ChemoID®

Drug Response Assay for Personalized Chemotherapy Treatment

MARSHALL

Edwards Comprehensive Cancer Center

Cordgenics

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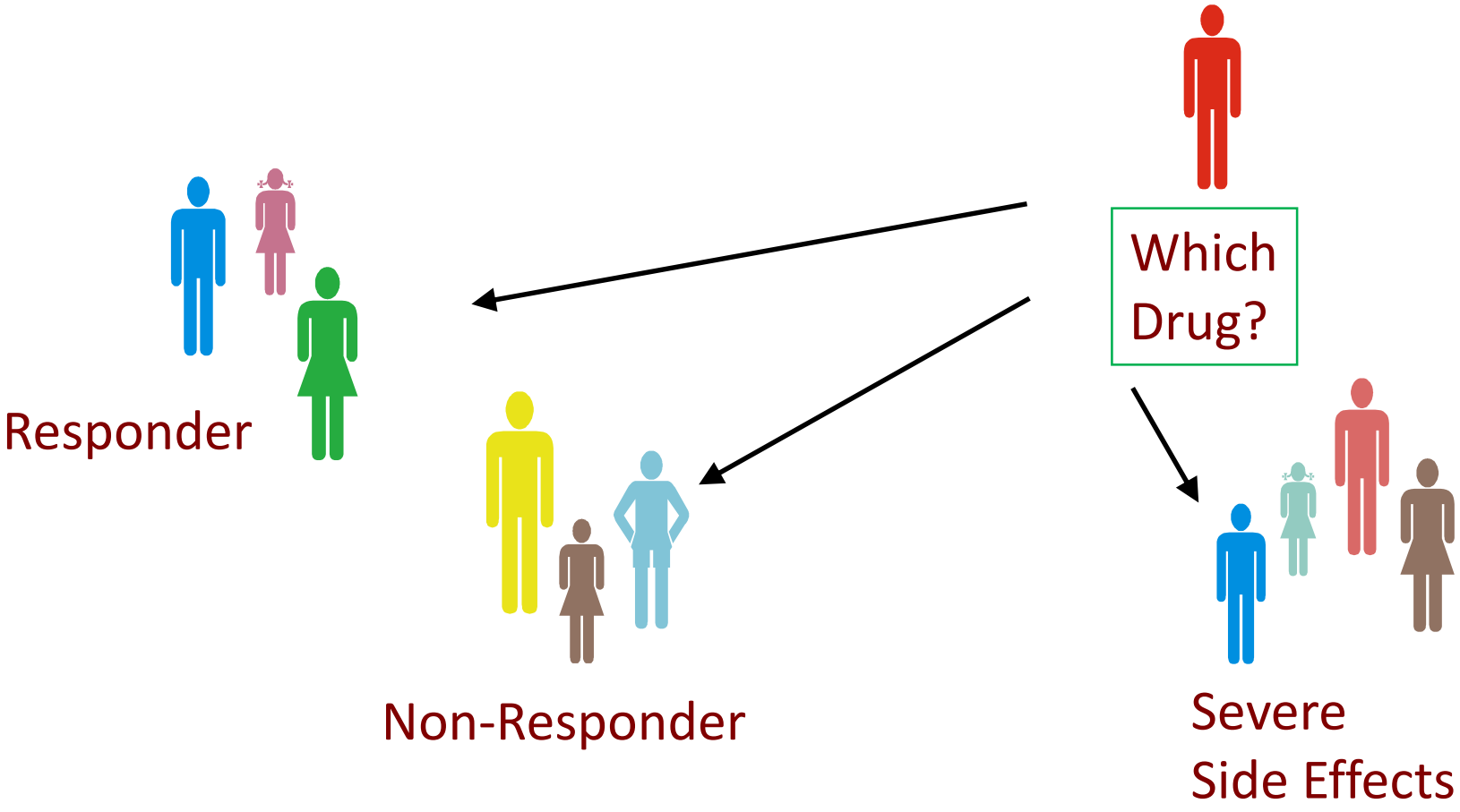
Cordgenics – Who We Are:

- Founded in 2010
- Clinical diagnostics company using exclusively licensed and proprietary technology for rapid expansion of cancer stem cells.
- **Mission:** Develop and deliver technology that helps physicians select the appropriate chemotherapy for an individual patient
- **Objectives**:
  - Better patient outcomes,
  - Reduced costs to patient, healthcare system and society as a whole

