The Telemetric and Holter ECG Warehouse (THEW) Initiative

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The objective of the Telemetric and Holter ECG Warehouse (THEW) is to provide access to electrocardiographic data to for-profit and not-for-profit organizations for the design and validation of analytic methods to advance the field of quantitative electrocardiography with a strong focus on cardiac safety.
Governance
FDA and University of Rochester Partnership

Facilitate collaborative discussions, leveraging of resources for the implementation of joint projects among FDA, UR, and other public and private stakeholders;

• Develop, identify and evaluate new electrocardiographic markers of cardiovascular risk related to management of patient care and evaluation of new molecular entities;

• As appropriate, incorporate scientific findings from the THEW into the pre-market evaluation process for ambulatory electrocardiographic devices, and into the total product life cycle.
2008 MILESTONES

Founding Donation Program:
- AMPS, LLC, NY, USA
- GE-Health Care Inc., WI, USA
- Global Instrumentations, LLC, NY, USA
- iCardiac Technologies Inc., NY, USA
- Mortara Instruments, WI, USA
- Philips Medical System, CA, USA
- Schiller America Inc., FL, USA

FIRST THEW EVENT:
FDA CAMPUS, SilverSpring, MD

FDA/URMC Agreement:
01-16-2008

Governance Structure:
07-15-2008

THEW Newsletter Issue 1:
09-03-2008

Pfizer DSA (TQT):
09-10-2008

THEW Newsletter Issue 2:
09-15-2008

THEW Newsletter Issue 3:
10-06-2008

Roche DSA DUA (TQT):
10-30-2008

Global Instrumentations TSA:
12-04-2008

Cardiocore:
12-04-2008

07-15-2008
09-15-2008
10-06-2008
12-04-2008
THEW : Data, Expertise and Tools

Promoting cross-fertilization of scientific knowledge, resources, and ideas that will advance the field of quantitative electrocardiography

DATA : ECGs for R&D activities
- Cardiac patients
- Healthy individuals
- Drug–induced arrhythmias
- Congenital LQTS

EXPERTISE:
- Academic Network
- Private Partners
- Others....

TOOLS:
- ECG data access / visualization / APIs (Client Application)
- Computing Centers for development/validation of ECG algorithm on large database.
## THEW data: the warehouse

[1] these companies agreed on sharing the data with the THEW, legal aspect around the data sharing are being discussed.

<table>
<thead>
<tr>
<th>Study</th>
<th>ECG type</th>
<th>Contributor</th>
<th># recordings</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDEAL 1</td>
<td>24-hour Holter</td>
<td>HRFUP</td>
<td>206</td>
<td>Acute Myocardial Infarction</td>
</tr>
<tr>
<td>IDEAL 2</td>
<td>24-hour Holter</td>
<td>HRFUP</td>
<td>265</td>
<td>Healthy Individuals</td>
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<tr>
<td>Moxifloxacin</td>
<td>24-hour Holter</td>
<td>Roche</td>
<td>142</td>
<td>Thorough QT study</td>
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<tr>
<td>Moxifloxacin</td>
<td>24-hour Holter</td>
<td>Pfizer</td>
<td>175</td>
<td>Thorough QT study</td>
</tr>
<tr>
<td>IDEAL 3</td>
<td>24-hour Holter</td>
<td>HRFUP</td>
<td>294</td>
<td>Coronary Artery Patients</td>
</tr>
<tr>
<td>Acqu. LQTS</td>
<td>24-hour Holter</td>
<td>Munich University</td>
<td>3</td>
<td>Drug-induced torsades de pointes</td>
</tr>
<tr>
<td>Cong. LQTS</td>
<td>24-hour Holter</td>
<td>Munich University</td>
<td>4</td>
<td>Genotyped, torsades de pointes</td>
</tr>
<tr>
<td>Sotalol</td>
<td>24-hour Holter + standard ECGs</td>
<td>Pfizer Inc. [1]</td>
<td>99+1600</td>
<td>Baseline, single and double dose of sotalol (160/320 mg)</td>
</tr>
<tr>
<td>ED patients</td>
<td>24-hour Holter ECGs</td>
<td>UCSF</td>
<td>1308 (189 HR)</td>
<td>24 hour following ED admission for chest pain</td>
</tr>
<tr>
<td>Cardiac patients with TdPs</td>
<td>10-min ECGs</td>
<td>Munich University</td>
<td>34</td>
<td>Cardiac patients with a history of drug-induced TdPs</td>
</tr>
<tr>
<td>Healthy Volunteers</td>
<td>24-Holter ECGs</td>
<td>Abbott [1]</td>
<td>TBD</td>
<td>Pre-competitive data</td>
</tr>
<tr>
<td>Dofetilide</td>
<td>24-hour Holter</td>
<td>Pfizer Inc. [1]</td>
<td>5,000</td>
<td>Drug-induced arrhythmias</td>
</tr>
</tbody>
</table>

