

Is Kevlar™ Enough?

Sustained federal investment in scientific research is critical for even stronger, lighter materials

The ground-breaking discovery of a new way to make polymers resulted in the development of Kevlar™, a strong, lightweight material with broad technological uses that protect soldiers, law enforcement, and average citizens. Over 3000 law enforcement officers' lives have been saved by this technology, not to mention countless troops stationed throughout the world. But, American innovation cannot stop with Kevlar™. As law enforcement and US troops continue to defend themselves against continually developing threats such as armor piercing bullets, it is critical for federal agencies to continue to invest in basic research that will lead to the next revolutionary material.

While historically large corporations may have had the capital to invest in basic research, resulting in such accidental discoveries of strong yet lightweight materials such as Kevlar™ at DuPont, economic factors compel industry to have a focus that is much more targeted and applied. A **sustained federal investment in basic research** is critical not merely for broader applications of Kevlar™, but to cultivate the revolutionary discoveries that are made at universities and national laboratories and to transfer those innovative technologies to start-up companies and small to mid-size businesses. Such investment contributes not just to safety, but also to a stronger US economy through job creation and domestic production.

Sustained investment in basic materials research generates huge dividends

Basic Research

Outfitting Soldiers

Nanotechnology—Tougher Than Kevlar™?

Small Business Initiatives/ Technology Transfer

Sustained investment in materials science research

Basic Research

The discovery of poly-paraphenylene terephthalamide—popularly and commercially now known as Kevlar™—stemmed from an initial investment in basic research. Federal agencies such as the **National Science Foundation** must continue this investment in the study of polymers, nanocomposites, and nanotechnology for development of strong and lightweight materials.

Outfitting Soldiers

Supported by the **US Army**, the mission of the Institute for Soldier Nanotechnologies is to outfit soldiers with durable, comfortable, and lightweight battledress and to increase the protection and survivability of soldiers with new technologies. Among key initiatives in the project are the development of stronger polymeric, metallic, ceramic, and hybrid materials to protect soldiers from blast and ballistic threats.

Nanotechnology—Tougher Than Kevlar™

Sustained investment in fundamental research seeks materials that are strong and lightweight like Kevlar™, but in anticipation of defending against more advanced munitions and more extreme environmental conditions, continued work is needed to develop a material as or even more resistant to failure. With funding from the **National Science Foundation** and the **US Office of Naval Research**, researchers at the University of Pennsylvania and Rice University work to create materials fortified by single-walled carbon nanotubes resulting in a nylon-polymer composite with greater strength and toughness. Northwestern University is supported by the **US Army Research Office** through a **Department of Defense Multidisciplinary University Research Initiative** to develop novel fibers engineered from polymer bound and spun carbon nanotubes with the potential to provide a material better than Kevlar™ at absorbing energy without breaking. This material has potential applications in bulletproof vests, parachutes, or as a composite with other materials for vehicles, airplanes and satellites of the future.

Small Business Initiatives/Technology Transfer

Department of Defense funding agencies and the **National Science Foundation** continue to invest in Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs that support development of Kevlar™ and future materials beyond Kevlar™, efforts that create jobs and stimulate the US economy.