ChemoID Addresses a Problem in Cancer Therapy: One Chemotherapy Doesn't Fit All Patients

Validated biomarkers are **not** available for chemotherapy selection



Consequences of the Problem that <u>One Drug Doesn't Fit All Patients:</u>

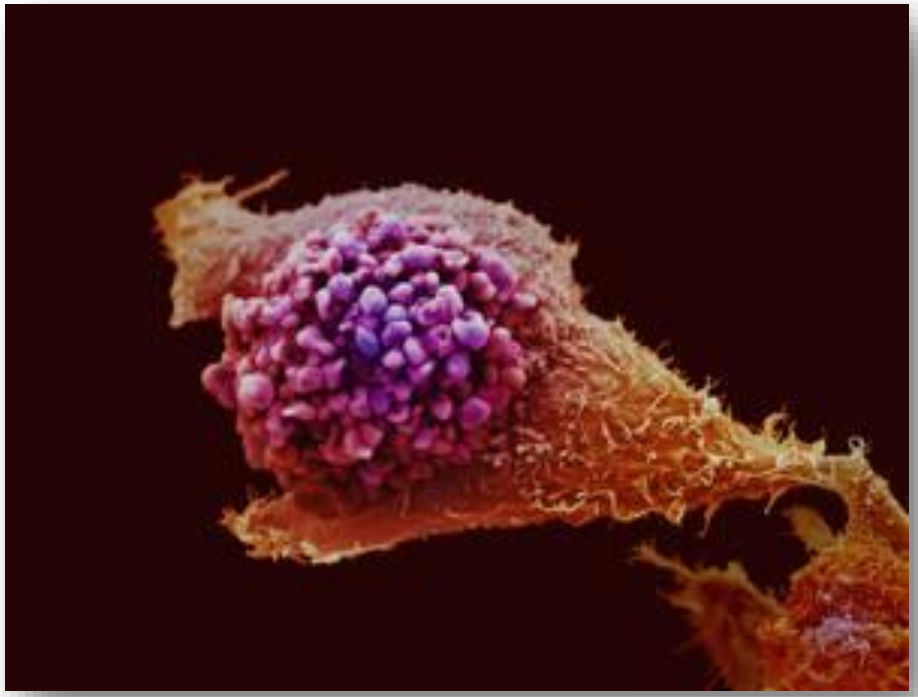
- 75% of chemo patients derive no long term benefit
- All patients suffer adverse side effects
- The response to chemotherapy in solid tumors is about 30%

RESULTS: Bad Outcomes, Extended Patient Suffering, Non-Compliance, Huge Financial Costs to Patient and Healthcare System

Solution: ChemoID® assay
Personalized Chemotherapy Selection

- CLIA certified and CAP accredited test
- **Second generation** chemotherapy sensitivity assay
- Real-time predictive chemotherapy guidance assay
- Functional prognostic test to measure response to chemotherapy early in treatment to **cancer stem cells** and **bulk of tumor cells**
- Useful for both newly diagnosed and recurring cancers

Unique Characteristics of Cancer Stem Cells (CSCs)



- SELF-RENEWAL
- PROLIFERATIVE ABILITY
- TUMORIGENIC POTENTIAL
- HIGHLY RESISTANT TO CHEMOTHERAPY

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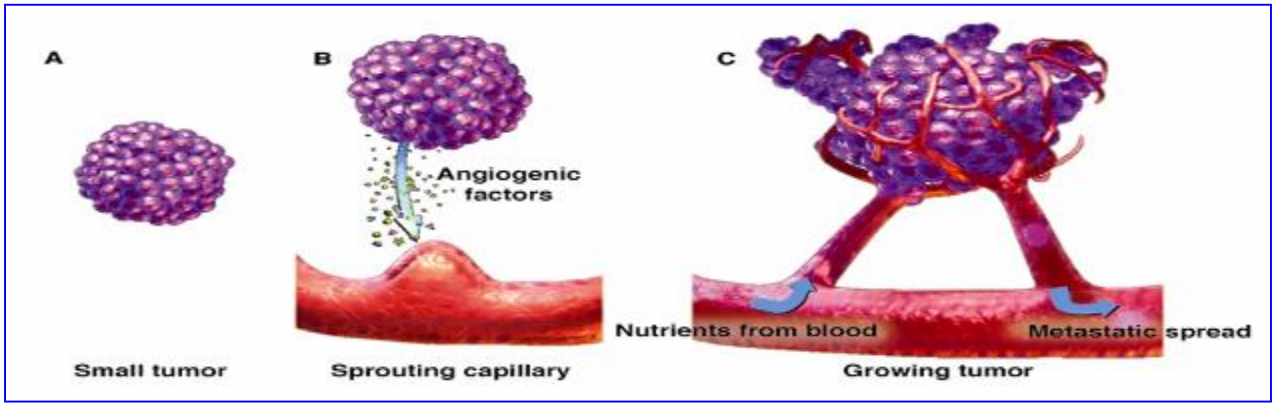
ABERRANT REGULATION

