Inflation, proposed in 1980 by Alan Guth, a physicist now at the Massachusetts Institute of Technology in Cambridge, predicts that the range of temperature variations should follow a bell curve — a smooth Gaussian distribution. Cosmologists had found hints in previous missions that the distribution was not so smooth, suggesting that some other process was involved in inflating the Universe (see *Nature* http://doi.org/bgjd86; 2008). But so far, Planck's temperature data look almost perfectly Gaussian, and standard theories for inflation are looking ever more secure.

"A lot of baroque inflationary models are gone," says Paul Steinhardt, a theoretical physicist at Princeton University in New Jersey, who has tried to poke holes in inflation by proposing theories such as ekpyrosis, which invokes a cyclical Universe that dies and is reborn in a series of Big Bounces.

But the cosmological case is not quite closed. There are a few details in Planck's map that seem out of place: an odd 'cold patch', for example, and a greater proportion of hotspots on one side of the sky. Moreover, Planck's value for the Hubble constant, which describes the rate of expansion of the Universe, is surprisingly low compared with estimates made with other astronomical techniques — perhaps a hint of new physics in play.

Full confirmation of inflation — and clues about what drove it — will depend on the detailed properties of the CMB's photons. The wrenching moment of inflation should have shaken the very fabric of space-time, resulting in gravitational waves. They in turn may have left a pattern in the polarization of the photons. The Planck team expects to release its polarization data early next year. "If we found gravitational waves, we'd get a Nobel prize — it's a big deal," says George Efstathiou, director of the Kavli Institute for Cosmology in Cambridge, UK, and one of Planck's lead researchers.

The exceedingly faint polarization signal may lie beyond the reach of Planck's detectors. Ground-based microwave telescopes, such as the Keck Array in Antarctica, are also in on the hunt, although they are limited to looking at one hemisphere of the sky, and in certain microwave frequencies, because oxygen in Earth's atmosphere can block some of the CMB photons. Charles Lawrence of NASA's Jet Propulsion Laboratory in Pasadena, California, the lead Planck scientist in the United States, says that it may take another space telescope to finish the job, or perhaps even a mission, decades away, to detect the gravitational waves directly.

But in terms of temperature variations, Lawrence says, astronomers will have to be content with Planck, which "squeezes pretty much all the juice out of the CMB". He finds that juice very sweet, even if it leaves a few questions beyond reach. "We have a pretty good idea of what the Universe is, but we don't have the faintest idea why it is," says Lawrence, adding with impish glee: "It's rather fun, isn't it?" ■


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**A naked woman joined protesters in Rome calling for stem-cell therapy for all incurably ill patients.**

REGENERATIVE MEDICINE

# Stem-cell ruling riles researchers

*Italian health minister's support for a controversial treatment appals the country's scientists.*

**BY ALISON ABBOTT**

Clinics that offer unproven stem-cell treatments often end up playing cat and mouse with health regulators, no matter which country they operate in. In Italy, however, one such treatment now has official sanction. The country's health minister, Renato Balduzzi, has decreed that a controversial stem-cell treatment can continue in 32 terminally ill patients, mostly children — even though the stem cells involved are not manufactured according to Italy's legal safety standards.

The unexpected decision on 21 March has horrified scientists, who consider the treatment to be dangerous because it has never been rigorously tested. In the opinion of stem-cell researcher Elena Cattaneo of the University of Milan: "It is alchemy".

The decision followed weeks of media pressure to authorize compassionate use of the therapy, which was developed by the Brescia-based Stamina Foundation and has been repeatedly banned in the past six years. Now, patient groups are pushing for the treatment to be available to anyone with an incurable illness. Hundreds protested in Rome on 23 March, including a naked woman with pro-Stamina slogans painted on her skin.

Stamina Foundation president Davide Vannoni, a psychologist at the University of Udine, says that the publicity around the treatment has won him 9,000 new patients. He hopes that further modifications to the law will allow him to expand the therapy.

A month ago, an investigatory television programme, *The Hyena*, reported that children with incurable diseases such as spinal muscular atrophy were being denied supposedly important treatment, and Italian show-business personalities joined the call to relax rules on stem-cell treatment.

In Italy, the compassionate use of as-yet-unapproved therapies is allowed on an emergency basis for dying individuals who have no other options, and the national health service must provide them for free. The law requires that health authorities approve the quality of such therapies, but some of its terms

are ambiguous, says Amedeo Santosuosso, a Milanese judge and a professor at the University of Pavia who specializes in science and law. "That has been the underlying problem in the Stamina debacle," he says. "In the case of the Stamina Foundation therapy, there is no suggestion that it might be efficacious, so in my opinion compassionate use is not legitimate."

Vannoni says that he developed the therapy after having successful stem-cell treatment for a virus-induced facial paralysis in 2004 in Russia. He invited a Russian and a Ukrainian scientist to Turin to develop the method and says that Stamina has since treated 80 or so patients — including people with Parkinson's disease, Alzheimer's and muscle-wasting disorders. He has not published the outcomes or precise details of his therapy, which uses the mesenchymal stem cells from bone marrow that differentiate into bone, fat and connective tissue. In his protocol, the cells are extracted from patients, manipulated in the laboratory and then re-infused.

