CH-13 Allergy, anaphylaxis and the immune body: epinephrine salvage and what else

HEALING after the FALL, research library, CH-13

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

Scope and how this was read

This report covers anaphylaxis, the adrenaline (epinephrine) rules, the honest shelf life of salvaged adrenaline, the second-line drugs and plants, prevention, and three smaller allergic problems: hay fever, hives and the false penicillin-allergy label. It builds on library reports without repeating them. ME-09 holds the salvage list and the long-term stability record, ME-10 the history of adrenal extracts, CH-03 the ephedra doses and asthma, ME-07 ephedra's harm record, WO-13 bee swarms, and IN-05 the penicillin anaphylaxis rate (THRIVING library, ME-09, ME-10, CH-03, ME-07, WO-13, IN-05). The brief points to WO-07 for cricothyrotomy, but WO-07 does not cover it (THRIVING library, WO-07). The only library text on the surgical airway is in IN-12, on diphtheria (THRIVING library, IN-12).

I read the Resuscitation Council UK guideline of May 2021 in full. I also read the full texts of the following: - The World Allergy Organization guidance of 2020 (first two-thirds) - Two papers by Turner and colleagues - A UK ampoule licence - The Hesperian anaphylaxis page - One nettle trial and one butterbur review - The 2025 review of expired emergency medicines

Most other sources were read as abstracts. The reference list says which.

Two corrections to the brief's leads: - Simons 2000 appeared in the Journal of Allergy and Clinical Immunology, not the Annals of Internal Medicine. - The lead that "most keep over 90 per cent for years if clear" overstates the data. In Cantrell 2017 only 56 to 61 per cent of devices held 90 per cent, though all held 80 per cent (section 5).

Findings by section

1. What anaphylaxis is, how often it happens, and how fast it kills

The tradition. None of the healing traditions reviewed here names anaphylaxis as an illness. Folk memory records sudden death after a sting, a food or an injection as bad luck, poison or a curse. The idea that the body can turn its defences against a harmless substance came with Portier and Richet's work in 1902 [VERIFY: not read]. This matters because the treatment depends on recognising the pattern within minutes.

How often. The World Allergy Organization puts incidence at 50 to 112 episodes per 100,000 person-years. Life-time prevalence is 0.3 to 5.1 per cent, and 26.5 to 54 per cent of people go on to have another episode (Cardona et al. 2020). For a village of 300 that is one episode every three to seven years. For a district of 3,000 it is one to three a year [VERIFY: my arithmetic].

How often it kills. In England and Wales from 1992 to 2012, hospital admissions for anaphylaxis rose 615 per cent, from 1.0 to 7.0 per 100,000 a year. Deaths over the same period held flat at 0.047 per 100,000 a year (Turner et

al. 2015). Of 480 deaths with a known trigger, 263 followed drugs or procedures, 124 followed food and 93 followed stings. Pumphrey's register gives a similar total of about 20 deaths a year (Pumphrey 2000). Of these, about 9 a year came from medicines, 6 from food and 4 from stings (Pumphrey 2004). About 1 per cent of hospital admissions for anaphylaxis ended in death, and about 0.1 per cent of emergency attendances (Turner et al. 2017).

Who dies of what.

- **Food** kills the young. Fatal food reactions peak between the ages of 10 and 29. Peanut or tree nut caused 69 of the 95 food deaths with an identified trigger (73 per cent) (Turner et al. 2015). Asthma was present in about 70 to 75 per cent of fatal food cases (Turner et al. 2017). In the UK register, 86 per cent of fatal food reactions went to respiratory arrest (Pumphrey 2000).
- **Stings** kill the middle-aged and old. The mean age at death was 59 (Turner et al. 2015), usually from shock 10 to 15 minutes after the sting (Pumphrey 2004).
- **Medicines** kill the old as well (mean age at death 58), most within 5 minutes of the dose (Turner et al. 2015, Pumphrey 2004). After the Fall the village will cause these reactions itself, every time it injects penicillin or antivenom (THRIVING library, IN-05, WO-13).

How fast. In Pumphrey's register, the median time from first symptom to arrest was:

Trigger	Median time to arrest	Range
Food	30 minutes	6 to 360 minutes
Venom	15 minutes	4 to 120 minutes
Medicines	5 minutes	1 to 80 minutes

(Pumphrey 2000). The longest gap from trigger to first arrest was 6 hours (Pumphrey 2004). Adrenaline was given in 62 per cent of fatal reactions, but before the arrest in only 14 per cent. A further 28 per cent were resuscitated and died later, between 3 hours and 30 days afterwards (Pumphrey 2000).

Inference for the village. At UK death rates, a district of 3,000 would lose one person to anaphylaxis about every 700 years. That figure is useless after the Fall, because it was measured in a world with ambulances and adrenaline in every pharmacy. Nobody has measured deaths from anaphylaxis where no adrenaline is available. Even with full hospital care, 1 in 100 people admitted dies (Turner et al. 2017). The district should therefore expect a death every few years, not every few centuries, and most will follow its own injections [VERIFY: inference, no data].

2. Recognition by hand, and the mimics

The Resuscitation Council asks for two things. There is a sudden problem with the airway, the breathing or the circulation, and usually changes in the skin (Resuscitation Council UK 2021). The World Allergy Organization adds that low blood pressure, wheeze or throat involvement soon after a known or likely allergen is enough on its own (Cardona et al. 2020).

Read it in this order:

- **Airway:** swelling of the lips, tongue or throat, a hoarse voice, difficulty swallowing, or stridor (a high-pitched noise on breathing in).
- **Breathing:** fast breathing, wheeze, a persistent cough, blue lips, exhaustion.
- **Circulation:** a fast, weak pulse, pale clammy skin, dizziness, collapse.
- **Skin:** flushing, itching, hives, swelling. Up to 20 per cent of reactions show no skin signs at all (Resuscitation Council UK 2021).

Hives and swelling alone, without a problem in the airway, breathing or circulation, are not anaphylaxis. The guideline's rule for doubt is to give adrenaline into the muscle (Resuscitation Council UK 2021).