IN NORMAL GENE PATHWAYS

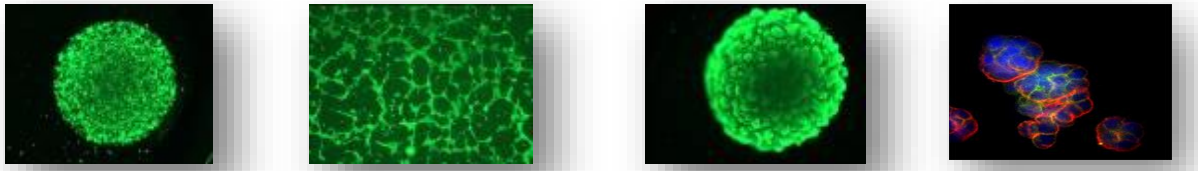
Cancer Stem Cells Drive Different Cellular Processes

In Vivo Tumors:



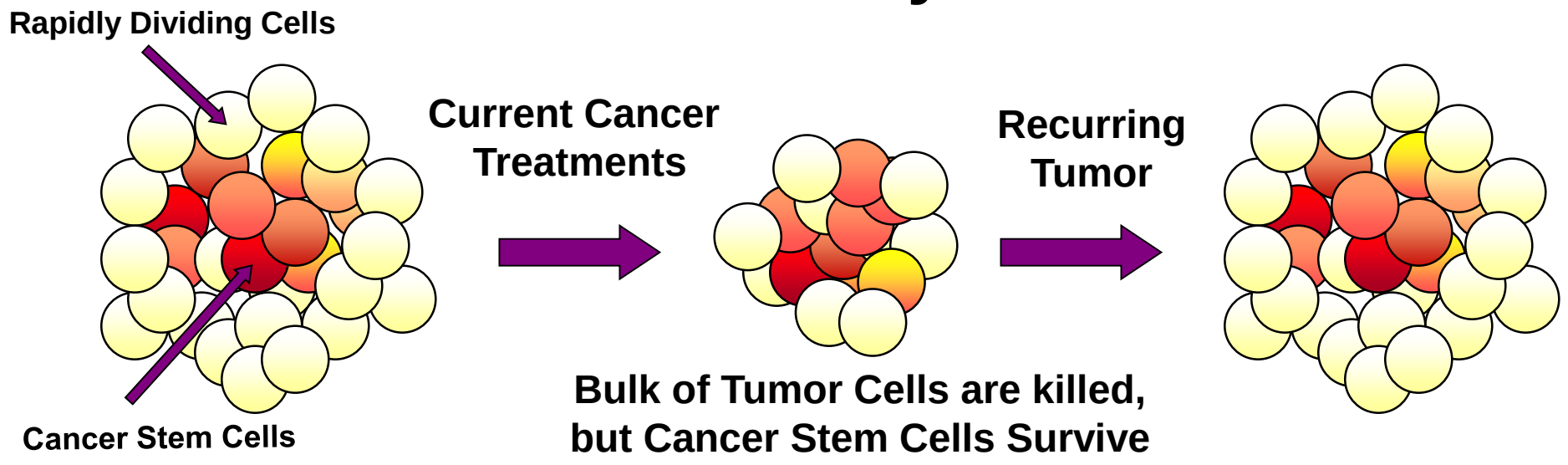
ChemoID® Assay

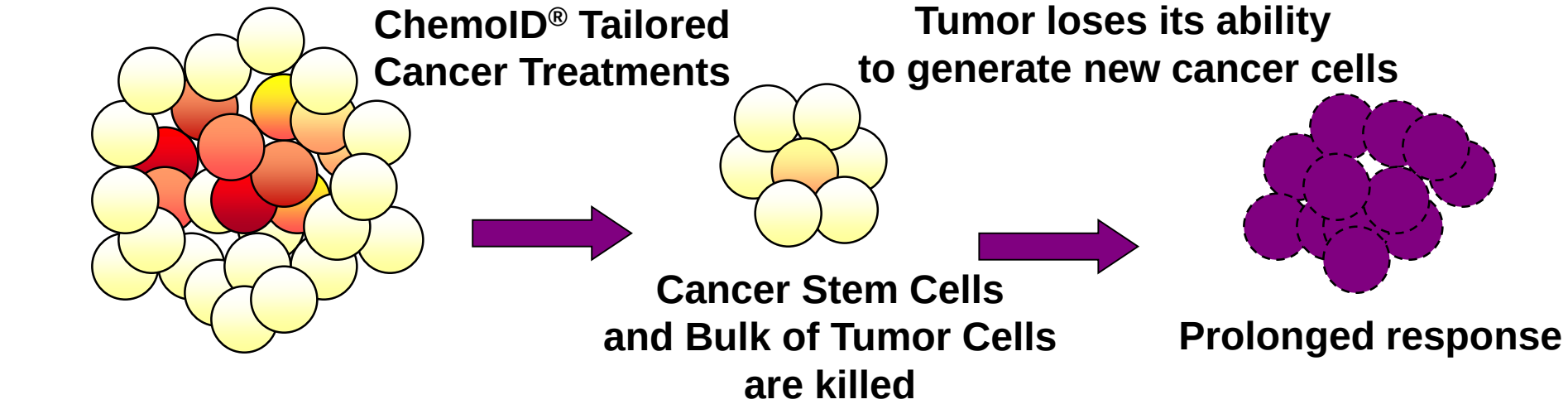
Tumor Growth	Tumor Angiogenesis	Tumor Invasion	Tumor Metastasis



- **ChemoID® Rapid screening of drugs targeting Cancer Stem Cells**

ChemoID® Assay Rationale





ChemoID® Assay Drug Panel Works with Numerous Chemotherapies

1. 5-Fluourouracil (Xeloda)
2. Adriamycin
3. Actinomycin-D
4. Arabinoside-C
5. Asparaginase
6. Azacytidine
7. AZD2281 (PARP)
8. Bevacizumab (Avastin)
9. Bleomycin
10. Bortezomib (Velcade)
11. BSI201 (PARP)
12. Carboplatin
13. Carfilzomib (Kyprolis)
14. Carmustine (BCNU)
15. Chlorodeoxyadenoasine – Cladribine
16. Cisplatin
17. Cytarabine (ARA-C)
18. Dacarabazine (DTIC)
19. Daunorubicin
20. Deoxyazacytidine
21. Docetaxel (Taxotere)
22. Doxorubicin
23. Epirubicin
24. Epothilone B (Ixempra)
25. Estramustine
26. Etoposide (VP16)
27. Everolimus (Afinitor)
28. Fludarabine
29. Gemzar (Gemcitabine)
30. Gleevec (Imatinib)
31. Herceptin
32. Idarubicin
33. Ifofosfamide
34. IL-2
35. Interferon-Alfa
36. Iressa (Gefitinib)
