

# **Problems Undermining Public Confidence in and Understanding of Research**

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- **Failure to explain the importance of basic biomedical research to advances in medical practice**

# **Top Ten Medical Advances in Heart and Lung Diseases, 1930-1970**

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- **Cardiac surgery**
- **Vascular surgery**
- **Drug treatment of hypertension**
- **Treatment of angina and heart attack**
- **Cardiac resuscitation**
- **Oral diuretics**
- **Intensive care units**
- **Antibacterial drugs**
- **Detection of disease at early stage**
- **Prevention of polio**

# What Research Led to the Top Ten Medical Advances?

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- 140 consultants
- Reviewed over 4,000 articles
- Identified 137 essential bodies of knowledge that made the medical advances possible

*Comroe JH, Dripps RD. Science 1976;192:105*

# Essential Knowledge that Made Cardiac Surgery Possible

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## *Preoperative Diagnosis of Cardiac Defects*

- Anatomy/physiology of heart and circulation
- Electrocardiography

## *Preoperative Care*

- Blood groups/transfusion biology

## *Intraoperative Management*

- General anesthesia
- Heart-lung machine

## *Postoperative Care*

- Treatment of infections

# Essential Knowledge That Made Heart-Lung Machine Possible

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- **Basic understanding of the exchange of oxygen and CO<sub>2</sub> between lung and blood**
- **Basic understanding of the blood's clotting systems, and the development of anticoagulants for therapeutic use**

# Relative Contribution of Basic and Applied Research to the Top Ten Medical Advances

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***Basic research:*** Author made no mention of any possible diagnostic, therapeutic or other medical application

**Basic research:** 41% of publications

**Applied research:** 59% of publications



# RNA Interference

- **Nobel Prize in Medicine, 2006**
- **Simple and precise technology for turning off the expression of specific genes**
- **Potential in treating human disease**
- **Powerful tool for discovering disease-related genes**

# The Story of a Purple Petunia





# Problems Undermining Public Confidence in and Understanding of Research

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- Failure to explain the importance of *basic* biomedical research to advances in medical practice
- Failure to explain contradictory results from *applied* biomedical research

# Hormone Therapy and Heart Disease

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**1990's:** Observational studies involving millions of patient-years find a nearly *50% reduction* in heart disease, among users of hormone therapy

**2002:** Randomized controlled trial finds a *29% increase* in heart disease, among users of hormone therapy

# A New Truth?

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- Overnight, the “new truth” emerged: hormone therapy *increases* the risk of heart attacks
- Millions of women stopped hormone therapy—and symptoms of menopause returned in many
- A price worth paying?

# The Observational Studies and Randomized Trial Are Both Right: *The Age Effect*

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- Estrogen slows the development of atherosclerosis in young women and for 10 years after the start of menopause
- Thereafter, estrogen makes plaques of atherosclerosis more likely to rupture and cause a heart attack
- Therefore: Estrogen *reduces* the risk of heart attack in *younger* women, and *increases* the risk in *older* women

# **The Observational Studies and Randomized Trial Are Both Right: *The Age Effect***

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- **Women in the observational studies were in their late 40's and early 50's**
- **Women in the randomized trial had an average age of 63!**
- **In the few older women in the observational studies, hormones had little protective effect**
- **In the few younger women in the randomized trials, hormones had a protective effect**