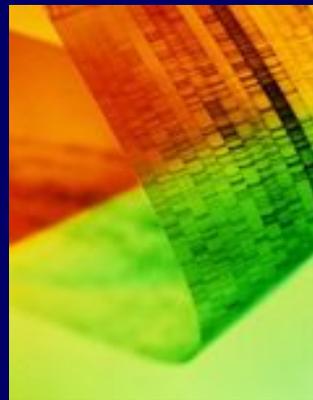


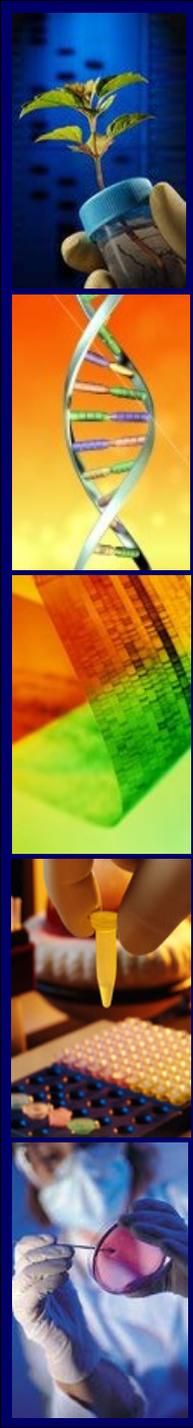
Progress Report of the NSABB Working Group on Outreach and Education



October 19, 2010

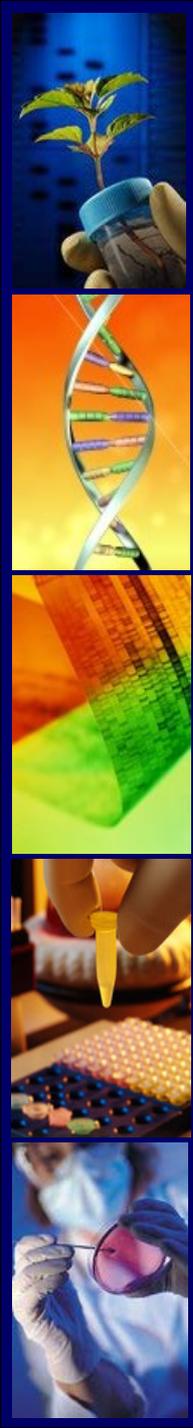
Initial Working Group Charge

- **Guide NSABB and staff on the development of strategies to educate the scientific community and public about dual use research;**
- **Recommend strategies for soliciting input from key stakeholders on Federal policy proposals; and**
- **Advise on development of specific outreach and education activities to include:**
 - Message development
 - Audiences
 - Vehicles for information dissemination.



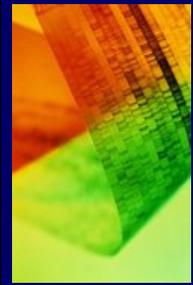
Implementation of Strategic Plan

- Web site as the portal for information on the NSABB, its meetings, work products; email inbox for public queries; listserv for updates
- Presentations and workshops to key constituency groups
- Exhibits at major meetings
- Poster presentations at meetings and conferences
- Video and educational brochure



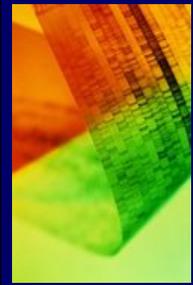
The Changing Nature of Biotechnology Research

- Projects that once cost millions of dollars can now be accomplished for only a few thousand, e.g. genome sequencing
- Increasing accessibility of biotechnologies to individuals outside of traditional institutions
- A growing hobbyist community (DIY and other amateur biologists)
- Lack of institutional infrastructure for training and oversight raises a host of biosafety and biosecurity concerns



The Changing Nature of Biotechnology Research

- **Historically, science developed in discrete disciplines of study**
- **Recent technological advances create opportunities that require disciplines to work together**
- **Synthetic biology, for example, brings together molecular biologists, computer scientists, engineers, and others**