37. Irinotecan (Camptosar)
38. Lenalidomide (Revlimid)
39. Lomustine (CCNU)
40. Methotrexate
41. Mitomycin-C
42. Mitoxantrone
43. Nexavar (Sorafenib)
44. Nitrogen Mustard (Melphalan)
45. Oxaliplatin
46. Paclitaxel (Taxol)
47. Pemetrexed
48. Pomalidomide (Pomalist)
49. Procarbazine
50. Rapamycin (Sirolimus)
51. Rituximab
52. Sprycel (Dasatinib)
53. Sutent (Sunitinib)
54. Tamoxifen
55. Tarceva (Erlotinib)
56. Temodar
57. Thalidomide
58. Topotecan
59. Trichostatin A (TSA)
60. Trimetrexate
61. Tykerb (Lapatinib)
62. Velcade (Bortezomib)
63. Vinblastine
64. Vincristine
65. Vinorelbine (Navelbine)
66. Vorinostat (SAHA)
67. Votrient (Pazopanib)
68. Zactima (Vandetanib)

ChemoID® Assay Process

- Cancer stem cell (CSC) culture enrichment process does not require addition of exogenous growth factors or cytokines.
- Results **< 21 days** in time to impact patient outcomes.
- Only FDA approved drugs and their combinations are screened by ChemoID® assay.
- The clinical dose is used in screening the CSCs and bulk of tumor cells in the ChemoID® assay.
- ChemoID® assay clinical results have been compared and **significantly correlate** with patient derived xenograft models.

