Sep. 21, 2016

CIRM 2.0

CALIFORNIA'S STEM CELL AGENCY

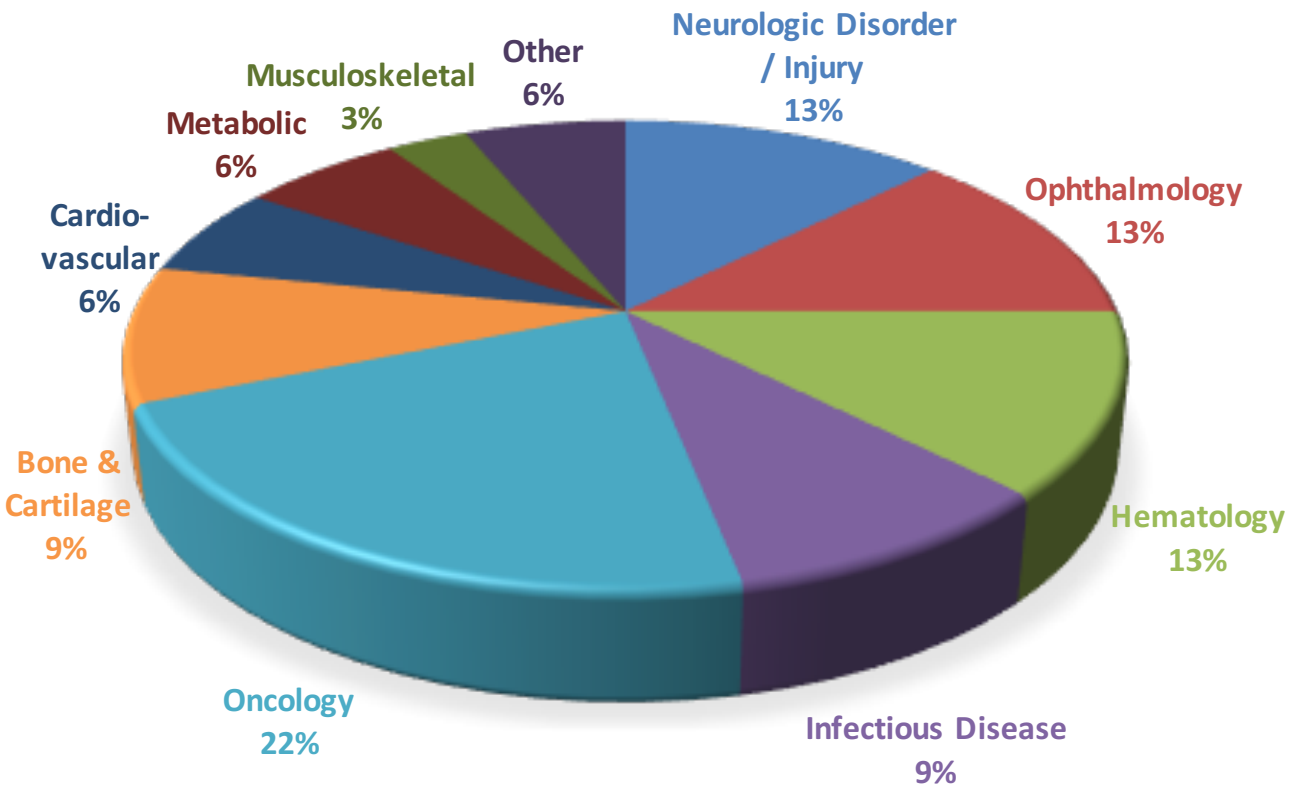
Clinical Program Update

Maria T. Millan, M.D.

