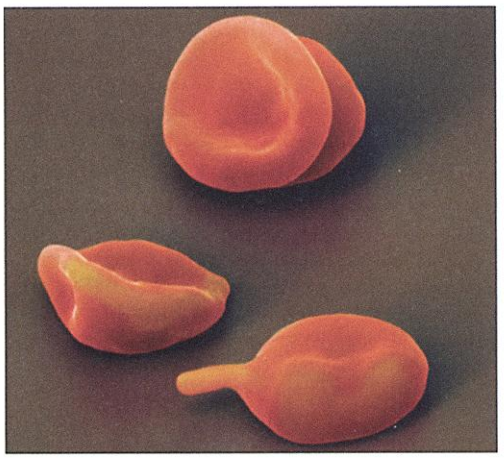

Bloodsuckers. A new compound kills malaria parasites (yellow) within red blood cells.

resistant strains of *Plasmodium falciparum*," says David Fidock, a molecular parasitologist at the Albert Einstein College of Medicine in New York City.

The compound, dubbed G25, aims at the third stage of the malaria life cycle in humans. The parasites first enter the bloodstream, dribbled in with the saliva of mosquitoes, as sporozoites, and then they quickly burrow into liver cells. There they multiply by the tens of thousands and emerge a week later as merozoites, which infiltrate red blood cells. These merozoites are the target of G25. Once inside the red blood cell, also known as an erythrocyte, a single merozoite produces some 20 progeny. These erupt from the cell, reinvade the bloodstream, and colonize yet more erythrocytes. This stage of the parasite's growth cycle is responsible for virtually all clinical symptoms of malaria, because the parasites can eventually colonize and destroy up to 70% of all red blood cells, causing severe anemia, fever, convulsions, coma, and death.

To Vial and his colleagues, the parasites were vulnerable because of their need to package each of their erythrocyte-born progeny in protective lipid membranes. Uninfected erythrocytes, in contrast, engage in no lipid synthesis of their own. By targeting this synthesis, Vial says, "in theory we would be attacking metabolism that is not present in the host cell and so would not affect the host cell. But if you prevent the parasite itself from synthesizing lipids, it will not survive."

Over the course of 20 years of research, Vial and his colleagues dissected the pathway by which the parasite takes choline from blood plasma and converts it into the major component of its protective membranes. They then demonstrated that blocking synthesis of phospholipids stops parasite replication. Finally, they designed the newly reported compound, G25, to block the receptor for choline transport, which can be found both on the surface of the infected erythrocytes and on the membrane of the parasite sequestered within.

The results were dramatic. In rodents and primates infected with *P. falciparum*, the most lethal form of malaria, G25 effected quick and total cures at low doses. "A few days after the first injection, all the parasites in the monkey were dead," says team member Clemens Kocken of the Biomedical Primate Research Center in Rijswijk, the Netherlands.

G25 is both easy to make and inexpensive—essential qualities for a drug that will be used in sub-Saharan Africa, where 90% of all malaria cases arise, and Southeast Asia, both of which are plagued by multidrug-resistant malaria. One drawback is that the drug must be injected. And, as Michael Gottleib, chief of parasitology at the National Institute of Allergy and Infectious Diseases in Bethesda, Maryland, points out, the researchers "obviously need a lot more toxicity data before it becomes obvious that this compound will be therapeutically effective." Vial says his team hopes to have a more convenient oral candidate for preclinical studies within 2 years.

–GARY TAUBES

CREDITS: (TOP TO BOTTOM) OLIVER MECKES/NICOLE OTTAWA/PHOTO RESEARCHERS; STEPHEN CHERNIN/AP; A. SEILACHER *ET AL.*, *SCIENCE* **282**, 80 (1998)

PALEONTOLOGY

Earliest Animal Tracks Or Just Mud Cracks?

When they were first discovered, the wiggly grooves on slabs of ancient sandstone from central India were dramatic enough: They appeared to some to be 1.1-billion-year-old worm tracks. That date would push the earliest known record of complex animals back a startling half-billion years (*Science*, 2 October 1998, p. 19). But, it

Wormy or just groovy? These putative worm tracks are now dated at 1.6 billion years.

ScienceScope

Rockefeller Rocked Rockefeller University is reeling from the resignation this week of its president, molecular geneticist Arnold Levine (below). The New York City university's trustees released a terse note on 10 February saying that Levine had offered to resign, "effective immediately," because of "health considerations." Rockefeller's interim president during the search for a new chief will be molecular biologist Thomas Sakmar, currently chair of the academic senate.

Levine, a prominent molecular biologist best known for his role in discovering the *p53* gene implicated in many cancers, was not available to comment. But in the statement he said that "I have become aware of matters affecting my own personal health that I need to address immediately." According to sources close to the university, Levine tendered his resignation after the board learned that he and a single female student had behaved "inappropriately" in the faculty club bar on 10 January.

Levine has been "an admired and inspirational leader," said chief trustee Richard Fisher, noting that he recruited 14 new lab chiefs and launched a $350 million fund-raising campaign.

Grant Nixed The U.S. Red Cross last week unexpectedly turned down the first stem cell research grant awarded under the Bush Administration's new policy (*Science*, 17 August 2001, p. 1242). On 7 February the National Institutes of Health (NIH) told Red Cross researcher Robert Hawley that he had won a $50,000 grant to extend to humans his mouse studies of blood cell production. But Red Cross chief scientist Jerry Squires returned the cash, saying that the group's research priorities have changed since he took over last summer.

Some observers believe the Red Cross, already reeling from a fund-raising controversy that prompted former head Bernadine Healy to resign in October 2001, rejected the grant to avoid criticism from anti–stem cell research groups. "My fear is their fund-raising agenda is affecting their research agenda," says Tony Mazzaschi of the Association of American Medical Colleges.

