Targeted therapy to save healthy cells

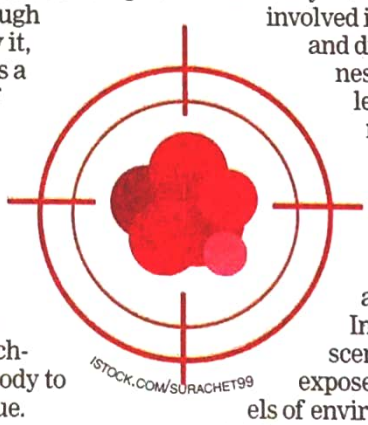
Prasun Chaudhuri interviews Subhrajit Saha of The University of Kansas Cancer Center, US, about his ongoing research



Radiation therapy is incredibly powerful, but its biggest limitation has always been the risk of damaging the healthy organs surrounding a tumour, says Subhrajit Saha (**in pic**). The thrust of his research is how to make radiation therapy safer, faster and more personalised. After all, when treating aggressive cancers in the abdomen — pancreatic or liver cancer — doctors often have to limit the radiation dose to protect the sensitive intestines nearby.

"This means the tumour might not get a strong enough dose to fully destroy it, which directly hurts a patient's chances of long-term survival. Our work bridges this gap," says Saha.

He goes on to talk about how his laboratory has uncovered multiple natural defence mechanisms within the body to protect healthy tissue.



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Fast and precise

Saha continues, "First, we discovered that specific immune cells release tiny biological messages that tell intestinal stem cells to quickly heal and repair themselves after radiation exposure. Based on this, we've helped develop smart, small-molecule treatments that kickstart this natural healing process in the gut. Additionally, our latest research shows that an advanced technology called Proton FLASH radiotherapy actually leaves the helpful bacteria in our gut microbiome untouched, allowing them to continue shielding the intestinal lining."

If conventional radiation is like a steady, slow stream, Proton FLASH is like a precise, lightning-fast burst.

It combines two advanced ideas. First, it uses protons — positively charged particles — instead of traditional X-rays. "Protons are unique because they can be programmed to stop exactly inside the tumour, leaving no 'exit dose' to harm tissues behind it," says Saha.

Second, FLASH delivers this dose at an ultra-high speed, completing the treatment in a fraction of a second.

Personalised radiotherapy

Beyond cancer care, the lab at the University of Kansas is deeply involved in national security and disaster preparedness. He says, "We lead federally funded research to create medical countermeasures that could be deployed during a large-scale nuclear accident or a dirty bomb threat. In these catastrophic scenarios, people are exposed to dangerous levels of environmental radiation, which can cause acute radiation syndrome — essentially shutting down the bone marrow, digestive system and skin."

Saha is working to design personalised radiotherapy. How will this work? He replies, "Every individual's body responds to radiation differently due to genetics and biology, yet standard cancer treatments today still use a one-size-fits-all formula. To change this, our lab takes tiny tissue samples from patients to grow miniature, living models of their organs in our lab, known as organoids. By testing radiation on these personalised organ models, we can study exactly how that specific patient's body will react."