Frontiers in Population Genomics Research Workshop: Cross-disciplinary Training

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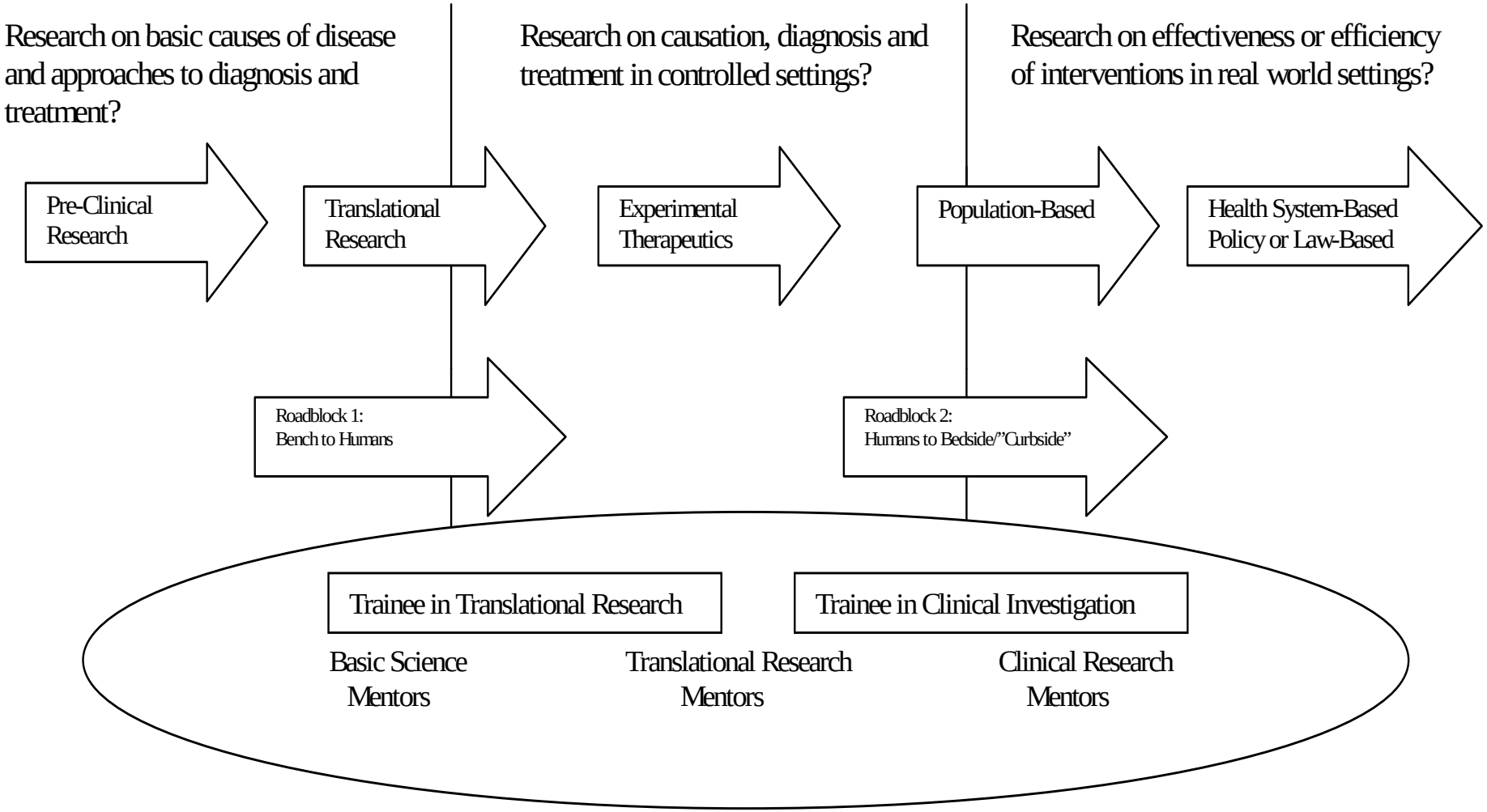
The Key Question for Training in Population Genomics Research:

What knowledge and competencies will be required for future leadership in population genomics research?

Conceptual Rationale for the Rochester CTSI Education and Training Key Function



Multidisciplinary Translational Research Teams

Premises for Cross-Disciplinary Training in Population Genomics

#1. Population genomics should be a model for bidirectional translational research training

Large, multidisciplinary research teams

Identification of novel pathogenetic mechanisms

Frequently include functional studies
- Gene expression
- Fine sequencing
- Animal models (e.g. knock-outs)

Prediction of disease at individual and population levels

Premises for Cross-Disciplinary Training in Population Genomics

#2. Population genomics involves a broad range of disciplines and methods, suggesting training having breadth (e.g. core curriculum) and depth (thesis project)

Population scientists need basic science:

- Biologic plausibility
- Genomic technologies
- Computational biology

Basic scientists need population sciences:

- Design of clinical/population studies
- Statistical genetics/biostatistics
- Translation of methods to clinical uses

Premises for Cross-Disciplinary Training in Population Genomics

#3. Population genomics is driven by technology; you can't study what you can't measure.

- Human genes, polymorphisms, etc.
- Gene expression
- Gene products/metabolytes
- Clinical phenotypes
  - Discrete outcomes (e.g. disease)
  - Continuous outcomes (anatomic, physiologic endpoints)

Premises for Cross-Disciplinary Training in Population Genomics

#4. Quantitative skills are essential for design, analysis, and interpretation of population genomics research studies.
    - Quality assurance/reproducibility
    - Evaluation of study efficiency and limitations
    - Sample size/power
    - Association
    - Prediction
    - Interaction/effect modification
    - Meta-analysis

Premises for Cross-Disciplinary Training in Population Genomics

#5. Computer science/informatics skills will be needed to participate in population genomics studies.

- Shared genomic databases
- Multi-institutional, multinational study populations
- Linkages of biorepositories to electronic medical records, morbidity/mortality registries, etc.
- Terminologies specific to informatics/computer science

Premises for Cross-Disciplinary Training in Population Genomics

#6. Cross-disciplinary mentoring may benefit the trainee performing cross-disciplinary genomics research.

Multidisciplinary mentoring team:

- Molecular Genetics
- Genomic Technology
- Informatics
- Biostatistics
- Epidemiology
- Clinical Nosology
- Diagnostic/Drug/Device Development

Premises for Cross-Disciplinary Training in Population Genomics

#7. A variety of practical skills will facilitate population genomics research.

- Research ethics
- Recruitment and retention of research subjects
- Intellectual property protection
- Community engagement

Strategies To Foster Research Training in Population Genomics

- Institutional and/or individual training and career development awards (e.g. T32, F32, K series, etc.)
- Collaboration with multi-institutional consortia with training components (e.g. CTSA, Cancer Centers)
- Courses/Curricula (Broad vs. Specific)
  - Summer institutes, short courses,etc.
  - On-line courses
- Training in access to and use of shared databases
- Mentor training in cross-disciplinary population genomics research