Improving Stem-Cell Based Cellular Products: Perspectives from a Patient-Centric Research Organization

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What is Multiple Sclerosis?

- Autoimmune disease of CNS
- Attacks myelin sheath of nerve axons
- Conduction failure of nerve signals
- Death of nerve cells
- Loss of mobility
- Loss of vision
- Cognitive problems
- Fatigue
- Sleep disorders
- Mental health problems
- 14 treatments approved since 1993
- No cure

from Calabrese, et al., 2015
Background on Accelerated Cure Project

- Founded in 2001
  - MIT-trained engineer diagnosed with MS
  - wanted to accelerated MS research
  - open-science and patient participation principles
- 501(c)3, funded by donors, grants and contracts
- ACP Repository program - since 2005
- iConquerMS™ PPRN - since 2014
ACP’s Programs - Repository

- Biosamples and extensive data from 3,200+ consented individuals at 10 MS Clinics (funded by ACP)
- Commercial biorepository partner for processing/storage
- Available to researchers worldwide (100+ studies, so far)
- Mandated data return creates virtual collaborations
- ACP manages samples/data distributions & returned data
ACP’s Programs - iConquerMS™

iConquerMS™: People-Powered Research Network bridged to Researchers and Other Stakeholders

- Needs, Ideas
- Plans, Resources
- Data, Samples
- Analysis, Results
- Dissemination
- Advocacy

IMPACT ON CARE

- ~4,000 participants*, growing daily
- Funded by PCORI as part of PCORnet
- Governed by majority of PwMS - the experts
- Research portfolio developing rapidly

OPEN SCIENCE driven by People with MS

*registered & consented + 1,200 e-mails (1,300 FB; 2,100 twitter)
Regenerative Medicine Opportunities in MS

• “Confused” Immune System
  – Reboot with stem cells
    (hemopoietic, mesenchymal)

• Damaged Myelin Sheath
  – Regenerate oligodendrocytes
    (mesenchymal SCs, iPSCs)

• Lost Nerve Cells
  – Regenerate nerve cells and
    make right connections
    (mesenchymal SCs, iPSCs)

50+ clinical studies registered on clinicaltrials.gov

16 US studies

12 US academic studies completed or no longer recruiting

4 US companies with AMSC studies “recruiting”
Autologous Hemopoietic SCs for MS

Mobilization
Cyclophosphamide
G-CSF

Leukoapheresis

Optional CD34+ selection

Cryopreservation of AHSTC graft

Transplantation

Conditioning
Regimen such as BEAM +/- ATG

Inpatient post-transplantation recovery
Antibacterial, antifungal, antiviral, prophylaxis

Discharge to home

Normal WBC range

WBC (x10^9/L)

Daycare
Home

Inpatient

Home

from Muraro, et al., 2017

Dave Bexfield
ActiveMSers & iConquerMS™
### Autologous Hematopoietic SCs for MS

**% of Patients with No Evidence of Disease Activity at 2 years**

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<th>Treatment</th>
<th>% No Evidence of Disease Activity at 2 years</th>
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<td>AHSCT (Nash, 2017)</td>
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Positive trials have led to plans for BEAT-MS clinical study from Muraro, *et al.*, 2017
Key to Trials and Routine Treatment

Material with Right Properties

In the Right Place

At the Right Time

At the Right Concentration
Improving SC-Based Products

Role of Patients and Advocacy Organizations

• Patients are the source of treatment material
• Educate patient and caregiver communities through networks and advocacy organizations
• Emphasize the need for high-quality clinical trials
• Bridge the expectation-reality gap driven by hope
• Include people affected by the disease in the entire continuum from study concept to impact on patients
• Protocol development, study participation, results dissemination, approvals, reimbursement
Improving SC-Based Products

Role of Biorepositories

- Research on the properties of cells at various stages is critically important to developing/improving products

- Harvesting, destroying, stimulating, post-treatment

- Need centralized biorepository for processing, storage and distribution of materials/data for research

- Need neutral management and oversight of:
  - activities of biorepository;
  - study approval and material/data distribution process; and,
  - returned data from research studies
Thank You