

## **ORYZON GENOMICS, S.A.**

De conformidad con lo establecido en el artículo 228 del Real Decreto Legislativo 4/2015, de 23 de octubre, por el que se aprueba el texto refundido de la Ley del Mercado de Valores, ORYZON GENOMICS, S.A. (“**ORYZON**” o la “**Sociedad**”) comunica lo siguiente

### **INFORMACIÓN RELEVANTE**

ORYZON va a presentar hoy resultados de su ensayo clínico de Fase I/IIA con ORY-1001 en pacientes de leucemia aguda recurrente o refractaria (EUDRACT nº 2013-002447-29) en la 58ª reunión anual de la *American Society of Hematology* (ASH).

Se adjunta la presentación con resultados de dicho ensayo clínico que la compañía realizará ante inversores.

Barcelona, 5 de diciembre de 2016



**ORYZON**

A GLOBAL LEADER IN EPIGENETICS  
PRESENTS:

**DEVELOPMENT OF ORY-1001, AN LSD1 INHIBITOR, A  
NOVEL THERAPEUTIC APPROACH IN ACUTE MYELOID  
LEUKAEMIA**

**by Dr. Tim Somervaille, PhD FRCP FRCPath**

Ancillary meeting to the ASH Annual Meeting 2016  
San Diego, December 5<sup>th</sup>, 2016

# LEGAL NOTICE

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# DEVELOPMENT OF ORY-1001, AN LSD1 INHIBITOR, A NOVEL THERAPEUTIC APPROACH IN ACUTE MYELOID LEUKAEMIA

by Dr. Tim Somervaille, PhD FRCP FRCPath



CANCER  
RESEARCH  
UK

MANCHESTER  
INSTITUTE



The Christie  
NHS Foundation Trust



# DISCLOSURE

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Tim Somervaille

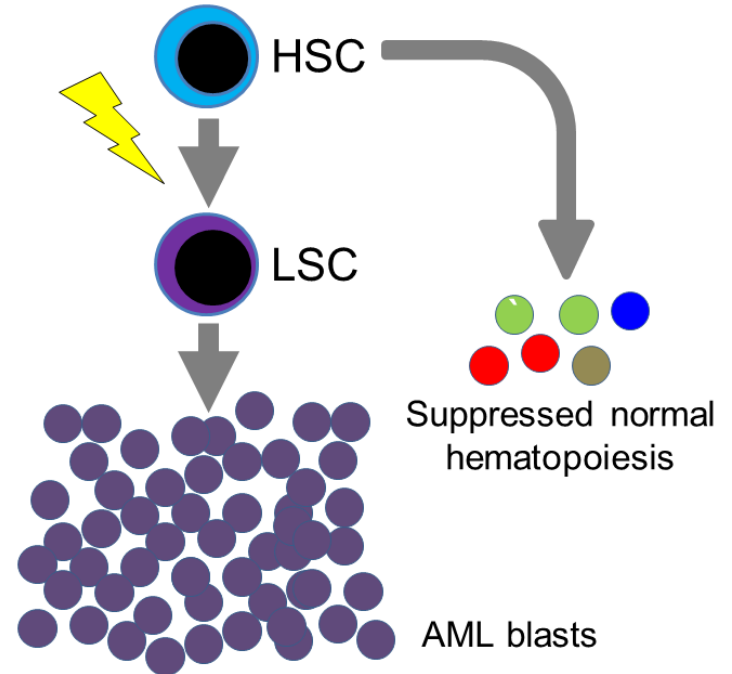
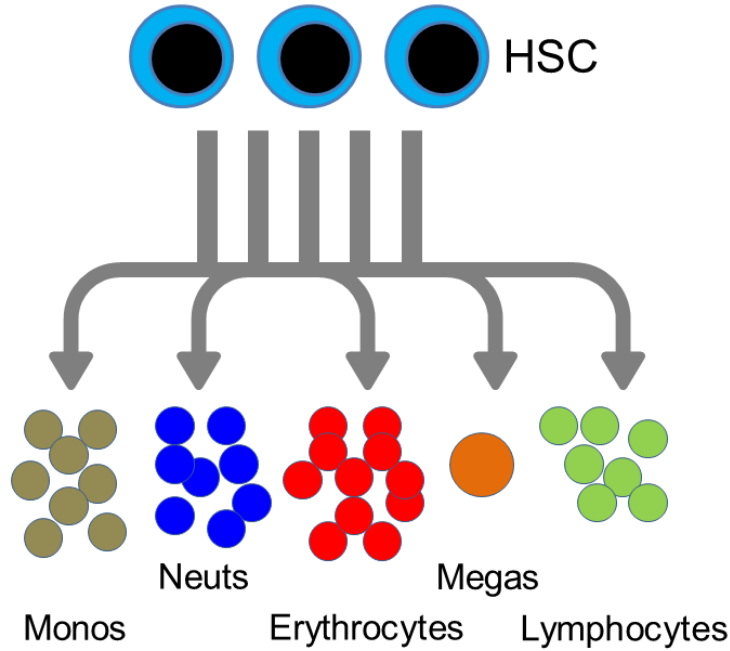
Consultant for Novartis , Imago Biosciences & Roche