Solution: ChemoID® assay Applicable CPT Codes

- ChemoID® assay is a multistep laboratory procedure identified by the following CPT codes:
- **89240** - Unlisted miscellaneous pathology test
- **88358**-TC- Morphometric analysis
- **87230** - Toxin or antitoxin assay, tissue culture (depends on the number of drugs)
- **88299** - Unlisted cytogenetic study
- **88184** – Flow cytometry, first marker, and technical component only
- **88185** (depending on tissue of origin) – Flow cytometry, each additional maker, and technical component only
- Other related HCPCS codes: **J9000 - J9999** Chemotherapy drugs.

ChemoID® Assay Sensitivity

• The ChemoID® assay performed on the **tumor bulk** produced a correct prediction **PPV=75%, NPV=100%** when compared to the drugs received.

• The ChemoID® assay performed on the **CSCs** produced a correct prediction **PPV=NPV=100%** when compared to the drugs received.

ChemoID® Sample Report
Clear Guidance for Physicians and Patients

Cordgenics — *Personalized Chemotherapy Assay*

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ChemoID® Patient Report

PATIENT INFORMATION			
PATIENT NAME:	John Doe	**PTI ACCESSION #:**	2014-000196478
DATE OF BIRTH:	12/16/1962	**PATHOLOGY #:**	2014-326466652
GENDER:	Male	**BARCODE #:**	00012345678900
SPECIMEN INFORMATION			
REQUESTING PHYSICIAN:	John Confident, MD	**REQUESTING FACILITY:**	Wake Forest Baptist Hospital
COLLECTING PHYSICIAN:	Michael Knife, MD	**COLLECTION FACILITY**	Wake Forest Baptist Hospital
PTI RECEIVED DATE:	05/24/2014	**COLLECTION DATE:**	05/23/2014
SPECIMEN SITE:	Kidney	**HISTOTYPE:**	Metastatic Renal Adenocarcinoma
REPORT DATE:	06/12/2014	**TESTING FACILITY:**	1600 Medical Center Dr. Huntington, 25701

NOTES: Biopsy showed bacterial contamination. Penicillin/Streptomycin treatment was initiated and maintained for 5 days to rid the bacterial contamination. Results are from three separate panels of drugs analyzed.

TEST RESULTS – INDIVIDUAL DRUG & DRUG COMBINATION RESPONSE

RESPONSE
60%-100% Cell Kill Rate

Cancer Stem Cells	Bulk of Tumor
Sunitinib 400mg + Gemcitabine 1500mg/m2 **67.6%±0.6**	Sunitinib 400mg + Gemcitabine 1500mg/m2 **84.2%±0.8**

INTERMEDIATE RESPONSE
30%-60% Cell Kill Rate

Cancer Stem Cells	Bulk of Tumor
Gemcitabine 1500mg/m2 + Cisplatin 60mg/m2 + Avastin 10mg/Kg **34.1%±1.0**	Cisplatin 60mg/m2 **51.7%±0.5**
Gemcitabine 1500mg/m2 + Cisplatin 60mg/m2 **29.0%±1.5**	Gemcitabine 1500mg/m2 + Cisplatin 60mg/m2 + Avastin 10mg/Kg **42.7%±1.9**
	Afinitor 10mg + Cisplatin 60mg/m2 **37.6%±2.4**
	Gemcitabine 1500mg/m2 + Cisplatin 60mg/m2 **35.2%±2**

Cordgenics, LLC 1600 Medical Center Drive, Huntington, WV 25705 (844) CHEMOID – (844) 243-6643 www.cordgenics.com **CLIA: 51D0235004**

