Stanford

A Dale Kaiser

CONTACT INFORMATION

- **Alternate Contact**

  Tel 650-725-5127

Bio

ACADEMIC APPOINTMENTS

- Member, Bio-X

ADMINISTRATIVE APPOINTMENTS

- Professor, Developmental Biology, (1989- present)
- Professor, Biochemistry, (1959- present)

HONORS AND AWARDS

- Abbott Lifetime Achievement Award, American Society for Microbiology (1997)
- Wilson Professor of Biochemistry, Stanford Medical School (1995)
- Thomas Hunt Morgan Award, Genetics Society of America (1992)
- Prize for Basic Medical Research, Waterford (1981)
- Lasker Award, Basic Medical Research (1980)
- Elected Member, American Academy of Arts and Sciences (1970)
- Elected Member, National Academy of Sciences USA (1970)
- U.S.Steel Award in Molecular Biology, - (1970)

PROFESSIONAL EDUCATION

- B. S., Purdue University , Science (1950)
- Ph. D., California Institute of Technology , Biology and Chemistry (1955)
- Postdoctoral Fellow, Institute Pasteur, Paris, France , Microbial Physiology (1956)
- Assistant Professor, Washington University Medical School , Microbiology (1958)
- Assistant Professor, Stanford Medical School , Biochemistry (1959)
- Professor, Stanford Medical School , Biochemistry (1966)
- Professor, Stanford Medical School , Developmental Biology (1989)

LINKS

- http://kaiserlab.stanford.edu: http://kaiserlab.stanford.edu

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

How are genes regulated to construct a developmental program? How do signals received from other cells change the program and coordinate it for organized multicellular development? The approach taken by our laboratory group to answer these questions utilizes biochemisty and genetics; genetics to isolate mutants that have particular defects in development and biochemistry to determine the molecular basis of the defects.

We study swarming and fruiting body development in Myxococcus. They are constantly moving as they grow maximizing their access to oxygen. When starving but still able to synthesize protein, these bacteria stop growing and initiate a developmental program. After a detailed assessment of their nutritional state and the number of cells, they aggregate to form fruiting bodies which contain about 100,000 spore cells and which have a species-specific shape. Fruiting bodies form through a regular sequence of morphological changes, finishing with the differentiation of rod-shaped growing cells into spherical, thick-walled spores. Biochemical changes parallel the morphological changes. New proteins are synthesized at particular times during aggregation and sporulation. A series of 30 developmentally regulated promoters have been found, each of which becomes active at a characteristic time. Mutants that have lost the ability to produce particular extracellular signals necessary for swarming or for fruiting body development have been isolated. These mutants are used to dissect the genetic program and to isolate and identify the signals.

The mutants have uncovered four different signals. One signal synchronizes theTwo signals which function in the same regulatory pathway have been chemically identified. The earlier of the two is water soluble and diffusible; it can signal when cells are distant from each other. The later signal is a 17 kDa protein that is cell bound and requires a detergent to extract it from cells. This molecule signals when cells are close together, and its transmission depends on the proper alignment of cells. The later signal is a morphogen. It induces the cells to aggregate into ridge-like heaps that move as travelling waves. Later the aggregates become hemispherical mounds, and eventually species-specific fruiting bodies. The later signal also induces cells within the fruiting body to differentiate myxospores. One signal can do these several different things because each has a different threshold signal intensity.

Teaching

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biochemistry (Phd Program)
- Cancer Biology (Phd Program)
- Developmental Biology (Phd Program)

Publications

PUBLICATIONS

- **Interconnected cavernous structure of bacterial fruiting bodies** *PLoS Comp Biol*
  Harvey, C.
  2013; 8
- **M. xanthus swarms are driven by growth and regulated by a pacemaker** *J Bacteriol*
  Kaiser, D., Warrick, H.
  2011; 193: 5898-5904
- **A cascade of coregulating enhancer binding proteins initiates and propagates a multicellular developmental program.** *Proceedings of the National Academy of Sciences USA*
  Giglio, K.
  2011; 108: E431-E439
- **Study of elastic collisions of Myxococcus xanthus in swarms** *Phys Biol*
  Harvey, C.

2011; 8

- **Are there lateral as well as polar engines for A motile gliding in myxobacteria?** *J Bacteriol*
  Kaiser, D.
  2009; 191: 5336-5341

- **Are there lateral as well as polar engines for A motile gliding in myxobacteria?** *J Bacteriol*
  Kaiser, D.
  2009; 191: 5336-5341

- **Periodic Reversal of Direction Allows Myxobacteria to Swarm** *Proc Natl Acad Sci USA*
  Wu, Y.
  2009; 106: 1222-1227

- **Spatial control of cell differentiation in Myxococcus xanthus** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Julien, B., Kaiser, A. D., Garza, A.
  2000; 97 (16): 9098-9103

- **Myxococcus cells respond to elastic forces in their substrate** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Fontes, M., Kaiser, D.
  1999; 96 (14): 8052-8057