# Mutations cause acute myeloid leukaemia

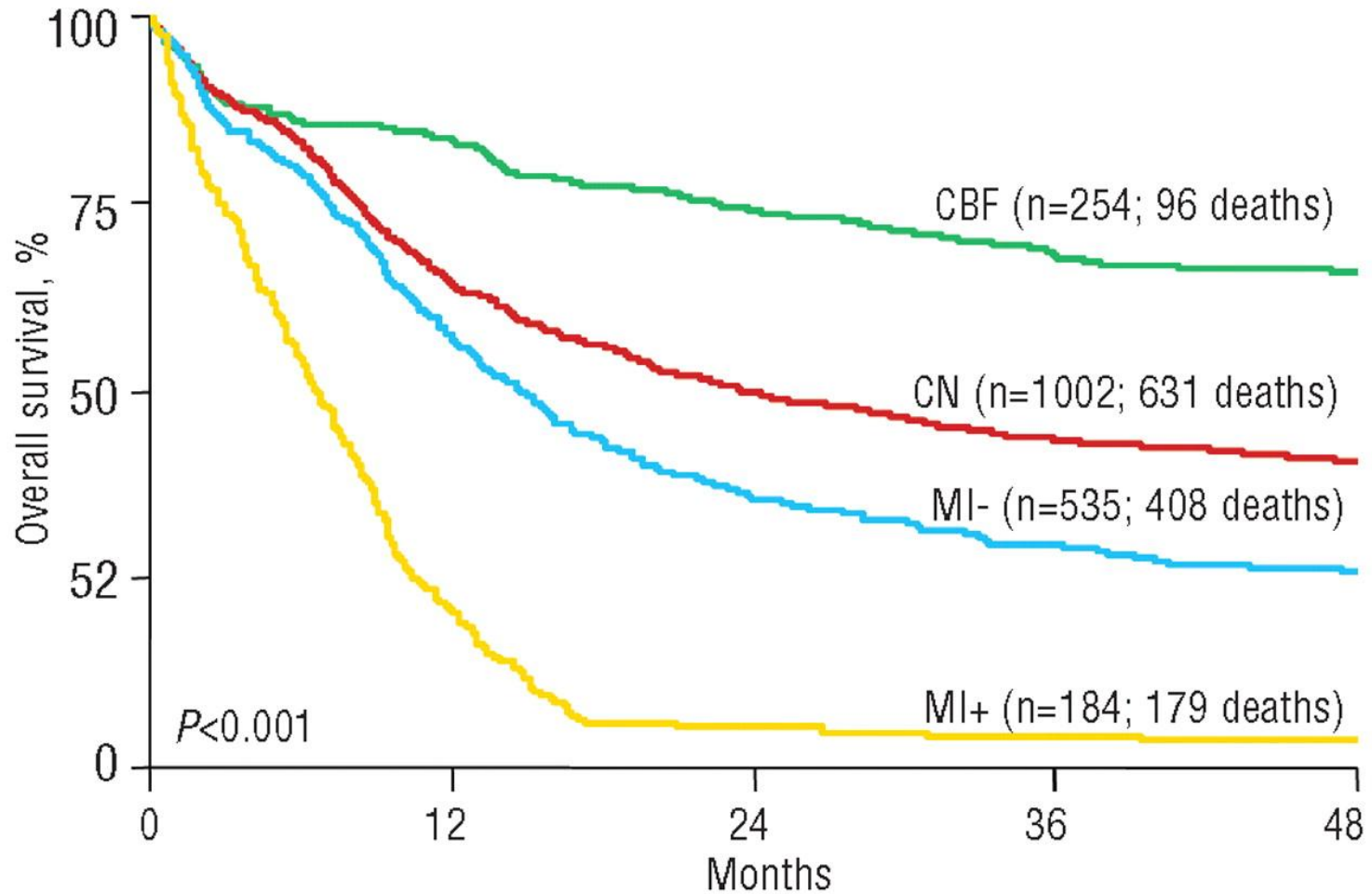
Normal polyclonal haematopoiesis



Leukaemic haematopoiesis



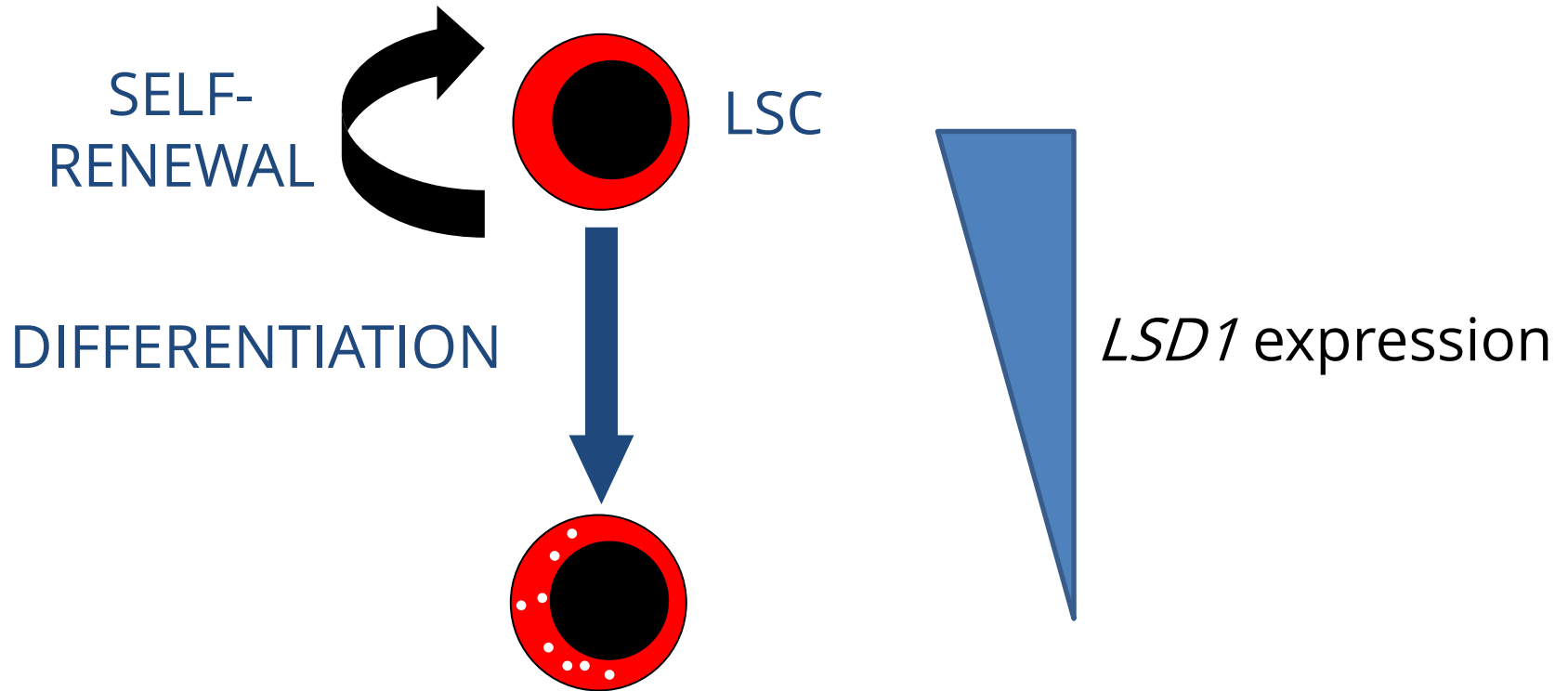
# Survival of younger (<60) adults with AML is often poor



....we need better treatments.

# LSD1 is down regulated as leukaemia stem cells differentiate

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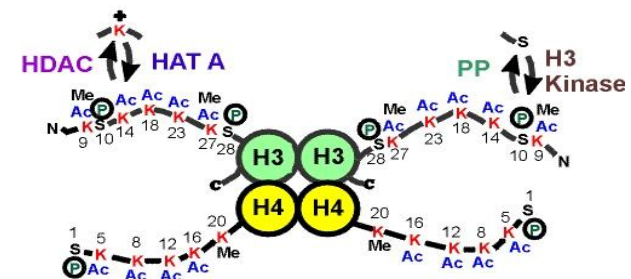
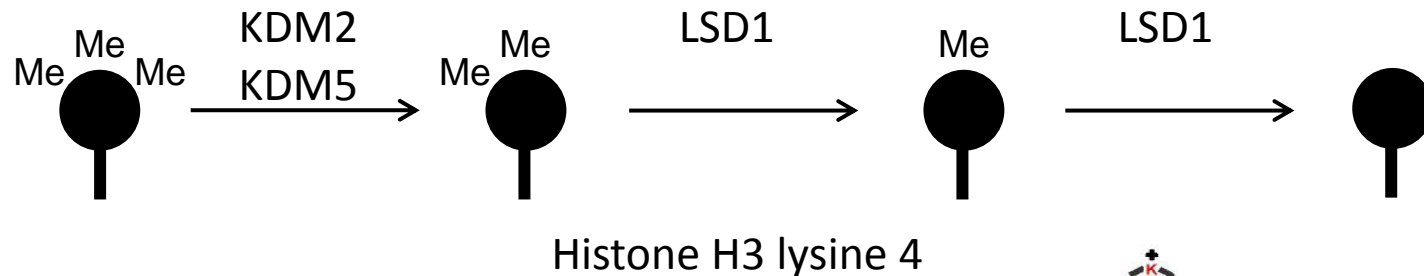


(Somervaille et al., 2009, Cell Stem Cell)

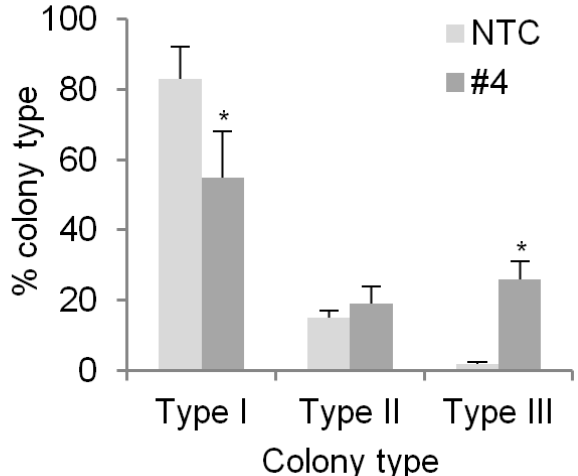
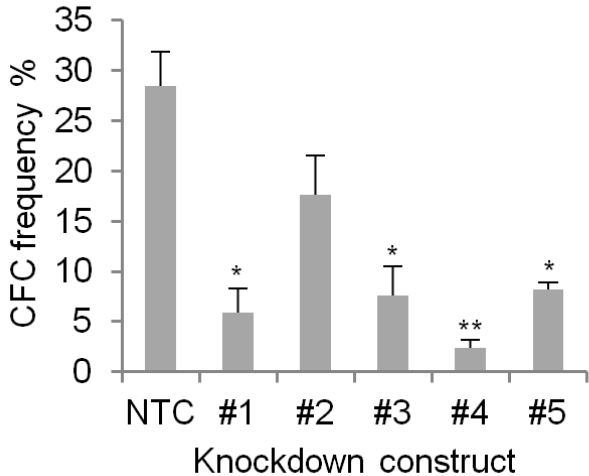
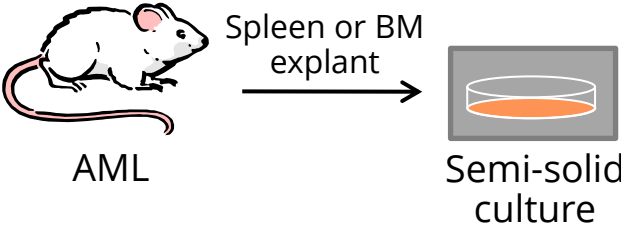