New Charge for the Working Group on Outreach and Education

- Outreach efforts limited to life scientists at established institutions are insufficient
- The Federal government tasked the NSABB to recommend outreach strategies to:
 - Amateur biologists
 - Scientists in non-life science fields



Amateur Biologists

- Conduct biological experiments as an avocation (not profession)
- Also known as “Do-it-yourself” biologists

Do-it-yourself biology on rise

New breed of scientists using technology to experiment outside usual lab settings

By Julian Guthrie
CHRONICLE STAFF WRITER

In a kitchen in Saratoga, an electrical engineer is working with pure strains of *E. coli* purchased over the Internet in hopes of creating a handheld diagnostic tool to detect dangerous bacteria.

Out of a garage in Sacramento, a bioengineer is designing low-cost equipment to allow people to see and construct DNA.

From a studio in San Francisco, an artist is building houses from a medicinal fungus.

Across the Bay Area, and in other high-tech hotbeds, a revolution is under way. Citizen scientists — or biohackers, as they're being called — are taking biology out of academia and closed-door laboratories and bringing it into garages and kitchens, studios and warehouses.

The dream is to make breakthroughs that will ultimately benefit humanity, in fields as diverse as biofuel and cancer

Biology continues on A18

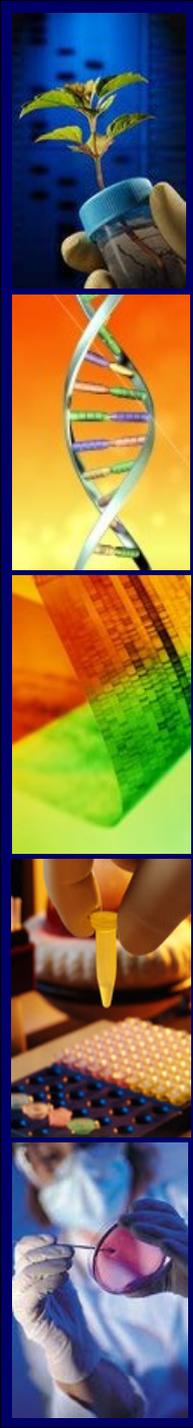


Tito Jankowski, who works on DNA research tools in his garage, started the San Francisco chapter of DIYbio.



Amateur Biologists

- **Community characteristics**
 - May not be formally trained as in science, biosafety, or biosecurity
 - Mostly conducting low biosafety level work (BSL1), but interested in learning about biosafety
 - Highly creative, curious, young
 - Early adopters of new technologies
 - Work outside of settings with infrastructure and oversight
 - May assemble into community groups
 - May not consider themselves researchers



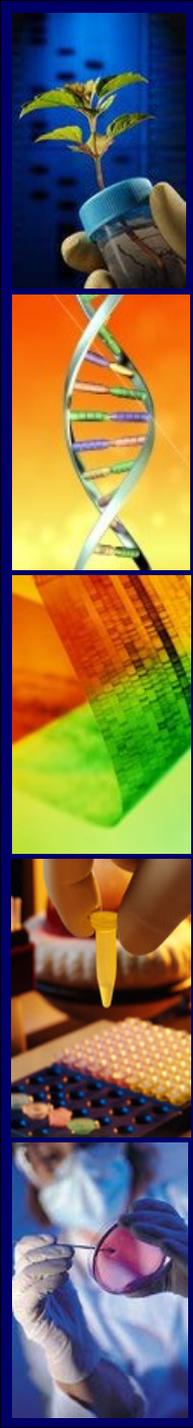
Scientists In Non-life Science Disciplines

- **Scope**
 - Those participating in life science research and collaborations
- **Community characteristics**
 - Span such fields as engineering, chemistry, computer science, mathematics, physics and others.
 - Not typically trained in biosafety and biosecurity
 - May not be subject to oversight by IBCs, IRBs, and IACUCs.
 - May be less familiar with oversight requirements even when subject to them



