OR-10 Animals and the healer: the veterinary basics a household needs

HEALING after the FALL, research library, OR-10

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How to read this report

A village of 300 after the Fall lives close to its animals. When one sickens, the person asked is the village healer, because there will be no one else. This report gives that healer the animal medicine that has evidence behind it, the zoonoses seen from the animal's side, and an honest account of where a household's reach ends.

The library is not repeated. The human side of the zoonoses and milk boiling is in IN-16, the human side of rabies in WO-13 and IN-15, salvaged veterinary penicillin in IN-05, human worm treatment in IN-08, ketamine in WO-10, carcass pits in NU-07, cysticercosis in CH-04, and ticks and rats in HY-06 (THRIVING library, IN-16, WO-13, IN-15, IN-05, IN-08, WO-10, NU-07, CH-04, HY-06). Husbandry and slaughter for food belong to FEASTING after the FALL.

Two disagreements with the library. IN-16 says no source it read supported a 2 metre burial depth for an anthrax carcass. The FAO manual for primary animal health workers gives exactly that, a pit 2 metres deep (FAO 1994). WO-13 and IN-15 both leave open whether killing dogs controls rabies. The record read here answers it, and the answer is no (section 3).

Findings by section

1. The village herd and what it carries

The village's animals carry two kinds of disease. Some cross to people and kill them, and call for a rule that protects people, often against the owner's wish to save the meat. Others kill only the animal, and can still starve the household.

The scale of the first kind is large. A report for Britain's aid department estimated that 13 zoonoses cause about 2.4 billion human illnesses and 2.2 million deaths a year, concentrated in poor livestock-keeping countries, with Ethiopia, Nigeria, Tanzania and India as hotspots (Grace et al. 2012, search summary). Zoonotic tuberculosis from cattle causes more than 140,000 human cases and more than 12,000 deaths a year, and Mycobacterium bovis is naturally resistant to pyrazinamide, one of the four standard human TB drugs (WHO et al. 2017, search summary).

Animal	Crosses to people and can kill	Kills or ruins the animal only
Dog	Rabies, hydatid (Echinococcus), roundworm larvae	Distemper, parvovirus [VERIFY: not researched here]
Cattle	Anthrax, bovine TB, brucellosis, leptospirosis, ringworm, Q fever	Bloat, milk fever, mastitis, foot rot, calf scour
Sheep and goats	Anthrax, brucellosis, Q fever, orf, hydatid (as host)	Worms (Haemonchus), foot rot, fly strike, bloat, tetanus

Animal	Crosses to people and can kill	Kills or ruins the animal only
Pigs	Taenia solium cysticercosis, trichinella, Streptococcus suis, leptospirosis	Worms, piglet scour
Horses	Tetanus is shared but not transmitted, ringworm	Tetanus, colic, castration complications
Poultry	Salmonella, Campylobacter, avian influenza	Newcastle disease, coccidiosis
Bees	None of note	American foulbrood, varroa

Three entries are new to the library. Streptococcus suis is a pig bacterium that enters through cuts during slaughter and butchering. A review of human cases pooled a case fatality of 12.8%, meningitis in 68% and deafness as the commonest lasting harm in 39.1% of survivors (Goyette-Desjardins et al. 2014, search summary). In a second systematic review, 61% of patients had documented pig or pork exposure (van Samkar et al. 2015, search summary). Gloves and covered cuts during pig slaughter protect hearing as well as life.

Newcastle disease is the leading killer of village chickens. A heat-tolerant vaccine strain, I-2, was developed for village use and given as an eye drop by trained community vaccinators (Alders and Spradbrow 2001, search summary). A Ugandan field study reported 100% protection in housed birds and 89% in unhoused ones (LRRD 2012, search summary).

American foulbrood kills honeybee colonies. Its spores survive for decades, at least 80 years by one inspection service's account, and antibiotics suppress signs without killing spores. Burning the colony and its woodware is the only sure control (Texas A&M Apiary Inspection Service n.d., search summary).

2. The community animal health worker record

The paravet programmes show much practical success and almost no controlled evidence.

What the programmes are. A community animal health worker (CAHW) is a herder chosen by the community, trained for weeks rather than years, and supplied with a short list of drugs and vaccines. Catley and colleagues reviewed the experience across Africa and Asia. Their abstract states that CAHW systems can reduce livestock illness and death, that community involvement and private supply of drugs were the factors behind success, and that the main obstacle was government policy rather than worker competence (Catley et al. 2004, abstract only).

Ethiopia. A participatory impact assessment in Dollo Ado and Dollo Bay, in the Somali south, found that CAHWs were accessible and trusted, and herders reported gains in milk, meat, income and draught power (Admassu et al. 2005, abstract only). I found no mortality figures.

Afghanistan. The strongest numbers come from Afghanistan in the 1990s, where the Dutch Committee for Afghanistan trained paravets and basic veterinary workers and ran veterinary field units through the civil war. Schreuder and colleagues compared districts with these services against districts without them. Annual mortality was 25% lower in calves, 30% in lambs and 22% in kids, and roughly 30%, 40% and 60% lower in adult cattle, sheep and goats. The benefit-cost ratio was 1.8 to 4.8 (Schreuder et al. 1996, search summary). It is observational, and I could not read the full paper [VERIFY].

China. The barefoot doctors of 1968 to 1983 had veterinary counterparts in the communes. Yi's 2022 dissertation on Mao-era veterinary workers was available only as an abstract with no numbers (Yi 2022, abstract only). The Chinese record could not be quantified here.

Kenya and southern Sudan. Here the CAHW story is bound up with rinderpest. Operation Lifeline Sudan used NGO-run community vaccination in the 1990s, and CAHW programmes reached over 80% herd immunity (Roeder et al. 2013). The decisive tool was a heat-stable vaccine, ThermoVax, which held its minimum protective dose for up to 8 months at 37°C and for 10 days at 56°C, with a recommended field life of 30 days outside the cold chain (Roeder et al. 2013). The last outbreak was in Kenyan buffalo in October 2001, and the OIE declared the disease eradicated on 25 May 2011 (Roeder et al. 2013, Wikipedia n.d.). Mariner and colleagues credit the eradication to thermostable vaccine in the hands of community workers (Mariner et al. 2012, abstract only). The stake was large. The panzootic of the 1890s killed an estimated 80 to 90% of cattle in eastern and southern Africa, and a third of Ethiopia's people and two-thirds of the Maasai are estimated to have died in the famine that followed (Wikipedia n.d., citing Normile 2008).

