(42)

Information from

Battelle
Pacific Northwest Laboratories
Battelle Boulevard
Richland, Washington 99352

Gary Petersen
Phone: (509) 946-2538

RICHLAND, Wash.---The interface between living bone and artificial materials is the object of an intensive research effort being conducted by Battelle-Northwest and the University of Washington. This study is regarded as the first essential step toward solving the critical problems of permanently attaching artificial devices to bones.

During the past year and a half scientists at Battelle and the University have been doing biomaterials research with prosthetics (artificial materials used to replace damaged or missing bones). Prior to this study persistent problems have developed where biomaterials are fixed to living bones in orthopedic applications such as the repair or replacement of joints or the correction of structural deformities with artificial bone segments.

In this cooperative effort, the research team has developed a unique metal structure called a void metal composite (VMC). The VMC has been tested in animals to determine its biological compatibility and the speed of bone tissue growth into the material. Initial evaluations of the mechanical properties of the interface between the bone tissue and porous metal have also been performed.

(more)

The study team has now received a $266,000 grant from the National Institute of Health's Institute of Arthritis and Metabolic Diseases, to continue research into the use of this porous material for attaining permanent attachment with bone. The continued study will be directed toward developing advanced materials, subjecting them to intensive mechanical testing and characterization, and then implanting them in animals. After implantations for periods to 18 months the research team will determine the rate, type and strength of ingrowing tissues, and study the nature of the interface bond between the tissue and the implant, and the strength and load-bearing capabilities of this bond.

"In addition to the extremely pertinent area of biomaterials that will be the focus of the program, other major reasons for this grant from the Institute of Arthritis and Metabolic Diseases are the collaborative team approach and the support of the two institutions in getting the work started," said R. P. Marshall, manager of Battelle's Metallurgy section and principal investigator for the project. "Work under this grant will broaden considerably the efforts of the research team that includes materials scientists working closely with life scientists with guidance and counsel of clinical specialists."

VMC appears to be well suited to fixing metals to living tissue, particularly hard tissue such as bone. Pore size in this material is easily and accurately controlled to pre-selected dimensions, and the gross mechanical properties appear readily modifiable to match the pertinent properties of bone.

(more)

K. R. Wheeler and K. R. Sump, Battelle materials scientists who have carried out the development and evaluation of VMC materials, report that a second generation of VMC structures will be used in this new study. These new structures have strength and elastic modulus properties close to those of hard tissue and offer the possibility of a range of values between the properties of hard tissue and wrought metals such as titanium and stainless steel.

To date VMC structures have been formed with pure titanium, the commercial titanium 6-4 alloy (6 percent aluminum and 4 percent vanadium), and 304 stainless steel.

Biological evaluations of the VMC material have been carried out by Dr. W. J. Clarke and Dr. M. T. Karagianes, Battelle-Northwest, and Dr. J. L. Nilles and Dr. John Coletti of the Department of Orthopedics, University of Washington. At Battelle-Northwest, biocompatibility of the VMC has been studied using tissue culture tests as a preliminary in-vitro evaluation, followed by implantation in the medullary canal of the femurs of experimental animals. Excellent acceptance by the tissue and speedy ingrowth into the VMC structure have been demonstrated.

Following implantation in the cortical layer of animal femurs, Drs. Nilles and Coletti also observed excellent ingrowth and ossification (calcification) of tissue in the VMC structure with high bond strengths between the implanted material and bone.

The research at both Battelle-Northwest and the University of Washington has been planned and carried out in close consultation with Dr. D. K. Clawson, chairman of the Department of Orthopedics, University of Washington. This close relationship between Battelle and the University in this research has been developed under the sponsorship of Dr. R. F. Rushmer, Director of Bioengineering, University of Washington. Dr. Nilles and Dr. Clawson will serve as co-investigators on the research performed under the new NIH grant.

# # #

BNW-71-42
062571