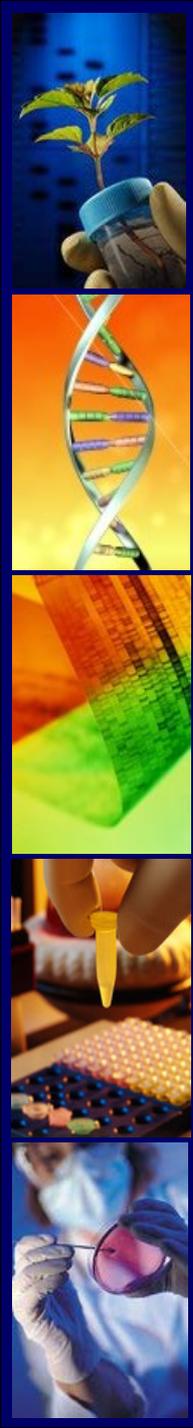
Approach To Understanding New Audiences

- Interviews were conducted with individuals who are members of, or familiar with, the two groups.
- The speakers answered discussion questions that were provided prior to interviews and answered questions from individual Working Group members.



Interviewees

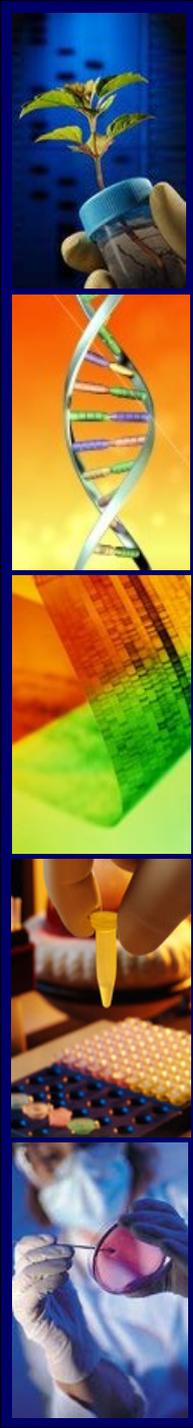
- **Kavita Berger, Ph.D.**
American Association for the Advancement of Science
- **Jason Bobe**
Co-founder, DIYbio
- **Drew Endy, Ph.D.**
Stanford University
- **Michele Garfinkel, Ph.D.**
J. Craig Venter Institute
- **Edward You**
Federal Bureau of Investigation

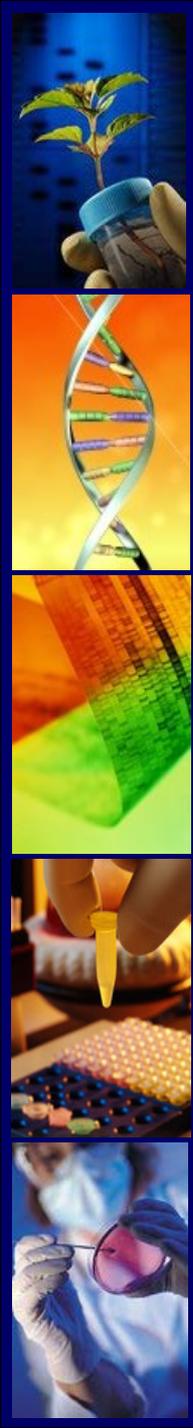


Additional Briefings

Additional interviews will be conducted as needed to:

- **Provide additional perspectives of the two new audiences**
- **Answer questions that arise during further development of the report**





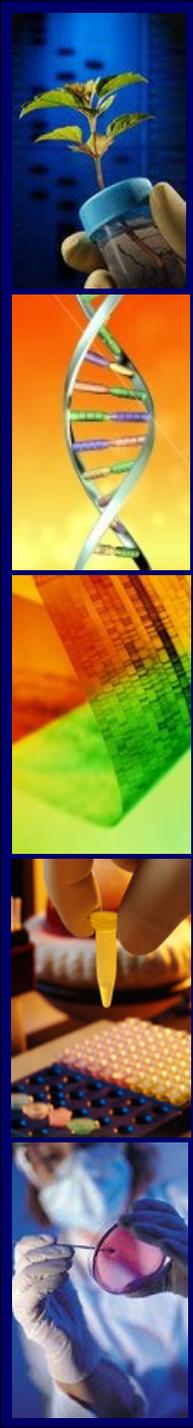
Strategies for Reaching Amateur Biologists