# What is known about Lysine Specific Demethylase 1?

- An essential gene in embryogenesis and adult haematopoiesis
- Protein is found in repressive chromatin complexes: CoREST, NuRD
- A histone tail demethylase, the first to be discovered
- Demethylates mono- and dimethyl-H3K4
- High expression in many human malignancies → Interest as a potential therapeutic target in cancer

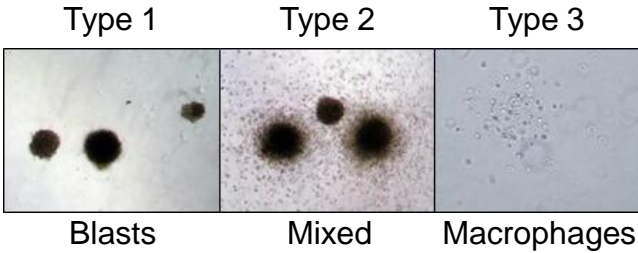


# LSD1 is essential for leukaemia initiation by MLL-AF9 LSCs (1)

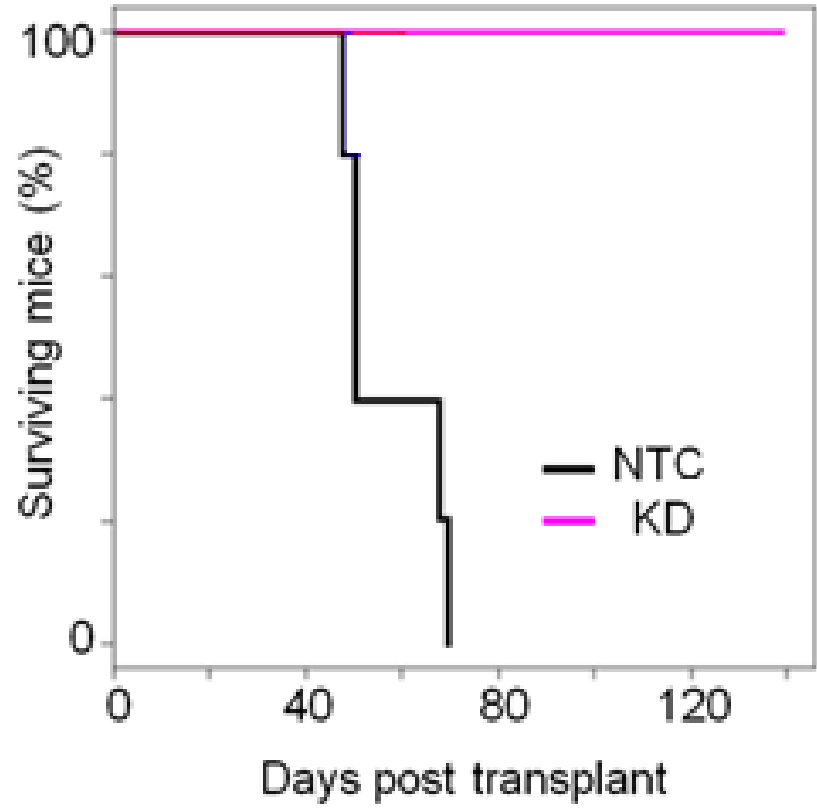


Loss of clonogenic activity

Increased differentiation



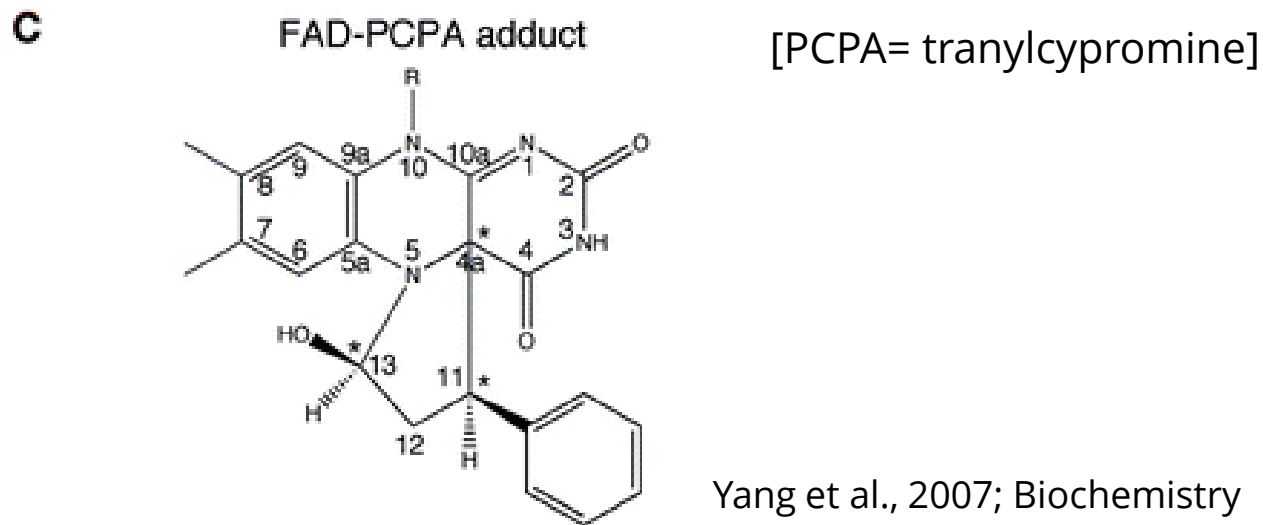
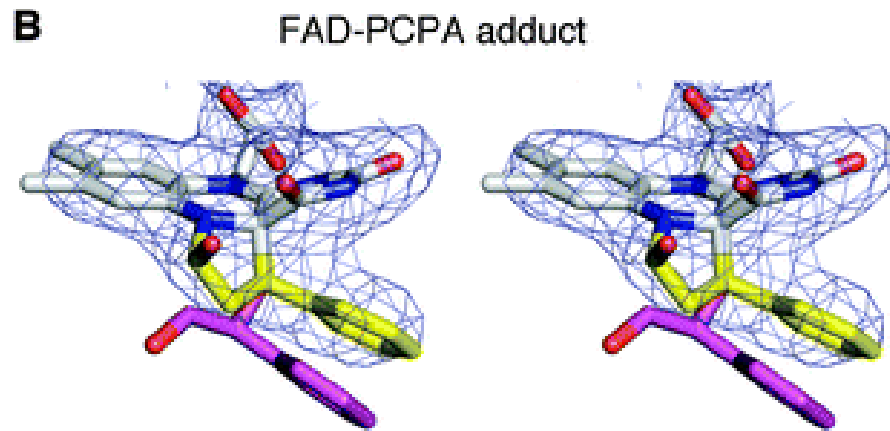
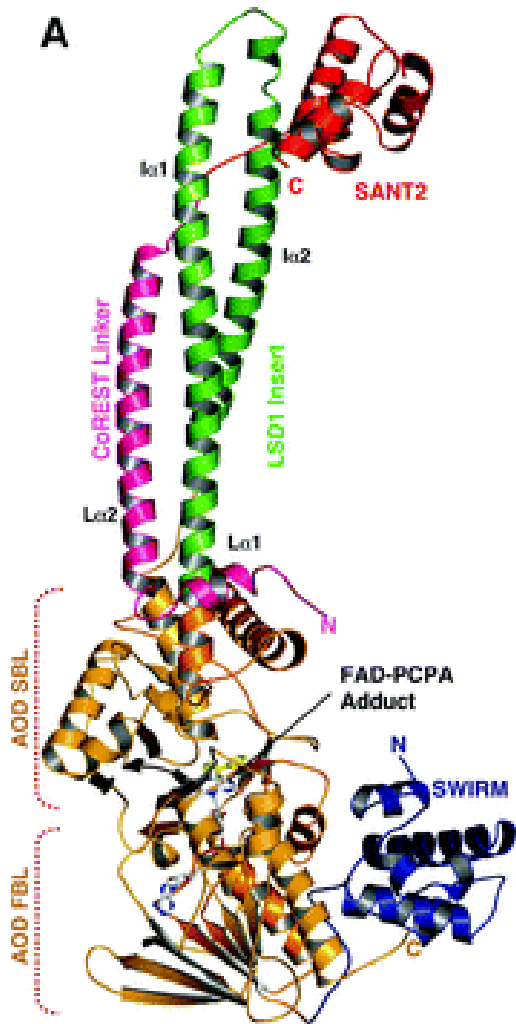
# LSD1 is essential for leukaemia initiation by MLL-AF9 LSCs (2)