The faint is the commonest mimic. It matters most at the moment of an injection, when both are likely. The Resuscitation Council table is the best bedside tool found:

Sign	Faint	Anaphylaxis
Onset	Seconds	Minutes to hours
Lying flat	Recovers quickly	Does not recover
Pulse	Usually slow	Usually fast, weak
Breathing	Shallow, not laboured	Fast, wheeze, cough
Throat	Normal	Swelling, hoarseness, stridor
Skin	Pale and clammy	Flushed, itchy, hives

(Resuscitation Council UK 2021). If a faint has not lifted within a minute or two of lying flat, treat it as anaphylaxis.

Other mimics: - A panic attack, especially in someone who has had anaphylaxis before. - A child's breath-holding attack. - Hives that come up on their own (Resuscitation Council UK 2021). - Asthma, which can also accompany anaphylaxis. An asthmatic who wheezes after a food and has hives has anaphylaxis until proved otherwise (Turner et al. 2017, THRIVING library, CH-03).

Errors in both directions. About half of anaphylaxis episodes in the literature were never given adrenaline into the muscle. Meanwhile, skin signs alone were sometimes wrongly treated with it (Resuscitation Council UK 2021). After the Fall the second error matters more, because a wasted dose cannot be replaced.

3. Adrenaline: dose, route and repeats, and the intravenous trap

The dose, from three independent sources. All use the 1 mg per mL strength (written 1:1,000), in which one millilitre holds one milligram.

Age	Resuscitation Council UK 2021	Ampoule licence (Martindale)	WAO 2020	Volume of 1 mg/mL
Adult and over 12	0.5 mg (0.3 mg if small or prepubertal)	0.5 mg (0.3 mg if small or prepubertal)	0.01 mg/kg, maximum 0.5 mg	0.5 mL
6 to 12 years	0.3 mg	0.3 mg	0.3 mg	0.3 mL
6 months to 6 years	0.15 mg	0.15 mg	0.15 mg (1 to 5 years)	0.15 mL
Under 6 months	0.1 to 0.15 mg	0.01 mg/kg	0.01 mg/kg	about 0.1 mL

(Resuscitation Council UK 2021, Martindale Pharma n.d., Cardona et al. 2020). The sources agree on the adult dose. They differ only at the edges, in the age bands and in fixed against weight-based doses for small children. WO-13 gives the same doses from a snakebite guideline (THRIVING library, WO-13).

The Resuscitation Council says plainly that the evidence for these doses is weak. They were chosen as safe and practical to draw up in an emergency (Resuscitation Council UK 2021). The weight rule, 0.01 mL per kg, is the one a lay healer can carry for any child.

The repeat. Repeat the dose after 5 minutes if there is no improvement (Resuscitation Council UK 2021, Martindale Pharma n.d.). The World Allergy Organization and the current Hesperian page allow 5 to 15 minutes (Cardona

et al. 2020, Hesperian 2026). An older Hesperian edition advised injection under the skin, repeated at 20 minutes (Werner n.d., search summary only). That advice is superseded.

Absorption into muscle peaks at about 5 to 10 minutes (Resuscitation Council UK 2021). If two doses have not helped, the reaction is called refractory. The guideline then turns to intravenous fluids and a specialist adrenaline infusion (Resuscitation Council UK 2021). After the Fall, all that is left is a third and fourth dose into the muscle, 5 minutes apart [VERIFY: inference, no guideline covers it].

The site and the needle. Inject into the outer side of the middle third of the thigh. Use a needle long enough to reach muscle: 25 mm suits all ages, 16 mm a very small infant, and 38 mm some adults (Resuscitation Council UK 2021).

Muscle beats skin. In 17 children, adrenaline into the thigh muscle peaked at a mean of 8 minutes, against 34 minutes under the skin (Simons et al. 1998). The ampoule licence forbids injection into fingers, toes, ears, nose, genitals or buttocks (Martindale Pharma n.d.).

The intravenous trap. In a person whose heart is still beating, adrenaline into a vein can cause dangerous rhythms, a heart attack, a stroke and severe high blood pressure. UK deaths have followed its use for reactions that were not even anaphylaxis (Resuscitation Council UK 2021). Pumphrey counted at least 3 deaths from adrenaline overdose in his early register (Pumphrey 2000), and 5 among 196 deaths from 1992 to 2001 (Pumphrey 2004).

A Mayo Clinic emergency department compared the two routes (Campbell et al. 2015):

	Bolus into a vein (30 doses)	Into muscle (316 doses)
Overdose	4 (13.3 per cent)	0
Heart complications	10 per cent	1.3 per cent

The denominators in the abstract do not quite agree with each other, so the exact rates are uncertain. Every overdose, though, came after a dose into a vein.

The licence says the 1 mg per mL strength must not be given into a vein (Martindale Pharma n.d.). The village rule is absolute: **adrenaline goes into the thigh muscle and nowhere else.** [OWNER: whether a doctor at the district infirmary may ever use diluted intravenous adrenaline]

Who should still get it. No group should be refused adrenaline in anaphylaxis. The licence advises caution in pregnancy, to be weighed against the benefit, and forbids injected adrenaline in the second stage of labour (Martindale Pharma n.d.). The Resuscitation Council no longer adjusts the dose for any group (Resuscitation Council UK 2021). A pregnant woman gets the same dose, lying on her left side.

4. Position, airway and fluid

Position: the one free treatment. Pumphrey reviewed 88 deaths from anaphylactic shock: - Four people died within seconds of being moved more upright. - One died after moving from a chair to a bed. - Five died while held upright and unconscious.

(Pumphrey 2003, read via Lewis 2013). In Australian series, upright posture was recorded in 68 per cent of fatal food reactions and 30 per cent of fatal venom reactions (Turner et al. 2017).

The mechanism is plain. In one series, rising red-cell concentration in 22 patients showed that up to 35 per cent of the circulating blood volume leaked out of the vessels within 10 minutes of onset (Fisher, via Resuscitation Council UK 2021). An upright posture then empties the heart.

