

## EPIDEMIOLOGISTS' PARADISE

**Diet, Life-style, and Mortality in China: A Study of the Characteristics of 65 Chinese Counties.** Chen Junshi, T. Colin Campbell, Li Junyao, and Richard Peto. Oxford University Press, New York, 1990. 894 pp., illus. \$172.50 (ISBN 0-8014-2453-4 cloth).

This extraordinary monograph presents the basic, uninterpreted data obtained from a huge multinational study of associations between behavioral and environmental risk factors and the principal causes of death among inhabitants of widely disparate communities in the People's Republic of China. Extravagant in price and size and elegant in format, this volume surely must constitute the first coffee-table book for epidemiologists. Its design is stunning. The pages, slightly larger than 9 by 12 inches, contain an entirely bilingual text set in double columns, the left in English and the right in Chinese. Chapter titles are hand-drawn ideograms (with translations); the dedication, in the personal calligraphy of the Chinese minister of public health, translates as "Put prevention first."

A study of this size and complexity could only be done in a population as large, geographically stable, dependent on the local food supply, and well monitored as that of China. In the mid-1970s, a public health survey conducted in more than 2000 counties, each with a population of 100,000–1,000,000, identified the causes of approximately 20 million deaths and permitted calculation of sex- and age-specific mortality rates for 82 distinct disease conditions. Because these rates varied by location by as much as a several hundredfold, the epidemiologists who conducted this study realized that it should be much easier to examine associated life-style factors in China than in western countries where disease rates and life-styles are more homogeneous.

In the early 1980s, the epidemiologists selected for study 65 counties with widely varying cancer-mortality rates. Within each county, they chose at random two communes and approximately 50 individuals from each commune to provide blood and urine

samples and medical, smoking, diet, and reproductive histories. Additional surveys determined levels of nutrients and toxic contaminants in the food commonly consumed by study subjects and collected information on demographic and geographic features of each region.

The magnitude of this effort commands respect. Investigators trained and supervised 24 field survey teams, assayed 50,000 vials of blood and urine, administered a questionnaire to 6500 individuals, and logged the equivalent of almost 600 person-years of labor, often under unimaginably difficult field conditions. What began as a relatively simple project to evaluate the association between dietary selenium and cancer grew to include 367 biochemical, dietary, environmental, and disease measures. With data for each item plotted by county against those collected for each of the other items, the study yielded more than 100,000 correlations.

This book presents the correlations. The text briefly explains why and how they were derived, but mainly it presents data. For each data item, a two-page layout of values is provided; these must be viewed with the book held vertically and open to its full 19-inch length. In this configuration, the top page lists the mean values obtained by county and the correlations obtained when the item is plotted against each of the 366 others. The bottom page contains a histogram of the values for the various counties, a scatter plot of those for males versus females or commune versus commune (to indicate levels of internal data consistency), and a map of China on which the counties are located by circles shaded to indicate quartile distribution.

Interpretation of these displays is no task for the faint-hearted. Each county is indicated by a two-letter code explained and located only once on a horizontal map on page 84; one must turn to that page and rotate the book to find the county name and place. Data items are listed by key words; these can be impenetrable. For example,  $m<150THPS$  stands for the cumulative mortality rate for children ages 0–14 for parasitic diseases other than schistosomiasis,  $r18:2n6tl$  for the total amount of linoleic acid in

red blood cells, and  $qMSPOT/YR$  for the number of times per year respondents to the questionnaire reported eating moldy sweet potatoes. Key words are listed within category, although in no apparent order. To decode  $m<150THPS$ , you must consult appendix 7, which lists key words by item number, find that item number in the table of contents or appendix 8 (neither of which lists page numbers), and search through the pages by item number to find the ones displaying this item. Finding an item of interest requires lengthy and awkward sessions of book and page turning. One is desperate for an index. Chinese colleagues say they fared no better.

With that said, these efforts are well rewarded. Once the data terms are decoded, the breadth of the study becomes evident and permits examination of the association of life-style factors to diseases as varied in etiology as diabetes, pneumonia, eclampsia, or tetanus of the newborn, or identification of diseases associated with plasma Epstein-Barr virus antibodies, red blood cell catalase, urine antiaflatoxin-reactive metabolites, food boron, fish protein consumption, age at first pregnancy, or type of employment. Statistically significant correlations can be recognized instantly by the presence of one, two, or three asterisks indicating increasing strength of association.

