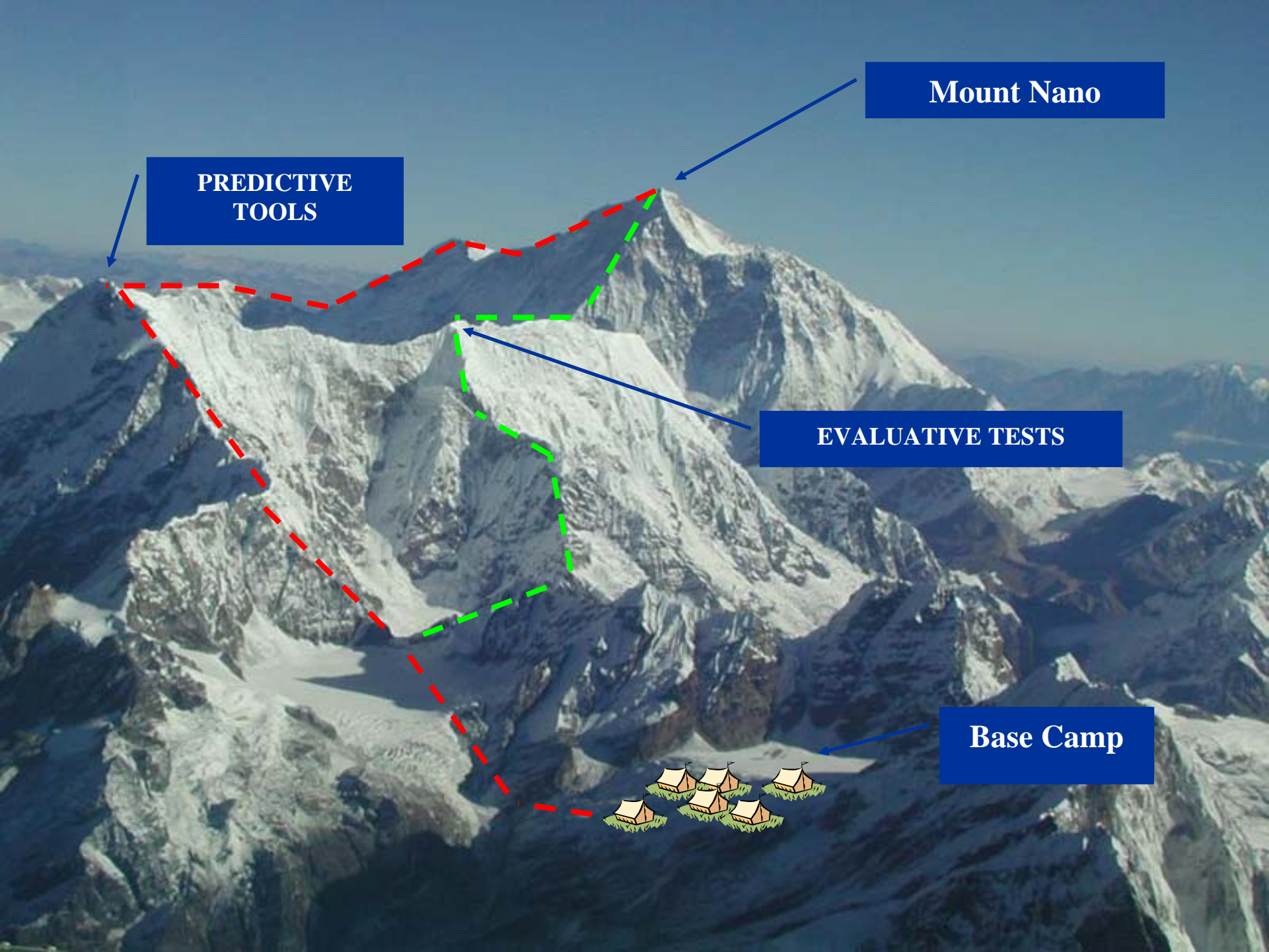


“Workshop Charge”

Wendy R. Sanhai, Ph.D.