The Chad joint campaigns. The brief's lead to "Schelling 2005 Bull WHO" could not be confirmed. The work exists in two other journals. Schelling and colleagues ran 14 joint human and animal vaccination rounds for nomads in Chari-Baguirmi and Kanem, Chad, in 2000 to 2005. They vaccinated 149,255 livestock, fully immunised 4,653 children and gave at least two tetanus doses to 7,703 women. Joint rounds reached 131 people a day against 100, and sharing transport and staff saved 15.1% and 4.1% of non-vaccine costs (Schelling et al. 2007). The earlier BMJ paper reports the same programme (Schelling et al. 2005, not read). This is "One Health" in practice, an idea Zinsstag and colleagues trace to Calvin Schwabe's "one medicine" (Zinsstag et al. 2011, abstract only). After the Fall it means the goat vaccinator carries tetanus toxoid for women on the same mule.

What the controlled evidence says. Curran and MacLehose searched for randomised trials and controlled before-and-after studies of community paraveterinary services for a Cochrane review. They found none that qualified, and concluded that it is unknown whether such services benefit households (Curran and MacLehose 2006, abstract only). Their separate literature review of 14 observational studies found "considerable potential" (Curran and MacLehose 2002, abstract only). The honest grade is C: strong practical record, plausible mechanism, no trial.

3. Rabies: the animal side

WO-13 holds the human side. The animal side turns on one number. Hampson and colleagues traced more than 3,000 potential transmission events among more than 1,000 suspect rabid animals in the Serengeti and Ngorongoro districts of Tanzania between 2002 and 2006. The basic reproductive number of dog rabies was about 1.05 (95% CI 0.96 to 1.14) in their main estimate, and in the range 1.1 to 2 across settings. It did not rise with dog density: districts with 9.38 and 1.36 dogs per square kilometre had the same R0 (Hampson et al. 2009).

Three consequences follow. First, vaccinating 20 to 45% of dogs at any moment should in theory stop spread. The 70% target (THRIVING library, WO-13) holds because dog populations turn over fast, growing about 9% a year in Tanzania, and coverage decays between campaigns. No outbreak occurred where coverage exceeded 70%, and yearly campaigns reaching 60% keep coverage above the critical level. Second, because R0 does not depend on density, fewer dogs does not by itself mean less rabies. Third, killing dogs once they showed signs shortened the infectious period only from 3.7 to 3.1 days. The authors call vaccination "the overwhelming factor" (Hampson et al. 2009).

The historical record agrees. Morters and colleagues reviewed dog culling as rabies control. On Flores, Indonesia, nearly 300,000 dogs were killed over four years from 1997, about half the population, and rabies persisted. Culling failed in Korea and Israel, and vaccination later succeeded in both. In Kelusa, Bali, culled dogs were replaced by unvaccinated puppies within days (Morters et al. 2013).

Bali is the clearest modern test. Rabies arrived in November 2008. About 108,000 dogs were killed before island-wide vaccination began and 40,000 more during it. Before mass vaccination, 94 people died, 4.3 a month. During the first island-wide campaign 34 died (4.8 a month), and during the second, with 249,429 dogs vaccinated and coverage above 70% in most villages, 9 died (1.1 a month). Dog cases fell from 44.7 a month to 10.8 and then 6.0 (Putra et al. 2013). Two years of culling had not produced that fall.

Britain is the case that culling's defenders cite. The General Rabies Order of 1897, under Walter Long, enforced muzzling and the destruction of strays district by district, and the last indigenous case was recorded in 1902 in Wales. Pemberton and Worboys treat the outcome with caution, because recording improved after the 1886 legislation and the true effect of the measures is uncertain. The 1901 Importation of Dogs Act then imposed six months' quarantine on imported dogs (Pemberton and Worboys 2007, search summary). Britain combined muzzling and destruction of strays with an island border, a police force and no wild reservoir. A village after the Fall has none of the last three.

For the village the policy is clear in outline. Every owned dog is counted and vaccinated while vaccine exists. A biting dog is confined and watched for 10 days rather than killed at once, because the watch tells the bitten person whether they need the scarce vaccine (THRIVING library, WO-13). A dog showing signs of rabies is killed. What to do about unowned dogs is the village's decision [OWNER]. No household can make rabies vaccine, and the old nerve-tissue vaccines caused neurological complications in about 1 in 1,000 recipients (search summary [VERIFY]). Stocks must come from the district or from salvage.

4. Anthrax: the animal side

The human rules for an animal found dead are in IN-16 and NU-07 and are not repeated: never open it, never eat it, never skin it, burn it or bury it deep (THRIVING library, IN-16, NU-07). Two additions belong here.

Recognition by eye. The FAO sign is sudden death with dark unclotted blood from the nose, mouth or anus (FAO 1994). The meat inspection manual adds the absence of rigor mortis and, if the carcass has already been opened against the rule, a large soft dark spleen. It directs condemnation by burning or burial without opening, and allows that meat from other carcasses dressed alongside may be salvaged only by boiling for at least 3 hours (Herenda et al. 1994). I would not adopt the salvage rule for a village without a laboratory [OWNER].

Burial depth. The FAO manual gives a pit 2 metres deep, the carcass laid feet up and the site fenced, or a burning trench about 1 metre long, 30 centimetres wide and 40 centimetres deep (FAO 1994). IN-16 cited at least 2 feet of cover from an Arkansas source. Cover and depth differ, and the FAO figure is the safer one to teach.

Vaccine. Animal anthrax vaccine is a live spore vaccine, the Sterne strain. Antibiotics given to the animal for 7 to 10 days either side of vaccination can kill the vaccine and should be avoided. Immunity develops in 7 to 14 days, and the usual schedule is two doses two weeks apart in a new area, then yearly (WHO 2008, search summary only, the full text was blocked). It needs a cold chain the district must hold.