The rules (Resuscitation Council UK 2021, Cardona et al. 2020, Hesperian 2026):

- Never let the person stand or walk during a reaction. Carry them.
- Faint, weak pulse or collapse: lie flat on the back with the legs raised.
- Breathing is the main problem and the pulse is good: half sitting, supported, never standing.
- Unconscious but breathing: on the side.
- Pregnant from about 20 weeks: on the left side.

The evidence comes from deaths, not trials, and the BestBets review notes the small numbers and the confounding (Lewis 2013). The physiology, the case series and three guidelines agree, so the grade is B.

The airway. Of 56 fatal reactions with a post-mortem report: - 23 showed swelling of the throat or larynx. - 15 showed asthma. - 23 showed nothing pointing to allergy.

Shock was a more common cause of death than asphyxia (Pumphrey and Roberts 2000). In the later series of 196 deaths, 88 were from shock and 96 from asphyxia, asthma included (Pumphrey 2004).

When adrenaline fails to open the throat, the last step is a cut through the membrane below the Adam's apple (cricothyrotomy). A case report describes this saving a patient after intubation failed through a swollen throat (EJCRIM case report n.d., search summary only [VERIFY]). In children under about 10 to 12, only a needle through the membrane is taught. It buys minutes at most (THRIVING library, IN-12). A surgical airway attempted from a book will usually fail [VERIFY: inference]. The village should not teach it. The district may train one person on animal tissue [OWNER].

Fluid into a vein. Fluid restores the volume that has leaked out: 500 to 1,000 mL for an adult and 10 mL per kg for a child. Repeat as needed, up to 3 to 5 litres in severe shock (Resuscitation Council UK 2021). This needs salvaged sterile fluid and a cannula, so it belongs to the district.

Fluid by mouth. No source tests oral fluid in anaphylaxis. A person whose throat is swelling, who is vomiting, or who is losing consciousness must not drink, because they may choke. Once the reaction has settled, sips of oral rehydration solution are reasonable after vomiting [VERIFY: inference only]. Oral fluid does not treat shock.

5. The salvage stock: how long adrenaline keeps and how a spoiled one looks

What the labels say.

UK 1 mg per mL ampoule (Martindale Pharma n.d.): - Shelf life of 15 months. - Store below 25°C, in the carton to protect from light. Do not freeze. - Do not use if discoloured. - It contains sodium metabisulfite, which can cause allergy, but that must not stop its use in an emergency.

US autoinjector label (EpiPen prescribing information, search summary only): - Store at 20 to 25°C, with excursions to 15 to 30°C allowed. Do not refrigerate. - Replace if the solution is pinkish, brown or cloudy, or has particles.

Why it fails. Adrenaline belongs to the catechol family. It oxidises to adrenochrome, which is pink, and later browns. Heat, alkalinity and traces of metal speed this up. Light causes a separate loss, turning the drug into an inactive mirror-image form (patent literature, search summary only [VERIFY]). Colour therefore shows the loss from oxidation, but not the loss from light, which leaves the solution clear.

What the studies of expired devices show. ME-09 summarised these studies (THRIVING library, ME-09). Read again from the original abstracts and the 2025 review, they give this picture:

Study	Devices	Months past expiry	What remained
Simons, Gu and Simons 2000	34 autoinjectors	1 to 90	About 73 per cent (0.238 mg against 0.326 mg in date). Content fell with time (r = 0.63). 2 darkly discoloured
Simons 2011 (abstract)	Autoinjectors	129 to 151	54.7 to 77.1 per cent
Rachid et al. 2015	Autoinjectors	3 to 36	84.2 to 101.5 per cent. All up to 24 months held 90 per cent
Cantrell et al. 2017	40 autoinjectors	1 to 50	All held at least 80 per cent. 61 per cent of adult and 56 per cent of child devices held 90 per cent. None discoloured
Weir et al. 2018	6 prefilled syringes	30	No loss, sterile
Kassel et al. 2019	46 autoinjectors	1 to 168	Median 97.2 per cent. 37 held 90 per cent
Saleheen et al. 2020	23 autoinjectors	12 to 207	0.05 to 1.43 mg/mL. Time predicted dose poorly (r = -0.37), colour well (r = -0.71)

(Simons et al. 2000, Charlton et al. 2025, Saleheen et al. 2020, news reports of Cantrell et al. 2017).

Ampoules 53 to 72 years old kept about 70 per cent (Zilker 2019, via THRIVING library, ME-09). No study has tested the human response to expired adrenaline. The review found minimal evidence of harmful breakdown products (Charlton et al. 2025). Simons and colleagues concluded that an expired device without discolouration or precipitate is better than none (Simons et al. 2000).

Where this agrees with ME-09, and what it adds. ME-09's working rule was near full strength to about two years past expiry, four-fifths at four years, and half to three-quarters at ten (THRIVING library, ME-09). This report agrees, and adds two points: - **The spread widens with time.** Saleheen's old devices ran from almost empty to above label strength. So an old clear device may be strong or weak, and nobody can tell which without a laboratory. - **Colour tracks the loss better than age.** This gives the village a reading it can make by eye.

Heat, cold and light. A review of nine studies found that freezing did not degrade adrenaline, and heat degraded it only after prolonged exposure. Only two of the studies involved autoinjectors (Parish et al. 2016). Autoinjectors left 12 hours in a car on a sunny day lost concentration: 3.3 per cent in the boot, about 13 to 14 per cent in the cabin and glove box (Lacwik et al. 2019, secondary summary only [VERIFY]).

The licence's "do not freeze" and the review's "freezing did no harm" need not conflict. The drug survives freezing, but the ampoule glass and the injector mechanism may not [VERIFY: inference].

The colour rule. The licence says not to use discoloured adrenaline (Martindale Pharma n.d.). The evidence says colour means lost drug, not poison (Saleheen et al. 2020, Charlton et al. 2025). The village rule:

1. Clear and in date: use first.
2. Clear and expired: use. Up to two years past expiry, treat it as full strength.

3. Faintly pink and clear, with nothing else left: the owner decides [OWNER]. The drug is partly spent, and no one has studied injecting its breakdown products into people [VERIFY].
4. Brown, cloudy or with particles: never.