Observation

To the extent that amateur biologists are organized, this occurs under such groups as DIYbio, BioCurious, and genSpace

Indicated Strategy

Emerging organizations are key conduits for reaching an important segment of this community's members



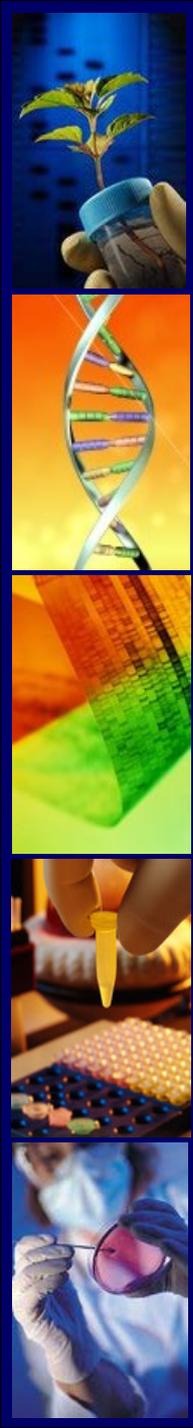
Strategies for Reaching Amateur Biologists

Observation

Community culture values reputation as “good citizen” and responsible user of research technologies

Indicated Strategy

Message points about dual use may be embedded in broader concepts of personal and social responsibility



Strategies for Reaching Amateur Biologists

Observation

Community has expressed desire to interact with many agencies, such as the FDA, USDA, etc.

Indicated Strategy

*Create opportunities for broad
Federal interaction*

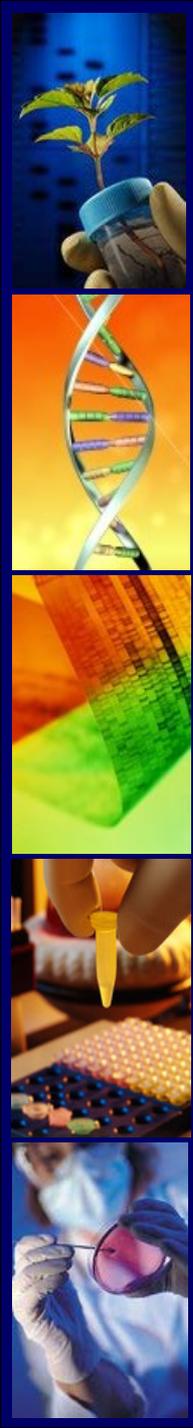
Strategies for Reaching Amateur Biologists

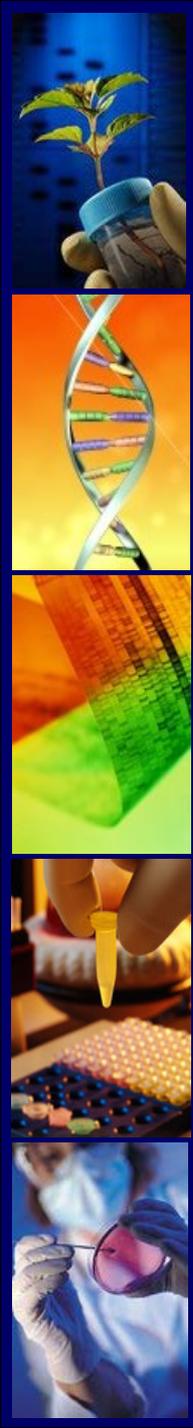
Observation

Community is skeptical of government's
interest in their activities

Indicated Strategy

*Message points should focus on the
possibility that amateur biologists can
develop findings and technologies that
could be abused by those who would do
harm*