LSD1 contributes to the differentiation block in murine MLL leukaemia

William Harris

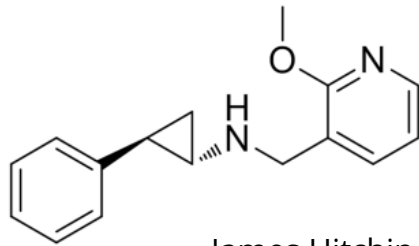
# Tranylcypromine covalently binds FAD to inhibit LSD1



A monoamine oxidase inhibitor licensed for the treatment of depression

IC<sub>50</sub> for LSD1 is ~5-20 μM

# Tranylcypromine derivatives phenocopy the LSD1 knockdown phenotype in the nanomolar range



James Hitchin

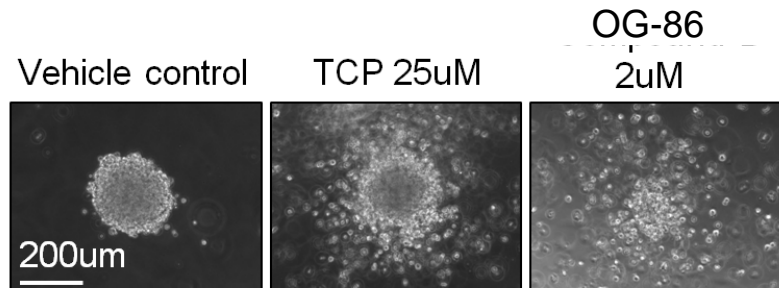
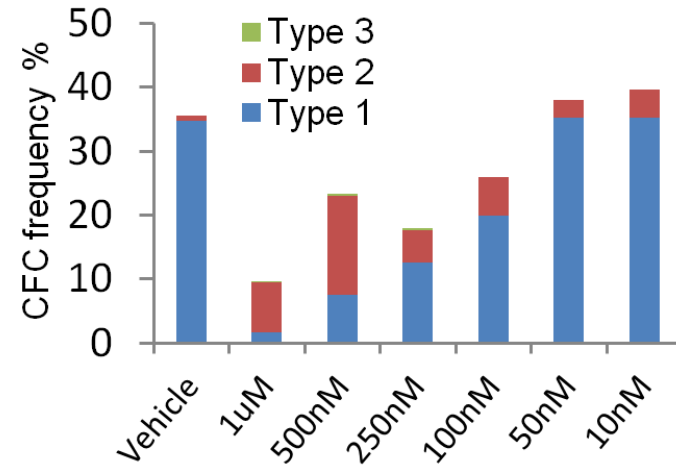
**OG-86:**

trans-N-((2-methoxypyridin-3-yl)methyl)-2-phenylcyclopropan-1-amine

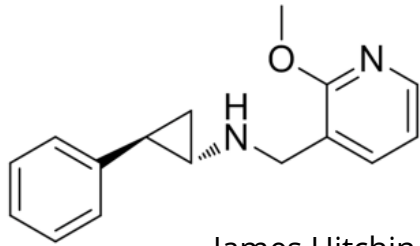
**ORYZON** WO2010/084160

Loss of clonogenic activity  
Increased differentiation

MOUSE MLL-AF9 - OG-86  
Type 1/Blast colony IC<sub>50</sub> 140nM



# Tranylcypromine derivatives phenocopy the LSD1 knockdown phenotype in the nanomolar range



James Hitchin

**OG-86:**

trans-N-((2-methoxypyridin-3-yl)methyl)-2-phenylcyclopropan-1-amine

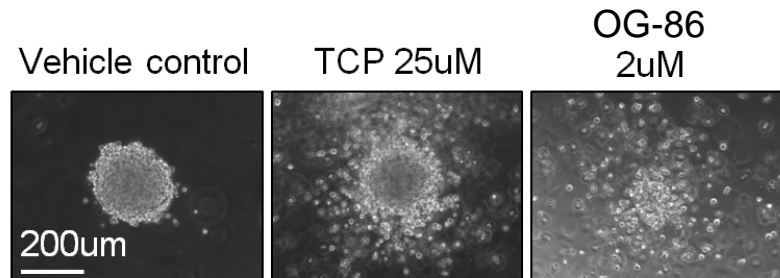
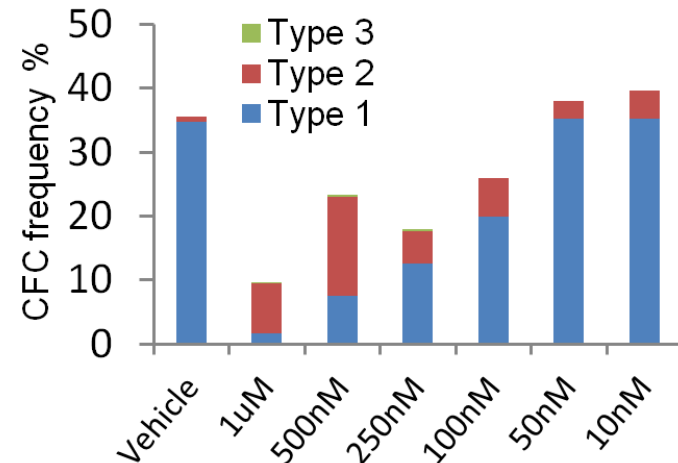
**ORYZON** WO2010/084160

Loss of clonogenic activity

Increased differentiation

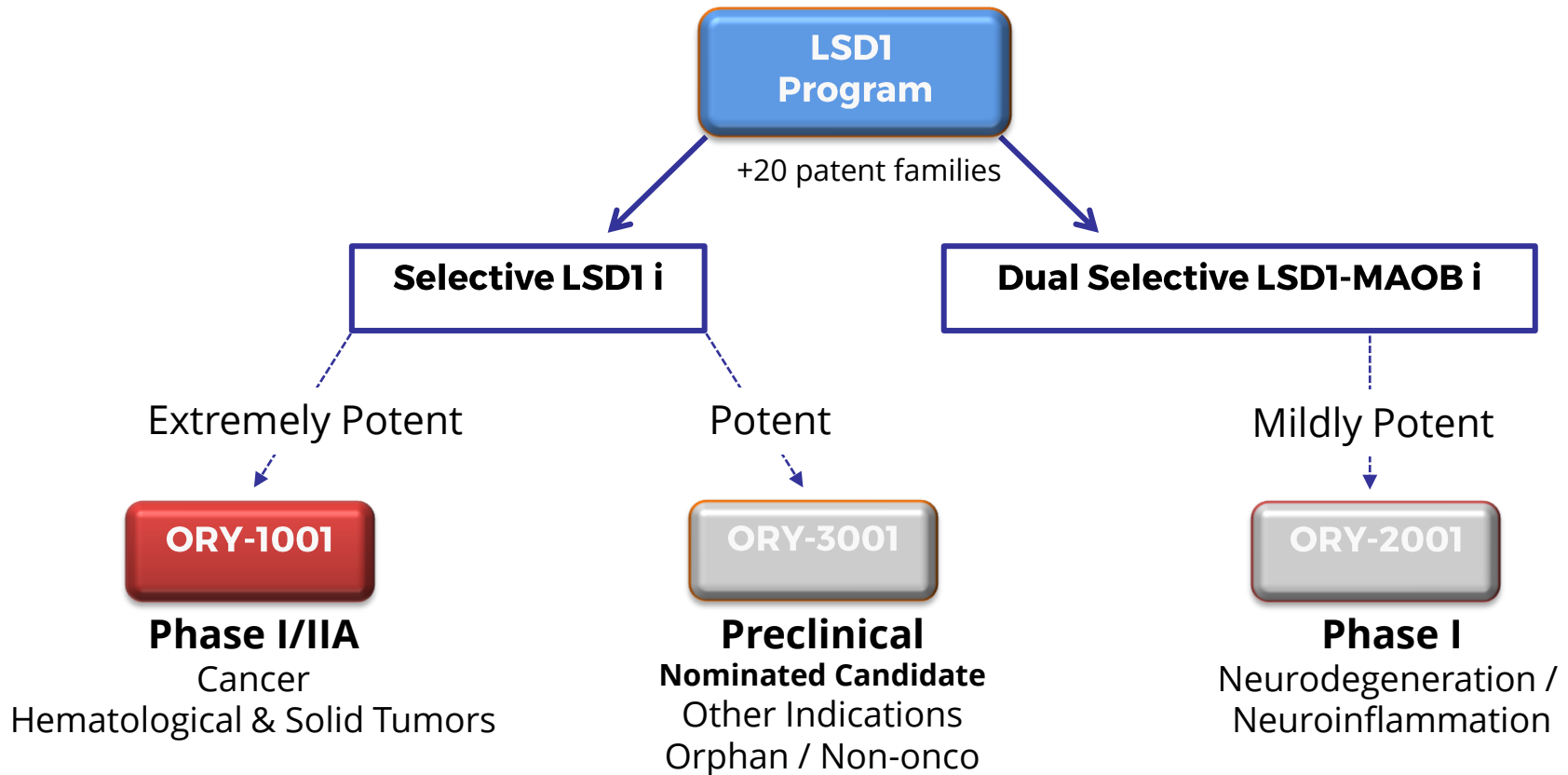
Similar results in:  
Human AML cell lines  
Primary patient cells MLL-AF9 cells  
In vivo mouse model

