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## The sky according to IRAS

The first half-year's data from the U.S.-Dutch-British Infrared Astronomy Satellite (IRAS) have been combined into this map of the entire infrared sky, missing only the areas indicated by the curved black stripes. The brilliant band across the image is the plane of our Milky Way galaxy, with the galactic center in the middle of the picture. As seen from our solar system, located off-center in the galaxy, the central region appears most intense because of

the concentration of IR sources there, while the smaller number of sources in the direction of the galaxy's near edge can be seen at the band's ends. Based on brightness measurements at wavelengths of 12, 60 and 100 microns, the hottest material is shown as blue and white, while cooler sources appear yellow to red.

The bright spot just above the center is a region of star formation in the constellation Ophiucus, while the two brightest

spots just below the plane at far right are similar regions in Orion. The isolated spot below right of center is the Large Magellanic Cloud. The hazy, blue S-shaped feature crossing the image from upper right to lower left is due to faint heat emitted by dust in the plane of the solar system. The superposition of hot material (stars) and cooler material (interstellar dust clouds) produces the white color in the central band of the galaxy. —J. Eberhart

## Surprising problems crop up in cholera vaccine work

Outsmarting a microorganism that causes widespread disease can be more difficult than scientists expect. Cholera, a diarrheal disease endemic in parts of Asia, has been under investigation for a century. Improvements in sanitation have limited its reach, but no satisfactory vaccine is available.

Armed with the powerful techniques of genetic engineering and a promising strategy, researchers several years ago optimistically set out to make an effective oral vaccine. The bacterial modification work was successful — two research groups now report the development of a live bacterium that lacks the gene for the cholera-producing toxin. But initial clinical trials of the potential vaccine indicate that the bacterium has yet another toxin up its sleeve.

Scientists had thought they knew exactly the means by which the cholera microorganism, *Vibrio cholerae*, produced diarrhea in the human body: The bacterium colonizes the small intestine

and secretes a potent toxin containing a subunit, called A, that irritates the bowel by stimulating production of a small biologically active chemical, cyclic AMP.

The mystery of the cholera microorganism has been considered to be its immunological characteristics. Both the outer surface of the bacterium and its toxin trigger an immune response in the human body. But neither vaccines made of killed whole bacteria nor of modified toxin molecules have produced the same long-lasting immunity that results from the natural disease. Faced with this puzzle, researchers decided the best vaccine would be one that closely resembles the intact bacterium. So they used recombinant DNA techniques to remove specifically the A subunit of the toxin gene.

Successful production of such a modified bacterium has just been announced by James B. Kaper, Myron M. Levine and colleagues at the University of Maryland School of Medicine in Baltimore. The work was reported in the April 12 *NATURE* and

the April *BIO/TECHNOLOGY*. A similar accomplishment was previously described by John J. Mekalanos of Harvard Medical School in Boston and colleagues.

Kaper and co-workers have begun clinical trials on about 35 volunteers. "The results we've seen so far show that the vaccine's efficacy is good," Kaper says. "But even with the cholera toxin gone, there is some moderate diarrhea." The diarrhea they observe lasts only a day or two, which might be a tolerable side effect in healthy adults, but it is not acceptable in a vaccine to be administered to small children in such areas as Bangladesh, Kaper says.

Kaper is now looking for another *Vibrio cholerae* toxin that can cause diarrhea. Mekalanos proposes that the residual diarrhea is not due to a novel toxin, but to other factors, such as excessive colonization of the small intestine by the vaccine microorganism. Kaper concludes, "Even though cholera has been investigated for a century, there are still surprises."

—J.A. Miller