Strategies for Reaching Amateur Biologists

Observation

Amateur biologists tend to be tech savvy, using Internet tools such as mobile devices, blogs, Twitter, Facebook, and Google groups to exchange information and organize

Indicated Strategy

Speaks to the value of electronic modes of communication

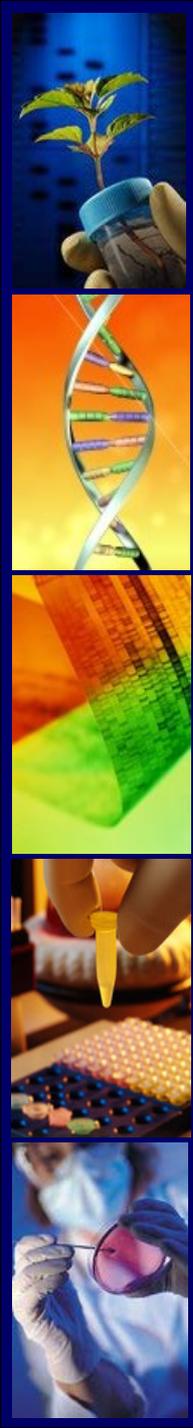
Strategies for Reaching Amateur Biologists

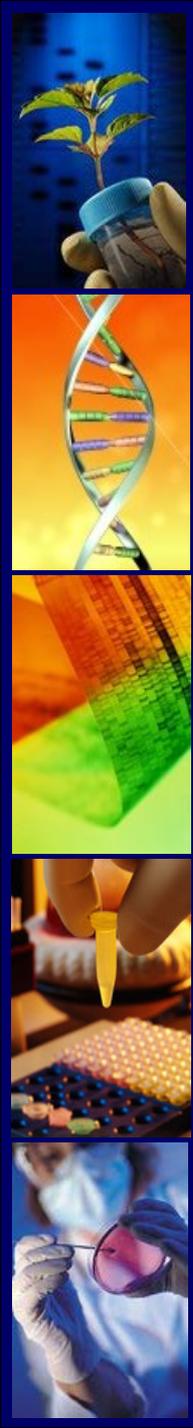
Observation

The youth and natural curiosity possessed by many in this group leads them to migrate to novelty devices

Indicated Strategy

Novelty and unconventional items can serve as effective conduits of information and messages regarding responsible research conduct





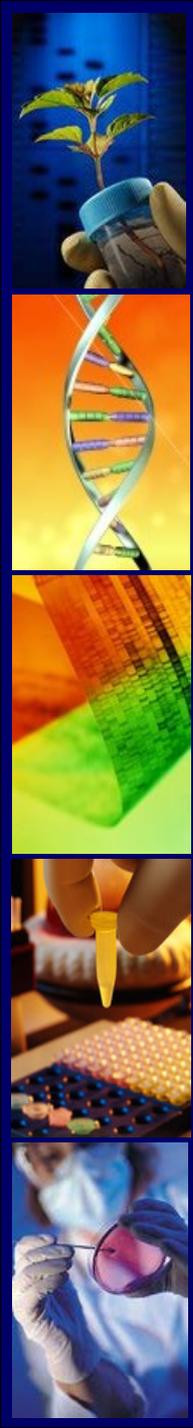
Strategies for Reaching Amateur Biologists

Observation

Have an interest in adhering to biosafety standards as a means of personal protection and social responsibility

Indicated Strategy

Message points about dual use research may be appended to information regarding biosafety practices



Strategies for Reaching Scientists in Non-life Science Fields

Observation

Individuals who collaborate in life science endeavors are extremely diverse in terms of training, scientific disciplines, and professional interests

Indicated Strategy

Outreach should take advantage of interdisciplinary mechanisms of communication (via associations, institutions, thought-leaders)