**Senior Scientific Advisor
Office of the Commissioner, FDA**

FDA/ANH Workshop : March 11, 2008



**PREDICTIVE
TOOLS**

Mount Nano

EVALUATIVE TESTS

Base Camp



Mount Nano

Chasm

**Where we are on
some issues**

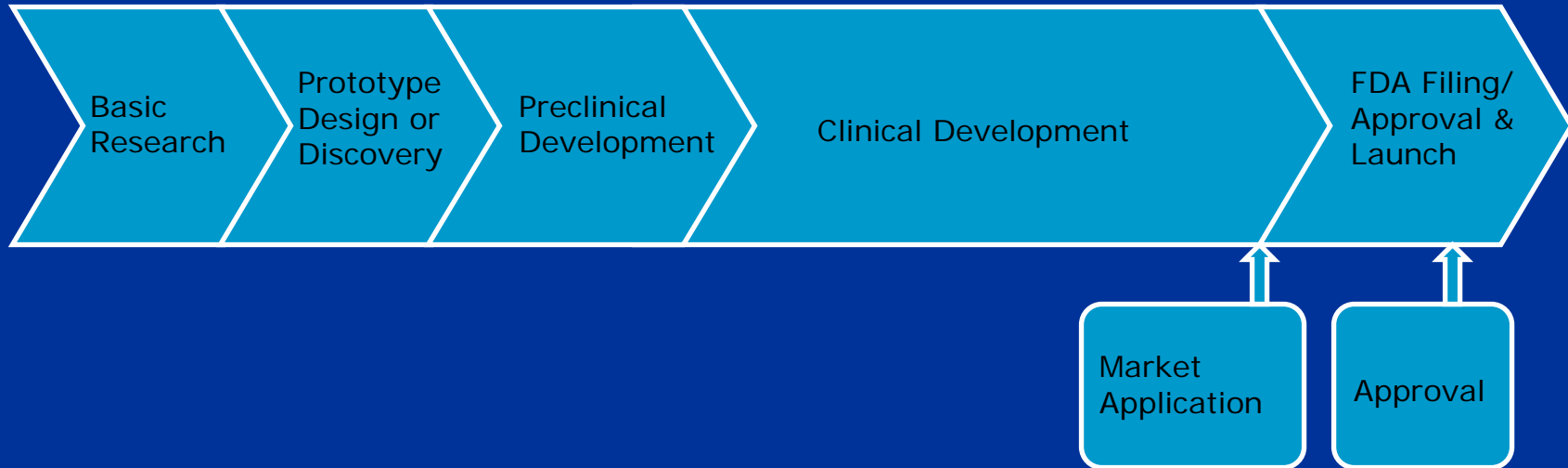
Early Pioneers

Stagnation



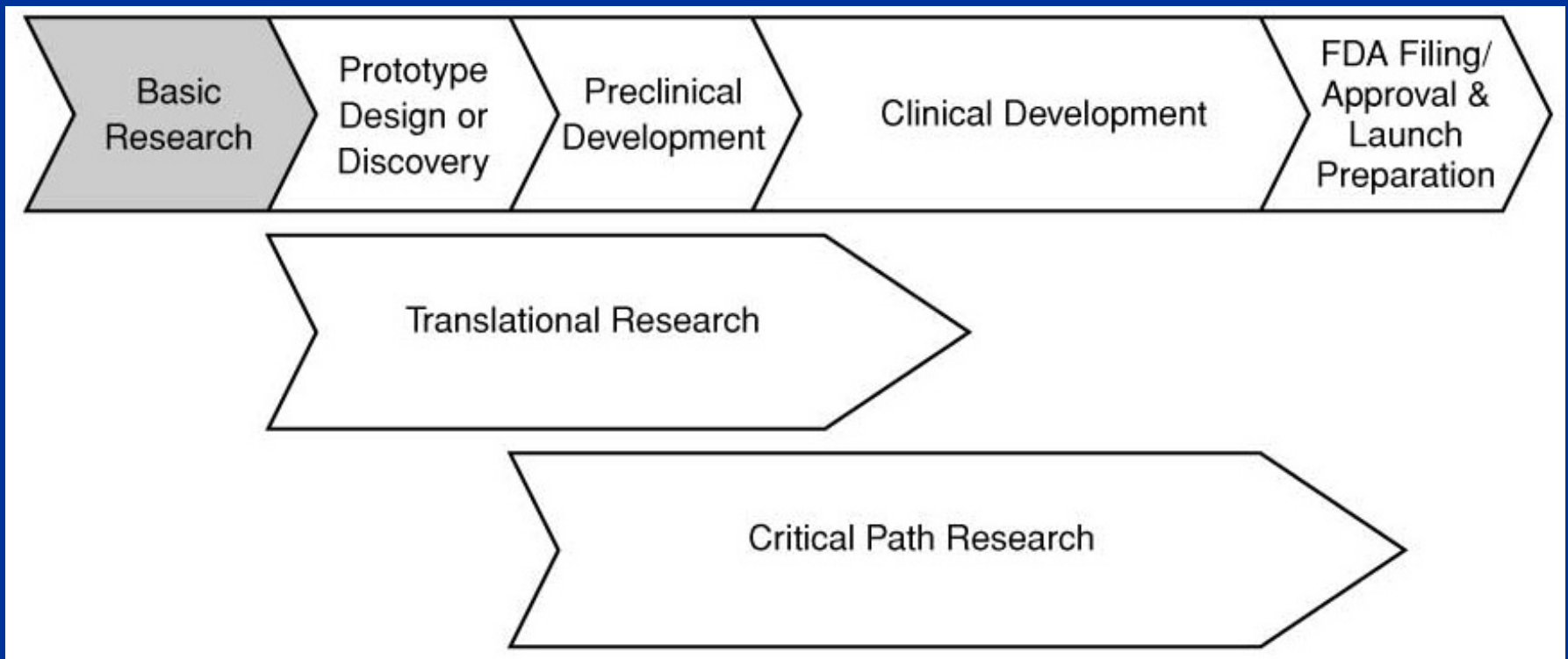
Innovation

Partner with Stakeholders to Bridge Gaps



CRITICAL PATH to NANO-PRODUCT DEVELOPMENT

Science Underlying The Critical Path of Medical Product Development: FDA has Unique Role



Science to evaluate safety & efficacy of new products, and enable manufacture, is different from basic discovery science

Scientific & Technological Challenges: Nanoengineered Product Development

- Lack of physical and chemical characterization methods and tools (*working with NCI, ISO, ASTM etc.*)
- Scientific gaps in (reproducible) control of stability of NP
 - Resulting lack of predictability in medical products
 - Potential adverse impact on environmental (*not in FDA's jurisdiction, EPA*)
- Lack of standards and reference materials
- Preclinical-Clinical challenges
- Manufacturing challenges

Scientific & Technological Challenges: Nanoengineered Product Development

Pre-Clinical/Clinical

- Safety Assessment (still needed)
 - Quantitative biodistribution/bioavailability
 - Rates of retention/clearance
 - Absorption, Distribution, Metabolism, Excretion (ADME), Toxicology profiles
 - Dose-response kinetics
 - Risk-benefit ratio (depends on pathology)

