7-2-92

SEMT

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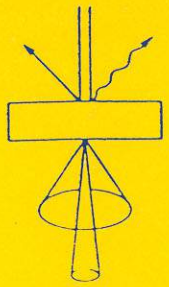

SMALL IS BEAUTIFUL –

Bugs & Germs

Friday, 7 February 1992

at

IMPERIAL CANCER RESEARCH FUND
Lincolns Inn Fields, London WC2

PROGRAMME

2.00 Viruses – little jewels or little devils

Prof C R Madeley (University of Newcastle upon Tyne)

2.35 How bacteria stick

Dr Pauline Handley (University of Manchester)

3.10 Tea

3.30 Diatoms – architecture with silica

Prof Frank Round (University of Bristol)

4.05 Ultrastructural techniques in the study of Dinoflagellates (red tide organisms)

Prof John Dodge (Royal Holloway & Bedford New College)

4.40 Chairman's Summing up and general discussion

. . . . . .

To the Secretary:

Dr Jill Lewis, Electron Microscope Unit,
St Bartholomew's Hospital Medical College,
Charterhouse Square, London EC1M 6BQ

I hope to attend the meeting at ICRF on 7 February 1992

Name . . . . . Telephone . . . . . .

Address . . . . . .

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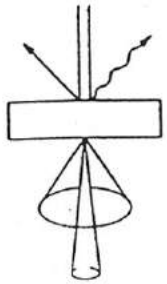

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ABSTRACTS – Friday, 7 February 1992

VIRUSES – LITTLE JEWELS OR LITTLE DEVILS

Prof C R Madeley (University of Newcastle upon Tyne)

Electron microscopy is the only method by which viruses can be seen directly and in all their beauty and diversity. This brief statement conveys some important truths because, to many, seeing is still believing. Although the structure of viruses to amazingly fine detail has been deduced from computer modelling of protein structure, they are only likely to be accepted as valid if they agree with what can be seen in the EM. Not only that, virus classification is still based mostly on virus structure and, so far, no virus has been assigned to a group or family into which it would not fit structurally. Hence EM forms a vital component of any research into how viruses are put together and structure, in turn, is relevant to such diverse aspects of virology as routine diagnosis by a variety of techniques and the production of genetically engineered vaccines.

Viruses, though they may be constructed like miniature jewels and details of their structure may fascinate the observer, are also causes of disease. The EM, in offering a catch-all technique, has an important role in distinguishing one from another. This is particularly so for virus-associated diarrhoea which may be due to anything up to 9 or 10 morphologically-distinguishable viruses. None of them will grow readily in cell culture and there is at present no alternative technique to detect them all with equal facility. There are alternative techniques for detecting some of the more common viruses but these by no means cover all the possibilities. Nonetheless, the high and increasing cost of buying and maintaining an EM has meant that these alternatives are seen as increasingly attractive to the cost-conscious in the Health Service. Despite this, EM remains the essential tool for investigating outbreaks. Any of the possible viruses may be involved and the possible advent of new viruses or new serotypes of old viruses means that antibody-based tests can never replace it. This requires the microscopist to be aware of all the possibilities and also, from time to time, to make decisions on when to recognise a virus. Faecal extracts usually contain a wide variety of objects, some of which can be very 'virus-like'. Deciding when to score them as positive requires skill and experience which can only be acquired by practice.

This talk will discuss the use of the EM in virus diagnosis and the problem of when is a virus not a virus.

HOW BACTERIA STICK

Dr Pauline Handley (University of Manchester)

Oral bacteria selectively adhere to specific receptors on different surfaces in the mouth, such as the teeth, tongue, gingivae, buccal mucosa and to other bacteria (co-aggregation). We have used negative staining to identify the surface structures on the bacterial surface that enable them to attach. For example, *Streptococcus sanguis* is a primary plaque colonizer, and the genus includes strains, each of which carry a slightly different type of surface structure. These are classified as fibrils and fimbriae and they are located either peritrichously, polarly or laterally on the cell in the form of tufts of fibrils. We have used colloidal gold as an electron dense marker to reveal charged and hydrophobic sites on the ends of the tuft fibrils. The tufted *S. sanguis* strains use their tuft to stick to another bacterium in plaque- *Corynebacterium matruchotii* and so contribute to plaque build up.

Staphylococcus epidermidis is a commensal skin bacterium but it is an opportunistic pathogen and can colonize indwelling catheters forming a thick bacterial film called a biofilm. We are currently investigating the structures responsible for adhesion to catheters, and SEM micrographs will be presented to illustrate the sequence of adhesion and biofilm formation on different surfaces.

Handley, P.S. (1990) Structure, composition and function of surface structures on oral bacteria. Biofouling **2**, 239-264

DIATOMS – ARCHITECTURE WITH SILICA

Prof Frank Round (University of Bristol)

The siliceous walls of diatoms have an architecture which can be viewed at three levels of magnification. The lower level corresponds with the cell size, i.e. 1000 um and involves a study of the multipartite encasement of the protoplast. Over almost 150 years the detail at this level was studied using light microscopy and the foundation of the classification was established but the SEM has greatly extended our knowledge, especially concerning the fitting together of the parts. The mid-level from 10 um to 1 um involves the complex of apertures through the individual parts. Most of the detail of the structures visible at this level have been seen only by electron microscopy and the details have added considerably to knowledge of the mechanism of movement, attachment and secretion by diatoms. The highest level of magnification reveals structures in the 1 um to 0.1 um range and involves the occlusion of some of the apertures. It came as a surprise to discover that at this level there was still a complex architectural component based on silica and it is still not known what its significance is.

Other problems which will be touched on are :-

Why is silica involved rather than the usual plant wall component, carbon, or is a carbon(hydrate) also present ?

Where and how common are diatoms ?

How are diatoms exploited by man ?

ULTRASTRUCTURAL TECHNIQUES IN THE STUDY OF DINOFLAGELLATES (Red Tide Organisms)

Prof John Dodge (Royal Holloway & Bedford New College)

Over the past thirty years many different EM techniques have been utilized in an attempt to understand the structure and function of dinoflagellates. The talk will focus on three main topics:- in studies of the flagella and the nucleus, TEM techniques have been most important but we still have uncertainties that perhaps could be cleared up with computerised reconstruction. The third topic, the cell covering or theca, will illustrate the great value of the SEM in understanding the complex structure whose variations can be used in the classification of the organisms. Here the microscopic beauty of dinoflagellates can be really appreciated.