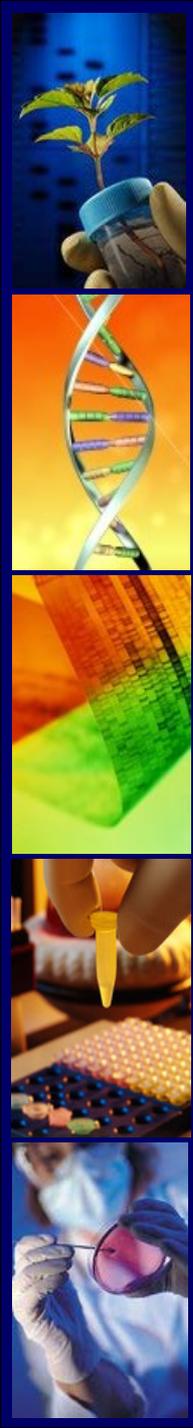
Strategies for Reaching Scientists in Non-life Science Fields

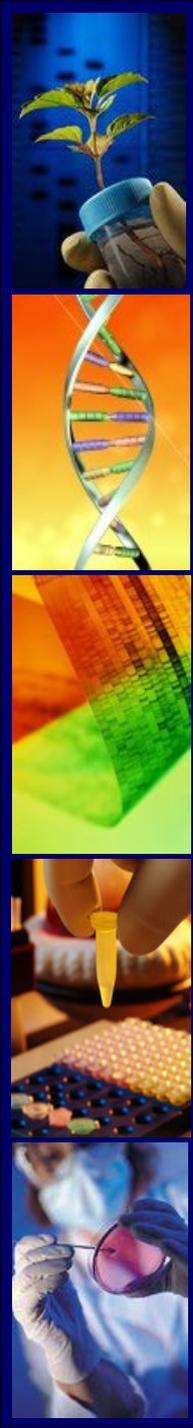
Observation

Many disciplines, such as physics and informatics, historically have had to consider the dual use implications of their research, and hence there is a greater acceptance and understanding of the dual use issue

Indicated strategy

The experience and familiarity of many non-life scientists with the dual use research issue can be leveraged for the purpose of communicating the issue to life science colleagues





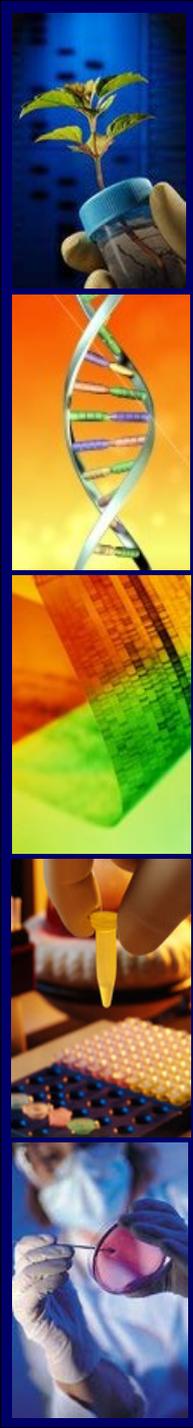
Strategies for Reaching Scientists in Non-life Science Fields

Observation

Practitioners of research in life science and non-life science fields share the responsibility for the integrity and safety of their work

Indicated strategy

Message points should note that non-life scientists should consider the ways in which the life science dimensions of their work could be misapplied, as their field may have already done historically for more discipline-specific activities



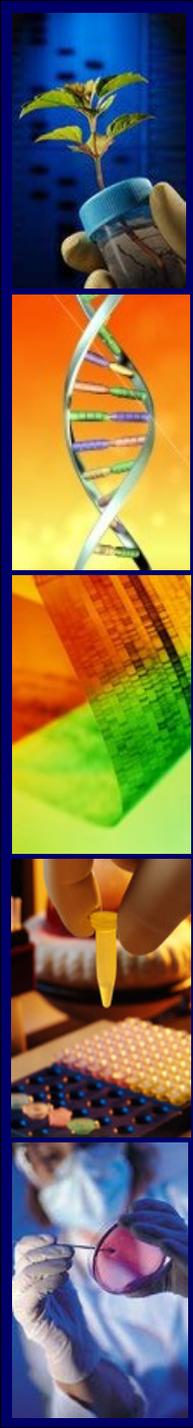
Strategies for Reaching Scientists in Non-life Science Fields

Observation

Young people tend to be more receptive to the dual use message, and furthermore educational strategies have a more lasting impact, and a true culture shift is more likely to occur, when the educational intervention comes early in the educational process and is performed repeatedly.