MOUSE MLL-AF9 -OG-86  
Type 1/Blast colony IC<sub>50</sub> 140nM

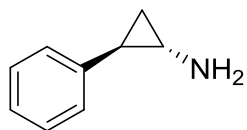


# ORYZON'S LSD1 TARGETING PROGRAMS

- LSD1 is an enzyme that demethylates histones: specifically mono and dimethylated H3K4 and H3K9
- LSD1 belongs to the family of FAD – dependent amine oxidases, which include known CNS drug targets, such as MAO-A and MAO-B
- The MAO inhibitor tranylcypromine (TCP) is a chemical starting point to design LSD1 inhibitors



# CLINICAL CANDIDATE ORY-1001



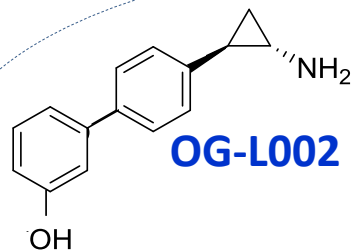
**Tranlycypromine**

(trans racemic mixture)

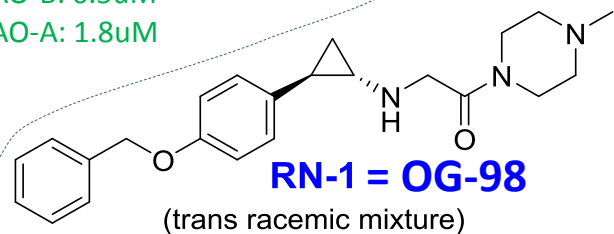
LSD1: 25uM

MAO-B: 0.5uM

MAO-A: 1.8uM

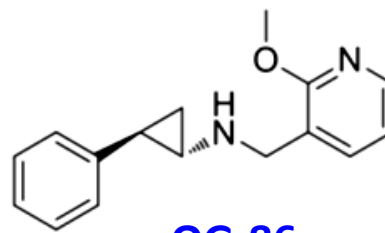


**OG-L002**



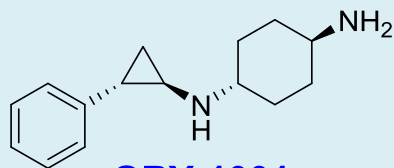
**RN-1 = OG-98**

(trans racemic mixture)



**OG-86**

(Compound B)



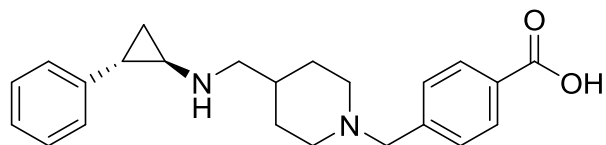
**ORY-1001**

(1R,2S isomer)

LSD1: 0.018  $\mu$ M

MAO-B > 100 uM

MAO-A > 100 uM



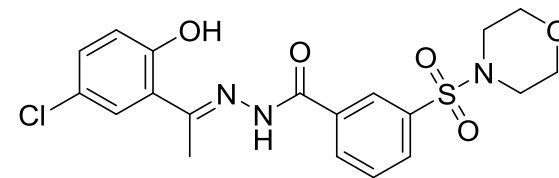
**GSK2879552**

(1R,2S isomer)

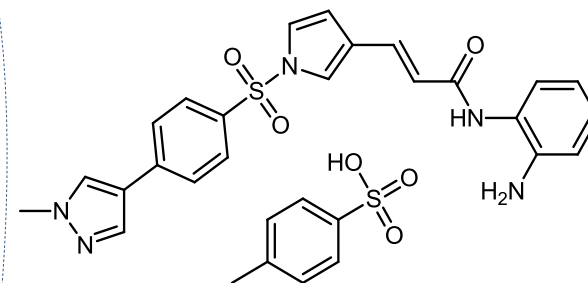
LSD1: 1.183  $\mu$ M

MAO-B > 100uM

MAO-A > 100 uM

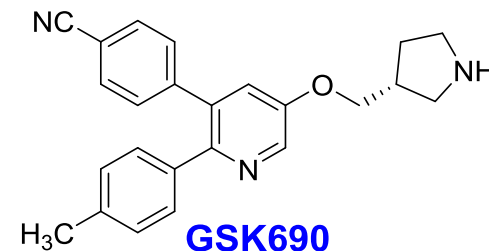


**SP-2509**



**4SC-202**

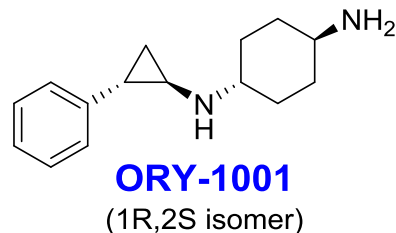
HDAC1,2,3/LSD1



**GSK690**



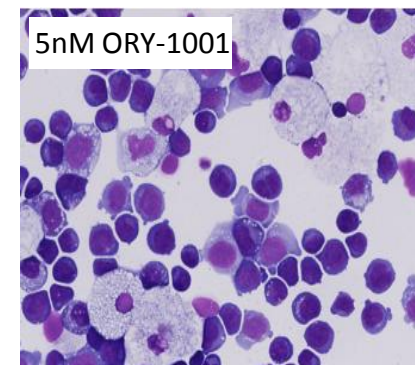
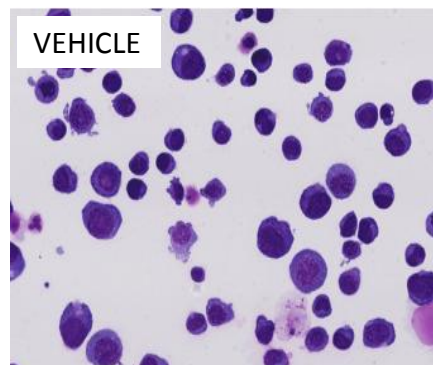
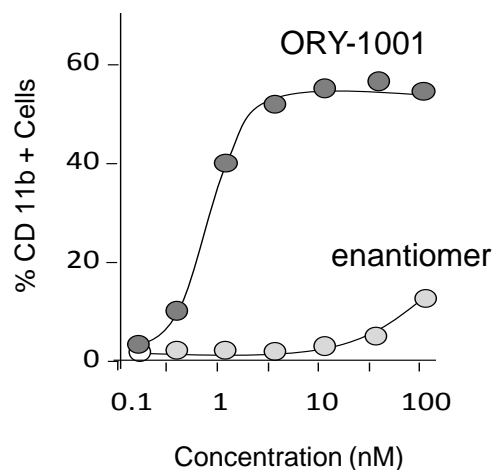
ORY-1001 is a potent and selective LSD1 inhibitor, first and best in class