What collapse did. In Rhodesia between 1978 and 1980, during the war of independence, veterinary services broke down, cattle dipping and vaccination stopped and only about 1,500 of 8,000 dip tanks still worked by 1979. Between 10,738 and 17,068 human cases of anthrax were recorded, with deaths reported between more than 100 and more than 200, about 95% of cases cutaneous. Somewhere between 170,000 and 1,000,000 cattle died (Turner 2025, citing Davies 1982). A later reanalysis estimated 17,199 cases over 245,750 square kilometres (PeerJ 2016, search summary). It is the largest recorded human anthrax epidemic, caused by the end of a veterinary service. For the brief's lead to a Zimbabwe outbreak in 2008 I found only news reports of three deaths in the Zambezi Valley and of vaccine shortages for want of foreign currency in 2004 [VERIFY].

5. The emergencies with evidence

The FAO manual for primary animal health workers was written for people with little schooling and few tools, and is the most useful single text for a village (FAO 1994). Where it and the Merck Veterinary Manual differ, both are given.

Bloat in cattle, sheep and goats. Gas is trapped in the rumen. The left flank swells high and the animal may die within an hour of grazing lush legumes, more often within three to four hours of signs. Losses in a group can reach 20% (Merck n.d., bloat). Free-gas bloat is relieved by passing the largest stomach tube the animal will take. Frothy

bloat needs an anti-foaming agent: oil 250 to 500 mL, poloxalene 25 to 50 g, or docusate 1,000 mg for a cow (Merck n.d., bloat). The FAO manual gives two large spoons of washing-up liquid or a small bottle of cooking oil, then walking the animal for half an hour (FAO 1994). The two sources agree on oil and differ on the detergent, which Merck does not mention. As a last resort the rumen is punctured high in the left flank. Merck places the trocar in the middle of the left paralumbar fossa, 5 to 10 centimetres below the lumbar transverse processes, after a skin incision, and warns that a narrow trocar will block in frothy bloat, which needs one of 2.5 centimetres diameter (Merck n.d., bloat). The FAO manual allows a knife where no trocar exists (FAO 1994). Prevention is feeding hay before turning cattle onto legumes, at about a third of the diet, and oil 60 to 120 mL per head per day in bloat season (Merck n.d., bloat).

Difficult birth. Extension guidance tells the keeper to intervene when a cow has strained for 30 minutes, or a heifer for 60 minutes, without progress (Cornell n.d., search summary). Cornell adds two triggers: the water bag visible for two hours without progress, and labour that stops for 15 to 20 minutes after progress (Cornell n.d., search summary). Momont advises more patience in the early stage (Momont n.d., search summary). The FAO manual gives the practical rules: clean hands and arm, rope above the fetlock and never on the jaw, pull only with the animal's straining, and expect the afterbirth within 24 hours in the cow and 3 hours in the ewe (FAO 1994). A malpresentation the keeper cannot correct is beyond the household. Brucellosis and Q fever are shed in birth fluids, so gloves protect the person (THRIVING library, IN-16).

Calf, lamb and kid diarrhoea. Dehydration kills scouring young animals. Merck's rules: an oral solution must contain sodium, glucose, an alkalinising agent and potassium, milk is not withheld, and plain water is available. Fluid goes by vein when the calf cannot stand, is 8% or more dehydrated, or will not suck. Antibiotics are reserved for the calf that is systemically ill, because at least 30% of those are bacteraemic (Merck n.d., calf diarrhoea). Merck warns against tubing glucose solutions into the rumen, where they ferment and cause acidosis. The FAO manual gives 6 level teaspoons of sugar and half a teaspoon of salt in 1 litre of warm water, 500 mL to a sheep or goat four times a day for three days, and for larger animals 5% of body weight twice daily (FAO 1994). The Irish Farmers Journal gives a recipe with potassium and bicarbonate, which the FAO recipe lacks: 8 g of low-sodium potassium salt, 12 g of bread soda and 40 g of glucose in 2 litres of warm water, in addition to milk, and accepts tubing (Brennan 2022). The recipes differ in content and strength, and the sources differ on tubing. Colostrum prevents much of this: 4 litres within 2 hours of birth for a calf (Merck n.d., calf diarrhoea), and the FAO manual adds colostrum for at least the first 4 days (FAO 1994).

Mastitis. A hot, swollen, painful quarter with clots in the milk. The FAO treatment is cold water on the udder, milking out the quarter morning and night, and every 2 to 3 hours if severe, with an intramammary antibiotic tube where one exists (FAO 1994). Antibiotics are often unnecessary. Between 10% and 44% of clinical cases grow no bacteria at all, and coliform cases often cure themselves. Roberson estimated that antibiotics were not justified in 50 to 80% of clinical cases (Roberson 2003 and Olde Riekerink et al. 2008, both via a secondary summary). Frequent stripping is the household treatment, and milk from the affected quarter is not drunk.

Foot rot in sheep and goats. A New Zealand trial found weekly 10% formalin and twice-weekly 10% zinc sulphate foot baths equally effective (Hughes et al. 1983, search summary). Australian guidance gives 10% zinc sulphate as 1 kg in 9 litres of water and formalin as 1 part to 19 parts water, about 5%, and calls zinc the safer of the two (NSW DPI n.d., search summary). The FAO manual gives 10% copper sulphate, or 40% formalin diluted 1 in 8, and local iodine or formalin every 2 days (FAO 1994). The FAO formalin is roughly twice the Australian strength by my arithmetic [VERIFY], and formalin burns skin and eyes. Two British trials changed practice. Trimming the foot slowed recovery and a long-acting antibiotic injection speeded it (Kaler et al. 2010, search summary). Treating every lame sheep within 3 days cut flock lameness to about 2%, against about 7 to 8% when treatment waited (Wassink et al. 2010, search summary, the two summaries I found give different control figures [VERIFY]). Without antibiotics, the lesson that survives is speed.

Wounds and fly strike. The FAO manual washes wounds with salt water, allows a tourniquet only on a leg or tail

and for no more than 20 minutes, and sends maggot-infested or gangrenous wounds for help (FAO 1994). Fly strike, the laying of blowfly eggs in soiled wool or wounds, is caused mainly by Lucilia sericata in Britain and by Lucilia cuprina, which accounts for over 90% of strikes in Australia. It can kill a sheep in a few days, and the fly's life cycle can complete in under 10 days in warm weather (NSW LLS n.d., search summary). Treatment is to clip the wool well beyond the strike, remove every maggot and crutch the flock. Daily inspection in fly season is the only chemical-free prevention.