Vice President, Therapeutics

California Institute for Regenerative Medicine

Therapeutics Portfolio



21 Clinical Trials
11 Preparing IND

CIRM funded Clinical Trials

Beyond CIRM 2.0 now it's personal

Neurological and Ophthalmic

Lebkowski/Asterias	Spinal Cord Injury	Phase 1/2a
Klassen/UC Irvine	Retinitis Pigmentosa	Phase 1/2a
Humayun/USC	AMD	Phase 1
Lebkowski/Geron	Spinal Cord Injury	Phase 1 (closed)
Wheelock/UC Davis	Huntington's Disease	Observational

Oncology

Gringeri/Immunocellular	Glioblastoma	Phase 3
Slamon/UCLA	Solid tumor	Phase 1
Kipps/UCSD	CLL	Phase 1
Weissman/Stanford	AML and solid tumor	Phase 1
Dillman/Caladrius	Melanoma	Phase 3 (closed)

Organ Systems

Foyt/Viacyte	Type 1 Diabetes	Phase 1/2a
Lane/UC Davis	Osteoporosis	Phase 1/2a

Hematological

Shizuru/Stanford	X-linked severe combined immunodeficiency	Phase 1/2a
Symonds/Calimmune	HIV/AIDS	Phase 1/2a
Kohn/UCLA	X-linked Chronic Granulomatous Disease	Phase 1/2
Kohn/UCLA	Sickle Cell Disease	Phase 1
Abedi/UCDavis	HIV/AIDS	Phase 1
Zaia/City of Hope & Sangamo	HIV/AIDS	Phase 1

Cardiovascular

Smith/Capricor	Myocardial infarction	Phase 2
Ascheim/Capricor	Duchenne muscular dystrophy cardiomyopathy	Phase 2
Lawson/Humacyte	Hemodialysis Access	Phase 3

Clinical Trial Updates:
Cardiovascular, Ophthalmic and Neurologic

Clinical Update: Cardiovascular

Project	Rationale	Outcome Measures	Status
Product: Allogeneic Cardiosphere-Derived Cells (CAP-1002) Indication: Duchenne Muscular Dystrophy (DMD) Cardiomyopathy Design: Phase 2 1:1 Randomized Open Label Ascheim/*Capricor* *$3.3M*	Cardiomyopathy is the leading cause of death in DMD Occurs in adolescence or early adulthood. Patients typically not eligible for heart transplant Data from ALLSTAR trial in ischemic cardiac disease Proposed mechanism: promotes regeneration and modulates immune response and fibrosis	Primary: Safety & Tolerability Secondary: Cardiac structure Cardiac function Quality of life	Enrollment Complete Favorable Safety Profile Study in progress *Projected award end: 10/31/18*

Clinical Update: Cardiovascular

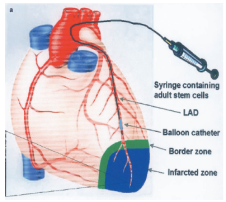
HOPE Trial - Cardiomyopathy in DMD

Phase 2
1:1 Randomized, Open Label
(N=25)

DMD cardiomyopathy

Standard of Care + CAP-1002 cells

Standard of Care



Strauer 2002 Circulation

Figures provided by Capricor

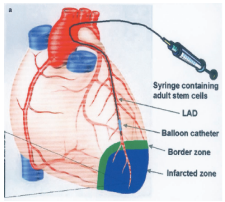
Infusion into three major coronary arteries

Clinical Update: Cardiovascular

Project	Rationale	Outcome Measures	Status
Product: Allogeneic Cardiac-Derived Stem Cells (CAP-1002) Indication: Heart Failure post Myocardial Infarction Design: Phase 2 2:1 randomized double blind placebo controlled Smith/*Capricor* *$19.8M*	Heart failure affects 5M people in U.S. and incidence increasing Preclinical studies show decreased infarct size and improved cardiac function Favorable Phase 1 clinical safety data	Primary: Safety Secondary: Infarct size Cardiac function	Enrollment near completion Favorable Safety Profile thus far Study in progress *Projected award end: 12/31/2017*