- ✓ Small compound, highly druggable
- ✓ Inhibits LSD1 by covalent binding to the FAD cofactor
- ✓ Potency  $\approx 1000$  x tranylcypromine,  $\approx 100$ x GSK2879552
  - ✓ Biochemical IC<sub>50</sub> LSD1 18nM
- ✓ Very high selectivity vs related FAD dependent enzymes, including MAOs
  - ✓ (IC<sub>50</sub> MAO-A > 100  $\mu$ M, IC<sub>50</sub> MAO-B > 100  $\mu$ M)
  - ✓ Risk for cheese effect, serotonin syndrome and hypertensive crisis associated with TCP has been eliminated.
- ✓ Very clean off-target profile (no relevant inhibition in > 100 targets)
- ✓ Highly potent in vivo, minimized risk for idiosyncratic toxicity

# CLINICAL CANDIDATE ORY-1001 INDUCES DIFFERENTIATION

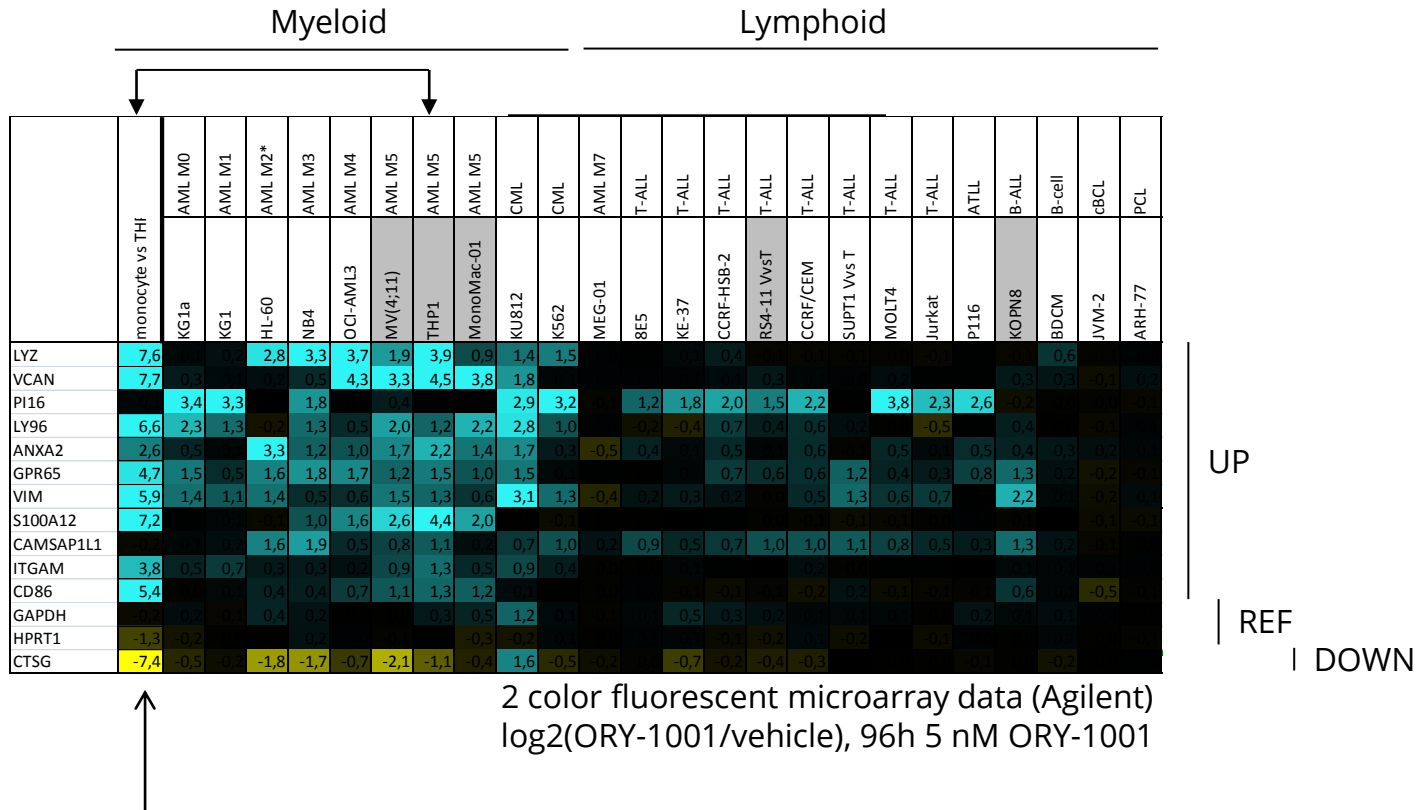
EC50 < 1nM



*The most potent LSD1 inhibitor in cells reported*

CODE	LSD1 (IC50 mcM)	$K_{inact}/k_i$ ( $\text{sec}^{-1}\cdot\text{M}^{-1}$ )	Fold selectivity LSD1 vs MAO-A	Fold selectivity LSD1 vs MAO-B	THP-1 cells differentiation assay (EC50 nM)
<b>ORY-1001</b>	0.018	226315	>5550	>5550	0.8
<b>GSK-2879552</b>	1.183	1076	>80	>80	≈ 100

# ORY-1001 induced gene expression changes in leukemia cells

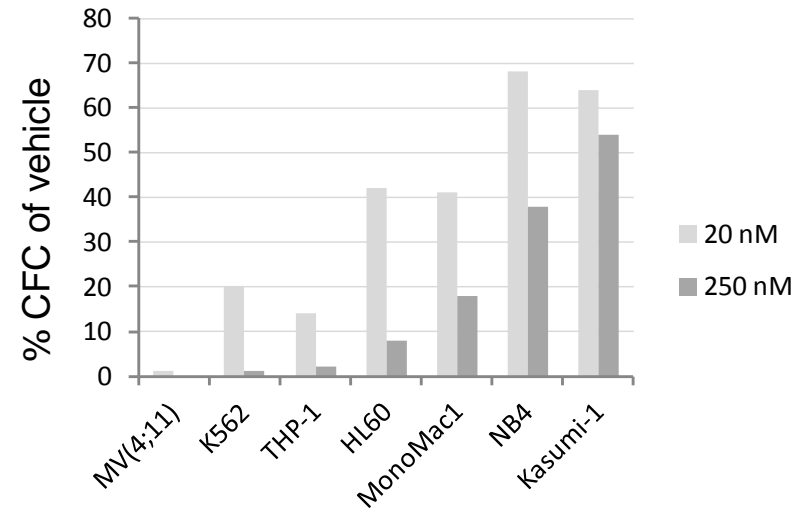
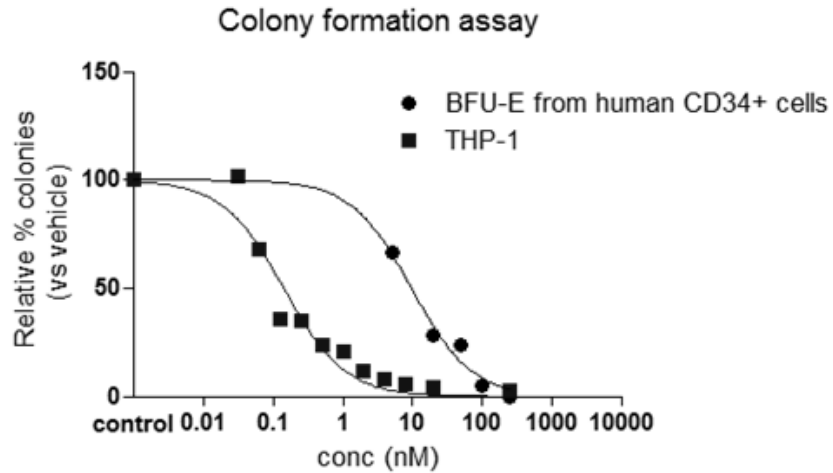


2 color fluorescent microarray data (Agilent)  
log<sub>2</sub>(ORY-1001/vehicle), 96h 5 nM ORY-1001

log<sub>2</sub> (monocytes/THP-1) values calculated based on data from Gebhard *et al.* (2006) Single colour fluorescent microarray (Affymetrix).

