 litre of clean water, half a level 5 ml teaspoon of salt (about 3 g) and 6 level teaspoons of sugar. Taste: it should be less salty than tears, and if in doubt add water, never salt (THRIVING library, FO-01,

HY-03). Tolerance: measure the litre, never guess salt.
5. Under 2 years, give one 5 ml teaspoon every 1 to 2 minutes, never by bottle. Older children sip from a cup. If the child vomits, wait 5 to 10 minutes, then give a spoonful every 2 to 3 minutes. Keep breastfeeding. Puffy eyelids mean too much: stop ORS and give breast milk or water (WHO 2005, via HY-03).
6. If the child is too drowsy to drink, give ORS by nasogastric tube at 20 ml/kg per hour if a trained person and tube exist, and move up the ladder (THRIVING library, HY-03).
7. Belly massage, gentle and with the child relaxed, may be given beside the ORS. Never press a swollen tense belly.
8. Never give oil, purges or mineral powders. Never hold an infant upside down.
9. Reassess at 4 hours (WHO 2005, via HY-03). No improvement, blood in the stool, high fever or vomiting everything: move up.

Protocol 3. Suspected lead from a folk remedy

1. Ask about orange or yellow powders, lead-glazed pottery used for acid food, and remedies from abroad.
2. Remove the source from the house. Do not burn or bury it near gardens or water.
3. Feed the child well, with iron and calcium foods, since a hungry child absorbs more lead [VERIFY].
4. Watch for drowsiness, vomiting, fits, unsteadiness. Any of these: move to the highest rung at once.
5. Ask the whole household: siblings given the same powder are likely to be poisoned too (CDC 1993 found asymptomatic children).
6. Record the remedy's name and source so the district can warn other villages.

Protocol 4. A safer temazcal

1. The fire must be outside the bathing chamber, in a firebox heating a wall or stones, or with a flue that takes all the smoke out [VERIFY: no study of modified designs read].
2. Before entry, let the fire burn down to embers and check that the chamber is free of smoke.
3. No round past about 15 minutes, with the door opened between rounds, and no session past about an hour (TR-08's inference, [VERIFY]). Leave at the first headache, nausea or dizziness.
4. The door must open from inside. Someone stays outside and calls in every 5 minutes.
5. Never: pregnant women in any bath with smoke, infants and young children, anyone with heart disease, epilepsy, fever, drunkenness or alone.
6. After birth, wait until bleeding is settling and the mother can stand and walk without dizziness [VERIFY: TR-14 for timing].
7. Drink water before and after. Cool down slowly.
8. If anyone is confused or faints: out, lie on side, fresh air, cool if hot, oxygen if held.

Protocol 5. Working with healers, and the plants not to use

1. Meet each curandero, huesero and partera. Ask what they treat and what they send away.
2. Agree that they refer red flags at once, that the dispensary does not stop their care without talking to them, and that both keep a simple record of what was treated, referred and died, reviewed together once a year.
3. Bonesetting: pad every splint, keep it loose and check it daily (TR-12), look at the fingers or toes whenever pain rises [VERIFY, my inference], and cut the binding at once if they are pale, blue, cold or numb.
4. A child with *susto* or *mal de ojo* who also has fever, fast breathing, diarrhoea or weight loss gets the healer's cure beside the dispensary's treatment, never instead of it.
5. Do not grow *Brugmansia* or *Datura* where children play (PH-04). Grow *Nicotiana rustica* fenced and handle wet leaf with gloves (TR-08).
6. No one in the village gives a tobacco purge, ayahuasca, San Pedro, mushrooms or kambo. A people's own ceremonial use is theirs and is not taught here.

7. After any of these: on the side, never alone, away from water, fire and heights, cooled if hot. Seizures, fever above 40 °C, a slow pulse or unconsciousness: move up at once.

Numbers to carry

1. Inca-period trepanation survival: 75 to 83 per cent, earlier about 40 per cent (Kushner et al. 2018).
2. Azarcon and greta: 70 to more than 90 per cent lead (CDC 1983). Lead harms from 10 µg/dl, encephalopathy from about 70.
3. ORS: 1 litre water, half a level teaspoon (3 g) salt, 6 level teaspoons sugar.
4. Temazcal CO: 431 to 661 ppm, carboxyhaemoglobin up to 30 per cent, children no lower than adults.
5. *Brugmansia*: about ten flowers can kill (PH-04).
6. Nicotine: lethal oral dose at least 0.5 to 1 g, but tobacco purges have killed (Mayer 2014, Sinclair 2017).
7. Tsimane infant mortality: about 13 per cent, 55 per cent of it infection (Gurven 2012).
8. Medical access raised Tsimane life expectancy from about 42 to 45 to about 53.
9. Ortiz de Montellano: 16 of 25 Aztec remedies plausible by their own goals.

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