Castration and tetanus. Castration of young ruminants is simplest at a few days old. A rubber ring sheds in about 2 weeks (FAO 1994). Both ring and knife open a door to tetanus, to which horses, pigs and sheep are most susceptible. Incubation averages 10 to 14 days and overall mortality is about 80% (Merck n.d., tetanus). A horse should receive a toxoid booster before elective surgery if its last dose was more than 6 months earlier. Treatment needs procaine penicillin at 22,000 units per kg every 12 hours, up to 50,000 units per kg in the first two days, or metronidazole 15 to 20 mg per kg, for at least 10 days, with a dark quiet stall (Merck n.d., tetanus). Antitoxin is made in horses and can cause allergy. Only oxidising disinfectants such as iodine and chlorine kill tetanus spores (Merck n.d., tetanus). Equine castration has a complication rate of 10 to 60% across studies, 22% after standing field castration against 2.1% after recumbent aseptic surgery, with severe haemorrhage in about 2.4%, gut coming out through the wound in 0.43 to 0.9%, and death in 0.3 to 1% (IVIS BEVA 2022, search summary). A colt castration is not a household job [OWNER].

The injured dog. A dog hit by a cart or kicked by a horse usually has a pelvic fracture or a limb fracture. In Algiers, conservative treatment of pelvic fractures with strict cage rest for 4 to 8 weeks gave full function in 95.23% of dogs and cats, with fractures into the hip socket doing worse (Algiers study 2020, search summary). The FAO manual notes that a large animal with a broken leg is usually slaughtered and a small one splinted (FAO 1994). An injured dog bites, so the cloth muzzle comes first.

6. Worms: drugs, resistance and plants

Haemonchus contortus, the barber's pole worm, sucks blood in the stomach of sheep and goats and kills many in warm wet seasons.

FAMACHA. Van Wyk and Bath designed a card that matches the colour of the inside of the lower eyelid to five anaemia grades, so that only pale animals are dosed (Van Wyk and Bath 2002, search summary). A South African validation found sensitivity up to 83%, rising to 93% if grades 2 to 5 count as anaemic, but a positive predictive value of 0.43, meaning more than half of animals flagged were not in fact anaemic (Reynecke 2009, search summary). It detects only blood-sucking worms. Its value is that untreated animals keep carrying drug-susceptible worms, which slows resistance.

Resistance. In the southern United States, Mortensen, Kaplan and colleagues found albendazole resistance on 14 of 15 goat farms, ivermectin resistance on 17 of 18, levamisole on 6 of 18 and moxidectin on 1 of 18 (Mortensen et al., year not confirmed, search summary [VERIFY]). Howell and colleagues found benzimidazole resistance on 98% of farms and resistance to all three main classes on 48% (Howell et al. 2008, search summary). Salvaged dewormers will be partly spent. Dosing only the pale, at the full weight-correct dose, stretches what remains.

Plants. Hoste and colleagues reviewed tannin-rich forages such as sericea lespedeza, sainfoin and quebracho against gut worms in ruminants, and found direct and indirect effects that vary by plant, parasite and host (Hoste et al. 2006, abstract only). The fifth author is Hoskin, not a second Hoste, and the brief's citation should be corrected. In one Louisiana trial sericea lespedeza hay was associated with about 80% lower faecal egg counts and 70% fewer adult Haemonchus in goats (Shaik et al. 2006, secondary summary [VERIFY]). Commercial herbal dewormers have not stood up. Two Delaware State trials found that a widely sold herbal wormer did not reduce faecal egg counts, and the reviewer concluded that no commercial non-chemical dewormer had been shown effective (O'Brien 2014). Tannin forage is a management aid to be grown and grazed, not a drench to be sold. The pumpkin seed evidence in IN-08

concerns human tapeworm and says nothing about Haemonchus.

For dogs and the hydatid cycle, the FAO manual's rule is to worm dogs every 3 months and never feed them raw offal, because tapeworm eggs survive a year on the ground (FAO 1994). Praziquantel is the drug that kills Echinococcus in dogs. Its human dose for Taenia is in IN-08. I did not find a canine dose from two sources and give none [VERIFY]. When Soviet veterinary services collapsed after 1991, the hydatid cycle restarted: cystic echinococcosis rose four-fold or more in Central Asia between 1991 and 2001, Kyrgyz incidence went from about 4 to about 15 per 100,000, and alveolar echinococcosis, the deadlier form, went from fewer than 3 to more than 60 cases a year between 1995 and 2011 (Torgerson 2013 and Usubalieva et al. 2013, search summaries).

7. The veterinary cabinet as human salvage, and its dangers

A farm's veterinary cabinet may hold more injectable antibiotic than the village dispensary. IN-05 grades veterinary procaine penicillin, 300,000 IU per mL, D as a human salvage drug (THRIVING library, IN-05).

Dose by weight, never by species. Doses move between species only through body weight, and sometimes not at all. A cattle procaine penicillin label gives 1 mL per 100 lb, about 6,600 IU per kg by my conversion, with no more than 10 mL at one site (Pro-Pen-G label, search summary). The FAO manual gives 100,000 IU per 10 kg, 10,000 IU per kg, daily for 3 to 4 days (FAO 1994). Merck uses 22,000 IU per kg twice daily for tetanus in horses (Merck n.d., tetanus), and extra-label guidance runs 12,000 to 40,000 IU per kg (Ohio State n.d., search summary). These sources differ more than three-fold, the label dose being the lowest and the therapeutic doses higher. Oxytetracycline in the FAO manual is 50 mg per 10 kg by injection for 3 to 4 days, or 250 mg per 20 kg by mouth for 4 to 5 days (FAO 1994). I found no second source for these and they should not be used without one [VERIFY]. Paracetamol is toxic to dogs above about 100 mg per kg, and in cats no dose is safe, with toxicity seen at 10 mg per kg. Ibuprofen causes gut damage in dogs from 25 mg per kg, kidney damage at about 175 mg per kg and death at about 600, and cats are affected at about half the dog dose (Merck n.d., analgesics). Weighing is the real problem. Visual estimates of cattle weight were off by 46% under and 25% over in one Kenyan study (Lukuyu et al. 2016, search summary). A heart girth tape model for East African zebu kept predictions within the ±20% band considered acceptable for dosing (Lesosky et al. 2012, search summary). A tape and a table are worth more than a second drug.