Cordgenics — *Personalized Chemotherapy Assay*

NON-RESPONSE
0%-30% Cell Kill Rate

Cancer Stem Cells	Bulk of Tumor
Avastin 10mg/kg + CPT11 125mg/m2 **28.7±0.2**	Sunitinib 400 mg **25.7%±1.3**
Sunitinib 400mg **25.9%±0.8**	Afinitor 10mg **24.9%±1.3**
Afinitor 10mg + Cisplatin 60mg/m2 **22.5%±2.0**	Votrient 800 mg **23.4%±2.1**
Afinitor 10mg **22.3%±1.7**	Avastin 10mg/kg + CPT11 125mg/m2 **18.5%±1.8**
Cisplatin 60mg/m2 **20.3%±1.3**	IL-2 366,000 IU **16.8%±2.5**
Sorafenib 50mg **13.8%±1.4**	Afinitor 10mg + Avastin 10mg/Kg **12.4±2.4**
Votrient 800mg **8.4%±1.1**	CPT11 125mg/m2 **11.8%±1.7**
Avastin 10mg/kg **4.6%±1.2**	Carboplatin AUC6 **10.3%±2.2**
Torisel 25mg **4.4%±2.2**	Sorafenib 50 mg **9.8%±3.4**
CPT11 125mg/m2 **3.1%±1.7**	Torisel 25 mg **7.5%±2**
IL-2 366,000 IU **0%**	Vinblastine 3.7 mg/m2 **6.5%±2.6**
Afinitor 10mg + Avastin 10mg/Kg **0%**	Avastin 10mg/kg **3.8%±2**
Doxorubicin 60mg/m2 **0%**	IL-2 250,000 IU **0%**
Gemcitabine 1500mg/m2 **0%**	Doxorubicin 60mg/m2 **0%**
IL-2 250,000 IU **0%**	Gemcitabine 1500mg/m2 **0%**
IL-2 72,000 IU **0%**	IL-2 72,000 IU **0%**
Carboplatin AUC6 **0%**	
Vinblastine 3.7 mg/m2 **0%**	

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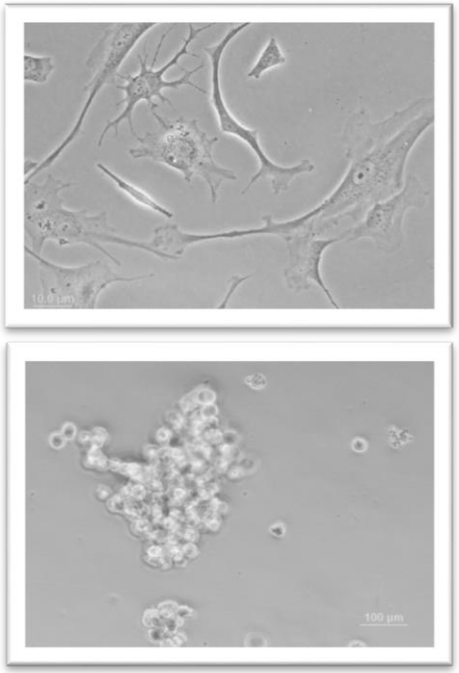
Biopsy transportation time

Viability of cells recovered from biopsies stored at room temperature

- from 1 to 4 days



This can expand the market to hospitals across the US

Benefits for Patients, Physicians, and Payers

- For non responding patients, treatment can be altered quickly
  - Significant reduction in adverse effects
  - Switch to alternate treatment improves survival benefit
- Objective & useful tool for physicians
- Cost savings for healthcare payers ($40k - $120K/patient)

ChemoID Health Care Savings (West Virginia Example)

- Percentage of West Virginia population dependent on Medicaid : 25%
- 2014 New Medicaid Cancer Patients: 3,000
- Current Per patient Treatment Costs : $110,000-$230,000
  (based on drug selection, and number of treatments)
- Total Annual State Medicaid Cost for Cancer Treatment: > $69,000,000
- Based on current cost projections, ChemoID® Assay could cut the cost of these chemotherapy treatments by 20 percent
- A 20 percent savings would reduce West Virginia Medicaid spending by up to $7M and Medicare by $13M statewide annually
- Further cost-savings as ChemoID use scaled up and treatment deployed earlier in patient's treatment regimen

Management Team

Management

- CSO: Dr. Pier Paolo Claudio, MD, Ph.D.
  - Co-founder and Entrepreneurial Scientist, Translational Genomics Research Laboratory, Edwards Cancer Center, Marshall University
- COO: Dr. Jagan Valluri, Ph.D.
  - Co-founder and Entrepreneurial Scientist, College of Science, Marshall University
- Medical Director: Dr. Linda Brown

  - Dept. of Pathology, Cabell Huntington Hospital

Scientific Advisory Board

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- Dr. Robert G. Hawley, Ph.D., George Washington University School of Medicine and Health Sciences
- Caterina Cinti, Ph.D. Center of National Research, Siena, Italy
- Dr. Nicholas J. Greco, Ph.D., Former Director of the Cord Blood Bank Processing Facility of the Cleveland Cord Blood Center