would allow them to screen many people rapidly and more rigorously test their findings in AIDS-KS patients.

NCI's Gallo says that if a herpesvirus does turn out to play a role in causing KS, "it will go a long way to further understanding a major issue in KS that has been gnawing us for a long time." But he adds that he believes such a finding will complement rather than supplant the work by his lab and others, including Miles' lab at UCLA, on the role of chemical messengers called cytokines—in particular, various interleukins, tumor necrosis factor, and basic fibroblast growth factor (bFGF)—in the formation of KS lesions. Gallo, Barbara Ensoli, and co-workers think HIV's Tat protein may work synergistically with the excess levels of bFGF found in HIV-infected people to induce KS lesions—and they have done experiments in mice that support this thesis, detailed in the 20 October issue of *Nature*.

Moore agrees that even if he and his colleagues do isolate a new herpesvirus, it may fit in well with hypotheses about cytokines. "It could be that this agent doesn't transform cells but works through a secondary mechanism like cytokines," says Moore. Alternatively, Miles suggests that a herpesvirus could transform cells, making them susceptible to wayward growth from secondary factors like cytokines.

Whatever the actual mechanism of tumor formation is, says Moore, "this virus is probably playing a central role." That thesis will be intensely scrutinized over the coming months. But if it stands up, solid headway will have been made toward solving a vexing riddle that arose more than a decade ago when an old tumor began popping up in new places, with deadly results.

–Jon Cohen

PHYSICS

Can Sound Drive Fusion in a Bubble?

JOSEPH T. CARLSON / U.S. NAVY

Point of light. A bubble flashes, driven by sound waves from transducers around the flask.

At Lawrence Livermore National Laboratory, the hundred-million-dollar machine known as Nova fills a room the size of a gymnasium. Built to study nuclear fusion, Nova is the most powerful laser in the world. Its 10 beams zap a tiny hydrogen-filled pellet from all sides and cause the pellet to implode, creating temperatures and pressures approaching those in a hydrogen bomb.

Meanwhile, on a benchtop in a nearby building sits a second machine, this one nameless. It cost about $2000 and consists of little more than a flask of water surrounded by several sound-generating transducers. Yet according to recent calculations, this simple device can produce temperatures and pressures just two or three orders of magnitude short of those in Nova. And if things work out as Livermore's William Moss hopes, the device or one like it may someday rival Nova's temperature-pressure combinations. If so, such a tabletop tool could someday be used to trigger fusion—at least on a very small scale in the laboratory. "We don't expect to power the Energizer bunny," Moss says.

He and others, who discussed these calculations last month at a meeting of the Acoustical Society of America in Austin, Texas, are quick to point out that this scheme has nothing to do with an earlier "fusion in a flask" notion. Five years ago, cold-fusion advocates claimed they could fuse atoms of deuterium, or heavy hydrogen, without the bother of high temperatures and pressures. There are no such shortcuts here—only a clever idea for doing some of the same physics Nova does, but on a smaller scale and with finesse instead of brute force. Even so, the idea faces skepticism from laser fusion experts. It's not impossible, says John Nuckolls, a former director of Livermore, but he thinks it's "highly improbable" that Moss and his colleagues can achieve the necessary temperatures and pressures.

The scheme stems from a research area far removed from fusion: sonoluminescence. For several decades, scientists have known that passing sound waves through water can cause myriad tiny air bubbles to form and then collapse with a flash of light, but only recently have researchers begun to get a good idea of what is happening in the bubbles (*Science*, 14 October, p. 233). Six years ago, Felipe Gaitan at the University of Mississippi found that by carefully tuning the frequency of the sound waves, he could create a single, stable bubble that stayed in one place and expanded and contracted, emitting light, in sync with the applied sound. That gave researchers a simple system to analyze in detail—what Seth Putterman of the University of California, Los Angeles, calls "the hydrogen atom of sonoluminescence."

Following up on the discovery, Putterman and his student Bradley Barber found that each light flash lasts less than 50 picoseconds (10^{-12} seconds). Another student of Putterman's, Robert Hiller, studied the spectrum of the flashes to learn that temperatures inside the bubbles must climb to tens of thousands of degrees or more. The most likely explanation for these observations seemed to be that the walls of the collapsing bubble generate an imploding shock wave that squeezes the gas and briefly pushes the temperature and pressure sky-high.

In the last 2 years, Putterman's co-workers C. C. Wu and Paul Roberts did calculations supporting this picture, leading Putterman to speculate about producing low-level fusion in the bubbles. More recently, Moss attacked the problem with a Cray supercomputer and complex computer codes that had been designed to simulate implosions in bombs. According to his calculations, for about 10 picoseconds the temperature at the center of the imploding bubbles peaks at between 100,000 and 1 million degrees and the pressure at 100 million or more times normal atmospheric pressure.

No one has directly measured conditions inside the tiny, pulsating bubbles to confirm the predictions, but researchers think they're in the right ballpark, says Larry Crum of the University of Washington. "When Moss got involved," he adds, "I thought he would shoot down the idealized calculations." Not only did Moss confirm the calculations, Crum says, but "he became excited too."

The excitement stems from both the scientific fascination of a simple system that can create such extreme conditions and the realization that the temperature and pressure in the bubbles need to be increased by a few—perhaps just one or two—orders of magnitude to fuse deuterium. That may still be a tall order, but Moss has been studying how to increase the force of the imploding shock wave by shaping the sound waves. He believes it should be possible to give the shock front an extra push by adding a "spike" to the acoustic wave. And Mike Moran, an experimentalist working with Moss, thinks he has produced sonoluminescence with bubbles containing deuterium instead of normal air.

The next step, which Moss and co-workers are already preparing to take, will be to run the experiments and watch for neutrons—the signature of a fusion reaction. That will be the real test, Putterman notes. No matter what the simulations say about what's going on inside the bubbles, he says, the only way to be sure is to see for yourself.

–Robert Pool