tional forms must be taken into account. The transitional forms are nonbacterial phases, including the L-phase, in which the organism preserves its generic identity, survives, and multiplies.

Data suggesting the possible pathogenic activity of transitional forms have been gathered from cases of subacute bacterial endocarditis, rheumatic fever, Reiter's syndrome, rheumatoid arthritis, staphylococcal asteomyelitis, and other chronic or recurrent diseases. Transitional forms isolated from patients have multiplied in tissue culture and occasionally exhibited cytopathogenicity. In cell-free culture media, these forms could revert to the parent bacteria. As a model, in a case of subacute bacterial endocarditis, transitional forms persisted for 5 years, were resistant to all antibiotics, and remained capable of reversion to bacterial form in vivo. Changes in morphological form of the organism could be correlated with changes in the clinical symptoms of the patient. The capacity of transitional forms to survive, multiply, and revert in vivo would suggest intrinsic pathogenic potential.

Discussion was enthusiastic and lengthy. Concerning the formation of protoplasts in vivo, L. Muschel (University of Minnesota) commented on early contributions of his group with Gram-negative bacteria, such as *E. coli*. E. A. Mortimer (Western Reserve University) presented preliminary results from experiments in mice inoculated intraperitoneally with several strains of group A streptococci. The L-forms were recovered from heart blood in about half of the instances and from peritoneal exudate in the remainder; L-forms and streptococci both were isolated at death of mice. By reversion, as well as other techniques, the L-forms have been shown to be derived from the group A streptococci. A reverse relationship may exist between virulence for mice and the production of L-forms. Although it was believed that the L-forms were produced in the mice, one could not be absolutely certain that they were not produced in vitro on L-form medium. In any event, this appeared to be an exciting way to produce these L-forms of group A streptococci, and another facet of host-parasite relationships may be observed.

Louis Dienes (Massachusetts General Hospital, Boston) closed the meeting with observations suggesting that L-forms may take part in some pathological processes. T. M. Brown (George Washington University) had expressed similar views in comments on antibody studies of human material (presented with H. W. Clark and J. S. Bailey) which indicate that the rheumatoid factor is associated with *Mycoplasma* immunologic complex. Antibody studies by Y. Crawford (Naval Medical Research Unit No. 4, Great Lakes, Illinois) have suggested L-forms in streptococcosis.

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Marine Microorganisms

Many disciplines of science—chemistry, geology, physics, biology—are involved in marine research. One rapidly developing field is marine microbiology. In order to introduce other workers to this field, a conference on biology of marine microorganisms was held in Berkeley, California, 21–23 December 1964. Approximately 70 participants from all parts of the United States attended.

The conference opened with a discussion of microbial environments in the sea. After introductory remarks by M. B. Allen (Kaiser Foundation Research Institute) two extremes of environment were described—the deep sea, by C. E. ZoBell (Scripps Institution of Oceanography), and the surface film, or neuston, by R. E. Norris (University of Washington). Techniques used in the study of marine microorganisms were also described—methods for the collection and study of bacteria (C. E. ZoBell), chemical methods (J. D. H. Strickland, Scripps Institution of Oceanography), collection and preservation of phytoplankton (R. W. Holmes, Scripps Institution of Oceanography), and the collection and cultivation of living phytoplankton (M. B. Allen).

The principal types of marine microorganisms were described and discussed. These included marine bacteria (J. Liston, University of Washington), marine fungi, including those living as endosymbionts with invertebrates (H. Whisler, University of Washington), and diatoms and dinoflagellates (R. W. Holmes). R. E. Norris discussed the still little-known nannoplankton which he suggested might better be called cryptoplankton because it includes all

the phytoplankton, large and small, not amenable to preservation by usual methods. M. B. Allen mentioned some effects of pollution on the marine biota.

Various activities of marine microorganisms were considered. The primary production of organic matter by photosynthetic microorganisms in the sea was discussed by J. D. H. Strickland. R. Y. Morita (Oregon State University) presented recent results from his laboratory on the effects of low temperature on marine bacteria and the factors responsible for obligate cryophily. The nutrition of phytoplankton and the possible role of soluble organic compounds produced by phytoplankton in the nutrition of zooplankton were discussed by M. B. Allen. (Allen also commented on the cycles of nitrogen and sulfur.) C. E. ZoBell described various geomicrobiological activities of marine microorganisms.

A general discussion period concluded the conference.

M. B. Allen

Kaiser Foundation Research Institute, Richmond, California

Forthcoming Events

February

8–10. American **Astronautical** Soc., annual, Denver, Colo. (Miss G. W. Heath, Flight Safety Foundation, 468 Park Ave. S., New York 10016)

8–11. Managerial Implications of the Emerging **Technology**, Washington, D.C. (P. W. Howerton Center for Technology and Administration, American University, 2000 G St., NW, Washington 20006)

8–12. American Soc. for **Testing and Materials**, spring meeting, Cleveland, Ohio. (ASTM, 1916 Race St., Philadelphia, Pa.)

9–10. International Soc. of **Terrain Vehicle Systems**, U.S.–Canadian regional meeting, Houghton, Mich. (E. W. Niemi, Dept. of Mechanical Engineering, Michigan Technological Univ., Houghton)

10–11. Corrosion of **Water Supply Systems**, 7th sanitary engineering conf., Urbana, Ill. (B. B. Ewing, Univ. of Illinois, Urbana)

10–12. American **Educational Research** Assoc., annual, Chicago, Ill. (R. A. Dershemer, 1201 16th St., NW, Washington, D.C.)

10–12. National Assoc. **Corrosion Engineers**, conf., Calgary, Canada. (T. J. Hull, NACE, 980 M&M Bldg., Houston, Tex. 77002)

10–13. National Soc. of College Teachers of **Education**, annual, Chicago, Ill. (E. J. Clark, Indiana State College, Terre Haute)

10–13. American College of **Radiology**, annual, Philadelphia, Pa. (F. H. Squire,