Clinical Update: Cardiovascular

ALLSTAR Trial -Treatment following Myocardial Infarction



Strauer 2002 Circulation

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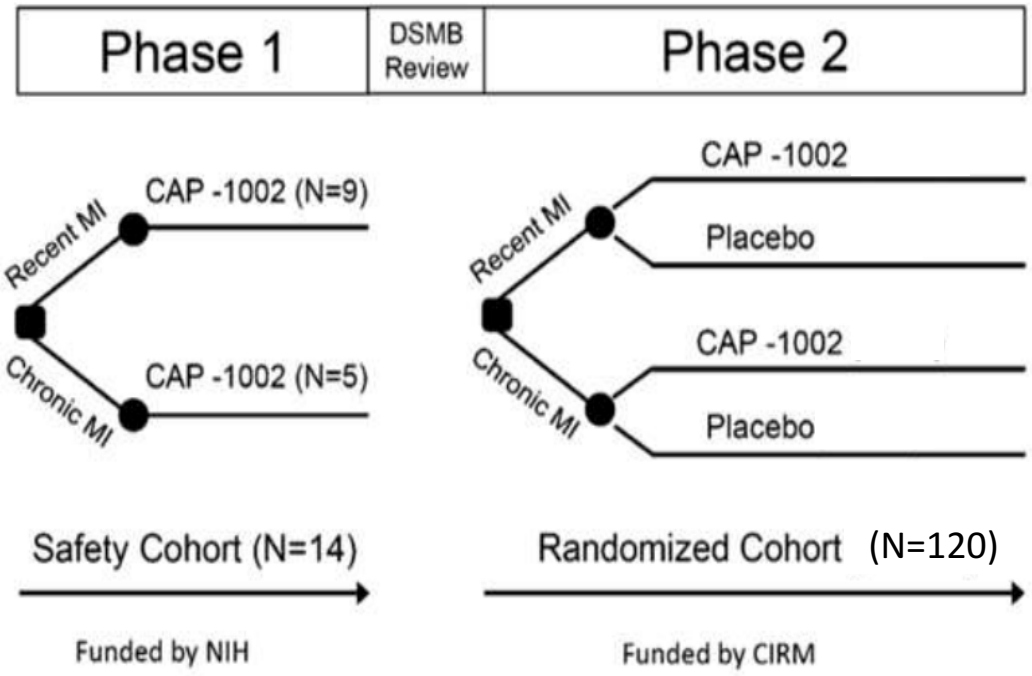


(Adapted from Chakravarty 2016 Cell Transplantation)

