National Security

Idaho National Laboratory

A Beautiful Mind

The Global Initiatives for Proliferation Prevention Program

At the height of the Cold War, it is estimated that the former Soviet Union employed nearly one million scientists and engineers in more than 4,000 institutions and state-sponsored laboratories. Due to an oppressive government, many of these technical experts were forced to be involved in the design, manufacture, and production of illicit chemical, biological and nuclear weapon systems.

Today, more than 750,000 Cold War scientists still live and work in the region. Due to conditions such as an uncertain economy, volatile political situations and a growing infiltration by terrorist organizations, it has become essential to national security for the United States to play a key role in engaging, retraining and redirecting the activities of former weapons scientists into peaceful and productive alternatives.

The Global Initiatives for Proliferation Prevention Program (GIPP) is one way in which the Department of Energy and the United States are working toward a more secure homeland by redirecting displaced WMD experts in Russia, the former Soviet Union, Libya, Iraq and other regions of proliferation concern, into sustained nonmilitary employment.

Since 1992, the program has helped scientists, engineers and researchers from the countries of the former Soviet Union convert their knowledge away from nuclear, chemical and biological weapons production, and into peaceful and commercially viable alternative technologies. Technologies developed under this program include breast cancer identification software and land mine detection products. In 2005, the program was extended to include the countries of Libya and Iraq.

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Scientists from the former Soviet Union work on a variety of peaceful scientific projects as part of the Global Initiatives for Proliferation Prevention.

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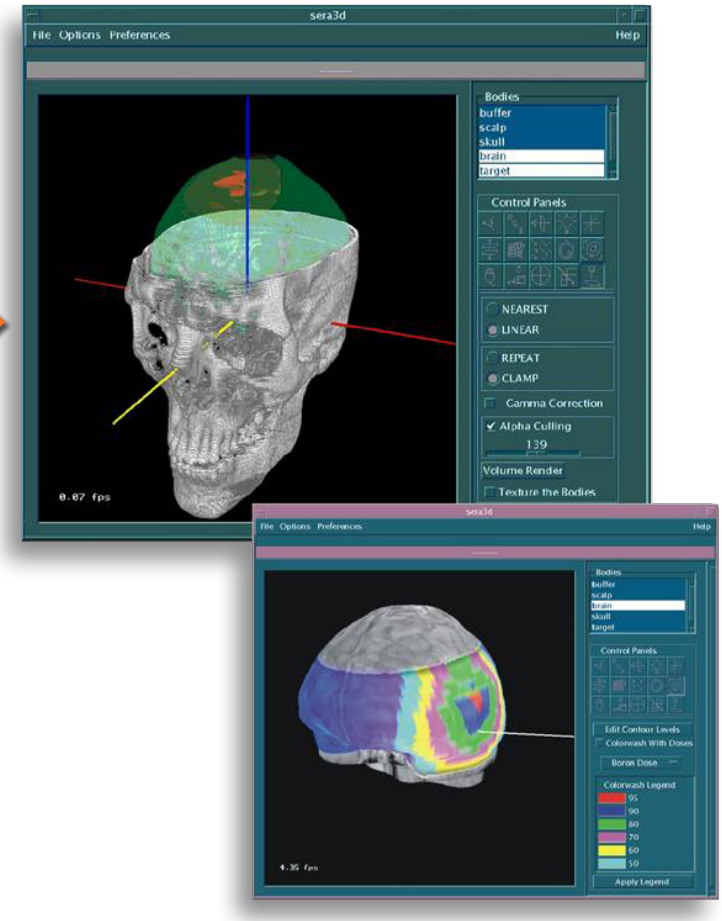
INL's Involvement

Idaho National Laboratory has participated in the program since its inception. In fact, INL's Dr. Trudy Overlin was elected in 2006 to a two-year term as chairperson of the Inter-laboratory Board of the Global Initiatives for Proliferation Prevention (GIPP) program. In this capacity, Overlin serves as a liaison between DOE and 12 national laboratories and other DOE facilities on international non-proliferation projects.

INL also participates in and oversees work in five active GIPP programs which range from the development of cancer treatment software to microbial decontamination techniques and enhanced concealed weapons detection devices. Additional efforts include work in anti-arthritic treatments, development of bioinsecticide products and cancer medicines.



INL and former Soviet Union scientists have developed an advanced cancer treatment technology that uses three dimensional algorithms to assist patients in planning treatment options.

Neutronics Computational Tools

This project works to combine state-of-the-art Monte Carlo radiation transport techniques and the most comprehensive nuclear and atomic databases available to construct a highly reliable three-dimensional neutronics optimization algorithm that can be applied both to designing cancer treatment facilities that use boron neutron capture therapy and to planning the treatments of individual patients at those facilities.

The emphasis of the research will be to develop accurate, fast and cost-effective ways of modeling how various materials moderate the energies of neutrons using methods originally developed in nuclear weapons design. The end result will be a set of tools for optimizing the dose distribution in the brain of the patient who is undergoing boron therapy.

Microbial Decontamination Deployment

This project involves the decontamination of concrete surfaces using biological microbes which erode the contaminated surface. This process is both environmentally friendly and a cost-ef-

fective alternative to current methods used to remove contaminated surfaces. Biological decontamination technology has been designed and developed to meet the costs and challenges of decontaminating and decommissioning these facilities.