Autoinjector or ampoule. In hospital the guideline prefers ampoule and syringe, because an autoinjector cannot give a weight-based dose (Resuscitation Council UK 2021). For a lay hand the autoinjector is safer. The dose is fixed, and it delivers into muscle where an ampoule and syringe could end up in a vein [VERIFY: inference]. Autoinjectors are available in only 32 per cent of 195 countries (Cardona et al. 2020). In many districts the stock will be ampoules from hospitals, ambulances and dental surgeries (THRIVING library, ME-09).

6. Can adrenaline be made?

The record. George Oliver and Edward Schäfer told the Physiological Society on 10 March 1894 that an extract of sheep and calf adrenal glands raised blood pressure. The work then moved quickly: - **1895:** Cybulski reported similar findings in Kraków. - **1897:** John Jacob Abel in Baltimore named a partly purified substance "epinephrin". - **1901:** Jōkichi Takamine obtained the pure crystals in New York, which Parke, Davis and Co. sold as Adrenalin. - **About 1905:** Stolz at Hoechst and Dakin at Leeds made it synthetically.

(Wikipedia, History of catecholamine research). Every success came from a laboratory with chemists, reagents and a steady supply of glands from slaughterhouses.

ME-10 records that crude whole-gland extracts were condemned as toxic by 1943 (THRIVING library, ME-10). I could not find a figure for the adrenaline content of a gland.

The verdict. No rung of the means ledger can make adrenaline of known strength. The dose is half a milligram, and the margin between that and a stroke is narrow even with a labelled ampoule (Resuscitation Council UK 2021). An extract of unknown strength cannot land inside that margin, and it would bring foreign protein and infection with it. Adrenal extract is grade X. This report gives no method.

7. The second-line drugs

Antihistamines. A Cochrane review found no randomised trial of H1 antihistamines in anaphylaxis, with searches running to November 2010 (Sheikh et al. 2007, updated). The Resuscitation Council ranks them third-line, for three reasons: - They do nothing for the airway, breathing or circulation. - Using them often delays adrenaline. - Chlorphenamine pushed fast into a vein can lower blood pressure.

They are for itch and hives once the person is stable, preferably a non-sedating one such as cetirizine (Resuscitation Council UK 2021):

Age	Cetirizine dose
Adults and over 12	10 to 20 mg
6 to 11 years	5 to 10 mg
2 to 6 years	2.5 to 5 mg
Under 2	250 micrograms per kg

The World Allergy Organization agrees that they have a limited role (Cardona et al. 2020).

Steroids. A Cochrane review found no trial of glucocorticoids in anaphylaxis, with searches running to September 2011 (Choo et al. 2012). The Resuscitation Council no longer advises them routinely (Resuscitation Council UK 2021). The World Allergy Organization says they may be of no benefit (Cardona et al. 2020). Salvaged prednisolone should be kept for asthma (THRIVING library, CH-03).

Salbutamol. An inhaled reliever helps wheeze after adrenaline has been given (Hesperian 2026). It does nothing for throat swelling or shock.

The second wave. About 5 per cent of patients have a biphasic reaction, a return of symptoms hours later with no new exposure. The median onset is about 12 hours. Of more than 9,000 cases in the European registry, 435 were biphasic, and none of them died.

The risk is higher in three cases: - A severe first reaction. - More than one dose of adrenaline needed. - Adrenaline delayed more than 30 to 60 minutes.

The guideline asks for at least 6 hours' observation after two doses, and at least 12 hours where emergency care is hard to reach (Resuscitation Council UK 2021). After the Fall, everywhere is such a place.

8. The plants: nettle, butterbur, ephedra, and the verdict

Nettle (*Urtica dioica*, leaf, sometimes root). - *Tradition:* In European herbal practice, nettle is a spring cleanser, a food and a tonic. Using the freeze-dried leaf for hay fever is a modern herbalists' practice [VERIFY: not traced to a historical source]. The European Medicines Agency's herbal monograph gives no hay fever use (THRIVING library, PH-01). - *Record:* Two small trials, neither showing a clear benefit: - Mittman enrolled 98 people, of whom 69 completed a week of freeze-dried nettle or placebo. Nettle scored better in global assessments, but only slightly better in symptom diaries (Mittman 1990, abstract only). - Bakhshaee and colleagues randomised 74 people to nettle root 150 mg four times a day or placebo for a month, both groups also taking loratadine and saline. Only 40 completed. Symptom scores fell in both groups, with no difference between them (P = 0.25) (Bakhshaee et al. 2017). - *Inference:* A safe food with no proven effect. Grade D for hay fever, X for anaphylaxis. - *Identification:* Stinging hairs, opposite toothed leaves, square stem. Dead-nettles (*Lamium*) look similar but do not sting, and are harmless.

Butterbur (*Petasites hybridus*, leaf and rhizome). - *Tradition:* In Balkan folk medicine, the rhizome and leaves treated spastic cough, bronchitis, asthma, migraine and allergic rhinitis (Mihajilov-Krstev et al. 2020). Austrian and Czech folk use of the leaf for hay fever is reported, and its old English name is pestilence wort (search summary only [VERIFY]). - *Record:* Two trials of one industrial leaf extract, Ze 339: - 125 people with hay fever took one tablet four times a day for two weeks. Global scores matched cetirizine, and there were fewer complaints of sedation (Schapowal 2002). A letter in the BMJ criticised the design (Shuster 2002, title only). - 330 patients took Ze 339 at 8 mg of petasines three times a day. It beat placebo and matched fexofenadine 180 mg (Schapowal 2005, abstract via search). - *Harm:* - The raw plant contains pyrrolizidine alkaloids, including senkirkine and senecionine, which damage the liver (Mihajilov-Krstev et al. 2020). - One assay found 104.8 ppm in the rhizome against 3.86 ppm in the leaf (search summary only [VERIFY]). - A root extract sold for migraine (Petadolex), which was meant to be free of alkaloids, drew 9 reports of severe liver injury and 2 liver transplants. Causality was judged likely in only 3 reports, and many patients were taking other drugs (Anderson and Borlak 2019). - The UK regulator withdrew unlicensed butterbur products in 2012 (search summary only [VERIFY]). - *Inference:* The trials tested an industrial extract with the alkaloids removed, which no village can make or test. A home brew carries an unmeasured dose of a liver poison that builds up silently. Grades: B for a salvaged Ze 339 leaf extract in hay fever, X for any home preparation, X for anaphylaxis. - *Identification:* Pink-lilac flower spikes in early spring, before the leaves, which grow up to 60 cm across. Found on riverbanks and in wet meadows (Mihajilov-Krstev et al. 2020). Do not confuse it with coltsfoot (*Tussilago farfara*), which also contains pyrrolizidines.