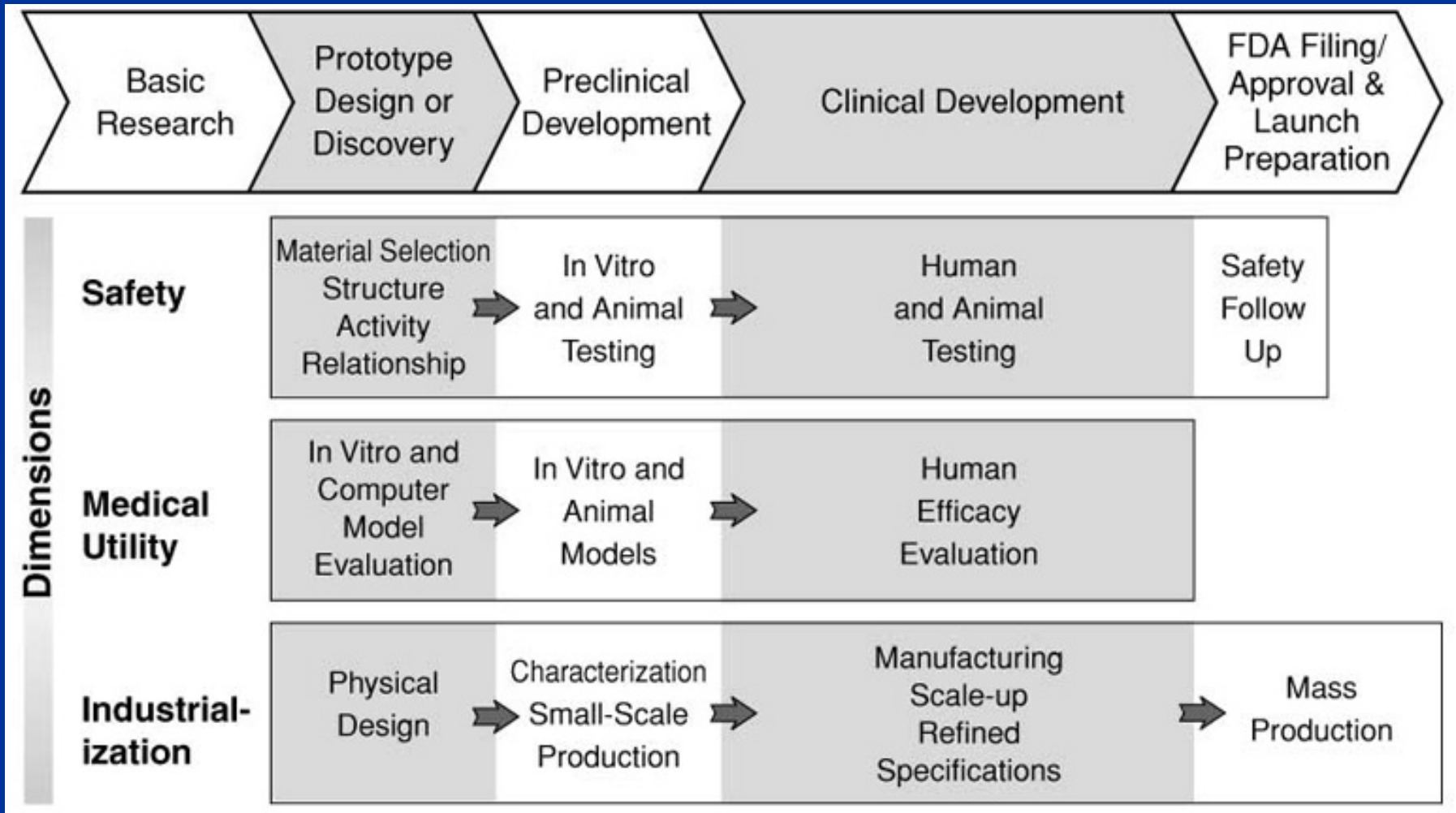
Scientific & Technological Challenges: Nanoengineered Product Development

Manufacturing *(costly even without additional challenges)*

- QA/QC
- GMP-is there anything special about nano?
- Special formulation issues?
- Batch-to-batch inconsistencies
- Unique chemical properties for nano?
 - Surface structure, charge-to-charge, reactivity, aggregation/agglomeration, size distribution, solubility?

Any Projects Proposed Today Must...

3 Key Dimensions on 'Critical Path' of Development



Shoot for the bull's-eye!



Think About Components of Strategy...

- Scope and Timeline (1yr...5yrs...) of activities
- Goals and objectives
- Source of sustainable activities (*projects and resources \$\$*)
- Growth strategy ?
- Resource deployments...what do we spend on?
- Synergy with aligned missions

CHARGE!

What is the Hurdle/Issue?

State the problem!

How do we remove the hurdle?

Identify key elements of the solution!

Who/What will benefit?

Outline:

Direct and Indirect benefits!

Immediate and Long Term Benefits!

Consequences of not solving!

State The Problem!

- 3-5 Sentences
- Where is the hurdle on the *Critical Path*?
- Pre-clinical/Clinical/Manufacturing?
- Any current activity in this area? (No Duplication!!)
 - *Think.... synergizing, leveraging, complementing*

Identify key elements of the solution!

- **Outline critical study design elements**
- **Identify needed resources:**
 - **Who can do what?...expertise**
 - **Instrumentation?**
 - **Infrastructure?**
 - **Sources of support?...financial, in-kind**
- **Timeline?**
- **Budget...estimate**

Who/What are Benefits?

