White Paper Report

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HJ-50069-12 The IMPACT Mummy Radiologic Database

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Project Activities

This project involved the creation of a Mummy Radiologic Database, the review of large number of mummy CT scans by collaborators from various expertise, and in-person meeting to facilitate reading by consensus. Many of the findings have been published in the scholarly literature and more publications are planned (see below). The project involved a computerized database which was set up by the Canadian collaborators.

Accomplishments

1. Discovery of the extensive presence of atherosclerosis, the disease which causes heart attacks and strokes, in ancient people from numerous ancient cultures. This finding was surprising to many because heart disease is thought to be a condition of modern man and caused by modern risk factors. The finding has led many specialists to re-think the importance of certain cardiovascular risk factors.

2. Large number of publications in the scholarly literature (see below)

3. Remarkable collaboration among specialists from widely disparate disciplines.

4. Development of a reading-by-consensus approach through this multidisciplinary collaboration.

5. Testimony to Congress in the Congressional Record.

   a. Audiences

Based on the response in numerous venues, the scientific / medical community, museum curators, anthropologists, and the general public all found the results of the project to be enlightening.

   b. Evaluation

The investigators view the project as being an overwhelming success. The grant money provided an unusual opportunity for specialists in widely disparate disciplines to collaborate and the scholarly literature contribution afforded by this grant has been remarkable. The general public has shown intense interest and great appreciation of the research work (see below). In terms of weakness, the Canadian collaborators created their own radiologic PACS and viewing system. This took much longer to develop and worked less well than systems which are now currently available commercially. An
approach using a commercial host server plus commercially available DICOM reading software (OsiriX) would work better, assuming security and licensing agreement concerns can be effectively solved. The team did use contemporary commercial internet communications tools (Go-to-meeting, Dropbox) with great success, however..

c. **Continuation of the Project**

The team plans to issue a final report of the cardiovascular system review in several months. Other investigators have asked to conduct research using the IMPACT radiologic system which is indeed a very rich database. The collaboration and partnership between the participating specialists from multiple disciplines were greatly strengthened by the project and will be continued.

d. **Long Term Impact**

The primary discovery, that atherosclerosis was present and not hard to find in ancient people, has caused many to reconsider the relative importance of cardiovascular risk factors and to consider alternative risk factors. Thus, the project has implications regarding the understanding of health and disease in ancient cultures and modern cardiovascular investigations. The research team was awarded a pilot grant this year and is applying for larger grant investment to pursue the next logical steps in this line of research.

e. **Grant Products**

Please see below for the list of publications..

**Appendices**

**Narrative. NEH Grant  HJ-50069-12**

The IMPACT Study was funded by a grant from the NEH beginning in 2011 as part of the Digging Into Data Challenge and in collaboration with Canadian collaborators. The project involved the accumulation and archiving of CT scans and x-rays of mummies. The US team (funded by the NEH) reviewed the images primarily focusing on signs of cardiovascular disease. After some initial delays related to the Canadian team solving
hardware and security issues for the computer image archiving, the research has progressed successfully. The US side of the research has generated over 20 published manuscripts and abstracts to date and the NEH was acknowledged as the funding source for these scholarly publications. The public interest in the research has been intense, especially after the March 2013 presentation at the American College of Cardiology Scientific Sessions with simultaneous publication in *The Lancet*. At that time the work was featured in most of the newspapers of the world and covered by almost all of the major television and radio news outlets. There was also considerable media coverage in August of 2014 after additional features of the work were featured in a special edition of *Global Heart*.

Another abstract has been accepted for presentation in March 2015. That presentation and the subsequent manuscript submission will detail the cumulative results of all of the mummies in the study. Also, this NEH grant funded a “Reading by Consensus” meeting, held in Phoenix in December 2013. The results of that meeting and the IMPACT Study collaboration will be detailed in 6 articles in a special edition planned for the *International Journal of Paleopathology*. Manuscripts for this special edition are currently in preparation.

The NEH grant facilitated the collaboration across disparate scholarly disciplines in a way which is uncommon, but which is necessary for this sort of innovative work. Cardiologist, radiologists, anthropologists, paleopathologists, aging biologists, preservationists, Egyptologists and archeologists all participated in the collaboration. The study was submitted as testimony to Congress and published in the Congressional Record as evidence of the large and sometimes unexpected benefits from such public Grant funding.

**IMPACT STUDY PUBLICATIONS FROM NEH Grant**

*Original Research:*

3. Thomas GS, Wann LW, Narula J. What we can learn about atherosclerosis from the study of ancient people and mummies. *Global Heart*, 2014;9(2);185-186.


Abstracts:


Letters to the Editor:


Selected news coverage of 2013 Lancet article and others