

Ancient Bacteria Brought Back to Life

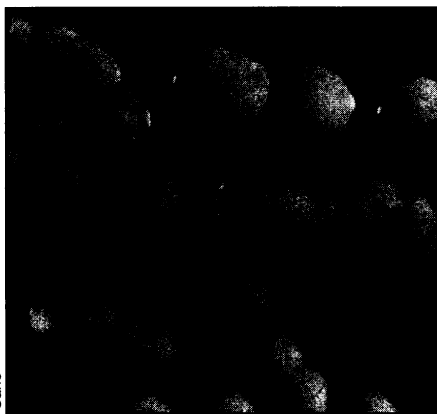
Talk about a good nap. A pair of microbiologists claims to have reawakened ancient bacteria that went to sleep when thunder-footed dinosaurs roamed the landscape.

In an experiment that recalls *Jurassic Park*, Raúl J. Cano and Monica K. Borucki discovered the bacteria preserved within the abdomens of insects encased in pieces of amber. In the last 4 years, they have revived more than 1,000 types of bacteria and microorganisms — some dating back as far as 135 million years ago, during the age of the dinosaurs.

In the May 19 SCIENCE, the two, from California Polytechnic State University in San Luis Obispo, describe resuscitating a species of bacteria from a sample of amber 25 million to 40 million years old.

If future tests duplicate such findings, the hoary bacteria would become the oldest known living organisms, far outlasting the most enduring animals and plants, whose lives span a few centuries or millennia at most.

Like other reports of revived bacteria,



Bacteria grown from ancient spores found inside a 25-million-year-old bee.

the new finding will draw criticism from researchers who believe that organisms cannot survive for millions of years. In past cases, skeptical scientists have dismissed purportedly ancient bacteria as modern contaminants.

But microbiologists familiar with the amber discovery say the work of Cano

and Borucki differs from previous efforts in the many precautions that the two took to rule out contamination. "I think the case they make for reviving the spores is a good one. I think they have proven their case beyond a reasonable doubt," says Philipp Gerhardt, a microbiologist from Michigan State University in East Lansing who studies bacterial spores.

"They've done all the controls that seem reasonable," says biochemist Peter Setlow of the University of Connecticut Health Center in Farmington. "But this is not something that can be proved beyond a shadow of a doubt," he adds.

In their paper, Cano and Borucki describe how they removed bacterial spores from a bee entombed in amber found in the Dominican Republic. Certain bacteria form spores as a survival tactic when threatened by a lack of food or water. The bacteria dehydrate and coat themselves with a protein shell that protects the dormant cells.

Cano and Borucki revived the spores in a nutrient solution and grew colonies of bacteria, which they identified as *Bacillus sphaericus*, a species that exists symbiotically in some bees. To address the contamination issue, they tested for bacteria on the surface of the amber, its interior, the solutions used in the experiment, and key locations in the lab.

Using a technique known as polymerase chain reaction, the scientists copied and sequenced a strand of the *B. sphaericus* DNA. The purportedly ancient DNA resembled a segment from modern *B. sphaericus* but did not match exactly, providing further proof that modern bacteria had not contaminated the experiment, the researchers say.

Cano believes the spores survived because the amber kept them dry. Recent work has demonstrated amber's remarkable preserving power. In 1993, Cano reported finding the oldest known DNA from insects in amber.

Although they first found the bacterial spores in 1991, Cano says they waited several years before reporting their work in order to validate the discovery. Because modern forms of the bacteria exist, the ancient types present no danger, he says. But he suggests they may provide new antibiotics or other useful compounds.

Setlow disagrees with the claim that the ancient bacteria may produce new antibiotics. But they could provide scientists with much-needed information about the mutation rate of DNA, a so-called molecular clock used to decipher evolutionary relationships among organisms.

— R. Monastersky

Physicists offer reassurances on EMF

The public has overreacted to reports linking electromagnetic fields (EMFs) to cancer, declares the 43,000-member American Physical Society in a new policy statement. More than \$23 billion has already been spent to minimize exposure to these fields — principally to alter the placement of power lines or the proximity of buildings to them, according to an accompanying background paper.

Many studies over the past 16 years have found hints of an above-average cancer risk within certain populations of workers and children exposed to EMFs. However, the APS statement notes, these studies have failed not only to link a consistent group of cancers to EMFs, but also to identify a plausible biophysical mechanism by which these power-line fields might foster cancer.

"The diversion of these [billions of dollars] to eliminate a threat which has no persuasive scientific basis is disturbing," the APS statement says. Moreover, it argues, "more serious environmental problems are neglected for lack of funding and public attention, and the burden of cost . . . is incommensurate with the risk, if any."

Why issue such a policy statement now?

"We've been tracking this for almost 7

years," says Robert Park in APS' Washington, D.C., office. "And all this time we've been watching as the epidemiology got fainter . . . and one proposed mechanism after another got shot down. Yet public concern [over EMFs and power lines] seemed to be rising. So we decided to take some action."

Park says the new policy "would stop short of saying there's no reason to continue research" in this area.

Epidemiologist David A. Savitz of the University of North Carolina at Chapel Hill agrees that "we don't know with these fields whether there's any risk at any level." However, he adds, "if you take studies that I and others have been involved with — and take their findings literally — they suggest there's a hazard at exposure levels that we currently live with." So if the cancer-EMF link proves real, merely avoiding extreme exposures may not be sufficient to eliminate risk, he says.

"That makes the policy options quite difficult," he says, and suggests that adopting no- or low-cost measures for prudent avoidance may make sense.

Park, by contrast, argues that "this whole argument about prudent avoidance has been terribly detrimental." He says the public has misinterpreted it to mean that there is some risk, not merely the possibility of risk.

— J. Raloff