

Physician and researcher Matthew Lewin treats a man with a leg infection in the Gobi Desert, Mongolia.



THE FIELD MEDIC

When emergencies happen in remote settings, field researchers can be left with little recourse. Erik Vance meets a man trying to change that.

It started with a minor cut. A rock had come loose during a palaeontological dig and grazed a worker's leg. But when Matthew Lewin checked on him several days later, an infection had spread to his blood. The man had a dangerously high fever and was close to kidney failure. The most serious complication, however, was his location: a remote sun-blasted corner of the Gobi Desert in Mongolia, where he was working as part of a 2005 expedition searching for fossils from the Cretaceous period. Most patients in his condition would be admitted to a hospital's intensive-care unit. "With good roads it would have been a two-day drive to the nearest hospital," says Lewin. Where they were, the roads were terrible.

Lewin, an emergency-care doctor with a speciality in wilderness medicine, gave the man a steady drip of antibiotics. Over the next two days he recovered. To save intravenous drugs, though, Lewin switched him to pills. Within a few hours, the man's condition worsened: ulcers sprouted around his mouth and his skin began to peel off. Lewin recognized and treated the rare and often fatal drug response known as Stevens–Johnson syndrome. "That night, I never left the guy's bedside. I was just praying he wouldn't lose his lungs," says Lewin.

With a combination of geeky awkwardness and outdoorsy bravado, Lewin shifts easily from talking about life-and-death emergency care to discussing obscure parasites, fossils and the best ways to trim 100 grams from his medical kit.

Wilderness medicine — care given in remote settings with limited resources — is a loosely knit field that has grown in prominence over

the past two decades. The Utah-based Wilderness Medical Society, the field's only membership organization, has 2,800 licensed members involved in the military, search and rescue, and disaster relief throughout the world.

Medicine in no-man's land

For far-flung research projects, having a doctor there is often seen as a luxury rather than a necessity. For example, there are only eight spots for people on the Gobi expedition, which is run by the American Museum of Natural History in New York, says Lewin. "Any time you are taking a physician, you are not taking a scientist."

Except when you're taking both: with an MD and a PhD, Lewin attends to both the scientists and the science. In addition to working as a medic in places such as Peru, Mongolia and Chile, he has published more than 40 papers on work ranging from exotic parasites and the defensive behaviour of moth larvae to how best to open a person's throat during improvised surgery. "I have a portable skill, which is medicine," says Lewin. "And then I have a scientific background to go with it, which allows me to do productive research."

Lewin is looking to spread the word. He has trained national-park responders, US special-forces medics, and medical students at the University of California, San Francisco, in methods for treating patients in the field. But he is also looking to expand the ranks of physician–scientists like himself.

For those doing field research, someone with medical expertise can be a blessing. "I appreciate somebody like that who's thinking about [potential emergencies] so that I don't have to," says Nicholas Pyenson, a palaeontologist at the University of British Columbia in Vancouver, who led an expedition to Peru's Pisco Basin in 2008 and brought Lewin along.

The California Academy of Sciences hired Lewin in the wake of a tragedy. In 2001, while leading a team of researchers into the jungles of Myanmar, snake expert Joseph Slowinski was bitten by a many-banded krait (*Bungarus multicinctus*), one of the world's most venomous snakes. The group had no anti-venom and minimal first-aid supplies. Slowinski died 28 hours later.

From harsh lessons like these, Lewin preaches a message of preparation. Before even stepping off the plane in Mongolia, he says he had located the country's 14 computed tomography (CT) and magnetic resonance imaging scanners. He knew that there were just two dialysis machines in the entire country, and that one of them was broken. And perhaps most importantly, he contacted heads of hospitals and medical schools around the region offering lectures and much needed antibiotics. The goodwill could help ensure hospitality, should he bring in an injured scientist.

Then there are his medical kits. Lewin co-authored the 'Wilderness Preparation, Equipment, and Medical Supplies' chapter in *Wilderness Medicine*, considered to be the

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most comprehensive text on the topic, and he takes his kits seriously. Sizes range from a beverage cooler to a sandwich bag, depending on the demands of the trip, but he calls his medium lunchbox-sized container his “single proudest professional accomplishment”. After more than a decade of adventures, Lewin has winnowed its contents down to the perfect balance of essentials and efficiency (see “The perfect kit”).

“The two big things people never bring are pregnancy tests and thermometers,” he says, and includes both. There is also superglue for small cuts and a special stapler for larger ones. Snake bites, sepsis and rare drug reactions aside, most medical care he provides is fairly mundane: watching for dehydration, or urging a rest day for a group that is dangerously tired. Something as simple as an abscessed tooth can ruin an expedition.