- Markers reflect differentiation
- Development of validated qRT-PCR panel for use in clinical trial

# CLINICAL CANDIDATE ORY-1001 REDUCES LSC CAPACITY



*The most potent LSD1 inhibitor in cells reported*

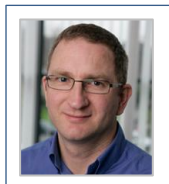
- ✓ ORY-1001 a highly potent and selective LSD1 inhibitor
- ✓ Orphan drug status granted by the European Medicines Agency (EMA) for AML
- ✓ Pharmacological Properties
  - High druggability
  - Optimal ADMET and PK profiles
  - Orally bioavailable once daily
  - Easy to scale up
  - Good pharmaceutical properties
- ✓ Phase I/IIA
  - Completed Part 1 of the study (Phase I) in acute leukemia.
  - Completed Extension Arm (Phase IIA)



# A phase I study of the Human Pharmacokinetics and Safety of ORY-1001

EUDRACT No. 2013-002447-29

## Principal Investigators Coordinators:



Dr. Tim Somerville  
Honorary Consultant in Haematology &  
Professor of Haematological Oncology  
The Christie NHS Foundation Trust  
Manchester, UK



Dr. Francesc Bosch  
Chief Haematology Department  
Hospital Universitari Vall d'Hebron  
Barcelona, Spain

The Christie   
NHS Foundation Trust



## 58th ASH® Annual Meeting and Exposition



San Diego Convention Center • San Diego, California

MEETING: DECEMBER 3-6, 2016

EXPOSITION: DECEMBER 3-5, 2016

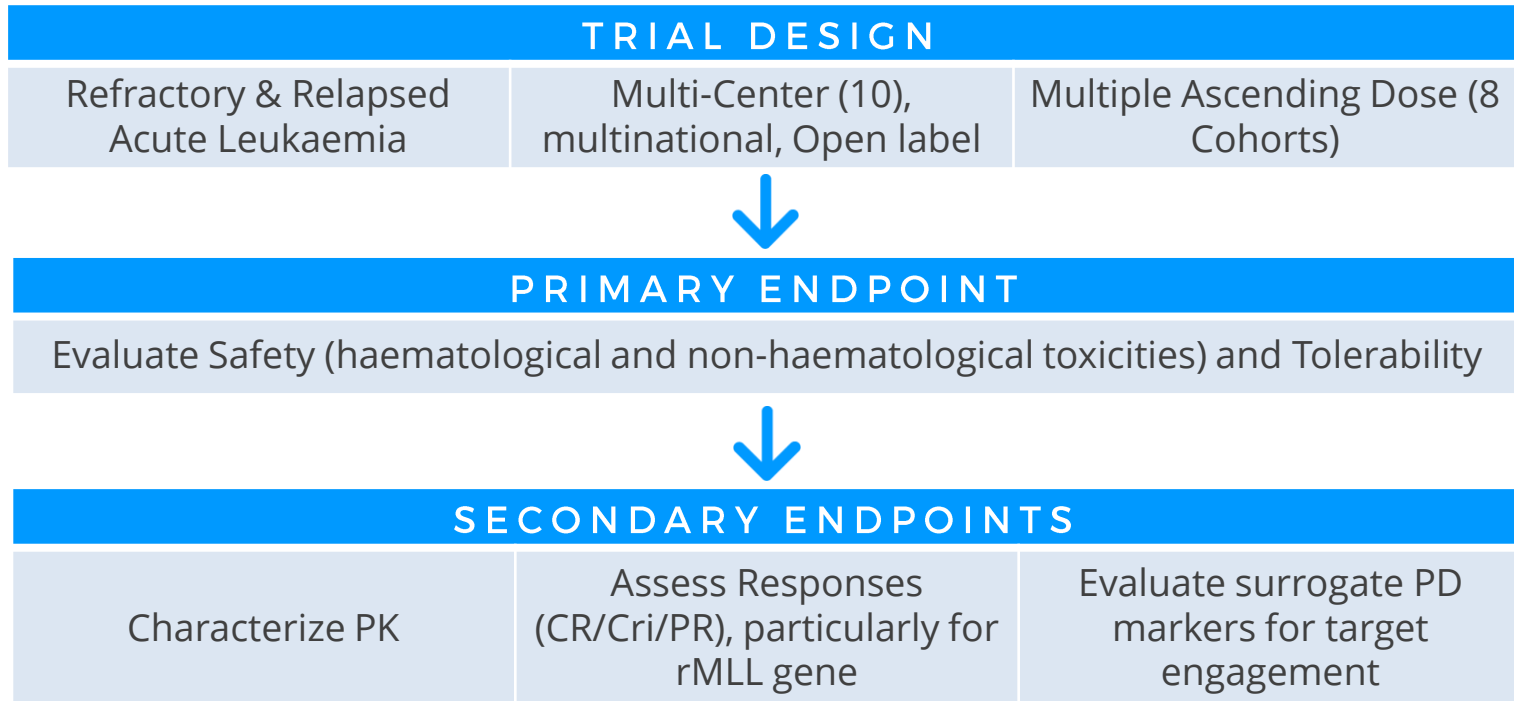
### Abstract #93141

**Safety, Pharmacokinetics (PK), Pharmacodynamics (PD) and Preliminary Activity in Acute Leukemia of Ory-1001, a First-in-Class Inhibitor of Lysine-Specific Histone Demethylase 1A (LSD1/KDM1A): Initial Results from a First-in-Human Phase 1 Study**

**Tim Somerville, MD PhD<sup>1</sup>**, Olga Salamero, MD<sup>2</sup>, Pau Montesinos, MD, PhD<sup>3</sup>, Christophe Willekens, MD<sup>4</sup>, Jose Antonio Perez Simon, MD<sup>5</sup>, Arnaud Pigneux, MD<sup>6</sup>, Christian Recher, MD, PhD<sup>7</sup>, Rakesh Popat<sup>8</sup>, Cesar Molinero, MD, PhD<sup>9</sup>, Christina Mascaro, PhD<sup>9</sup>, Tamara Maes, PhD<sup>10</sup> and Francesc Bosch, MD, PhD<sup>11</sup>

# Phase I: Design and End Points

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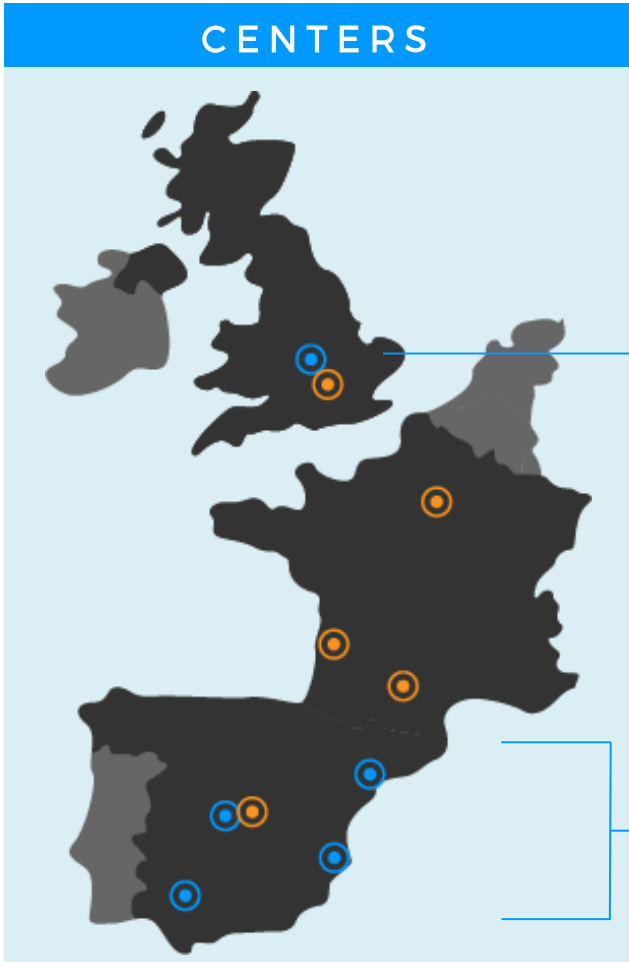


# Phase I: dose escalation

Patient population: relapsed or refractory acute leukemia >16 years

Unselected AML+ AL

## CENTERS



First patient in: 10 February 2014

Last patient out: 15 July 2015

Total patients: 27

### 5 Hospitals in 2 Countries

#### → UK

- Christie Hospital, Manchester

#### → SPAIN

- Valle de Hebron, Barcelona
- La Fe, Valencia
- Virgen del Rocío, Sevilla
- 12 de Octubre, Madrid