Ivermectin. The 1% cattle injection holds 10 mg per mL and is given at 1 mL per 50 kg, which is 200 micrograms per kg, the same per-kilogram dose IN-08 gives for people (Noromectin label, search summary, THRIVING library, IN-08). Horse paste is far more concentrated, about 1.87% by its label name, and a person who doses from a horse tube by eye can take many times the intended amount [VERIFY: my arithmetic, not a measured case]. In August 2021 the Oregon Poison Center took 21 calls about ivermectin taken for Covid-19, 17 of them involving veterinary products. Six people were admitted, four to intensive care, with confusion, ataxia, seizures and low blood pressure, and none died (Temple et al. 2021, search summary).

Ketamine and xylazine. WO-10 covers veterinary ketamine at 100 mg per mL as a human anaesthetic (THRIVING library, WO-10). Xylazine, the sedative usually found with it, is different. It is an alpha-2 agonist with no approved human reversal agent, naloxone does not reverse it, and in people it causes slow heart rate, low blood pressure, low body temperature and slow-healing necrotic wounds (Pennsylvania Department of Health n.d., search summary). It has no place in the human cabinet and should be stored separately and labelled [OWNER].

Euthanasia solutions. Pentobarbital euthanasia solution kills scavengers that feed on the carcass. A review counted about 125 incidents involving 432 animals, mostly dogs and wild scavengers feeding on poorly buried carcasses, with eagles making up 86% of the bird cases (pentobarbital review, search summary). In Colorado in 1999 veterinarians were fined 10,000 dollars after seven eagles died (AVMA 2002, search summary). A carcass killed with pentobarbital must be burned or buried deep and promptly. This solution has no place in the human cabinet [OWNER].

Vaccines that injure the vaccinator. Two vaccine hazards are specific to animal work. Oil-adjuvant vaccines, used in cattle, pigs and sheep, cause severe injury if injected into a finger, because the oil raises pressure inside the tendon

sheath and cuts off the blood supply. O'Neill and colleagues report a 20-year-old herdsman who injected about 1 mL of an oil-emulsion bovine vaccine into his little finger. Despite decompression at 4 hours and repeated debridement, which found oily fluid in the tissues, the finger was amputated. The paper cites a rate of 5.5 self-injections per 100 veterinarians a year, or about 1 per 1,000 vaccinations given, and advises early surgical debridement and frequent review (O'Neill et al. 2005). Live Brucella vaccines infect people. The old S19 strain occasionally caused human brucellosis. Of 26 veterinarians exposed to the RB51 vaccine, 81% by needle-stick, 73% developed at least one systemic symptom consistent with brucellosis even though 69% had taken prophylaxis (Ashford et al. 2004, search summary). RB51 is resistant to rifampicin and does not show on standard serology, so the usual human brucellosis regimen in IN-16 is the wrong one for an RB51 exposure. Doxycycline for at least 21 days, or co-trimoxazole, is the recommended post-exposure course (CDC 2018, search summary).

8. Meat inspection by eye

FEASTING covers slaughter for food. Inspection is health, and the FAO meat inspection manual gives the rules a trained eye can apply without a laboratory (Herenda et al. 1994).

Tuberculosis shows as yellow cheesy or gritty calcified lumps in the lymph nodes of the head, lungs and gut. Disease spread through the body, or the fine seed pattern of miliary TB, condemns the whole carcass. A single affected node condemns that organ and the rest is heat-treated. Pig cysticercosis shows as pearly white cysts in the heart and muscle. A heavy infestation condemns the carcass, and a light one requires thorough cooking or freezing. Trichinella cysts are about 1 by 0.5 mm in the pillar of the diaphragm, which can just be seen, but reliable detection needs a microscope (Herenda et al. 1994). The anthrax carcass is never opened (section 4).

In Zambia, tongue palpation of live pigs found only about 10% of the pigs that full dissection showed were infected with Taenia solium cysts (Chembensofu et al. 2017, search summary). A 2025 review gave a pooled sensitivity of 16.1% for tongue palpation and 38.7% for routine carcass inspection, both with specificity near 100% (Frontiers review 2025, search summary). A pig that passes inspection is not a safe pig. Cooking and penning protect the village (THRIVING library, CH-04, IN-16).

9. Collapse: what happens to herds

When the state fails, livestock numbers fall, veterinary services stop and the held-down zoonoses return. In Russia, Ukraine and Kazakhstan, livestock inventories fell by half or more during the 1990s (USDA ERS n.d., search summary). In Kazakhstan, sheep and goats fell from 34.2 million in 1993 to 13.7 million in 1996 amid a near-total collapse of veterinary services (Lundervold 2001, search summary). Echinococcosis followed (section 6). In Rhodesia, anthrax followed (section 4). In 1890s Africa, rinderpest killed the herds and then the people who depended on them (section 2).

The animal is also a sentinel. The anthrax death, the abortion storm and the dog that bites without cause warn of a human risk before anyone falls ill. A village that records where animals died and why has begun surveillance.

10. What no household can do

Seven things lie beyond any household. It cannot make or store vaccine for rabies, anthrax, Newcastle disease or brucellosis. It cannot diagnose bovine TB or brucellosis in a herd without tuberculin or serology. It cannot correct a severe malpresentation or perform a caesarean on a cow. It cannot castrate a horse safely. It cannot detect Trichinella or a light Taenia infection by eye. It cannot control rabies or hydatid by its own dog alone, because both are village problems. And it cannot treat its way out of worm resistance. Most need the district.

Evidence grades

A: systematic reviews or several good trials. B: one good trial or strong consistent observational data. C: observational or programme data. D: manuals and expert guidance without outcome data. X: harmful or shown not to work.