Ephedra (*Ephedra sinica*, green stem). CH-03 and ME-07 cover the tradition, the doses and the harm (THRIVING library, CH-03, ME-07). The question here is whether it can stand in for adrenaline. ME-10 searched for evidence of ephedrine in anaphylaxis and found none (THRIVING library, ME-10), and I found none either.

A 2026 case series described low blood pressure that did not respond to repeated ephedrine but recovered quickly with adrenaline (Turkish case series 2026, search summary only [VERIFY]). Ephedrine by mouth works slowly, and anaphylaxis kills in a median of 5 to 30 minutes (Pumphrey 2000).

Ephedra for an adult whose wheeze persists after the adrenaline is used up is grade D at best, and only within CH-03's protocol with a blood-pressure cuff. As a substitute for adrenaline it is grade X.

The verdict. No plant replaces adrenaline: not nettle, butterbur, ephedra, thorn apple or honey. A household that waits for a herbal tea while a throat closes loses the 15 minutes that matter. The book must say this plainly, because each of these plants will be offered for it.

9. Prevention

Removing the sting. At least 90 per cent of a honeybee's venom sac empties within 20 seconds of the sting, and all of it within a minute (Schumacher et al. 1994). In Visscher's experiments, the swelling grew with every second before removal, and scraping and pinching gave the same result (Visscher et al. 1996). Remove the sting at once, by any means (Resuscitation Council UK 2021). WO-13 covers swarms and wasps (THRIVING library, WO-13).

The register of the allergic. After the Fall, prevention is mostly a matter of knowing who is at risk. Pumphrey concluded that some reactions kill whatever is done, and that avoiding the trigger is the best management (Pumphrey 2000).

The register should hold, for every person who has had anaphylaxis: - Their trigger. - Whether they have asthma. - Where the nearest adrenaline is kept.

[OWNER: who holds the register and who may read it]. Controlling asthma is part of preventing deaths from food (Turner et al. 2017).

The return to beekeeping. In a meta-analysis, 23.7 per cent of beekeepers reported a systemic reaction at some point in their lives, 7.3 per cent in any one year, and 6 per cent a severe one (Carli et al. 2024). Among 1,080 Slovenian beekeepers the lifetime figure was 9.4 per cent (Carli et al. 2025). A village that keeps bees for honey and wax increases its exposure to stings. Anyone who has had a systemic reaction should not keep bees [OWNER].

Desensitisation. Venom immunotherapy works: - After treatment, 2.7 per cent reacted to a later sting, against 39.8 per cent untreated (risk ratio 0.10). - But 9.3 per cent reacted to the treatment itself (Boyle et al. 2012, summary via search).

Oral immunotherapy for peanut, pooled across 12 trials, tripled anaphylaxis (risk ratio 3.12) (Chu et al. 2019, secondary summaries). Both treatments need standardised extracts, with adrenaline at hand for every dose. Both are grade X after the Fall.

Feeding infants early. The LEAP trial randomised 640 infants aged 4 to 11 months with severe eczema or egg allergy. Half ate at least 6 g of peanut protein a week, the rest avoided peanut. At 5 years old, the rates of peanut allergy were:

Infants at start	Avoided peanut	Ate peanut
Skin test negative	13.7 per cent	1.9 per cent
Skin test positive	35.3 per cent	10.6 per cent

There was no difference in serious adverse events (Du Toit et al. 2015). A village that gives its infants family foods early, nuts as smooth paste and never whole, is doing what the best trial supports [VERIFY: extending this to other foods is inference]. Grade A.

10. Hay fever, hives and drug allergy

Salt-water washes. A Cochrane review of 14 small studies (747 participants) found that saline irrigation may ease hay fever symptoms. The standardised mean difference was -1.32 up to 4 weeks and -1.44 up to 3 months, but the

evidence was of low quality (Head et al. 2018).

The NHS recipes agree on the basics: 1 pint (570 mL) of water cooled to body warmth, with a teaspoon of salt and a teaspoon of bicarbonate of soda (NHS Kernow n.d.). NHS Lothian uses half a teaspoon of bicarbonate, and halves the salt if it stings (NHS Lothian n.d.). The boards disagree on whether to boil the water. After the Fall, always boil it [VERIFY: infection risk from unboiled water not sourced here]. Grade A, low certainty.

Local honey. Rajan randomised 36 people to a tablespoon a day of local honey, commercial honey or corn syrup, and neither honey beat placebo (Rajan et al. 2002). A Malaysian trial of 40 people taking 1 g of honey per kg a day alongside loratadine reported a benefit (Asha'ari et al. 2013). That is about 60 g a day for an adult. The popular belief is folklore. Grade X for the tablespoon, D for the high dose.

Hives. Hives without problems in the airway, breathing or circulation need only an antihistamine, cool cloths and time (Resuscitation Council UK 2021). Hives that spread after a drug mean the drug is stopped and recorded.

The false penicillin label. About 10 per cent of patients report a penicillin allergy, but fewer than 1 per cent are truly allergic (CDC 2025). Most labels come from a rash during a viral illness, a family history or a stomach upset. The allergy itself fades over time (CDC 2025). Over 95 per cent of labelled patients can take penicillin safely (Shenoy et al. 2019, secondary summary). A false label wastes the safest antibiotic in the store (THRIVING library, IN-05).