Indicated strategy

As is true of life scientists, sensitization to the dual use issue should occur early in the educational process, starting prior to doctoral-level training



Strategies for Reaching Scientists in Non-life Science Fields

Observation

Many of the educational tools developed to date have broad applicability

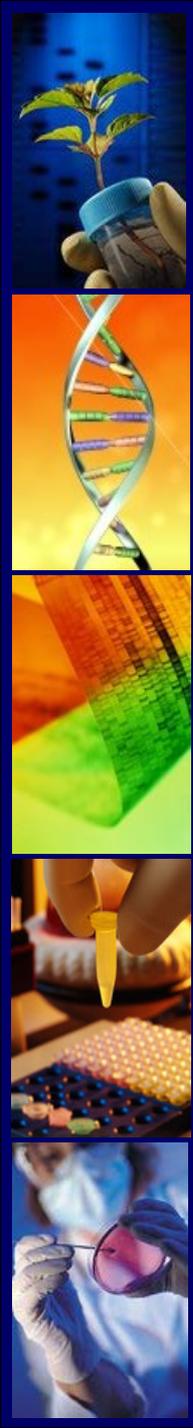
Indicated Strategy

Existing NIH educational tools have utility with respect to all scientific disciplines and should be fully utilized

Future educational tools should be developed with a scientifically diverse audience in mind

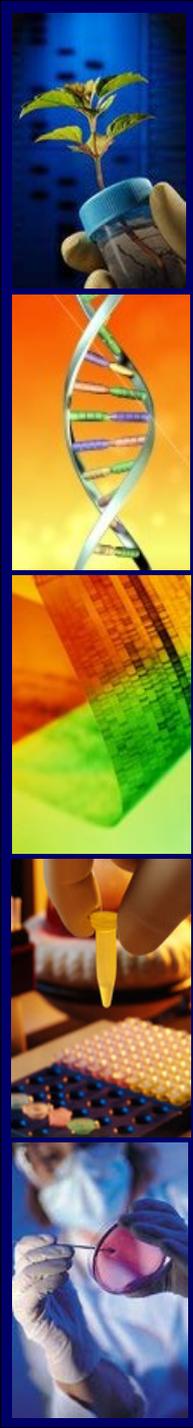
Conclusions

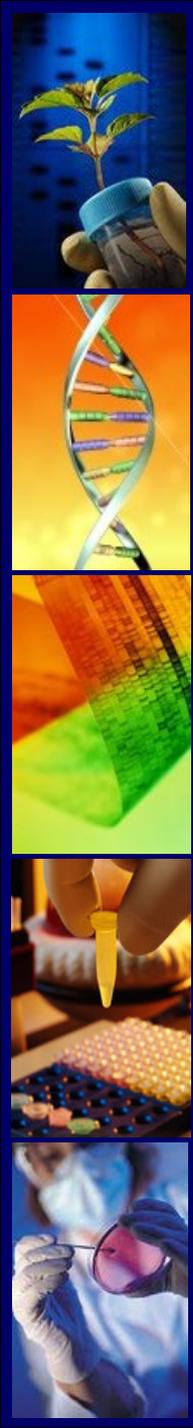
- Original strategic plan is still applicable
- Research on new audiences revealed special strategies that can be useful for these groups
- Opportunities for outreach and education are vast



Next Steps

- **Additional interviews**
- **Refining of the report**
- **Delivery of final report in February**





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