Meanwhile, NIH announced last week that it has added six South Korean stem cell lines to its registry of approved lines, bringing the total to 73.

arrest; researchers then determine whether it induces blood flow. "It can't inflict pain," explains Lee Parmley, interim chair of critical care and the leader of the study.

The second and third subjects in the Pasqualini team's study are not brain dead but "nearly dead"—unconscious patients on ventilators with failing organs but continued brain activity. This set prompted additional scrutiny to ensure respect for the patients' wishes.

Although the team has published results on just one subject, scientists such as McDonald are impressed. The group homed in on certain sets of peptides that share similar amino acids, including one that appears specific to prostate blood vessels. But uncertainties remain. Due to their grave condition, these subjects may not be broadly representative, says UCSF ethicist Bernard Lo. In addition, the sheer number of peptides infused could interact with each other to skew results. Arap says that double-checking against other tissue samples to confirm results suggests that thus far, these problems haven't surfaced.

Meanwhile, the biomedical community is notably silent, says Michael DeVita, a University of Pittsburgh physician. DeVita and three colleagues are planning a presentation at a conference this fall, where they will explore how the dead, on and off life support, may appropriately be used in research—and how they may not. **–JENNIFER COUZIN**

NUCLEAR HISTORY

Letters Aver Physicist Supported Nazi Bomb

For more than half a century, historians have speculated about a private conversation that took place in September 1941 between German physicist Werner Heisenberg and Danish physicist Niels Bohr. Long-secret letters released on 6 February by the Niels Bohr Archive in Copenhagen finally provide an answer. They flatly contradict claims made by Heisenberg after the war that he told Bohr he intended to subvert the Nazi bomb program from within.

Eighteen months after German troops occupied Denmark, while the Nazi war machine was still crushing all in its path, Heisenberg traveled to Copenhagen to see his former mentor, Bohr. The two Nobel laureates talked in private, and Heisenberg said something about nuclear fission that so disturbed Bohr that the Dane abruptly ended both the exchange and their long friendship.

Heisenberg later implied he had tried to signal that he knew it was possible to make an atomic bomb, but that he would subtly sabotage the German drive to do so. Bohr misunderstood his intentionally oblique language, Heisenberg said in a letter published in 1957 in Robert Jungk's history of atomic weapons, *Brighter Than a Thousand Suns*. Bohr disagreed with this account and drafted a letter to Heisenberg to set the record straight. He never posted the letter, however, and it surfaced only after Bohr died in 1962, folded into his copy of Jungk's book. The letter was to have remained sealed in the Bohr archive until 2012, but the Bohr family agreed to release it and 10 other secret documents ahead of schedule in response to the intense interest sparked 4 years ago by *Copenhagen*, the award-winning play by writer Michael Frayn that speculates about what the two men said. The archive published the documents on the Internet (www.nba.nbi.dk).

In the letter found in the book, Bohr writes: "You spoke in a manner that could only give me the firm impression that, under your leadership, everything was being done in Germany to develop atomic weapons and that you said that there was no need to talk about details since you were completely familiar with them and had spent the past two years working more or less exclusively on such preparations." In another letter, Bohr explicitly repudiates Heisenberg's contention that he implied he would undermine the Nazi bomb program. "It is therefore quite incomprehensible to me," Bohr writes, "that you should think that you hinted to me that the German physicists would do all they could to prevent such an application of atomic science."

Of course, the letters provide only Bohr's recollection of the conversation, says Gerald Brown, a physicist at the State University of New York, Stony Brook, who knew both men. "I don't think Bohr understood what Heisenberg was trying to say," Brown says. Heisenberg, who died in 1976, had no reason to endanger himself by revealing the Nazi nuclear research program unless he was try-

Fallout. Werner Heisenberg (left) and his mentor Niels Bohr, shown here in 1934, later split over German A-bomb research.

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ScienceScope

Northern Innovation Will the rhetoric match the reality? That's what Canadian scientists are asking after Industry Minister Allan Rock (below) unveiled a 10-year innovation plan this week. The long-overdue white paper affirms a government commitment to double annual R&D spending, to $9.2 billion, by 2010. It also backs greater commercialization of publicly funded academic research and at least 10 Silicon Valley–like "technology clusters." But academia must "more aggressively" contribute to industrial innovation if it wants more cash, the plan says.

The white paper kicks off 7 months of meetings leading up to a national innovation summit in October. Robert Giroux, president of the Association of Universities and Colleges of Canada, says that "the real test will be whether the government will be prepared to properly fund these initiatives."

Never Too Old Japan's rigid retirement rules have allowed Singapore to recruit an entire top-notch research lab, boosting the tiny nation's efforts to become a biomedical power. Molecular biologist Yoshiaki Ito, one of Japan's top cancer researchers, last week announced that his 10-person team at Kyoto University will soon move to the National University of Singapore. Ito will use a joint appointment at the Institute of Molecular and Cell Biology and the medical school to launch an Oncology Research Institute, another piece of Singapore's $1-billion-a-year investment in the life sciences.

Ito hopes his move will help shake up Japan's national universities, which require professors to retire in their early 60s. "I want to show that productivity [can extend] beyond retirement age," he says.

No to Lab Animal-rights protesters have blocked the development of a new primate research laboratory in Cambridge, U.K. Local officials last week rejected the University of Cambridge's request for a permit to plan the new center after police leaders said it might cost too much to protect the facility from protesters. The British Union for the Abolition of Vivisection and other groups had rallied against the lab. The decision sets a "worrying precedent," says the Research Defence Society, an advocacy group. The university may appeal, saying the setback could hamper its neuroscience program.

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