### Table: Population

<table>
<thead>
<tr>
<th>Year</th>
<th># recordings</th>
<th>Contributors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>1,082</td>
<td></td>
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<tr>
<td>2009</td>
<td>4,131</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>9,131</td>
<td></td>
</tr>
</tbody>
</table>
THEW Expertise: Academic Network

US Committed Scientific Investigators:
(MD) Bethesda, MD - Dr. Mark Haigney, Division of Cardiology, Department of Medicine, Uniformed Services University of the Health Sciences;
(MD) Minneapolis, MN - Dr. Morrison Hodges, University of Minnesota;
(PhD) Utica, NY - Charles Antzelevitch, Masonic Medical Research Laboratory;
(PhD) Salt Lake City, UT - Robert Lux, CRVTI, University of Utah;
(PhD) Silver Spring, MD - Norman Stockbridge, CDER, FDA, US Human Health Department
(PhD) Rochester, NY - Mark Bocko, University of Rochester
(PhD) Rochester, NY - Jean-Philippe Couderc, University of Rochester Medical Center
(MD) New-York City - Eric Rashba, Stony Brook University Medical Center
(RN, PhD) San Francisco - Barbara Drew, University of California

European Committed Scientific Investigators:
(MD) Paris, France - Pierre Maison-Blanche, Hospital Lariboisiere
(PhD) Milan, Italy - Alberto Porta, University of Milan
(PhD) Rotterdam, Netherland - Jan Kors, Erasmus MC
(PhD) Jena, Germany - Andreas Voss, University of Applied Sciences
(MD) Lyon, France - Philippe Chevalier, Hopital Louis Pradel
- Paul Rubel, INSA
(MD,PhD) Lund, Sweden - Pyotr Platonov and Dr. Fredrik Holmquist, Lund University Hospital
(PhD) Ancona, Italy - Laura Burratini Polytechnic University of Marche
(PhD) Brno, Czech Republic, Josef Helamek, Academy of Science of Czech Republic
(PhD) Zaragoza, Spain, Pablo Laguna Centro Politécnico Superior, Universidad de Zaragoza
THEW Tools: the Client Application

The version of the THEW Client Application (V1.4) is tested on site at the FDA and in 20 sites in the U.S. and in Europe.

Free demo version available at www.thew-project.org

- Visualize ECG signals and annotations
- Download ECG signals and annotations
- Password protected access/database
- APIs empowered application
- SDK available
- Enable local machine epoch generation
THEW Tools: the Client Application

Thorough QT study: E-HOL-12-140-008

File format for ECG signal and annotation:
1/ ASCII format
2/ ISHNE format
3/ FDA-XML (coming up)

Selection of extracted period, no limitation in duration.
Conclusions

- **Our heritage** is the Heart Research Follow Up Program that has extensive experience in the design, conduct, and analysis of world-wide, multicenter, clinical research studies ranging from 100-3,500 subjects (MADIT I, MADIT II, MADIT CRT, LQTS and ARVD registries).

- **Our alignment** with the Critical Path Initiative has been officially expressed by a partnership agreement between the University of Rochester and the FDA - a 3-year partnership for the development of ECG technologies within the drug safety arena.

- **Our objective** is to promote cross-fertilization of scientific knowledge, resources, and ideas that will advance the field of quantitative electrocardiography.

- The THEW will play an important role in the development of novel ECG technologies by helping the access to scientifically relevant ECG recordings and their clinical information.
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