Examination of the display for stomach cancer rates, for example, immediately reveals significant positive associations with plasma albumin, starch and sugar intake, height and weight, and latitude, but negative associations with plasma levels of cotinine and a hot climate. Breast cancer rates are positively associated with plasma testosterone, urinary potassium, and consumption of wine and hard liquor but not of beer; they are inversely associated with urinary iodine, food calcium, and the 1981 birth rate. In the county with the highest breast cancer rate (Wudu in Gansu province in central China), study subjects consume more wheat and starchy tubers but less rice than average and fewer fruits and green vegetables. Dietary intake of sea vegetables correlates positively with colorectal cancer but negatively with cirrhosis of the liver. The percentage of caloric intake from fat, which varies

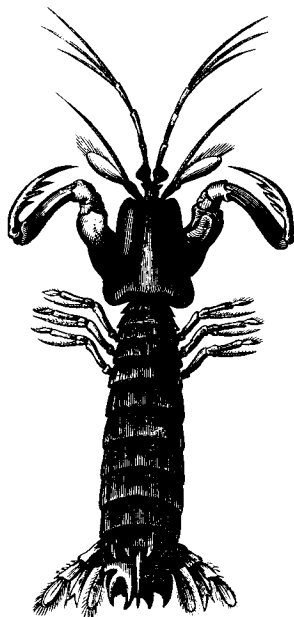
from 5.9 to 45.2, is positively associated with childhood brain cancer, plasma selenium, use of snuff, and literacy, but negatively with esophageal cancer, red blood cell glutathione reductase, pipe smoking, and agricultural employment.

What are we to make of such associations? The authors offer only one conclusion: the least risk for cancer is generated by consumption of fresh plant foods. Beyond that, they warn us repeatedly to consider correlations meaningful only when they are supported by reasonable explanations and confirming data. Many—perhaps most—of the statistically significant correlations are spurious. The authors challenge readers to distinguish signal from noise and to develop verifiable hypotheses.

Readers who would like to take on this challenge may request copies of the 366 scatter plots for any one data item against all others. It would be a shame if the price of this book inhibited such requests.

Like the best of the coffee-table genre, this book should reward readers with many hours of involvement and pleasure. The authors promise an imminent second volume containing more recent data that will permit evaluation of time trends. I, for one, can hardly wait.

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## ANIMAL-INSECT INTERACTIONS

**Insect Defenses: Adaptive Mechanisms and Strategies of Prey and Predators.** David L. Evans and Justin O. Schmidt, eds. State University of New York Press, Albany, 1990. 482 pp., illus. \$73.50 (ISBN 0-88706-896-0 cloth), \$24.95 (ISBN 0-7914-0616-4 paper).

My usual response on discovering a new book is to look for a preface, so that I may understand the book's purpose. This book has no preface, although it is divided into four sections, each with a two-page introduction. Next, I looked for a systematic index, so that I might check on the latest words about some of my favorite insects. This book has no systematic index, although it does have a contents list (chapter titles), a list of illustrations, a subject index, and an author index. Only in a few instances are names of describers of species (author names) cited in the text, though such citation is normal in entomological texts because of the vast and ever-changing insect nomenclature. I concluded that it is not a reference book, but one that I should read from cover to cover for the joy of reading. Fortunately, I had a weekend to devote to the reading, and the reading was joyful.

The last few years have seen publication of several multiauthored books on plant-insect and fungus-insect relationships. This new book, *Insect Defenses*, also multiauthored, treats part of the subject of animal-insect relationships. It is the part of greatest appeal to biologists: how animals (principally birds, bats, and spiders, with a few examples from the insects) locate and catch their insect prey and what strategies insects use to prevent this from happening. The omitted, reciprocal, and voluminous part, the subject of insects feeding on other invertebrates, especially other insects, has been adopted mainly by specialists in biological control, and the subject of insects feeding on vertebrate animals is the domain of medical and veterinary entomologists.

How can one book evoke defensive mechanisms of 800,000 or more insect species? Simply by picking

known examples, with the vast majority of examples (probably even stranger) still to come. The behaviors are theatrical: for every action there is a reaction, and it would be difficult for competent and knowledgeable writers not to produce a worthwhile book on the subject. The contributors are knowledgeable and competent and have produced a worthwhile book. This book deals with how "kamikaze" termites explode to splatter an invader with their body contents and thus protect the colony, how bombardier beetles bombard, the relative painfulness of wasp venoms, and what influences site selection of webs by spiders.

This book deals with how bats use echolocation to detect the presence of moths, how the hearing of moths has evolved to counteract this ability of bats, how birds respond to subterfuge by moths, and how caterpillars and sawfly larvae defend themselves against their predators. This book explores the enormous variety of chemicals produced by insects to deter would-be predators, in venoms, exudates, and sprays, the glands from which the chemicals are produced, and how the insects behave when confronted with a predator. (Some of the chemicals are synthesized by the insects, and others are recycled from plants on which the insects feed.) This book deals with how solitary insects deter would-be predators by flashing a pair of large eyes, or by hissing or spitting, and how insects in aggregations and colonies provide mutual defense. Solitary insects also may hide from predators by their camouflage as leaves, twigs, or bird feces, or deter them by resembling toxic species. Insects may escape from predators in space and time. This is a book of 15 chapters in which every chapter recounts provocative facts, speculative ideas, or both.

*Insect Defenses* is quite well produced. The black-and-white photographs are adequate, the drawings are of high quality, and both are reproduced clearly. The print is highly legible, so it would appear that the typesetters and printers have done a good job. The editors can be faulted for not eliminating typographical and grammatical errors; typographical errors increase in the literature cited, which is inconsistent in style among chap-