Practice	Effect	Grade
Dog vaccination at 70% for rabies	Stops transmission	B
Dog culling for rabies	Fails as control	X
10-day confinement of a biting dog	Guides human vaccine use	C
Heat-stable vaccine via CAHWs	Rinderpest eradication	C
CAHW programmes generally	Lower livestock mortality	C
Joint human and animal vaccination rounds	Cheaper reach to nomads	C
Anthrax carcass unopened, burned or buried 2 m	Stops spore release	C
Sterne vaccine	Prevents livestock anthrax	B [VERIFY: grade from WHO summary]
Oral rehydration for scouring calves	Survival	C
Colostrum 4 L in 2 hours	Prevents scour deaths	B [VERIFY]
Trocar or stomach tube for bloat	Saves the animal	D
Oil or detergent for frothy bloat	Breaks foam	D
Dystocia intervention timings	Calf survival	D
Frequent stripping for mastitis	Recovery	D
Antibiotics for every clinical mastitis	Not needed in 50 to 80%	C
Zinc sulphate or formalin foot bath	Foot rot cure	B
Treat lame sheep within 3 days, no trimming	Lower flock lameness	B
Clip and clean fly strike	Survival	D
Tetanus toxoid before castration	Prevents tetanus	C
Conservative care of canine pelvic fracture	Full function in 95%	C
FAMACHA targeted worming	Fewer doses, slower resistance	B
Tannin forages	Lower egg counts	C
Commercial herbal dewormers	No effect	X
Tongue palpation for pig cysts	Misses about 85 to 90%	X as a safety test
Visual meat inspection for TB	Finds advanced disease	C
Human painkillers for cats or dogs	Poisoning	X
Horse paste ivermectin for people	Poisoning	X
Xylazine in a human cabinet	No antidote	X

Means ledger

Need	Hands	Hearth, garden and still	Village dispensary	District infirmary	Hospital before the Fall
Rabies	Know dogs, confine biters, wash bites	Kennel, rope, muzzle	Dog register, 10-day watch	Dog vaccine, cold chain, human vaccine	Laboratory diagnosis, immunoglobulin

Need	Hands	Hearth, garden and still	Village dispensary	District infirmary	Hospital before the Fall
Anthrax	Never open the dead	Fuel, 2 m pit, fence	Doxycycline for people	Sterne vaccine, penicillin	Laboratory confirmation
Birth and dystocia	Clean arm, rope, timing	Soap, warm water, lubricant	Obstetric chains, gloves	Skilled hands, embryotomy wire	Caesarean
Scour	Colostrum, feed milk	Sugar, salt, bicarbonate, potash	Bottle, tube	IV fluids	Electrolyte products
Bloat	Walk, tube	Cooking oil	Trocar and cannula	Rumenotomy	Poloxalene
Lameness and strike	Daily look, early catch	Zinc or copper bath, shears	Iodine, formalin	Long-acting antibiotic	Vaccines, insecticides
Worms	FAMACHA eye check	Tannin forage, rotation	Salvaged dewormers, scales	Faecal egg counts	New drug classes
Meat	Look, feel, cook	Fire, pot, freezing	Trained inspector	Microscope for Trichinella	Abattoir and laboratory
Drugs	Weigh, count	Tape and table	Separate animal shelf	Pharmacist	Licensed supply

The household reaches the first two columns. The rest depends on trained people.

Harm test

The trocar is a wound into the abdomen, and an unclean one gives peritonitis, so it is used only when the animal will otherwise die. Pulling a calf too early tears the birth canal, pulling too late kills the calf, and rope on the jaw breaks it. Tubing glucose into a calf's rumen causes acidosis, and withholding milk starves it (Merck n.d., calf diarrhoea).

Formalin burns skin, eyes and lungs, and a foot bath where children walk is a hazard. Copper sulphate poisons sheep that drink it and pollutes water [VERIFY: not from a source read]. Unneeded mastitis antibiotics select resistance. Trimming foot rot slowed healing (Kaler et al. 2010, search summary).

Animal drugs harm people more than the reverse. Horse ivermectin paste, xylazine and pentobarbital can kill a person, the oil-adjuvant vaccine can cost a finger, and live Brucella vaccine can give brucellosis that the usual rifampicin regimen will not cure if the strain is RB51.

Culling dogs harms twice. It does not stop rabies, and vaccinated dogs are replaced within days by unvaccinated puppies (Morters et al. 2013). It also teaches owners to hide dogs from the vaccinator [VERIFY: my inference].

The FAO manual states that fresh chicken eggs may be eaten raw (FAO 1994), which carries a Salmonella risk. Opening an anthrax carcass to see the spleen exposes the opener and the ground for decades. No diagnosis is worth that.

Red flags

Send for the most skilled person within reach, and expect to lose the animal, when any of these appear. - Sudden death with dark blood from the openings. Treat as anthrax (section 4). - A dog or cat that changes behaviour, bites without provocation, drools or cannot swallow. Treat as rabies. - Several animals dead or ill at once. - An abortion storm in goats, sheep or cattle. Think brucellosis and Q fever. - A bloated animal down and unable to rise. - A calf

in the birth canal for more than 30 minutes of hard straining, or with only one leg or the head showing. - A scouring calf that cannot stand or will not suck. - Stiff gait, raised tail, locked jaw or a third eyelid flicking across the eye in a horse or sheep. Think tetanus. - Maggots in a wound or in the fleece. - A person with a needle-stick from an oil vaccine or a live Brucella vaccine. - A person who has taken a veterinary product.

The case against

The evidence base is thin. Curran and MacLehose found no trial of community paraveterinary services that met Cochrane's standards (Curran and MacLehose 2006, abstract only). Programme reports are written by those who ran them, and Catley, the leading advocate, is also a leading author of the evidence (Catley et al. 2004). The reply is that rinderpest is gone, that the Afghan comparison showed large differences in mortality, and that the alternative after the Fall is no one. The grade stays C.

The book may make the wrong person bold. Veterinary bodies have objected that minimally trained workers misuse drugs and drive resistance. I found no study measuring this for CAHWs [VERIFY]. Professionally advised American farms ruined their dewormers anyway (Mortensen et al., Howell et al. 2008, search summaries).

