



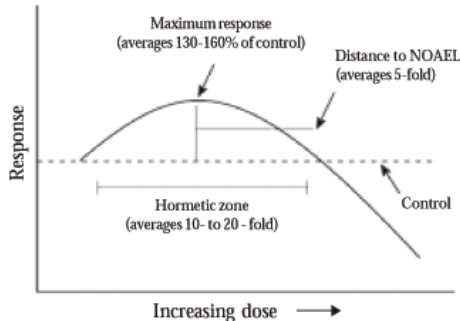
# Hormesis Research in the People's Republic of China: Past Trends in the Academic Literature and Future Directions

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## INTRODUCTION

The term hormesis refers to biological responses to chemical and physical stressors characterized by a low dose stimulation and high dose inhibition. Pollutants or toxins can elicit a moderately beneficial biological response at low doses. While hormesis research in the United States began decades ago and has become an established field, scientists from the People's Republic of China (P.R.C.) have only recently explored this subject, and their publications have proliferated significantly. The aim of this study is to understand the state of hormesis research in the P.R.C. and to provide insight to scientists and policy makers.



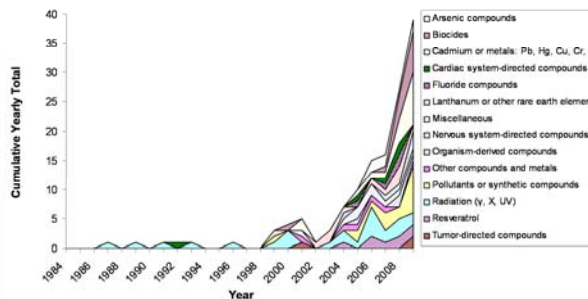
Cook, R. and Calabrese, E.J. The importance of hormesis to public health. *Environ Health Perspect* 114:1631-1635 (2006). Modified.

## METHODS

- Articles from scientific and medical journals were collected via:
  - a Web of Science (WoS) search: Address=(China) AND Topic=(hormesis or hormetic or Arndt-Schulz Law or U shaped dose response or J shaped dose response or biphasic dose response)
  - references from WoS results
- The search was not limited to a specific time frame.
- Articles that hypothesized, discovered, mentioned, discussed, or dismissed hormesis were accepted. All others were rejected.
- 66 articles were accepted from WoS and 21 were rejected. 70 reference-derived articles brought the total to 136.
- The earliest accepted article was published in 1987.
- Each article was classified by publication year, agent (e.g., chemical stressor), journal, source of funding, and location.

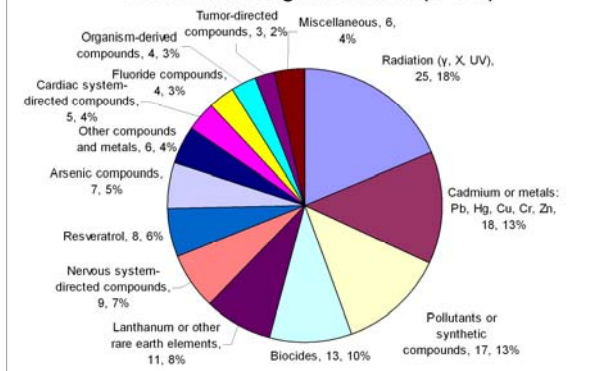
## RESULTS & DISCUSSION

Number of Publications per Year: Cumulatively and by Agent



- Strong evidence was found for:
  - a near absence of articles published before 1999.
  - a dramatic upward trend in the last ten years.

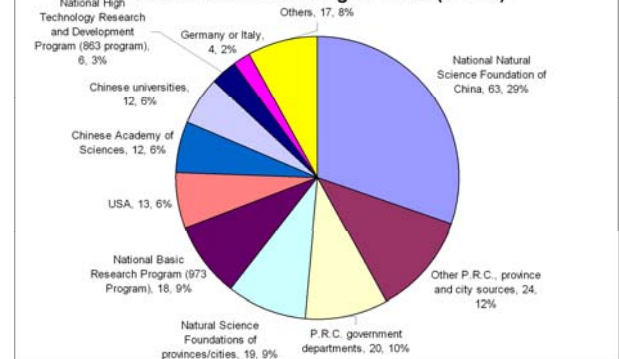
Distribution of Agents Studied (n=136)



- 14 categories of agents were identified
  - The largest category was ionizing radiation.
  - One of the smallest categories, miscellaneous, included alcohol, dust, physical activity, plant trimming dosage.
  - The agents of all other categories were chemicals.
- The 136 articles were published in 98 journals.
  - 6 published in *Toxicology in Vitro*; 5 in *Ecotoxicology and Environmental Safety*; 4 in both *Chemosphere* and *Neuroscience Letters*. All other journals had less.

## RESULTS & DISCUSSION

Distribution of Funding Sources (n=208)



- Notable USA funding sources: Philip Morris, NIH, American Chemistry Council, American Heart Association
- Reoccurring research motivations were evident:
  - health improvement (e.g., tumor-size decrease via radiation, radiation safety, disease-directed compounds, resveratrol)
  - environmental contamination (e.g., metals, arsenic, and synthetic pollutants' effects on organisms)
  - agricultural improvement (e.g., via rare earth elements, target and non-target response to biocides)

Distribution of Primary Locations of Literature



Note: Size represents number. Beijing was the primary location of research in 17 papers. There were 33 total locations. Cities represented once are not included (17).

- Most hormesis-related research from Changchun dealt with radiation. In fact, more than half of the category took place there. No other city had such unidirectional research.