



# Grayson-Jockey Club RESEARCH TODAY

The Newsletter for Benefactors of Grayson-Jockey Club Research Foundation, Inc.

## Promoting Healing Of Fractures

*Among projects recently funded by Grayson-Jockey Club Research Foundation was work conducted by Dr. Mark Markel at the University of Wisconsin on an intriguing development in promotion of bone healing. The title of the project and Dr. Markel's subsequent scientific paper was "Acceleration of third metacarpal fracture healing with rhBMP-2." Research Today asked Dr. Markel about the project and its importance.*

***What were some of the benchmarks of knowledge which led to the hypothesis and the ability to conduct this study?***

Dr. Markel: The family of bone morphogenetic proteins (BMPs) was discovered in the 1960s by Marshall Urist when he demonstrated that the extracellular matrix of allogenic bone contained a previously unrecognized substance that elicited new bone formation. As many as twenty BMPs and growth differentiation factors (GDFs) have subsequently been identified.

Beginning in the mid-1980s, recombinant DNA technology allowed production of many of the various BMPs by bacteria or other cell lines in pure form. Our laboratory conducted some of the first studies evaluating recombinant human BMP-2 (rhBMP-2) for spine fusion using a titanium cage in a goat model. These studies and later human clinical trials led to the development of the first commercially available product using rhBMP-2 for cervical spine fusion in humans.

Concomitant with these studies, we and others also undertook studies evaluating, rhBMP-2 and

rhBMP-7 for augmentation of bone healing. Initial studies combined rhBMP-2 with a collagen sponge which is the current clinical product approved for spine fusion and fracture healing. Subsequently, injectable and implantable calcium phosphate putties have been evaluated for their

These benchmarks lead to the study funded by the Grayson-Jockey Club Research Foundation in which we proposed to investigate whether rhBMP-2 combined with two different types of bone cement would augment fracture healing of the splint bones in horses.



*Cartilage repair through the use of heat or resurfacing has attracted the attention of the National Football League, National Institutes of Health, and the National Arthritis Foundation, as well as the Grayson-Jockey Club Research Foundation. Researchers (from left to right: John Bogdanske, Marie Meyer, Dr. Mark Markel, and Dr. Yan Lu) use specialized radiofrequency units to anneal damaged cartilage.*

application in fracture healing.

Studies conducted in our laboratory demonstrated that these materials significantly improved fracture healing in dogs and sheep.

We proposed to evaluate splint bone healing in order to minimize complications associated with fracture treatment and healing.

*(continued on page 2)*



## RESEARCH TODAY

is the newsletter of

**The Grayson- Jockey Club  
Research Foundation, Inc.**

a 501(c)(3) organization

*Chairman*

Dell Hancock

*Vice-Chairman*

Dr. Gary Lavin

*Directors*

Josephine Abercrombie

Dr. Rick Arthur

William Backer

Dr. Larry R. Bramlage

Charlsie Cantey

Aisling Cross

Adele B. Dilschneider

Donald Dizney

Bill Farish

John K. Goodman

Lucy Young Hamilton

Joseph W. Harper

Braxton Jones Lynch

Eugene Melnyk

Leverett Miller

John M. B. O'Connor

John C. Oxley

Daisy Phipps

Ogden Mills Phipps

Dr. Hiram Polk Jr.

Geoffrey Russell

Joseph V. Shields Jr.

*Director Emeritus*

Dr. Jack Robbins

*President*

Edward L. Bowen

*Treasurer*

Laura Barillaro

*Secretary/*

*Vice President of Development*

Nancy C. Kelly

*Assistant Director of Development*

Jenifer Van Deirse

*Operations Administrator*

Resia Ayres

*Veterinary Consultant*

Dr. Johnny Mac Smith

821 Corporate Dr., Lexington, KY 40503

Ph: 859-224-2850 • Fax: 859-224-2853

40 East 52nd St., New York, NY 10022

Ph: 212-371-5970 • Fax: 212-371-6123

<http://www.grayson-jockeyclub.org>

## Promoting Healing Of Fractures (continued from page 1)

***Is the use of human bone morphogenetic protein to treat horses a novel approach? Does similar protein exist in horses?***

Human rhBMP-2 has been shown to improve fracture healing in numerous species. The gene sequence is highly conserved, although there are differences between human BMP-2 and equine BMP-2.