Magnetic Induction Tomography Technology

International collaboration between INL, scientists from the former Soviet Union and General Electric has led to the development of new magnetic sensors that will enhance the capabilities of the INL-developed concealed weapons detector.

Most commercial metal detectors generate false positive alarms due to environmental noise factors. False alarms are further increased as the detectors range of operation is exceeded, such as in double-door configurations or stand-off operation. In addition, the levels of sensitivity required for scanning more than one person at a time are a difficult challenge to overcome.

On the other hand, the INL detector uses 16 passive magnetic sensors to replicate the Earth's ambient magnetic field. As contraband items pass through the field, they are rapidly detected and their location is pinpointed on a computer monitor. This immediate identification makes it easier for security guards to search an individual and identify and remove dangerous items. The detector can precisely locate items ranging from razor blades to handguns.

Now, the INL system has been enhanced with new, powerful sensors developed in Russia, which allow the detector to be installed in a double-door configuration and used to scan multiple people simultaneously. INL and the former Soviet Union are also working to develop sensors capable of detecting nonmetallic weapons and liquids.

The INL-developed concealed weapons detector has been enhanced with advanced low-cost sensors for detecting metallic and nonmetallic weapons and other concealed contrabands.

Bioinsecticide Products

At the Sibbiopharm facility, located in Berdsk, Russia, research is being conducted to capture, improve and commercialize advanced microbial bioinsecticide products used to disrupt the mating patterns of noxious insects and pests. In addition, investigative and explorative methods will be used to acquire and optimize the strain selection and specific manufacturing improvements to the virulence of current and discovered strains of *Bacillus thuringiensis* and *Bacillus sphaericus*.

This project is also applying sophisticated technology to develop a bioassay laboratory to guarantee that the Russian

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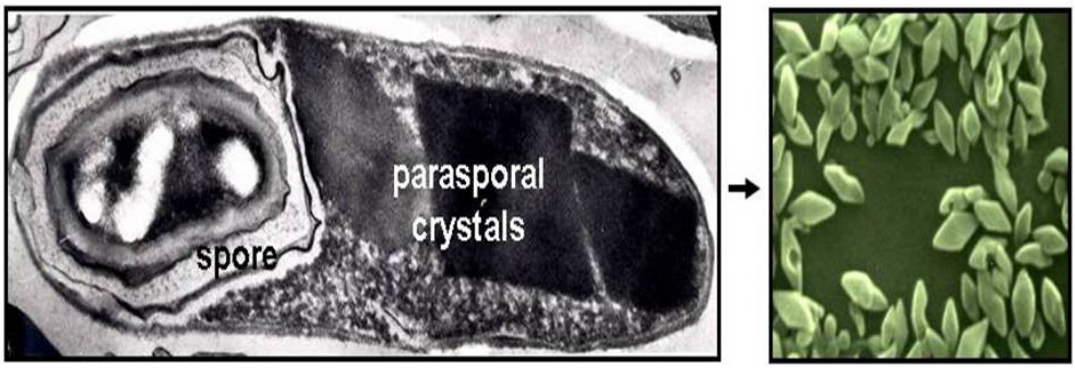
INL and former Soviet Union researchers are working to prevent the spread of West Nile virus by developing a natural mosquito deterrent using a soil-based bacterium.



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product meets or exceeds U.S. standards for technical and formulated entomopathogenic products.

Novel Anti-Arthritic Treatments

This project is working on the concurrent development of novel peptides, peptide analogs and nonpeptido-mimetics drugs as a treatment of inflammation associated with osteoarthritis and rheumatoid arthritis.

The approach is to design, synthesize and purify potential inhibitors of specific matrix metalloproteases, and with a U.S. industry partner, measure the ability of each potential inhibitor to reduce specific matrix metalloprotease activity in cell-free and in cell-based systems. The project work will investigate existing compounds that will be chemically modified in multiple defined ways, with each group of modifications forming a single existing compound, which will be retested for MMP inhibitor activity. The best compound from each group will be identified.

Development of Anti-cancer Treatments

This project collaborates with select Russian pharmacological research institutes to design, synthesize, identify, screen and develop novel and proprietary oncological drugs. Drug development will center on the synthesis of platinum-based compounds that can be matched with a commercial partner's "On-Off" anticancer platforms. The significance of the proposed work will be the development of a group of aggressive, platinum-based anticancer drugs that have limiting effects on nontargeted tissues. The outcome of this joint venture will be to design, synthesize and develop a library of anti-cancer agents with higher therapeutic indices than what is currently available in platinum-based anti-cancer drugs.

Major Accomplishments to Date

- 16,000 scientists, engineers and technicians at 180 institutes across the FSU engaged
- 7,400 FSU scientists and engineers currently engaged in GIPP projects.
- $195 million in private sector matches from U.S. industry
- 30 technologies commercialized and/or received venture capital since 1999
- $40 million in commercial sales and to U.S. industry partners and FSU scientists
- $119 million in private venture capital in support of GIPP projects
- 2,300 new high-tech jobs created in Russia, Kazakhstan, and Ukraine

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