Phase 2, 2:1 Randomized
Double Blind
Placebo Controlled

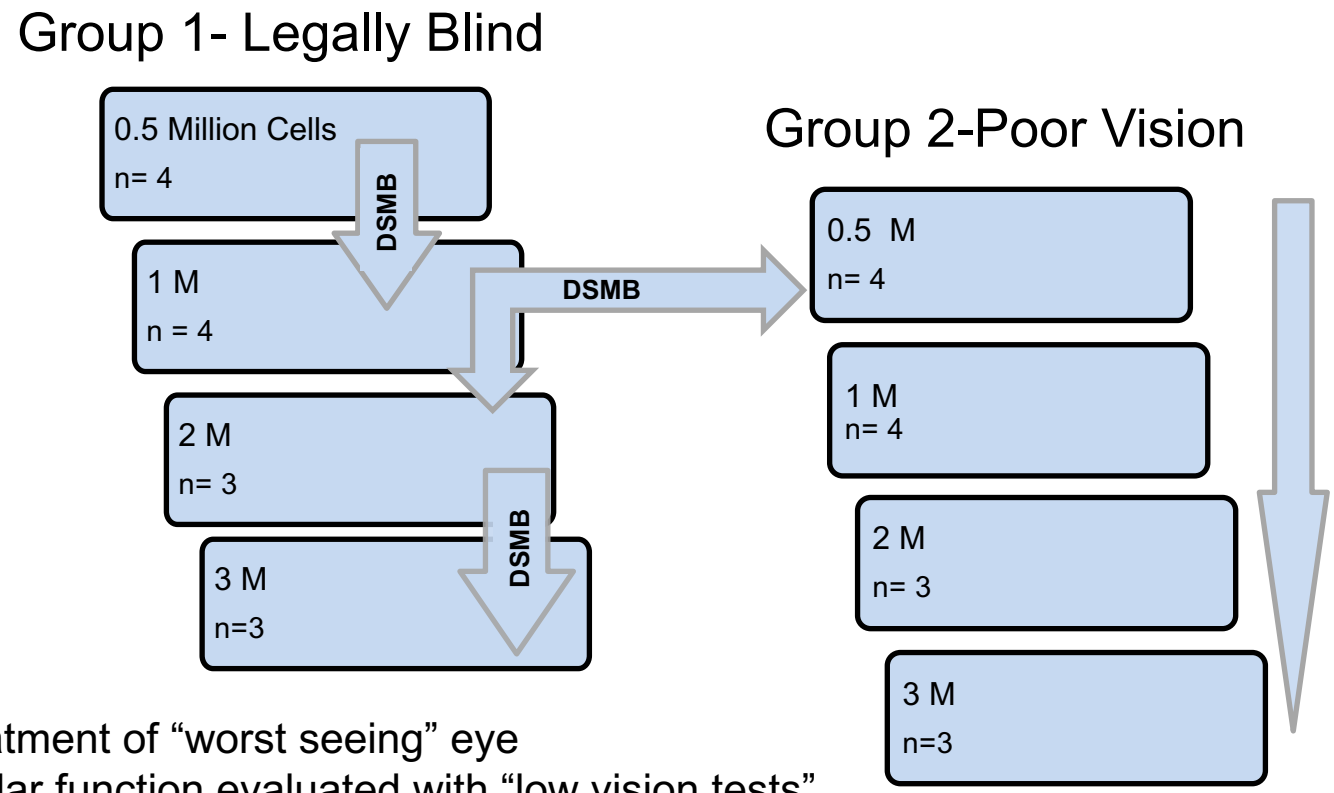
Clinical Update: Ophthalmic

Project	Rationale	Outcome Measures	Status
Product: Allogeneic Retinal Progenitor Cells Indication: Retinitis Pigmentosa (RP) Design: Phase 1/2a Open label Single arm Multiple dose Klassen/*UC Irvine* *$17.3M*	Incidence of RP 1:4000 Legal blindness often by age 40 Neural degeneration of photoreceptors Intraocular injection of allogeneic retinal progenitor cells to rescue photoreceptors	Primary: Safety Secondary: Ocular function	Enrollment complete Five subjects with 12 months follow-up Favorable Safety Profile Study ongoing *Projected award end: 12/31/16*

Clinical Update: Ophthalmic

Retinal Progenitor Cells for Retinitis Pigmentosa

Phase 1/2a, Open label, Single Arm
Multiple dose



Treatment of “worst seeing” eye
Ocular function evaluated with “low vision tests”
12 month Follow-up