Sorting the labels. The PEN-FAST rule scores four questions:

Finding	Points
Reaction 5 years ago or less	2
Anaphylaxis or swelling	2
Severe skin reaction (blistering, peeling, mouth ulcers)	2
Treatment was needed	1

A score below 3 is low risk, with a negative predictive value of 96.3 per cent (Trubiano et al. 2020, secondary summary). In the PALACE trial, 377 adults scoring below 3 were randomised to a direct oral challenge or to skin testing first. One patient in each arm reacted (0.5 per cent), both mildly (Copaescu et al. 2023, secondary summaries).

After the Fall, the challenge belongs at the infirmary, with adrenaline drawn up, and only for low scores [OWNER]. Anyone who has ever had blistering or peeling skin is never challenged (THRIVING library, IN-05).

11. Tradition, record and inference

Claim	What tradition says	What the record shows	What science infers
Adrenaline into muscle	No tradition	Fatal cases got it late or not at all	The only reversal
Lying flat	No tradition	Deaths after sitting or standing	Keeps blood in the heart
Expired adrenaline	Expired medicine is poison	80 per cent or more at 4 years if clear	Better than none
Adrenal extract	Organ therapy of the 1890s	Toxic, cannot be dosed	Never
Antihistamine, steroid	Medical habit	No trials	For itch, for asthma
Nettle, butterbur	European and Balkan use	Small trials of extracts	No role in anaphylaxis
Ephedra	Chinese use for wheeze	No data in anaphylaxis	Too slow, harms the heart

Claim	What tradition says	What the record shows	What science infers
Local honey	Popular belief	No benefit in a trial	Folklore
Penicillin label	Medical habit	Fewer than 1 in 10 labels true	Test the low-risk ones

Evidence grades

Remedy or practice	Use	Grade	Basis
Adrenaline into thigh muscle	Anaphylaxis	B	Guidelines, fatal series
Repeat at 5 minutes	Anaphylaxis	B	Guidelines, absorption
Intravenous bolus by lay hands	Anaphylaxis	X	Overdose, deaths
Injection under the skin	Anaphylaxis	X	Slow absorption
Expired clear adrenaline	Anaphylaxis	B	Seven bench studies
Faintly pink adrenaline	Anaphylaxis	D	No human data
Adrenal extract	Any	X	Toxic, cannot be dosed
Lying flat, legs raised	Shock	B	Fatal posture series
Fluid into a vein	Shock	B	Guideline, physiology
Oral fluid	Acute shock	D	No data
Antihistamine	Anaphylaxis	X as first line, B for itch	No trials
Steroid	Anaphylaxis	D	No trials
Cricothyrotomy	Closed throat	D	Case reports
Ephedra	Anaphylaxis	X substitute, D later wheeze	No data
Nettle	Hay fever	D	Two small trials
Butterbur Ze 339 extract	Hay fever	B	Two trials
Butterbur home brew	Any	X	Pyrrolizidines
Fast sting removal	Sting	B	Experiments
Venom or oral immunotherapy	Prevention	X after the Fall	Reactions to treatment
Early infant peanut	Prevention	A	LEAP
Saline nasal wash	Hay fever	A, low certainty	Cochrane
Local honey, tablespoon	Hay fever	X	Rajan 2002
PEN-FAST and oral challenge	Penicillin label	A	PALACE

Means ledger

Practice	Hands and knowledge	Hearth	Garden and still	Village (300)	District (3,000)	Hospital before the Fall
Recognition	Faint table, ABC	Same	Same	Trained healer, register	Blood-pressure cuff	Monitoring

Practice	Hands and knowledge	Hearth	Garden and still	Village (300)	District (3,000)	Hospital before the Fall
Position	Flat, never stand	Blanket	Same	Stretcher	Same	Same
Adrenaline	None	Household autoinjector	None	Salvaged ampoules, 1 mL syringes	Reserve, cool dark box	Infusion
Fluid	None	None for shock	None	None	Sterile fluid, cannula	Litres
Airway	Side position	Same	Same	Same	Trained hand [OWNER]	Intubation
Second line	None	None	Nettle as food	Cetirizine, salbutamol	Steroid for asthma	Same
Prevention	Sting removal	Early infant foods	Bee rules	Register	Penicillin challenge	Immunotherapy
Hay fever	Avoid pollen	Salt wash	Salt wash	Antihistamine	Same	Nasal steroid

Hands and knowledge give recognition and the position rule. The garden adds no drug for anaphylaxis. The village dispensary is the first rung that can stop a reaction, and only while its adrenaline lasts. The district adds fluid and a reserve but cannot make adrenaline. The hospital adds infusions and intubation, which save most of the refractory cases the district will lose.

Harm test

Adrenaline. - *How it harms:* Too much, or a dose into a vein, causes severe high blood pressure, bleeding in the brain, dangerous rhythms and heart attack (Martindale Pharma n.d.). Known errors are the wrong strength into a vein (Resuscitation Council UK 2021) and a 10-fold error in a child's dose drawn up in a large syringe [VERIFY: inference]. - *Overdose trap:* Pallor after adrenaline comes from narrowed vessels, but it is easily taken for continuing shock, which leads to giving more. A sharply raised blood pressure is the key sign of overdose (Resuscitation Council UK 2021). - *Warning signs:* Pounding headache, chest pain, a racing or irregular pulse, sudden breathlessness. - *What to do:* Stop giving it and sit the person half up, since its effect is short. - *Who must never receive it:* Nobody in true anaphylaxis is refused it. A misfired autoinjector in the thumb risks tissue death there (Martindale Pharma n.d.).

Expired stock. It may give a weak dose and false confidence. Repeat at 5 minutes regardless.

Position. Standing or sitting up can kill within seconds (Pumphrey 2003). Laying flat someone whose main trouble is breathing can make that worse, so they sit half up.

Antihistamines. They cause sedation, and chlorphenamine given fast into a vein lowers blood pressure (Resuscitation Council UK 2021). The greater harm is that they delay adrenaline.