Vannoni acknowledges that he has not published outcomes but says that the method is far from alchemy. Each treatment uses five types of cell, he explains, with their claimed characteristics tuned to replace damaged tissue or to secrete molecules that could reduce inflammation, fight infection or promote blood-vessel growth. "Whatever the disease, one of the types of cell is going to have the right effect," he says.

When a 2007 European Union regulation required that stem-cell therapies follow the same safety and efficacy rules as pharmaceuticals, Vannoni moved his lab to the republic of San Marino. "There, rules were not so strict," he says.

But his work had drawn the attention of a Turin prosecutor, Raffaele Guariniello, whose investigations concluded that Vannoni's operation could be "dangerous to public health". Vannoni says that Guariniello marshalled international pressure to stop him working in San Marino, so he moved to Trieste, where he says Guariniello again stopped his work.

From there, Vannoni moved to a public hospital in Brescia. Last May, a delegation including representatives of the Italian Medicines Agency (AIFA) and the ISS, the health ministry's national institute, visited the Brescia lab and reported chaotic conditions: ethics-committee approvals had been based on inadequate information, and there were no detailed protocols or patient follow-up, for example. The AIFA closed the lab, stating that the facilities could not be trusted to produce contamination-free preparations.

Patients and families turned to the legal system to allow treatments to continue as compassionate use; many of the courts concluded that it was a patient's right to receive treatment and that health services must offer it, and in some cases the Brescia lab once again supplied cells.

Some of the compelled treatments led to the only publication of clinical results so far. Clinicians at the Burlo Garafalo Children's Hospital in Trieste treated five babies with type I spinal muscular atrophy and published the results last October (M. Carrozzi *et al. Neuromuscul. Disord.* **22,** 1032–1034; 2012). They found that "the treatment did not change the course of the disease", says co-author Marco Carrozzi. Vannoni argues that the therapy failed because the clinicians did not use his exact cocktail of cells.

Setting himself against his own regulatory agencies, Balduzzi had earlier angered scientists when, on 7 March, he authorized continued therapy for a three-year-old child with the deadly disease metachromatic leukodystrophy — provided that the stem cells were created in a good manufacturing practice (GMP) facility. Thirteen academics, including Cattaneo and Santosuosso, published an open letter to Balduzzi warning him of the dangers (see go.nature.com/pb1wdl; in Italian).

***"The treatment did not change the course of the disease."***

That authorization was bad enough, says Paolo Bianco, a stem-cell scientist at the University of Rome who co-signed the letter. "Now the minister is allowing the non-GMP version and saying that an unauthorized, unpublished, unknown practice is a 'treatment'."

Balduzzi's decree is likely to be his last legislative act in Italy's outgoing government, and scientists hope that his successor will respect the role of the AIFA and other science-based agencies. AIFA president Luca Pani declined to comment on the political decision but says that his agency is sticking to its statements on the safety and efficacy of the stem-cell preparations from Brescia. "Our ban holds," he says. ■

POLICY

# Drug-company data vaults to be opened

*European agency will publish firms' clinical-trial results.*

**BY DANIEL CRESSEY**

International calls for the pharmaceutical industry to share the results of clinical trials have grown ever more intense amid revelations that high-profile companies have hidden crucial data on safety and efficacy. Now Europe is moving towards measures that would significantly increase disclosure of such data.

The European Medicines Agency (EMA) in London, which licenses drugs for use in the European Union, is developing a policy to publish some clinical-trial data submitted by companies. And next month, major players in the UK medical community will meet to discuss the practical problems of data openness.

The meeting is likely to take place on 19 April and could feature representatives from biomedical charity the Wellcome Trust, as well as the Academy of Medical Sciences, the Association of the British Pharmaceutical Industry and the Association of Medical Research Charities. It marks a move from discussion to action, says Nicola Perrin, head of policy at the Wellcome Trust in London. "We should all stop discussing whether [the issue is] important or not and start having practical discussions about how we move forward," she says.

The United States already requires that clinical trials used to secure drug approvals are listed in a public online registry. Other countries have rules that encourage registration. But some researchers and campaigners fear that key details are not getting into the public domain, making it difficult to assess a drug's safety and depriving researchers of data.

Critics note, for example, that in recent years the London-based drug company AstraZeneca has been mired in legal problems including accusations that it concealed data on the side effects of its antipsychotic drug Seroquel (quetiapine). And GlaxoSmithKline (GSK), also based in London, has paid out billions of dollars after pleading guilty to charges including misrepresenting the safety of its diabetes drug Avandia (rosiglitazone) and the effectiveness of its antidepressant Paxil (paroxetine) in children. The Cochrane Collaboration, an international group of medical experts, has called for Roche in Basel, Switzerland, to open up its data on the influenza drug Tamiflu (oseltamivir) so that the group can assess the drug's efficacy.

Drug companies are making concessions. GSK and Roche have agreed to share data with scientists whose requests are deemed legitimate. But critics say that Roche has not established a fully independent group to assess requests.

Last year, following pressure from campaigners, the EMA said that it would proactively publish certain data submitted by drug companies. The agency is consulting industry and academic researchers and funders on ▶