Equine BMP-2 has been sequenced, and investigators at Ohio State University and the University of Illinois have used the equine product in viral vector delivery studies. The advantage of the human product is that it has already been produced in large quantities in pure form. Its main disadvantage is its high expense. Fort Dodge Animal Health, a subsidiary of Wyeth Pharmaceuticals, is currently investigating rhBMP-2 application in dogs and has undertaken a FDA clinical trial in order to evaluate its efficacy in dogs. This would likely yield a far less expensive protein available on the market.

There are currently no groups producing sufficient quantities of equine BMP-2 necessary for clinical applications although with its sequence known, the protein can be delivered using viral vectors as has been described by Dr. Alicia Bertone's group at the Ohio State University.

***University of Wisconsin is unusual in the way equine and human medical facilities coordinate. Is this study an example of that type of cooperation?***

The University of Wisconsin is unique in that the Schools of Engineering, Medicine and Public Health, and Veterinary Medicine are all located on the UW-Madison campus and within a half-mile of

each other. The Comparative Orthopaedic Research Laboratory at the School of Veterinary Medicine has a long history of strong collaborations with the Department of Orthopedics and Rehabilitation in the School of Medicine and Public Health and the Department of Biomedical Engineering at the School of Engineering.

These have led to studies funded by the National Football League, Major League Baseball, Federal agencies such as the National Institutes of Health and the Department of Defense, engineering foundations, and various veterinary medical foundations such as the Grayson-Jockey Club Research Foundation.

The BMP-2 studies conducted in our laboratory in the early 1990s were designed as pre-clinical studies collaborating with spine surgeons in the School of Medicine and Public Health in order to develop a commercial product that was subsequently approved for cervical spine fusion in humans.

***What are some of the other uses of BMPs?***

Uses of BMPs in addition to fracture healing and vertebral fusion include applications for craniomaxillofacial and mandibular surgery and dental applications for regeneration of periodontal tissues. BMPs have also been investigated for enhancement of cartilage and tendon healing. I suspect that a broad array of applications for various BMPs will be developed in the coming years.

***How would you describe the results of your project in lay terms?***

Our study compared rhBMP-2 to the gold standard of an autogenous cancellous bone graft and compared



*A life-size bronze sculpture by Wisconsin artist Alexa King depicts the breadth of the veterinary medical profession. The sculpture, dedicated in September 2008 as part of the UW-Madison School of Veterinary Medicine's Walk of Honor, was made possible by the generous support of Margo and Jack Edl. The sculptor has also been commissioned to depict Barbaro.*

to leaving the defect empty. We concluded that rhBMP-2 was equal to or better than the cancellous bone graft for the treatment of larger defects of the splint bone. Both were better than no treatment for large defects. For small defects (less than one millimeter) there

were no significant differences between no treatment, cancellous bone graft, and rhBMP-2.

This study confirmed that rhBMP-2 has the potential to improve fracture healing in difficult fractures that have large defects or gaps.

***Is there a take-home message from this research that can be applied by practicing veterinarians? If not now, what are the prospects for this knowledge being used regularly in support of the athletic horse?***

The take-home message of our research and others' is that off-the-shelf products to improve fracture healing will be available to the equine practitioner within the next five years. There likely will also be new products available for improvement of osteoarthritis and cartilage healing and additional products available for tendon healing.

All of these will enhance the longevity and ability of the athletic horse in the coming years.



## Rokeby Circle Members

*In honor of the generosity to the Foundation by the late Paul Mellon, Grayson-Jockey Club designates inclusion in the Rokeby Circle for those donors/members at the \$10,000-plus level within the year. The honor is named for Rokeby Farm, Mr. Mellon's estate in Virginia. Current members of the Rokeby Circle as of December 2008.*

