Meetings

Marine Biology

Unresolved problems in marine biology—sampling techniques, media requirements, distribution of bacteria in the sea, metabolism, autotrophy, and other technological problems involving marine bacteria—were discussed at the fourth meeting on marine biology, 9–12 January 1966 at Princeton, New Jersey.

Carl H. Oppenheimer (Florida State University, Tallahassee) and Luigi Provasoli (Haskins Laboratory, New York) dealt with the problems of sampling the environment and the nutrient needs for the cultivation and isolation of marine bacteria. It was concluded that each environment in the oceans poses a special problem for collecting adequate representative samples of bacteria (for example, surface slicks, deep sea pressures and temperatures, sedimentary environments, and others). Various special media are needed for the cultivation of the indigent bacteria.

The discrepancy was pointed out between the normal low nutrient content of seawater and the high nutrient content of the average media used to isolate and study marine bacteria. The marine environment is normally in a steady state and the low numbers of one type of bacteria in a given parcel of water can be significant. It was also pointed out that the marine bacterium is adventitious and its abundance is in proportion to the availability of nutrient at any time within the steady state system. The various collecting devices for marine bacteria were also discussed which will be included in the published book.

John Liston (University of Washington, Seattle) and Wolf Vishniac (University of Rochester, New York) discussed the distribution of terrestrial and marine microorganisms and the definition of a marine bacterium. They noted that when differential media are used it is possible to trace the movement of terrestrial microorganisms in seawater. No final definition of marine bacteria was accepted, except perhaps that any organism functional in the sea is necessarily a marine bacterium. The significance of the small incidence of bacteria in the open ocean was noted, but no conclusions made. Many of the deep-water bacteria favor cold environments which raises the usual question—whether the shock of bringing bacteria to the surface could affect the determination of final numbers.

Vishniac presented some rather interesting data on the amount of light energy available to photosynthetic organisms in the sea, suggesting a total of primary production with a striking similarity to total world's fish catch. Such data always raise the question as to the total capacity of the marine environment for the production of life. If the data are near correct, the seas now approach the level of their capacity for primary production. The discussion centered on the nitrogen cycle and the sulfur bacteria, and the continuing lack of a suitable method for the accurate determination of the total members of nitrogen-oxidizing bacteria in the sea. In as much as many so-called autotrophic bacteria require trace amounts of organic molecules, there was the usual attempt to define the term autotrophy.

Richard Morita (Oregon State University, Corvallis) and Edward Zuraw (General Dynamics, Groton, Connecticut) led discussions on the metabolism of marine bacteria and technological problems. Much of the discussion on metabolism was related to the salt requirement of marine bacteria. Robert MacLeod (McGill University, MacDonald College, Quebec, Canada) noted that sodium was required by some marine bacteria and was needed for transport and metabolism. Other evidence of sodium requirement was presented by William Payne (University of Georgia, Athens). Hajime Kadota (Kyoto University, Japan) showed the osmotic effect of seawater on the distribution of terrestrial bacteria in the sea and the positive correlation of sulfate-reducing bacteria to organic matter. Morita gave examples of pressure-temperature effects on marine bacteria. Warren Litsky (Florida State University, Tallahassee, and University of Massachusetts, Amherst) described 5 years of research on the pollution of Raritan Bay, New York; the high coliform counts and biological oxidation are evidence of pollution. They also described the difficulties involved in eliminating such pollution. A discussion followed on the effect of microbes on man-made structures in the marine environment and the use of submersibles for the collection of bacteria from the sea.

The conference brought up many more problems than were solved. However, one valuable output was the small collection of methods media and the evaluation of collecting devices for marine microbiology.

The conference, held under the auspices of the Interdisciplinary Communications Program of the New York Academy of Sciences, was supported by the Office of Naval Research and the National Aeronautics and Space Administration.

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Antimicrobial Agents and Chemotherapy

There are many infections that are not adequately treated by the antimicrobial agents now available. In particular there is a need for a good antifungal agent, a better agent against gram-negative bacteria, and agents to treat a host of "uncovered" diseases, including the viral diseases and those caused by protozoa and other parasites. Hence at the Fifth Interscience Conference on Antimicrobial Agents and Chemotherapy–Fourth International Congress for Chemotherapy (Washington, D.C., 17–21 October 1965) there was a great deal of interest in the prospects for antibiotic therapy. This was evident both in the opening addresses by E. B. Chain, S. A. Waksman, and J. F. Enders and in various panel discussions in which the need for nontoxic, effective antibotics for

treatment of gram-negative infections, the fungal infections, and venereal diseases was repeatedly stressed.

At an open meeting of the Committee on Nomenclature of Antibiotics (American Society for Microbiology), S. A. Waksman (chairman) proposed the following recommendations for coining names for new antibiotics:

1) Cognizance should be given to the fact that antibiotics are often chemically related members of a series or "family." A name should be chosen which yields a root (or suffix or prefix) which can be modified to show that the variants are members of a related series.

2) A name should be chosen which is euphonious.

3) The name should be based on the chemical structure of the compound if the chemical structure has been established or there is strong evidence for a structure.

