The Study of Bone Diffusion in Canine Tibia

Mariela Gonzalez-Nieves
Cleveland State University, M.GONZALEZ96@csuohio.edu

Follow this and additional works at: https://engagedscholarship.csuohio.edu/u_poster_2012
Part of the Biochemical and Biomolecular Engineering Commons
How does access to this work benefit you? Let us know!

Recommended Citation
https://engagedscholarship.csuohio.edu/u_poster_2012/20

This Book is brought to you for free and open access by the Undergraduate Research Posters at EngagedScholarship@CSU. It has been accepted for inclusion in Undergraduate Research Posters 2012 by an authorized administrator of EngagedScholarship@CSU. For more information, please contact library.es@csuohio.edu.
The Study of Bone Diffusion in Canine Tibia

Fenn College of Engineering
Department of Chemical and Biomedical Engineering

Student Researcher: Mariela Gonzalez-Nieves
Faculty Advisor: Joanne M. Belovich

Abstract

The provision of nutrients is imperative in order to maintain healthy bone structure. Bones are composed of dense connective tissues that are consistently reforming making it difficult for simple diffusion of large signaling molecules to occur. Fully understanding the rate at which nutrients, minerals, and waste travel throughout bone could lead to solutions to problems such as bone illnesses, breaks, and integration of prosthetics in the human body. Enhanced targeted medication delivery can be established as well.

In this particular case study, experimentation performed by K. Farrell in 2011 yielded an overall average diffusion coefficient of $1.3 \times 10^{-7} \pm 2.0 \times 10^{-8} \text{ cm}^2/\text{s}$ while the current experiments yielded average diffusion coefficients of $2.6 \times 10^{-6} \pm 1.5 \times 10^{-7} \text{ cm}^2/\text{s}$. The results are an order of magnitude different. This difference could be attributed to the 2 orders-of-magnitude increase in solute concentration used in this work. Other possible explanations may be the increased age of the bone sample, during which the lipids and proteins may have degraded over time.

Diffusion coefficients differ among the quadrants of each section. This is, in some cases, due to the canaliculi and haversian canals within the sample.