distinct calcium-transport systems within mitochondria, and the question whether calcium uptake is passive in response to active phosphate uptake. These three papers showed well the growing evidence that energy conservation is linked to conformational changes occurring within the mitochondrial membrane.

A concerted picture also emerged in two contributions concerning mixed-function oxidases. R. W. Estabrook (Dallas) studied the synergistic effects of NADH and NADPH on the two electron-donor systems of liver microsomes, while I. C. Gunsalus (Urbana) demonstrated that the system is limited by the binding of substrate to cytochrome $P_{450}$. L. P. Hager (Urbana) discussed kinetic and mechanistic models of chloroperoxidase-mediated halogenation reactions, proposing an ordered ionic mechanism.

The symposium ended with an account of the role of lysosomes and myeloperoxidase in the phagocytic process. S. J. Klebanoff (Seattle) showed how leucocyte myeloperoxidase, with hydrogen peroxide and iodine, exerts a microbicidal action, and M. J. Cline (San Francisco) described a patient in whom the lack of myeloperoxidase could account for his inability to combat fungal infection.

TEETH

# Preventing Dental Decay

from our Social Medicine Correspondent

FITTING all adults with dentures at an early age regardless of the state of their dental health is one way of preventing dental decay. A more moderate approach to the problem, however, is being made by Dr W. H. Bowen and his colleagues in the department of dental science, Royal College of Surgeons. They have developed a vaccine containing live cariogenic streptococci which, when injected into monkeys, substantially reduces the number of carious lesions caused by bacteria of the same strain (*British Dental Journal*, February 18, 1969).

The preliminary nature of their work is indicated by the small number of experimental animals used—six; two were aged 17 months and were about to erupt their first permanent molars, and four were aged 11 months with complete deciduous dentitions. A strain of dextran-producing *Streptococcus* known to be cariogenic in hamsters and monkeys was isolated from human carious lesions, suspended in saline and injected intravenously into three monkeys in 1 ml. amounts on eight occasions in 3 weeks. This was followed by a single booster dose of vaccine 12 weeks later. All animals had been infected by mouth with the same streptococcal strain and were fed on a diet rich in fermentable carbohydrate.

At the latest count (18 months post vaccination in the two older animals and 13 months post vaccination in the other four), unvaccinated controls had a total of thirty-eight established carious lesions and thirteen early lesions, compared with a total of six established lesions and four early ones in vaccinated animals. According to Professor B. Cohen, the appearance as well as the number of carious lesions was modified by vaccination. Thus controls had lesions similar to those in children with active dental lesions—the dentine within the lesions was soft and the lesions extended laterally as well as in depth so that the enamel margins were undermined. In vaccinated animals, on the other hand, there was less conspicuous softening of the dentine and less obvious undermining of the enamel.

The fact that bacteria were present throughout the experimental period suggests that the vaccine antibody has little direct effect on the organisms, but may act on a soluble antigen or enzyme produced by the bacteria—dextran sucrase, for example. This is interesting in the light of earlier work carried out in the department using dextranases to dissipate the dextran film on teeth produced by the action of bacterial dextran sucrase on sucrose. The vaccine seems to act at a stage earlier than the dextranases, possibly by inactivating or preventing the formation of dextran sucrase.

The vaccine is unsuitable for human use because bacteria similar to the strain used have been implicated in sub-acute bacterial endocarditis. This hazard apart, it would be inconceivable to use a live unattenuated vaccine clinically. But, as Professor Cohen pointed out, if the vaccine acts as an antienzyme, the need for inoculating with bacterial cells, attenuated or otherwise, would obviously not arise. One would simply have to isolate the active component and use this in a purified form.

MOLECULAR BIOLOGY

# Ball and Chain

from our Molecular Biology Correspondent

MANY of the most interesting features of self-aggregation processes in proteins are still unexplained. Many complex structures, for example, grow only up to a limiting size, rather than polymerize indefinitely. In other cases relatively trivial changes in the environment engender striking alterations in the geometry of the aggregate, presumably by distorting the relative disposition of the binding sites, or in some cases by liberating new sites.

An original example of such a phenomenon is described by Spragg *et al.* (*Biochem. J.*, **111**, 345; 1969), who have studied the behaviour of the serum α-globulin, orosomucoid. This glycoprotein, which has a molecular weight of 40,000 and contains 10–14 per cent *N*-acetylneuraminic acid, prevents agglutination of red cells by influenza and related viruses, but functions effectively only in an aggregated form, which can be achieved *in vitro* by brief heating of the solution. What Spragg *et al.* have now discovered is that two quite distinct forms of the polymer can be generated, depending on the salt concentration of the solution. With a relatively high concentration of salt, a spherical structure is formed (ball polymer), which in the electron microscope shows a remarkably narrow size distribution, with an average diameter of some 150 A. A sphere of this size could accommodate eight monomer units. At low salt concentrations, on the other hand, the protein forms long fibres (chain polymer), 50 Å in width, which is of the order of size of the monomer.

These ball and chain forms are both stable, but can be depolymerized by treatment with 3 M guanidine hydrochloride. The monomer recovered in this way from the ball polymer is indistinguishable from native orosomucoid in its properties, and can be repolymerized by heating to give ball or chain forms. The depolymerized chain polymer, however, has a remarkable "memory", in that it will repolymerize only to