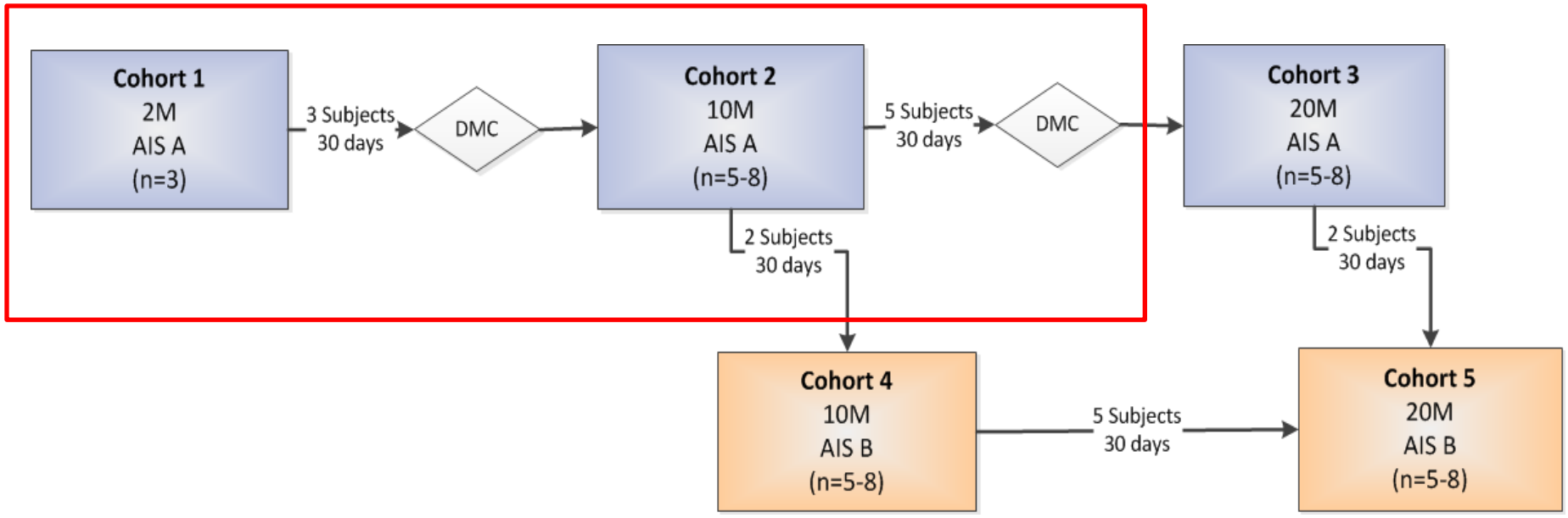
Clinical Update: Neurologic

Project	Rationale	Outcome Measures	Status
Product: ESC derived oligoprogenitor cells AST-OPC1 Indication: Cervical Spinal Cord Injury Design: Phase 1/2a Open Label Single Arm Dose Escalation Lebkowski/*Asterias* *$14.3M*	Up to 12,000 Americans suffer a spinal cord injury each year Leads to a high level of permanent disability and decreased life expectancy No current treatment	Primary: Safety Secondary: Neurologic function by upper extremity motor scores Motor level on International Standards for Neurological Classification	Enrolled 2 Cohorts Favorable safety profile Study in progress Interim observations presented Sep. 2016 *Projected award end: 9/30/18*

Clinical Update: Neurologic

Cervical Spinal Cord Injury

Completed

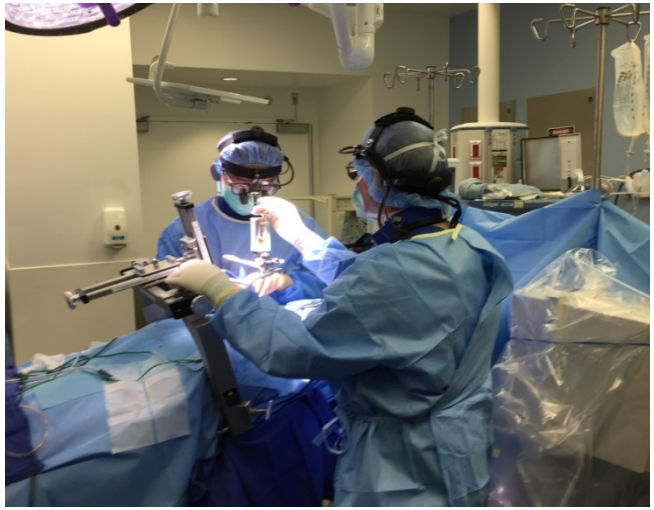


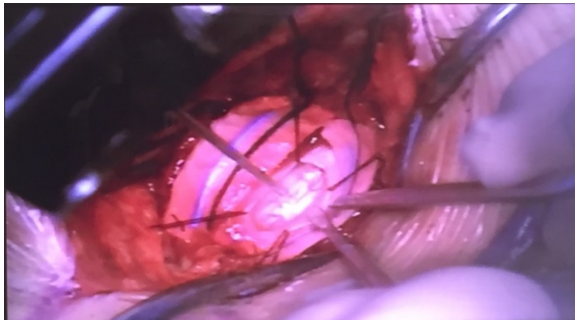
Phase 1/2a, Open Label, Single Arm
Dose Escalation
Neurologic evaluation at 30, 60, 90, 180, & 365 days
Currently recruiting for Cohorts 3 & 4

With permission from Asterias presented at ISCoS Meeting September 14, 2016

Clinical Update: Neurologic

Cervical Spinal Cord Injury





Injections into the spinal cord lesion

With permission from Asterias presented at ISCoS Meeting September 14, 2016

Update by Asterias at the International Spinal Cord Society Meeting:

- No serious adverse events related to the investigational cell product
- Tolerated by subjects with subacute cervical spinal cord injury
- Possible efficacy signal at 90 days

MISSION

Our Mission

To accelerate stem cell treatments to patients with unmet medical needs.