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KAVEH KAZEMI/GETTY



A woman undergoes chemotherapy in Tehran, where some cancer treatments are in short supply.

POLITICS

Iran hit by drug shortage

Sanctions cause increasing shortfall in medicines and vaccines.

BY DECLAN BUTLER

A tightening of already draconian international economic sanctions against Iran is causing serious shortages of certain drugs, vaccines and other key medical supplies in the country, medical researchers and public-health officials are warning.

The items, along with humanitarian goods such as food, are technically exempted from sanctions imposed by the United Nations, the United States and the European Union, which have strangled Iran's economy. But the sanctions' effects, for example on financial transactions, are causing shortages that are having a severe impact on hospitals, medical-research centres and the Iranian people, says

Ali Gorji, a neuroscientist at the University of Münster in Germany, and director of the Shefa Neuroscience Research Center in Tehran.

Exports of pharmaceuticals to Iran from the United States alone fell by half last year, from US\$31.1 million in 2011 to \$14.8 million. And Novartis, a pharmaceutical company based in Basel, Switzerland, says that the flow of life-saving products to Iran has been "severely affected, if not fully ceased".

Particularly affected are medicines and vaccines meant to treat and protect infants, as well as antibiotics and supplies for diagnostic equipment. As a result, lives are being put at risk, says Gorji.

A landmark deal to freeze the country's nuclear activity, reached last month by six

world powers and Iran, will see some sanctions relaxed, but Gorji and other experts are sceptical that it will have any immediate effect on alleviating the shortfall. Gorji adds that there is an urgent need for an independent outside assessment of Iran's medical shortages.

Gorji has been working to raise awareness of the problem since the beginning of the year, and in June organized a letter — signed by 70 scientists and physicians around the world — to UN secretary-general Ban Ki-moon asking him to address the situation. In his reply, Ban acknowledged that sanctions were having a detrimental effect on health, noting, for example, that "it is difficult, if not impossible, for importers to pay for medical supplies and equipment". He added that he was trying "to ensure that sanctions ▶

► regimes have in place fair and clear procedures for granting humanitarian exemptions”.

Iran has a strong domestic drug and vaccine industry, producing 90% of its own medicines, but these are mostly generic drugs. The country has to import newer and more sophisticated drugs such as for cancer treatments, and imports of these specialist medicines have been hardest hit by sanctions, says Richard Garfield of Columbia University in New York, who studies the effects of conflicts and economic sanctions on public health. Iran's industry is also highly dependent on imports of raw materials, with difficult-to-source ingredients for more-complex drugs being most affected, he says.

According to Gorji, there are severe shortages of many drugs, including antibiotics, clofarabine for treating children with leukaemia and deferasirox for thalassaemia, a blood disorder common in Iran. He says that he witnessed the death of several children and adults as a result of drug shortages on a visit to Iran in early November. The routine child vaccine that protects against the bacterium *Haemophilus influenzae*, which causes severe pneumonia and meningitis in infants, is another casualty, adds Gorji. Also affected are parts and consumables for advanced medical technologies such as magnetic resonance imaging.

A major problem is the legal complexity of the sanctions — a maze of bans on certain transactions, individuals and organizations. Uncertainty as to what is and is not covered has led

many of the US, European and other companies that previously sold medical supplies to Iran to become reluctant to do so, says Garfield. Several companies, including Swiss financial firm Credit Suisse and London-based bank Standard Chartered, have incurred fines of hundreds of millions of dollars for falling foul of US sanctions against Iran, adding to the disincentive. Many firms are also nervous about being seen to be trading with an international pariah, Garfield adds.

Even when hospitals and research centres can find a supplier, tough sanctions on Iranian banks and foreign banks' dealings with Iran mean that they often cannot find a route to pay for medical supplies, says Seyed Hesamedin Madani, head of medical procurement for the Red Crescent Society of Iran in Tehran.

