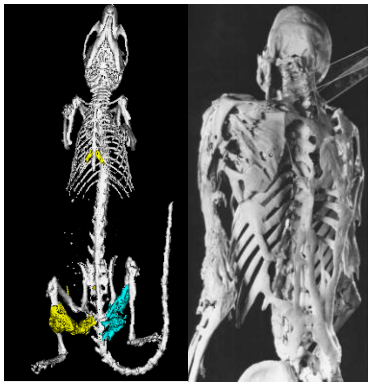
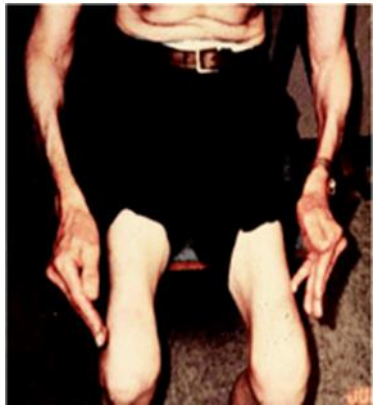
REGENERON

science to medicine™



# Accelerate Translation of Discoveries to Therapies for FOP Patients




**Xiaobing Qian, MD PhD**

**Early Clinical Development**

**Regeneron**



**@UK FOP Meeting**

**May 20-22, 2015**

# Disclosures

- Employee at Regeneron Pharmaceuticals, Inc

- Regeneron: BioPharma Company
  - US: Tarrytown, Basking Ridge, Rensselaer
  - EU: Dublin, Limerick

# Accelerate Translation from Discovery to Therapy to Meet Urgent Medical Needs in FOP

- **A time of exciting new developments**
  - Very active research and drug discovery/development activities
- **Principle: “patient first”**
  - FOP patients urgently need SAFE and EFFECTIVE treatment: time is of essence
- **It takes a collaborative community to advance our therapies**
  - Learnings from humanized mouse models and FOP patient samples
  - Emerging data on natural history, imaging, biomarkers
  - Experience of FOP patients, physicians, clinical researchers, and other drug development programs
  - Reduce trial burden, avoid “repetitive” learning
  - Document long term disease progression in the IFOPA Connection Registry – supports drug development and build evidence for drug approval

# From Discovery to Clinical Trials: the Path of a Novel Monoclonal Antibody Drug Candidate

- Monoclonal antibody
  - Specific to target; Regeneron mAbs are fully human
  - Administration by intravenous infusion or subcutaneous (under the skin) injection
  - Longer half-life compared to small molecule drugs, given once every few weeks
- Extensive preclinical activities before starting clinical trials
  - Toxicology testing in rats and monkeys (at what dose levels the drug is safe?)
  - Pharmacokinetics studies (how long does the drug last in the body?)
  - Pharmacology studies (at what dose levels the drug is active?)
  - Drug manufacture, formulation, and testing for quality and stability
  - Develop and validate assays for clinical samples (PK, biomarkers)
- Application for initial drug testing in human subjects
  - Regulatory authorities: investigational new drug (IND) application (US); Clinical Trial Authorization (CTA) application (EU)
  - Ethics committee review
  - Adequate protection of patient safety

# Accelerate Translation from Discovery to Therapy in FOP

- Safety, PK, and “dose finding”
  - Start at low dose level and gradually increasing dose (4-6 dose levels)
  - To be conducted in heathy volunteers – fastest way to get data (FOP rare), done at Phase 1 units specialized in such studies
  - Goal is to determine safe and well-tolerated doses that are potentially pharmacologically active
- FOP trials: safety, translation of findings in FOP mice to humans (“proof of concept”, POC)
  - Safety, tolerability in FOP patients
  - “POC”: show inhibition of heterotopic ossification (HO) by imaging or biomarker
  - Option for patients to continue treatment in an open label extension trial to continue monitor safety, and efficacy on HO and function

# Regeneron has Broad Capability and is Committed to FOP Research and Drug Development

- **Our common goal:**
  - **Strong science → important medicine → urgent unmet need**

- **Regeneron has the full capability** for scientific research, drug discovery and development
  - VelociGene mouse model – FOP mice
  - VelocImmune antibody technology – fully human antibody
  - Scientific research Therapeutic Focus Areas
  - Monoclonal antibody discovery, manufacturing, and quality control
  - Offices in US and EU, global clinical development experience
  - We have done it many times, from ultra-rare disease to large indications

- **A collaborative community**, with patient associations, physicians, scientists, and clinical researchers

***Thank you!***