- List potential scientific outcomes...what can this lead to?
- Where is greatest impact?... Pre-clin/Clin/Manu.
 - How will this solution, inform/stimulate medical product development?
- What can this lead to?
 - standards for industry?
 - regulatory decision-making tools?
 - Go/No-Go investment/screening decisions?

Types of Projects Should We Choose?

STARS

- Quantitative Imaging techniques and protocols to track Biodistribution/Rates of clearance post administration

???

Pie in the sky

LOW HANGING FRUIT

- Physical/Chemical Characterization,
- In-Silico Modeling

No-Deal!!

- Product-specific projects
- Proprietary/IP/company-specific
- Basic Research...
not Critical Path Research

A Process for Project Implementation

FDA/ANH Partnership Under the Critical Path Initiative



*Protecting Consumers,
Promoting Public Health*

U.S. Food and Drug Administration

+



Basic Steps in Developing PPPs with FDA

(not comprehensive! not consecutive!)

Start with the Public Health Need, SCIENCE!
Identify Priorities for multiple stakeholders (done 76!)

Identify gaps/avoid duplication
Hold expert workshop, Identify partners etc.

- Leverage resources/expertise
- Identify partners: define roles/responsibilities
- Co-develop: proposals, budgets, timelines etc.
- Implement joint *Proof-of-Concept* projects
- Share data in public domain as quickly as appropriate

Some Benefits

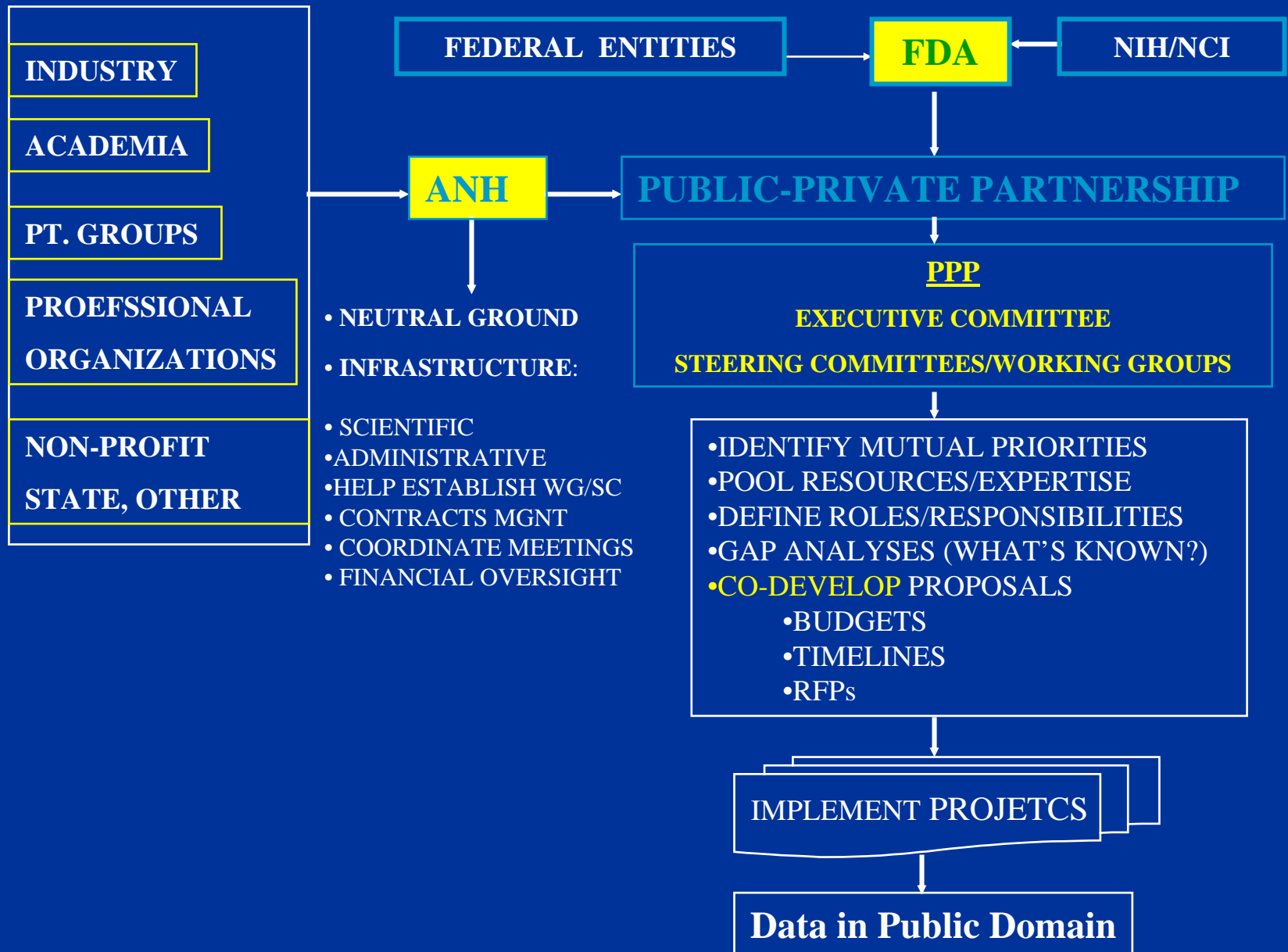
PRIVATE PARTNERS: Know-how, Predictive Tools & Input in Project Selection