Culling has its defenders. Britain is still cited, and some governments still cull. Pemberton and Worboys doubt the British causation (Pemberton and Worboys 2007, search summary), and Morters and colleagues found culling failed wherever tested (Morters et al. 2013). Hampson's density finding comes from one East African ecosystem, and a European village with few dogs may differ [VERIFY].

Raw milk has its defenders, who argue for taste, nutrients and tradition. IN-16 sets out why boiling is the rule. The village decides [OWNER].

The dog as pet. Readers will resist the idea that their dog is a reservoir. The data do not say dogs should be removed. They say dogs should be counted, vaccinated, wormed and kept from offal.

Moving drugs across species. A book that gives doses invites experiment. Every veterinary dose here carries its source, its weight basis and its conflict. Vendors of herbal dewormers sell claims without trials (O'Brien 2014), and the same scepticism applies to this book.

10-line summary

1. Rabies spreads with an R0 near 1.05 to 2 and does not depend on dog density (Hampson et al. 2009).
2. Vaccinating 70% of dogs stops it. Culling dogs has failed wherever tested, including Flores and Bali.
3. A biting dog is confined for 10 days, not killed, so the bitten person knows whether to use scarce vaccine.
4. An animal found dead with dark blood is never opened, and is burned or buried 2 metres down.
5. Collapse of veterinary services brought the largest human anthrax epidemic on record in Rhodesia and a four-fold rise in hydatid in Central Asia.
6. Community animal health workers with a heat-stable vaccine helped eradicate rinderpest, but no controlled trial has tested CAHWs.
7. Calf scour is treated with oral fluid and continued milk, bloat with oil and a tube, foot rot with early treatment and foot baths.
8. Only pale-eyed goats and sheep should be wormed, to slow resistance that already ruins most dewormers.
9. Inspection by eye misses most pig tapeworm cysts and all light Trichinella. Cook pork through.
10. Xylazine, pentobarbital and horse ivermectin paste do not belong in the human cabinet.

Open questions

- What mortality reduction did CAHWs achieve in Kenya and Ethiopia in numbers? Only participatory and qualitative data were found.

- What did the Chinese barefoot veterinarians achieve? No numbers were available.
- How should a village of 300 that cannot vaccinate dogs manage rabies? Confinement and registration are logical but untested.
- What is the minimum dog-vaccine cold chain for a district after the Fall, and can heat-stable rabies vaccine be stored as ThermoVax was?
- What canine praziquantel dose should the book carry, from two sources?
- Can tannin forage replace dewormers in a temperate village?
- Did the Zimbabwe anthrax outbreak of 2008 occur on the scale the brief implies?

Sources to read in full

1. Forse B. 1999. Where There Is No Vet. The village-level manual. Catalogue entry only seen.
2. FAO 1994. A manual for the primary animal health care worker. Partly read here, should be read in full.
3. WHO 2008. Anthrax in humans and animals, fourth edition (Turnbull). Blocked here.
4. Curran and MacLehose 2006. The Cochrane review. Abstract only.
5. Schreuder et al. 1996. Afghan paravet benefit study. Not read.
6. Hoste et al. 2006. Tannin forage review. Abstract only.
7. Schelling et al. 2005 BMJ. Not read.
8. Mariner et al. 2012 Science. Abstract only.
9. Herenda et al. 1994. Meat inspection manual. Partly read.
10. Merck Veterinary Manual sections on foot rot and fly strike. Blocked.
11. Pemberton and Worboys 2007. Mad Dogs and Englishmen. Review only.

At the bedside after the Fall

A household. With a few hens, a goat or two, perhaps a pig and a dog, it needs a measuring tape and a weight table, a muzzle, rope, soap, a bucket, salt, sugar and bicarbonate, iodine, sharp shears, a clean knife and a pot for boiling milk. It needs the skill to recognise the animal that must not be touched and the will to keep the dog off offal and the pig from the latrine. The first failure will be the dog fed the raw liver of a slaughtered sheep, because nothing else is to hand.

A village of 300. It has perhaps 30 to 60 dogs, a few hundred small ruminants and a few dozen cattle [VERIFY: my own estimate]. It needs one trained animal health worker, a dog register, a separate shelf in the dispensary for animal drugs, a set of obstetric ropes and chains, a trocar, a foot bath, a fenced carcass pit, and a slaughter place away from houses and water. It needs village rules on dogs, raw milk, carcasses and the separation of animal and human drugs [OWNER]. The first failure will be the dog register lapsing within a year as the novelty passes.

A district of 3,000. It needs the cold chain for rabies, anthrax and Newcastle vaccines, a joint vaccination round that carries human vaccines as in Chad, a microscope for faecal egg counts and Trichinella, a laboratory or at least someone who can do a tuberculin test, and a person able to perform a caesarean on a cow and castrate a horse. It holds the human rabies vaccine. The first failure will be the cold chain, the first time the generator or ice fails in summer.

Protocols

Protocol 1. The household's animal first-aid list. Quantities are my own estimate for one season for a household with a few animals [VERIFY]. - Measuring tape (cloth, 2 to 3 metres) and a written heart-girth to weight table. - Two muzzles or 1 metre of soft cloth strip per dog. - Rope, 3 metres, soft, two lengths, for calving and restraint. - Soap, a bucket, a nail brush. - Gloves, at least 10 pairs, for birth and for handling dead animals. - Salt 500 g, sugar or glucose 1 kg, bicarbonate of soda 250 g, low-sodium salt (potassium) 250 g, for rehydration. - Feeding bottle with teat, 2 litres. - Cooking oil, 1 litre, for bloat. - Povidone iodine or tincture of iodine, 500 mL. - Zinc sulphate, 1 kg, for one foot

bath of 10 litres. - Sharp shears for clipping wool around strike. - A clean knife and a pot to boil it 15 minutes (FAO 1994). - Cotton wool, bandage, splint material. - Charcoal, powdered, for poisoning: FAO gives 1 g per 20 kg (FAO 1994). I found no second source and the figure seems low beside human doses [VERIFY]. - A notebook for each animal's weight, treatment and date.

