Diagnostic approaches to connective tissue diseases

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Connective tissue is one of the body's most pervasive tissues and is responsible for producing and maintaining form in nearly every organ in the body. It functions in a mechanical role, producing a matrix that serves to support and protect most of the major organ systems. Because connective tissues have such an important function, most of the major connective tissue diseases are either life threatening or crippling with enormous impact on healthcare cost. Diseases of connective tissues are manifested by either increased breakdown of connective tissues, as in osteoarthritis and osteoporosis, or overproduction of connective tissues, as in scleroderma and hepatic fibrosis.

Surprisingly, in spite of the enormous impact of connective tissue diseases on our healthcare system, until recently very little effort was made to develop tools for early detection and prevention of these diseases. Recognizing the impact and the opportunity for a major breakthrough, efforts to develop matrix biomarker assays have increased significantly.

Perhaps the most extensive research has been on identifying bone and cartilage markers. Three of the most prevalent connective tissue diseases, osteoporosis, osteoarthritis and rheumatoid arthritis involve bone and joint destruction. Disorders that adversely affect bone mass such as estrogen deficiency, hyperthyroidism, glucocorticoid excess, and malignancy are extremely common and have significant impact on our healthcare systems. Osteoporosis related fractures in the US cost between $7 to $10 billion annually. Providing care to patients who have fractures may exceed $60 billion annually by the year 2050. The ability to identify disease at the point when therapeutic measures will be most beneficial has always been medicine's goal. As life expectancy in the developed countries continues to rise, achieving this goal becomes more important. The need and demand for inexpensive safe, and accurate bone diagnostic tests will increase as healthcare providers try to ensure better health among the elderly, particularly women over age 50. Hence, reliable, inexpensive technologies that can detect early changes in bone turnover will become increasingly important in the future.

Useful and specific markers of bone turnover and cartilage metabolism will be discussed by speakers in this and other sessions. I would like to expand on recent progress in developing clinically useful biomarker assays and the role industry has played in bringing these assays to clinical laboratories.

Over the past 5 years remarkable progress has been made in identifying and developing bioassays for bone turnover as result of extensive collaboration between industry and academic institutions. These assays may allow clinicians to identify treatment candidates and tailor therapeutic regimens to individual patient needs.

Industry's role is to participate in the development and commercialization of biomarkers, from concept to the market phase. To establish clinical utility for a biomarker significant developmental effort and clinical studies are needed. This requires financial commitment to product, clinical investigation, regulatory and marketing issues. It is only through a productive relationship between academic and industrial laboratories that progress from basic into applied research, and the eventual introduction of assays into the clinical laboratories will be possible. Several immunoassays based on specific biomarkers have been developed. These assays have the high reproducibility, precision, and specificity needed to meet the high standard of clinical practice. Significant clinical data have been generated suggesting that several of these assays may prove to be powerful tools in diagnostic and therapeutic monitoring of bone diseases.