ACADEMIA: Best Practices, Publications, Patents, Additional Grants

FDA: Guidances, Standard-setting, Evaluative Tools, Clinical Data

Patients: faster, safer and cheaper medical products!!!!

PROPOSED COLLABORATION MODEL



Basic Funding Options

FDA/ANH Nanotechnology Initiative

Private Only

Private

Public

Public Only

Individually or
in groups
launch project/s

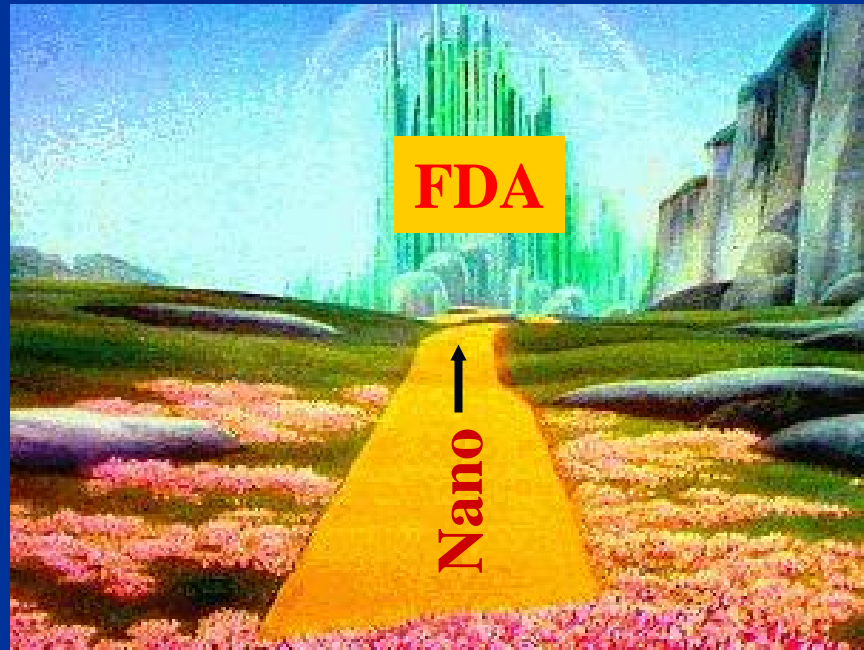
Launch PPPs with combination
of public/private resources
with mutually beneficial
goals and objectives

FDA, NIH, CMS
Other government

Data, new guidances, best practices, informed clinical decisions, evidence based medicine
Effective & safe medical products to patients faster, and more efficiently

R&D of Nano-Medical Products and the “Critical Path” to the Future

- Targeted Rx
- Drug Delivery Systems
- Reduced Toxicity
- Personalized Medicine



- Safety Assessments
- Simulation Modeling
- Imaging tools
- Predictive/Evaluative tools

Approved/Validated for intended use/s

Regulatory Guidances and Standards

CHARGE!

State the problem!

```
graph TD; A[State the problem!] --> B[Identify the key elements of the solution!]; B --> C[Outline: Direct and Indirect Benefits! Immediate and Long Term Benefits! Consequences of Not Solving!];
```

Identify the key elements of the solution!

