

in diameter, but which were of much lower density than the ferritin granules of normal asbestos bodies (Figures 1 and 2). In some cases, especially in the laminated spheres, some ferritin granules were present, mixed with the lower density granules, when the contrast between the two was quite apparent. When calcification occurred the apatite crystals were first seen around the periphery of the coated asbestos fibers, but eventually they were found throughout the entire tissue.

These findings are important from two points of view. First, when it was realized that only a small percentage of dust ever became coated to form asbestos bodies, it was difficult to decide if this was due to a few fibers having a different chemical composition than the rest, or whether only a few fibers found themselves in a suitable chemical environment for coating to occur. The finding that all dust fibers become coated with something in early calcification certainly suggests that it is the environment that is important. Moreover, the fact that the coated dust in these areas is really quite like genuine asbestos bodies, may indicate that the important elements of the localized environment needed for asbestos body formation and the generalized environment of calcifying tissues, may be very similar. A great deal of information is certainly available on the chemistry of tissue calcification and although some of this is contradictory most workers appear agreed that one important factor in tissues about to calcify is that there is a great increase in acid mucopolysaccharides. It seemed likely, therefore, that the material coating of the asbestos dust in the calcifying lesions might be acid mucopolysaccharide, and this was confirmed by histochemical staining. The material proved to be P.A.S. positive, showed metachromasia with toluidine blue, and actively took up colloidal iron in Hale's staining technique. This last method is not only the most specific of the three for acid mucopolysaccharides, but it may indicate the method of formation of asbestos bodies. If the dust were coated first with acid mucopolysaccharide, this material would automatically become impregnated by any colloidal iron in the area, and the most abundant source of this material would be ferritin. In cellular tissues the supply of ferritin would be good, but in areas of acellular avascular collagen the supply would probably be very small and this could account for the fact that the dust coating found in the calcifying tissues contained little iron.

If this suggestion were correct, then at the start of the experiment it should be possible to demonstrate dust fibers coated only with mucopolysaccharide before iron impregnation has begun. Present studies involve the examination of dust granulomas during the first few days after dust injection and it has indeed been possible to find several asbestos fibers coated with a thick layer of low density material in which ferritin impregnation has only just begun (Figure 3). These studies are being continued.