To make matters worse, sanctions affecting exports of Iranian oil have cut off the country's main supply of hard currency, says Madani, and the value of Iran's currency, the rial, has fallen by half against the dollar in the past 14 months, drastically increasing the price of medicines.

But the situation may be improving. In response to concerns from suppliers and banks about the difficulties in enacting exemptions for medical supplies, the US Department of

the Treasury's Office of Foreign Assets Control (OFAC) issued new guidance in July. The guidelines aim to reassure US and non-US medical suppliers and banks that exporting medicines and medical devices is 'broadly authorized', provided that it does not involve Iranian organizations proscribed under sanctions.

The guidance also expanded the list of medical supplies that can be exported without OFAC approval. Garfield says that OFAC's action is a step in the right direction, but thinks that without more proactive measures, the weight of disincentives for firms to engage with Iran means that little is likely to change.

Last month's interim agreement between Iran and the group of countries known as the P5+1 — the United States, the United Kingdom, France, Russia and China, plus Germany, and facilitated by the European Union — has also raised hopes. It puts Iran's nuclear programme on hold for six months, thus stalling any development of a nuclear weapon, and will see sanctions eased slightly in return.

The deal also includes a proactive provision to establish a financial channel to facilitate humanitarian trade with Iran. This would involve designating foreign and Iranian banks that are authorized for this purpose, and in principle would provide an official route for suppliers and Iranian hospitals and medical centres to carry out transactions. Garfield welcomes the channel as long overdue, but he warns that making it work is another matter. ■

Many firms are also nervous about being seen to be trading with an international pariah.

GENOMICS

Hominin DNA baffles experts

Analysis of oldest sequence from a human ancestor suggests link to mystery population.

BY EWEN CALLAWAY

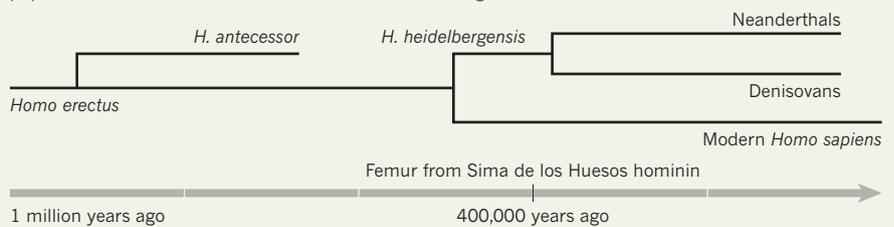
Another ancient genome, another mystery. DNA gleaned from a 400,000-year-old femur from Spain has revealed an unexpected link between Europe's hominin inhabitants of the time and a cryptic population, the Denisovans, who are known to have lived much more recently in southwestern Siberia.

The DNA, which represents the oldest hominin sequence yet published, has left researchers baffled because most of them believed that the bones would be more closely linked to Neanderthals than to Denisovans. “That's not what I would have expected; that's not what anyone would have expected,” says Chris Stringer, a palaeoanthropologist at London's Natural History Museum who was not involved in sequencing the femur DNA.

The fossil was excavated in the 1990s from

FAMILY MYSTERY

The mitochondrial genome of a 400,000-year-old femur has an unexpected link with a group of hominins called Denisovans. One interpretation is that this could be the result of interbreeding between more ancient populations, such as *Homo antecessor* and *Homo heidelbergensis*.



a deep cave in a well-studied site in northern Spain called Sima de los Huesos ('pit of bones'). This femur and the remains of more than two dozen other hominins found at the site have previously been attributed either to early forms of Neanderthals, who lived in Europe until about 30,000 years ago, or to *Homo*

heidelbergensis, a loosely defined hominin population that gave rise to Neanderthals in Europe and possibly humans in Africa.

But a closer link to Neanderthals than to Denisovans was not what was discovered by the team led by Svante Pääbo, a molecular geneticist at the Max Planck Institute for Evolutionary