

The Marriage of Biomaterials and Biological Science: A Required Alliance

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A review of biotechnology and major device company product pipelines and recent FDA approvals shows that a growing proportion of new U.S. products are based on biomaterials, therapeutic polymers, and combination products that have biological activities. The creation of novel health care advances that use biomaterials is evolving from adapting existing materials designed into implant devices primarily using engineering principles, into realizing that biomaterial can be a means to actively or passively control biology. Our new generation of products often relies heavily on controlling specific biological or physiological actions; this requires understanding, as much as it is possible, how biomaterials fit into the biological world. Ultimately, it's all about the biology. Biology is our queen and on the surface there is little in common with biomaterials science and engineering. Although we will never completely understand biology's remarkable complexity, we must be closer aligned so that we can better control it to our benefit.

It is not sufficient for successful product development to just recognize that biology and its interaction with biomaterials are important; product development teams should reflect this complexity. At Genzyme, we are highly dependent on biologists for defining the problem we wish to solve, understanding the underlying biology, and developing the experimental approaches that lead from discovery to the clinic. For example, we draw from cell biology, molecular biology, informatics and genomics to identify specific signal transduction pathways to affect with local therapies to treat osteoarthritis. Our biology team members also develop the in vitro and in vivo screens for evaluating biomaterials and drugs that might beneficially affect arthritis. Because the interaction of the biologists with biomaterials is so critical for this program, we have put the orthopaedic biology and biomaterials groups together to optimize communication and effectiveness. Examples of successes and failures in other programs that rely on the relationship between biology and biomaterials will include treating the consequences of disease with therapeutic polymers, and developing cell-based therapies for tissue repair.