Butterbur. Liver injury severe enough to need transplants (Anderson and Borlak 2019). - *Never in:* pregnancy, children or liver disease [VERIFY: exclusions inferred from the mechanism]. - *Warning signs:* jaundice, dark urine, pale stools.

Ephedra. Stroke, heart attack and seizures (THRIVING library, ME-07, CH-03). It also kills by delay when given instead of adrenaline.

Graded challenge. A truly allergic person may react to the challenge dose. Never give one without adrenaline drawn up, and watch for at least 2 hours [VERIFY: matched to the guideline's 2-hour fast-track observation].

Saline washes. Unboiled water carries infection.

Historical harms. - At least 5 UK deaths in a decade from adrenaline overdose (Pumphrey 2004). - UK deaths from intravenous adrenaline given for reactions that were not anaphylaxis (Resuscitation Council UK 2021). - Two liver transplants after a butterbur extract (Anderson and Borlak 2019).

Red flags

These signs mean the person may die without what the village lacks.

1. **Throat swelling or stridor after two doses.** Keep giving adrenaline every 5 minutes, sit them half up, and prepare the last airway only if someone is trained.
2. **Collapse with a weak or absent pulse after a sting or injection.** Lay them flat with legs up, give adrenaline, and start CPR if breathing stops.
3. **A silent chest in an asthmatic after food.** Adrenaline first, then salbutamol, half sitting.
4. **No adrenaline left.** Lay them flat, remove the trigger, keep them warm and still, give salbutamol for wheeze, and stay with them. Many reactions settle on their own. Some do not.
5. **Symptoms come back hours later.** Treat it as the first reaction.
6. **Jaundice after butterbur.** Stop it at once.

Honest comfort. When the adrenaline is gone and a reaction does not settle, the person is often frightened and fully aware. Lay them down, hold them, speak quietly and stay. Some reactions are fatal whatever is done (Pumphrey 2000). Tell the family that the death came from the illness, not from any failure of theirs.

The case against

Against putting adrenaline first. No trial has shown that adrenaline prevents death in anaphylaxis, and fatal reactions occur despite it being given in time (Turner et al. 2017). Up to a third of fatal food reactions in England and Wales happened despite prompt adrenaline (Turner et al. 2015). The Resuscitation Council itself calls the evidence for the doses weak. *Reply:* A placebo trial would be unethical, the physiology is clear, and late adrenaline is the commonest finding in the deaths (Pumphrey 2000).

Against using expired stock. Manufacturers and regulators advise against expired pens when fresh ones exist, and no study has measured the human response to them. *Reply:* That advice assumes fresh pens exist. After the Fall, most of the time they will not.

Against the posture evidence. It rests on ten deaths among 88, with confounding (Lewis 2013). *Reply:* Lying down costs nothing and harms nobody who can breathe lying down.

Against the verdict on plants. Herbalists will cite the Schapowal trials. *Reply:* Those trials tested an extract with the poison removed, for hay fever, not anaphylaxis.

Against downgrading antihistamines. Many clinicians still give them, and the absence of trials does not prove they have no effect. *Reply:* Nobody claims they stop shock or throat swelling, and the harm comes from the delay.

Against removing penicillin labels. A mistake in someone truly allergic can kill. *Reply:* The reactions in PALACE were mild, and the challenge happens only at the infirmary, with adrenaline ready.

Against the romance of the hospital. Even before the Fall, 1 in 100 people admitted with anaphylaxis died (Turner et al. 2017). The hospital did not abolish these deaths either.

10-line summary

1. Anaphylaxis is rare: 50 to 112 episodes per 100,000 a year, so 1 to 3 a year in 3,000 people.

2. It kills fast: median time to arrest is 5 minutes after a drug, 15 after a sting and 30 after food.
3. Half the deaths follow medical treatment, which the village will now give itself.
4. Inject adrenaline 1 mg/mL into the outer thigh: 0.5 mL for an adult, 0.01 mL/kg for a child, repeated every 5 minutes.
5. Lay hands never inject it into a vein. In one series, 13 per cent of intravenous doses caused an overdose.
6. Lay them flat with legs raised, or half sitting if breathing is the problem. Never stand them up.
7. Clear expired adrenaline keeps 80 per cent or more for about four years. Colour shows the loss.
8. No trials support antihistamines or steroids in anaphylaxis, and neither treats shock or the throat.
9. No plant replaces adrenaline. Home-brewed butterbur poisons the liver.
10. Fewer than 1 in 10 penicillin labels is true, and the low-risk ones can be tested.

Open questions

- How many people die of anaphylaxis where no adrenaline is available? No data found.
- How does partly spent or faintly pink adrenaline perform in people? No study found.
- Are the breakdown products of oxidised adrenaline harmful when injected? Charlton found minimal evidence of harm but did not test discoloured solution [VERIFY].
- Is the biphasic rate higher where the first reaction was treated late? Late adrenaline is a known risk factor, so the village rate may be higher [VERIFY].
- Does early feeding of eggs, fish and tree nuts protect the way peanut does?
- Who enforces the ban on beekeeping for those who have had a systemic reaction [OWNER]?
- Who may run a penicillin challenge, and under what rules [OWNER]?

Sources to read in full

1. Resuscitation Council UK (2021), Emergency treatment of anaphylaxis.
2. Pumphrey (2000), the fatal register.
3. Pumphrey (2003), Fatal posture in anaphylactic shock.
4. Cardona et al. (2020), World Allergy Organization guidance.
5. Charlton et al. (2025), expired resuscitation medicines.
6. Saleheen et al. (2020), colour and the remaining dose.
7. Turner et al. (2017), fatal anaphylaxis.
8. Anderson and Borlak (2019), butterbur and the liver.
9. Shenoy et al. (2019), penicillin allergy review.
10. Du Toit et al. (2015), LEAP.

At the bedside after the Fall

The household. - *Minimum:* Everyone knows the signs, the faint table and the position rule. Nobody with a swelling throat or a faint pulse stands up. Bee stings come out within seconds. Infants eat family foods early. - *Autoinjectors:* A household with an allergic member keeps that person's autoinjector at room temperature, away from sun and frost. - *First failure:* Someone helps the patient sit up or walk to the healer.

