



Alaska BRIN

Biomedical Research Infrastructure Network

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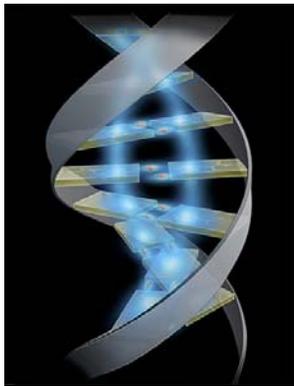
OVERVIEW: In September 2001, the University of Alaska (UA) accepted a \$6 million award to form an Alaska Biomedical Research Infrastructure Network (BRIN). The national BRIN program helps universities in rural states develop biomedical research excellence. BRIN research themes are blends of federal and state priorities. BRIN is the biomedical analogue of the National Science Foundation's EPSCoR program.

Each BRIN builds from the special talents and opportunities already in the state and addresses national research needs. For Alaska, our starting point was a May 2000 meeting on high latitude contaminants and biomarkers that the National Institute of Environmental Health Sciences sponsored in Anchorage. At that time, we resolved to develop UA expertise in "Toxicogenomics" - a science born from the 21st century revolution in genetic biology. Toxicogenomics asks how chemical contaminants damage proteins and genes in cells and tissues.

The national BRIN program aims to create enduring and self-sustaining research cores in the universities of each rural state. The Alaska BRIN will hire established investigators to build vigorous cutting-edge programs at UA. We will strive to leave a legacy of biomedical faculty who will win repeatedly in national competitions for federal funding in Toxicogenomics. Our Alaska emphasis will be on subsistence food species.

Each BRIN research core forms the heart of the statewide Biomedical Network that links research at the doctoral campus to teaching at the graduate, undergraduate, and pre-college levels across the state. We will train our own students to ask Alaska-relevant questions using state-of-the-art concepts and techniques.

RESEARCH CORE: Gerald Plumley at the University of Alaska Fairbanks (UAF) is BRIN Co-Principal Investigator (Co-PI) and Director of the Research Core.



Toxicogenomics springs from the explosively-expanding knowledge of the human genome. Genomics reveals that since all vertebrates share many similar genes, all manufacture almost identical proteins. Toxic contaminants can disturb the normal functioning of these genes or modify the corresponding proteins. Thus environmental toxicants could cause disease.

Fish and wildlife research is strong in Alaska. All fish and wildlife contain chemical contaminants; in Alaska these contaminants come from local sources and also from lower latitudes. We do not know whether these low-level toxicants perturb the genetics and physiology of subsistence species as they pass up the food chain.

The Alaska BRIN research projects will explore the impacts of contaminants on the genes and proteins in subsistence food species. To initiate and to sustain these efforts, BRIN funds will be used to support the following:

New teaching/research tenure track faculty:

- A senior-level, "Magnet Research Scientist", to be recruited at UAF. To win this position of Research Leader, a candidate should have made seminal research contributions in genomics or molecular toxicology, have a strong history of NIH R01 research funding, and bring current R01 funding.
- A junior-level biomedical scientist to be recruited at University of Alaska Anchorage [UAA]. Successful candidates must bring a strong publication record, have post-doctoral research training, and present a credible, well-documented research agenda in toxicogenomics.

New research instrumentation: Alaska BRIN will invest over \$1 million in state-of-the-art equipment including:

- A *real-time quantitative PCR apparatus* and a *microarray system and robotics unit* to facilitate study of the changing patterns of gene expression. With NSF EPSCoR funds, our Genetics Core Lab recently acquired devices to sequence DNA (see DNA structure in figure above), to isolate nucleic acids by partially denaturing high performance chromatography, and to screen rapidly for mutations.
- A *time-of-flight mass-spectrometer* to permit protein quantification (see protein structure at the left) and to reveal post-genomic protein modifications. Proteomics capability complements the emerging capacity for genomics at UAF.



Seed grants, small college partnership grants, and small equipment grants will “kick-start” new research ideas and allow collection of pilot data to develop competitive proposals for major NIH-funded programs in biomedical research.

Teaching and mentoring: Research in the university should always interface with teaching. We will support: 1) BRIN graduate research fellowships, 2) undergraduate student research projects [BURA, the BRIN Undergraduate Research Access program], 3) supplies, travel, and salaries for research mentoring which pair UA junior faculty with more experienced scientists, and 4) exchanges of faculty between institutions for research training.

BIOINFORMATICS CORE: Genomic and proteomic researchers generate complex extended data sets. Merely collecting long strings of base sequences does not necessarily provide meaningful understanding of cells or diseases. We need computational and biomathematical expertise to guide our design of experiments and to refine our analysis of the data streams. The Bioinformatics Core will address those challenges.



This Core will be one component of a new Bioinformatics Program, to be jointly funded by the NSF EPSCoR program, the NIH BRIN, the NIH COBRE program, the Arctic Regional Supercomputer Center at UAF, the Institute for Systems Biology in Seattle, and UAF. The Bioinformatics Program at UAF will include:

New teaching/research tenure track faculty:

- A position in Bioinformatics funded by NIH BRIN.
- A position in Bioinformatics/Biostatistics funded by NIH COBRE.
- Two Bioinformatics faculty (one of them a senior Magnet Investigator who will be Program Leader) funded by Alaska NSF EPSCoR.

Development of computer and statistical models that allow BRIN faculty and others at UA to glean new insights from our locally generated research data and to enrich the teaching environment for our students.

Workshops and seminars for faculty and students in areas related to Bioinformatics and Biostatistics.

Undergraduate and graduate training for professions in Bioinformatics and quantitative biology.

LIAISON CORE: Carl Hild at UAA is BRIN Co-PI and Director of the Liaison Core.



The Liaison Core provides an interface between BRIN research activities, Alaska educational entities, and citizens of the state who have a strong interest in biomedical research questions and findings. The specific aims of the Liaison Core are:

- To develop and maintain a BRIN Network among Alaska’s academic institutions.
- To link the Alaska BRIN to academic researchers outside Alaska.
- To provide a communication channel between Alaskan governmental and community organizations and biomedical research at UA.
- To create a two-way research dialogue which facilitates understanding between western scientific research and Alaska Native and traditional knowledge.

Biomedical and Health Research at the University of Alaska is supported by three other major federal capacity-building initiatives which have been funded within the past year:

- The NIH/National Institute of Neurological Diseases and Stroke has funded a **Specialized Neuroscience Research Program (SNRP)** at UAF. SNRP is recruiting a senior investigator and augmenting the research programs of three junior faculty with equipment, supplies, and mentoring. The Principal Investigator (PI) is Professor Lawrence Duffy at UAF (907-474-7525).
- The **Center for Biomedical Research Excellence (COBRE)** is another NCCR/IDeA program at UAF and UAA. It will establish an Alaska Native Health Research Center with an emphasis on obesity and diabetes. The PI is Professor Gerald Mohatt at UAF (907-474-6415). The Co-PI is Professor Bert Boyer at UAF (907-474-7733).
- The National Science Foundation **Experimental Program to Stimulate Competitive Research (EPSCoR)** includes all UA major administrative units. Two EPSCoR Research Focus Areas, “Integrative Approaches to Environmental Physiology” and the “Alaska Genomics Initiative”, have many biomedical aspects. Professor George Happ (907-474-1527) is Project Director for NSF EPSCoR and PI for NIH BRIN.