Mrs. Josephine Abercrombie	William S. Farish	Keeneland Association	Mr. & Mrs. John M. B. O'Connor
Joseph Allen	William S. Farish Jr.	Keeneland Foundation	Paul F. Orefice
Anonymous	William Stamps Farish Fund	Kentucky Thoroughbred Owners & Breeders, Inc.	Audrey W. Otto
Ashford/Coolmore	Tracy Farmer	Kentucky Thoroughbred Association Inc.	Overbrook Farm
Caroline and I. Banwell	Mr. & Mrs. Bertram Firestone	Ronald K. Kirk, Kirk Horse Insurance	John C. Oxley
Ramona & Lee Bass	Florida Thoroughbred Charities, Inc.	Lanes End Farm	The Oxley Foundation
Mr. & Mrs. John T. Behrendt	Gainesway Farm	Dr. & Mrs. Gary Lavin	Ogden Mills Phipps
Bessemer Trust	Dr. Susan Galandiuk	Jacqueline B. Mars	Dr. Hiram C. Polk Jr.
Gary Bizsantz	The William Gallion Family Foundation	Mr. & Mrs. Michael R. Matz	Carl Pollard
Breeders' Cup Ltd.	John K. Goodman	Mr. & Mrs. William J. McAlpin	Richard Santulli
Alexander G. Campbell	Mr. & Mrs. Greg Goodman	Eugene Melnyk	Mr. & Mrs. Barry Schwartz
Mr. & Mrs. William Casner	Helen Groves	Robert E. Meyerhoff	Mr. & Mrs. Joseph V. Shields Jr.
Alice Chandler	Lucy Young Hamilton	Mill Ridge Farm	Mace Siegel
Sherwood Chillingworth	Ms. Clay Hancock	Mr. & Mrs. Leverett S. Miller	Stuart Subotnick
Estate of Michael G. Chouffi	Dell Hancock	Mrs. Maxwell J. Moran	George Steinbrenner
Claiborne Farm	Seth W. Hancock	National Thoroughbred Racing Association	Stella Thayer
Mr. & Mrs. Dennis Dammerman	Joseph W. Harper	NetJets	The Tucker Foundation
Darley Stud Management LLC	Hess Foundation	North American Specialty Insurance Company/Swiss Reinsurance Group	(Mr. & Mrs. S.K. Johnston)
Del Mar Thoroughbred Club	Norma Wilentz Hess	Northern Trust Bank	Thoroughbred Charities of America
Mr. & Mrs. Robert O. Delaney Jr.	Ian Highet	NTRA Charities	Thoroughbred Owners & Breeders Association
Adele B. Dilschneider	Louise I. Humphrey	Oak Tree Racing Association	James R. Treptow
Donald R. Dizney	The Jockey Club		Virginia Guest Valentine
Dogwood Stable	Johnson & Johnson Consumer Products Company		Jack Weakley
Michael Dubb	Annie Jones		Jack Wolf
Mrs. & Mrs. C. Steven Duncker			William T. Young Jr.
Elizabeth Locke Jewels			

Notice: Upon request, a copy of the latest Annual Report filed by Grayson-Jockey Club Research Foundation, Inc. with the New York Secretary of State may be obtained from the Foundation (821 Corporate Drive, Lexington, KY 40503) or from the Secretary of State (162 Washington Ave., Albany, NY 12231).



# HAY, OATS & WATER ANYTONE?

*A strong faction in Thoroughbred racing prefers that no therapeutic medication would be allowed on race day. This philosophy is commonly summarized by the phrase "Hay, Oats and Water."*

*A generous donor to Grayson-Jockey Club Research Foundation has trademarked the phrase, "Hay, Oats and Water," and assigned commercial income from that phrase to our Foundation.*

**Only \$25\* each**  
*So, purchase of a T-shirt represents a donation to the leading source of veterinary research specifically aimed at promoting health and soundness of horses of all breeds.*  
(KY Residents Only \$26.50 with KY Sales tax)

## Yes! Please send me the following sizes:

Size	Small	Medium	Large	X-Large	XX-Large
Quantity					

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Address: \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Telephone: \_\_\_\_\_

Email: \_\_\_\_\_

I would like to purchase \_\_\_\_\_ shirt(s) @ \$25 each for a total of \$ \_\_\_\_\_

Enclosed is my check made payable to Grayson-Jockey Club Research Foundation, Inc.

Please charge my Credit Card:     AMEX                       MasterCard                       Visa

Card Number: \_\_\_\_\_ Exp Date \_\_\_\_\_

### Grayson-Jockey Club Research Foundation, Inc.

821 Corporate Drive • Lexington, KY 40503  
 (859) 224-2850 • Fax: (859) 224-2853

40 East 52nd Street • New York, NY 10022  
 (212) 521-5305 • Fax: (212) 371-6123

[www.grayson-jockeyclub.org](http://www.grayson-jockeyclub.org)

# HAY, OATS & WATER...IF YOU SAY IT, WEAR IT