The village of 300. - *Minimum:* A healer who can recognise anaphylaxis and inject the thigh. - *Kit:* Salvaged adrenaline, 1 mL syringes, 25 mm needles, the colour rule, a register of the allergic, and a log of every injection given. - *Every penicillin or antivenom injection:* Adrenaline drawn up, the patient lying down, then 30 minutes of watching [VERIFY: inferred from the 1 to 80 minute range]. - *Expect:* One episode every three to seven years. - *First failure:* The adrenaline is used up on hives, or kept in a hot window and found pink on the day it is needed.

The district of 3,000. - *Minimum:* A reserve kept dark and below 25°C, inspected twice a year and sent to the villages oldest first. - *Kit:* Sterile fluid and cannulas, a nurse who can place a cannula, the penicillin-label review, and

rules for beekeepers. - *Expect:* One to three episodes a year. - *First failure:* The stock runs out, and the district must then say honestly that the next severe reaction may be fatal.

Protocols

Protocol 1. Anaphylaxis (the one-page protocol)

1. **Think anaphylaxis** if, within minutes to hours of a sting, food, drug or injection, any of these appear, usually with hives or flushing:
    - swelling of the lips, tongue or throat
    - a hoarse voice, wheeze or noisy breathing
    - a weak, fast pulse, faintness or collapse
2. **Stop the trigger.** Stop any injection. Pull out a bee sting at once, any way you can.
3. **Position now.** Never let them stand or walk.
    - Faint or weak pulse: flat, legs raised.
    - Hard to breathe: half sitting.
    - Unconscious but breathing: on the side.
    - Pregnant: on the left side.
4. **Inject adrenaline 1 mg/mL into the outer middle thigh muscle.**
    - Check the label says 1 mg/mL.
    - Use a 1 mL syringe and a 25 mm needle.
    - Doses:
        - Adult and over 12: 0.5 mL. A small or prepubertal child: 0.3 mL.
        - Age 6 to 12: 0.3 mL.
        - 6 months to 6 years: 0.15 mL.
        - Under 6 months: 0.1 mL.
        - If you can weigh them: 0.01 mL per kg, no more than 0.5 mL.
5. **Write down the time.**
6. **Choose the vial in this order:** clear and in date, then clear and expired, then faintly pink (only if the owner's rule allows). Never brown, cloudy or with particles.
7. **Not better after 5 minutes:** give the same dose again in the other thigh. Repeat every 5 minutes while signs persist and stock lasts.
8. **Never into a vein, and never into a drip.**
9. **Wheeze after adrenaline:** salbutamol through a spacer, as in CH-03.
10. **Shock, at the district:** put in a cannula and give 500 to 1,000 mL of sterile saline for an adult, or 10 mL per kg for a child. Repeat while the pulse stays weak.
11. **Breathing stops:** start CPR.
12. **Once settled:** cetirizine for itch (10 mg for an adult).
13. **Watch them lying down for 12 hours,** within reach of adrenaline. Carry them home. Do not let them walk.
14. **Record:**

- trigger, signs, times and doses
- which vial, its colour and its date
- the outcome Enter it in the register, and tell the family the trigger must be avoided for life.

Protocol 2. Salvaged adrenaline: inspection and storage

1. Collect stock from hospitals, ambulances, dental surgeries, pharmacies and schools (THRIVING library, ME-09).

2. Check the strength on the label:
    - 1 mg/mL (1:1,000) is the strength for injecting into muscle.
    - 0.1 mg/mL (1:10,000) holds a tenth of the drug per mL. Send it to the district, marked "not for muscle".
3. Hold each container to daylight against white paper. Record what you see: clear, faintly pink, pink, brown, cloudy or particles.
4. Throw away anything brown, cloudy or with particles.
5. Store it in the original carton, in a closed box, in the coolest dark place that does not freeze, ideally 15 to 25°C. Never store it in a window, a vehicle or near a stove.
6. Inspect every six months, and issue the oldest clear stock first.
7. Keep a ledger of counts, locations, dates, colour, and who each dose was given to.

Protocol 3. Bee and wasp stings

1. Remove a bee sting within seconds. How you do it does not matter.
2. Use a cool cloth for local swelling.
3. Watch for 30 minutes [VERIFY: inferred from the range of venom deaths].
4. Any sign in the throat, breathing or circulation: go to Protocol 1.
5. Swarm attack: follow WO-13.
6. Anyone who has had a systemic reaction goes on the register [OWNER].

Protocol 4. Penicillin-label review (district only)

1. Ask what happened and when, whether there was swelling or collapse, and whether there was blistering, peeling skin or mouth ulcers.
2. Score it with the PEN-FAST table (section 10).
3. A score of 3 or more, or any severe skin reaction ever: keep the label for life.
4. A score below 3: offer a challenge, with the person's consent [OWNER].
5. Run the challenge:
    - The person lies down.
    - Draw up 0.5 mL of adrenaline beforehand.
    - Give one oral dose of amoxicillin [VERIFY: the PALACE dose was not read].
    - Watch for 2 hours.
6. Any reaction: Protocol 1, and the label stays for life.
7. No reaction: remove the label from every record and tell the person in writing.

Numbers to carry

1. **0.5 mL** of 1 mg/mL adrenaline into the thigh for an adult. **0.01 mL per kg** for a child.
2. **5 minutes** between doses.
3. **Never into a vein.**
4. **5, 15, 30 minutes:** median time to arrest after a drug, a sting and a food.
5. **Flat, legs up.** Never stand.
6. **20 seconds:** by then at least 90 per cent of a bee's venom is in.
7. **80 per cent:** the least that clear expired autoinjectors held up to about four years.
8. **12 hours** of watching after a reaction.
9. **1 in 10** people carries a penicillin label. **Fewer than 1 in 100** is truly allergic.
10. **25°C:** store adrenaline below this, in the dark, and never frozen.

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