Outline:

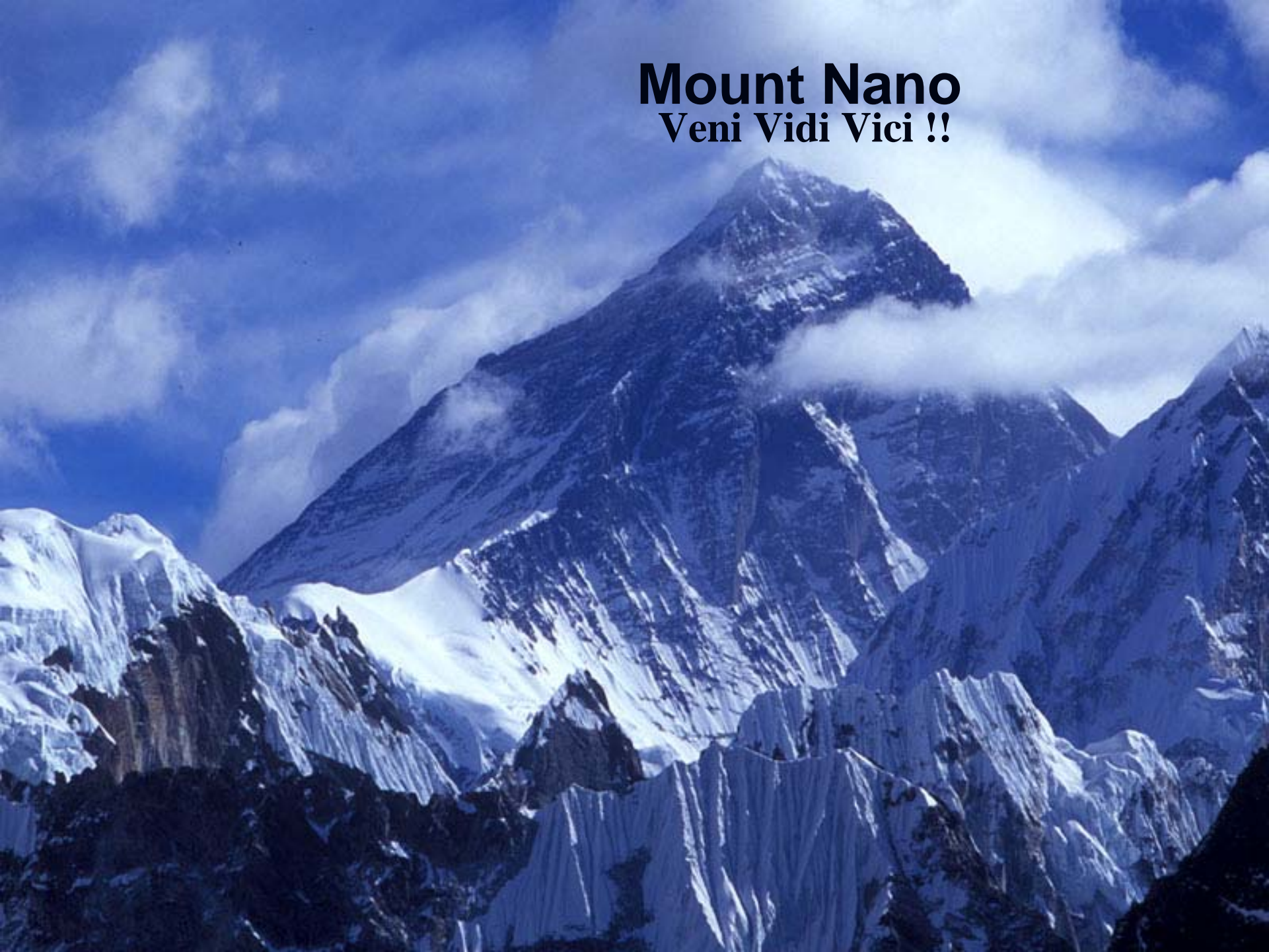
Direct and Indirect Benefits!

Immediate and Long Term Benefits!

Consequences of *Not Solving!*

Mount Nano

Veni Vidi Vici !!



*“The Best Way to Have A Good
Idea...
Is to Have Lots of Them”*

Linus Pauling, 2X Nobel Laureate