4) When the investigator has little or no knowledge of the chemical structure of the new antibiotic the following principles should be used as a guide:

a) The genus (or family or order) epithet of the producing organism should be given first consideration as a source of the root for a new name, and "mycin" should be limited for application to products from organisms belonging to the order Actinomycetales.

b) If the genus is preempted as a name source, some property of the antibiotic which has scientific merit may be used. Geographic area of origin has no merit.

c) A code designation may be used if necessary during early stages of study, but a name is highly desirable by the time the compound moves into clinical evaluation.

In summarizing results of the United States Public Health Service trials of isoniazid prophylaxis, Shirley Ferebee concluded that in the 4 to 9 years of observation after the prophylaxis year, isoniazid reduced the incidence of tuberculosis among the 73,000 participants by 50 percent.

As more is known of the mechanisms of action of various antibiotics it is possible to use these inhibitory agents as biochemical tools. For instance, chloramphenicol has been used to study synthesis of lysine peptides by enzyme systems, aminoglycoside antibiotics have been used to study the genetic code, and the antifungal antibiotics have been used as agents in observing physiology of molds and yeasts. These and other applications were discussed in a symposium led by J. T. Park.

The first day of the congress was devoted to a series of papers on problems of infectious disease. Later sessions included discussions of new penicillins and other clinically oriented penicillins, with special emphasis on cephaloridine in therapy of a variety of bacterial infections. The differences between the beta-lactamases that hydrolyze penicillins and those that split cephalosporin C were summarized by Sabath and Abraham, who noted that the latter requires a zinc co-factor and that there are differences in heat stability between these enzymes from *Bacillus cereus*.

Among the especially noteworthy reports on the chemistry of antimicrobial agents were:

1) The presentation of the structure of the iron-containing antibiotic, ferrimycin A_1, and the disclosure that a "minor change" of an amide group changes ferrimycin A_1 from an antibiotic to a growth factor (V. Prelog, Federal Institute of Technology, Zurich).

2) A study of the relation between structure and activity among the depsipeptide antibiotics (with special reference to valinomycin) was summarized by M. M. Shemyakin (Institute for Chemistry of Natural Products, Moscow) who concluded that there is a parallelism between antifungal activity and ability to selectively induce active K^+ transport in mitochondria.

3) Proof of the structure of the antibiotic verrucarin A was used by G. A. Sim (University of Illinois) to demonstrate the usefulness of x-ray crysatllography in determining the structures of antibiotics and other natural products.

4) The antitumor action of the copper-containing phleomycins and the new antibiotics, bleomycins (Institute of Applied Microbiology, Tokyo), involves inhibition of DNA synthesis as does pluramycin, H. Umezawa (Institute of Applied Microbiology, Tokyo) reported. On the other hand, the high-molecular-weight enomycin was found to have a selective action on ascites cells and was more rapidly absorbed by these cells than by normal cells.

5) A series of antibiotics, the moenomycins, was reported by Schmidt-Thome (Hoechst) as having the empirical formula $(C_{70}H_{124}N_7O_{40}P)_n$. Hydrolysis showed the presence of glucose, glucosamine, quinovosamine, phosphoric acid monesters, a terpene-like carbon chain, and a chromophore. These antibiotics are active against gram-positive bacteria. Very slow elimination was noted on subcutaneous administration and blood levels of 47 days were demonstrated. The moenomycins have been widely tested as feed supplements and were found more useful than the tetracyclines in growth-promotion tests with chickens, pigs, and calves.

6) Kasugamycin, an aminoglycoside antibiotic, was originally selected on the basis of antifungal activity against rice blast disease. It was reported by H. Umezawa and T. Ichikawa (First National Hospital, Tokyo) to be useful in controlling *Pseudomonas* infections in clinical trials.

7) Desdamine, desdamethine, and ethesdamine are new antibiotics formed when S-methyl cysteine or S-ethyl cysteine was added to celesticetin producing fermentations.

8) Everninomicin B is an antibiotic produced by *Micromonospora carbonacea*. It is active in vivo against gram-positive bacteria.

9) A group of antibiotics called the sugordomycins was described by Berger *et al.* (Hoffmann-LaRoche) as chemically related to the coumermycins, and as having favorable potentialities in vivo against gram-positive infections.

10) Wiley (The Upjohn Company) reported on the identification of the cytotoxic agent U-20,904 as *cis*-beta-acrylamidine.

11) The structure of alazopeptin was reported by Patterson (Lederle Laboratories) to be L-alanyl-(6-diazo-5-oxo)-L-norleucyl-(6-diazo-5-oxo)-L-norleucine.

The conference was sponsored by the American Society for Microbiology and the International Society for Chemotherapy and was organized with the cooperation of the Infectious Diseases Society of America. Most of the papers presented will appear in *Antimicrobial Agents and Chemotherapy–1965*, which will be published in June 1966 by the American Society for Microbiology. The book will be available from Society headquarters, 115 Huron View Boulevard, Ann Arbor, Michigan.

The next conference will be held 26–28 October 1966 in Philadelphia, Pennsylvania. Further information and abstract forms can be obtained from R. W. Sarber, Executive Secretary, American Society for Microbiology.

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