Protocol 2. Ten rules of animal hygiene that protect people, with the harm of each. 1. Boil all milk. Harm: fuel cost, taste. Some people will refuse [OWNER]. 2. Never open, skin or eat an animal found dead. Burn it or bury it 2 metres down, fenced. Harm: the loss of meat in a hungry year, and the labour of a pit. 3. Never feed raw offal to dogs. Worm dogs every 3 months while drug exists. Harm: offal must be cooked or buried, a fuel and labour cost, and dewormer is used up. 4. Count, name and vaccinate every dog. Confine any dog that bites for 10 days. Harm: the labour of the register, conflict with owners, the dog that escapes [OWNER: the number of dogs allowed, and what is done with unowned dogs]. 5. Keep pigs penned away from latrines and children. Harm: feed must be carried to them instead of their scavenging, and penned pigs need more feed. 6. Keep animals out of sleeping rooms at night, and pens away from the house (THRIVING library, HY-06). Harm: theft and cold in winter. 7. Wear gloves for birth, abortion, and slaughter, and wash after. Cover cuts when handling pigs. Harm: cost of gloves, and the false confidence that gloves give. 8. Cook all pork through. Harm: fuel, and the loss of traditional cured raw products [OWNER]. 9. Keep animal drugs, xylazine and euthanasia solutions on a separate locked shelf, labelled, never in the human cabinet (THRIVING library, OR-06). Harm: a desperate person cannot reach a drug that might help, which is the intended effect. 10. Slaughter away from houses and water. Water for people upstream, for animals downstream (FAO 1994). Harm: walking distance.

Protocol 3. The biting dog. 1. Wash the bite for 15 minutes with soap and water (THRIVING library, WO-13). 2. Catch the dog with a noose, never by hand. Muzzle it. 3. Confine it alone, with water, for 10 days. Feed through a gap. 4. If the dog is alive and well on day 10, it was not shedding rabies when it bit. 5. If it sickens or dies, the bitten person needs post-exposure vaccine (THRIVING library, WO-13). If a laboratory exists, ask it how to send the head. 6. A dog that cannot be caught is assumed rabid.

Protocol 4. Found dead. 1. Look at the openings without touching. Dark unclotted blood means anthrax until proven otherwise. 2. Do not open, skin or move by dragging. Keep people, dogs and flies off. 3. Dig a pit 2 metres deep beside it, roll the carcass in, legs up, cover, fence (FAO 1994). Or burn it completely. 4. Wash hands and arms, boil clothing. 5. Tell the healer and the district. Vaccinate the rest of the herd if Sterne vaccine exists.

Protocol 5. Bloat. 1. Look at the left flank. If high and tight, act now. 2. Walk the animal for half an hour (FAO 1994). Stand it with the front end uphill [VERIFY]. 3. Pass a stomach tube. If gas escapes, it was free-gas bloat. 4. If foam, give oil 250 to 500 mL to a cow (Merck n.d., bloat) or a small bottle (FAO 1994). Give a sheep or goat proportionally less [VERIFY]. 5. If the animal goes down, puncture the left flank 5 to 10 cm below the spine at the middle of the hollow, with a trocar of at least 2.5 cm in frothy bloat (Merck n.d., bloat).

Protocol 6. Scour. 1. Keep feeding milk. 2. Give oral solution between feeds: FAO recipe (6 teaspoons sugar, half teaspoon salt, 1 litre warm water) at 500 mL four times a day for a kid or lamb, or for a calf 5% of body weight twice daily (FAO 1994). Prefer the Brennan recipe, which adds potassium and bicarbonate (Brennan 2022). 3. If it cannot stand or suck, it needs fluid by vein, which the household cannot give.

Protocol 7. Birth. 1. Note when straining begins. Clean hand and arm. 2. Intervene after 30 minutes without progress in a cow, 60 in a heifer, or 2 hours with the water bag showing, or 15 to 20 minutes stalled after progress (Cornell n.d.). 3. Two front feet and a nose is normal. Anything else, call help. 4. Rope above the fetlock, never on the jaw, pull only with straining (FAO 1994). 5. Afterbirth within 24 hours in a cow, 3 in a ewe (FAO 1994). Beyond that, seek help. 6. Colostrum within 2 hours, 4 litres for a calf.

Protocol 8. Dosing by weight. 1. Weigh or tape every animal before any drug. 2. Find the dose per kg in two sources. Note the difference. 3. Have a second person check the sum. 4. Never more than 10 mL of an injection at

one site in cattle. 5. Never move a dose between species without weight correction, and never give human painkillers to cats. 6. Record.

Protocol 9. Worming small ruminants. 1. Check the inside of the lower eyelid against a FAMACHA card or a remembered colour, every 2 to 3 weeks in the wet season [VERIFY: interval not from a source read]. 2. Dose only the pale animals, at the full weight dose. 3. Graze tannin forage where it grows. 4. Rotate pasture.

Protocol 10. Ending an animal's life [OWNER]. 1. The method is the village's decision [VERIFY: field methods not researched here]. 2. If pentobarbital is used, burn or deeply bury the carcass at once. 3. Never leave a euthanised carcass for scavengers.

Numbers to carry

- Dog rabies R0: about 1.05 (Hampson et al. 2009). Critical vaccine coverage: 20 to 45%. Target: 70%. Campaign aim: 60% yearly.
- Biting dog watch: 10 days.
- Anthrax carcass pit: 2 m. Sterne vaccine immunity: 7 to 14 days. No antibiotics 7 to 10 days around vaccination.
- Colostrum: 4 L within 2 hours.
- Scour ORS: 6 teaspoons sugar, half a teaspoon salt, 1 L water (FAO). 5% of body weight twice daily for large animals.
- Bloat oil: 250 to 500 mL for a cow. Trocar: 2.5 cm.
- Dystocia: 30 minutes cow, 60 minutes heifer.
- Afterbirth: 24 h cow, 3 h ewe.
- Foot bath: zinc sulphate 10%, 1 kg in 9 L.
- Treat lame sheep within 3 days.
- Tetanus mortality: about 80%. Horse toxoid booster if more than 6 months.
- Procaine penicillin: 6,600 to 40,000 IU per kg depending on source.
- Ivermectin cattle 1%: 1 mL per 50 kg. Max 10 mL a site.
- Paracetamol: no safe dose in cats.
- Worm dogs every 3 months.
- Tongue palpation finds 10 to 16% of infected pigs.
- Oil vaccine self-injection: 1 per 1,000 vaccinations.

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