Arti Gaur, PhD, assistant professor of neurology at the Geisel School of Medicine.

SOLVING THE DILEMMAS OF DETECTION AND DELIVERY

These multitasking chips may answer previously inscrutable questions about brain disease.

A biologist who focuses largely on detecting, treating, and curing brain cancer, Arti Gaur, PhD, works in another realm of neuromodulation: producing tiny chips that can find disease and deliver medication.

In collaboration with Axel Scherer, PhD, from California Institute of Technology, Gaur is developing devices that are just 1 millimeter by 1 millimeter—about the size of a grain of salt—but their impact could be enormous. These multitasking chips may answer previously inscrutable questions about brain disease by identifying the biomarkers that indicate the presence of disease, carrying medicine to parts of the brain that were until now unreachable, and monitoring the effects of treatment.

"We need to understand what's right in order to figure out what's wrong," explains Gaur. "There's an absolute randomness to which patients get brain tumors. Why do some children get gliomas? Is there an initial insult to the developing brain, or is it a failure of the immune system? Can we predict brain metastases—which develop from cancers that originate elsewhere in the body but kill more people than brain tumors?"

Gaur and her team of research assistants, graduate students, medical students, and undergrads—a team that includes clinicians, engineers, chemists, and biochemists—already have tested the chips in mice, and Gaur speculates it won't be long before patients in the intensive care unit volunteer to be part of human trials.

"Patients usually ask, 'How can I help?' before we've even finished explaining what we're trying to accomplish," Gaur says. And though she is not a clinician, she believes speaking with patients is one of the most important parts of her job.

"It's imperative for basic scientists to see patients, to be reminded of what we're fighting for and why we fight."