Field doctors can also find themselves making psychological interventions. Some researchers break down during remote trips. Fights happen, especially when alcohol is allowed. And once, Lewin had to surreptitiously sedate an agitated team member who was endangering the lives of his colleagues by provoking a band of local gunmen.

A curious mind

Lewin says a doctor should be able to carry his weight in the infirmary and in the field. He has published work on a previously unknown species of ostrich-like dinosaur in northern China¹, infectious diseases of Mongolia² and even the defensive behaviour of hornworms in Texas³. During a 2007 trip to the Gobi Desert, he found what looked like a dinosaur egg with the embryo still inside. Others on the trip doubted its contents, but rather than letting it go into storage, Lewin brought it home and snuck it into a CT scanner at his hospital. Inside was the fossil of an intact *Yamaceratops* embryo. It was the first embryonic example of its genus, and more detailed scans led to a paper that shed light on how the animals might have developed⁴.

“He has a curious mind,” says Paul Auerbach, a surgeon at Stanford University in California who edited *Wilderness Medicine*. “He takes an approach that is a combination of enthusiasm, curiosity and wonderment to these settings. He isn’t there just to be a doctor.”

In the wake of Slowinski’s death, Lewin has been assembling funds to establish an “exploration and travel health” institute with the California Academy of Sciences. He hopes to launch the centre within a few years. The idea is to partner knowledgeable medical doctors with scientists travelling the globe. A doctor with diving experience and a classics degree

could pair well with a trip to uncover sunken Mediterranean antiquities, for example.

The group will also conduct research on how to improve wilderness medicine, evaluating resource-limited and ad-hoc remedies to determine best practices. They will teach classes, help scientists apply for expedition grants and prepare medical kits. David Mindell, who oversees research at the academy and nominated Lewin for membership, says that just having Lewin around has been helpful.

Different risk thresholds

A big part of Lewin’s work is advising scientists going to the field. He is careful not to push, though. Some researchers, such as Brian Fisher, an entomologist at the academy, prefer to go it alone. On his path to discovering more than 1,000 new species of ant, Fisher has visited the most inhospitable and dangerous places on Earth. He has been airlifted from war zones, has sewn up his own arm with fishing line and has been infected by just about every pathogen imaginable.

“I don’t need a freaking thermometer. I am not taking this,” says Fisher as he goes through a modest packet that Lewin prepared for him. For Fisher, speed is the key. He spends just a few days at one deep-jungle site before moving on to the next, and draws a hard line between “making-you-feel-good medicine” and “making-sure-you-come-out-alive medicine”. Anything beyond pain medication, bandages and antibiotics is not necessary, he maintains.

Fisher was initially wary of Lewin, assuming that Lewin would think his work was too dangerous and try to load him with things he didn’t need. But Lewin is tactful. Field experience has taught him that different people accept different levels of risk. He honed his advice to a narrow set of recommendations.

Fisher quickly warmed to Lewin and now refuses to deal with other doctors. He has also added an extra emergency provision. “I do have a satellite phone, and Lewin’s is the first number I have on there,” says Fisher, adding that he recently dropped his previous emergency service — a commercial company that provides medical advice and evacuation. “Now I just rely on Matt.” ■

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1. Makovicky, P. J. *et al. Proc. R. Soc. B* **277**, 191–198 (2009).
2. Lewin, M. R. & Musher, D. *Lancet* **363**, 1076 (2004).
3. Walters, E. T., Illich, P. A., Weeks, J. C. & Lewin, M. R. *J. Exp. Biol.* **204**, 457–469 (2001).
4. Balanoff, A. M., Norell, M. A., Grelet-Tinner, G. & Lewin, M. R. *Naturwissenschaften* **95**, 493–500 (2008).

THE PERFECT KIT

A sample of what Matthew Lewin likes to carry.



DAY TO DAY

Ear plugs
For sleep issues.

Nail clippers
Foot care is commonly overlooked, and ingrown toe-nails are misery on long hikes.

Superglue
For most cuts and ‘foot rot’.

Suture stapler
For the cuts that are too big to super glue.

Thermometer
Crucial for diagnosis of malaria.

Duct tape
For blisters (or throat lozenge wrappers can be glued to feet).

Condoms
Because scientists are not immune to prostitution or becoming amorous with colleagues.

THE UNEXPECTED

Pregnancy test
Standard care changes drastically for pregnant patients.

Zip ties
To prevent tampering with the kit. A combination lock can’t be opened if the physician is unconscious.

DRUGS

Adrenaline
For all manner of bites.

Antibiotics
Doxycycline is good for marine infections.

Pills
Not capsules, which can crack in the arid desert.

Vacuum-sealed medication
To keep humidity out.

WHAT’S NOT IN THE KIT?

Suction venom extractors
“They suck,” Lewin says.

Rehydration salts
Common salt and sugar work.

Vicodin
Potential recreational drugs are best guarded by the trip leader.