# Phase I: dose escalation

Cohort	Dose
Cohort 1	5 ug/m <sup>2</sup> /d
Cohort 2	15 ug/m <sup>2</sup> /d
Cohort 3	30 ug/m <sup>2</sup> /d
Cohort 4	45 ug/m <sup>2</sup> /d
Cohort 5	60 ug/m <sup>2</sup> /d
Cohort 6	80 ug/m <sup>2</sup> /d
Cohort 7	140 ug/m <sup>2</sup> /d
Cohort 8	220 ug/m <sup>2</sup> /d

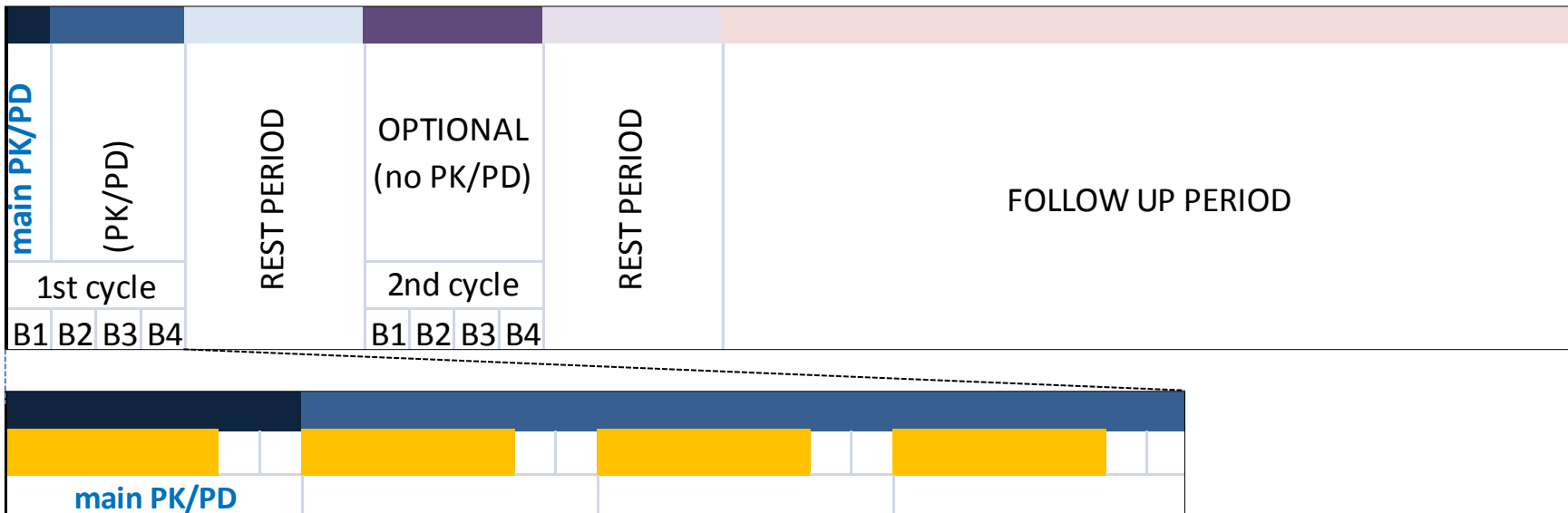
Patient population: relapsed or refractory AL >16 years  
 → unselected AML + 1 ALL

Oral administration

Patients treated five days per week for four weeks in a 28-day cycle

28-day rest (or less) period with option of repeat

Dose escalation phase (3 patients per dose level) with establishment of maximum tolerated dose (220mcg/m<sup>2</sup>/d) in Fall 2015. Recommended dose (RD)= 140 ug/m<sup>2</sup>/d



## Phase IIa: extension arm

The extension arm (Phase IIa) with selected profiles, including MLL gene translocation (n=6), other MLL gene rearrangement or mutation (n=4) and AML M6 (n=4)

Dose: RD = 140 ug/m<sup>2</sup>/d

First patient in: 2 September 2015

Last patient out: 25 August 2016

Total patients: 14

### CENTERS

#### 10 Hospitals in 3 Countries

##### → UK

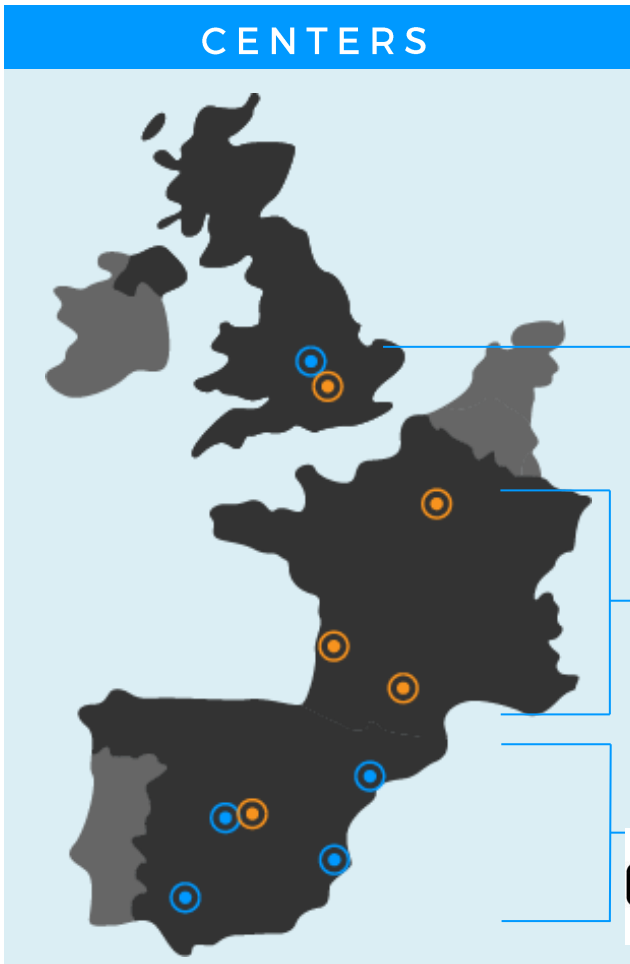
- Christie Hospital, Manchester
- University College London hospitals NHS, London

##### → FRANCE

- Gustave Roussy, Paris
- CHU Hopitaux, Bordeaux
- Hôpital Purpan - (CHU), Toulouse

##### → SPAIN

- Valle de Hebron, Barcelona
- La Fe, Valencia
- Virgen del Rocío, Sevilla
- 12 de Octubre, Madrid
- Gregorio Marañón, Madrid



**Dose escalation phase: (8 COHORTS)**

Cohort 7,  $140\text{ ug}/\text{m}^2$ : (n=3) Unselected AML

Cohort 8,  $220\text{ ug}/\text{m}^2$  (n=5) Unselected AML

**Extension arm :**

**(n=14)**

MLL gene translocation (n=6)

Other MLL gene rearrangement or mutation (n=4)

AML M6 (n=4)

# PRIMARY OUTCOMES

## Summary

- ORY-1001 was well tolerated
- Predicted toxicities were thrombocytopenia & anaemia and, in patients not transfusion dependent at the start of treatment, development of a low platelet count after 12-15 days was invariable and evidence of in vivo activity
- The great majority of AEs and SAEs were likely related to the underlying disease and not to drug
- AEs observed at the MTD were:
  - Lung infections
  - Severe fatigue
  - Erythema nodosum

## SAEs during the study: Total 71

SAE Ascending Dose		SAE Extension Cohort	
Pneumonia / lung infection	9	Febrile neutropenia	9
Febrile neutropenia	7	Progressive disease	5
Sepsis	5	Leukocytosis	3
Intracranial haemorrhage	3	Pulmonary infection	3
Respiratory failure	2	Supraventricular tachycardia	2
Line infection	2	Rising white cell count/ differentiation syndrome	2
Fever	2	Soft tissue infection (Cellulitis)	1
Depressed level of consciousness	1	Acute kidney injury grade III	1
Hepatobiliary disorders	1	Diarrhoea	1
Stroke	1	Bone pain	1
Heart failure	1	Fever	1
Sinusitis	1	Leukemia cutis	1
Acute myeloid leukemia progression	1	Hypotension	1
		Thrombocytopenia	1
		Sepsis during transfusion	1
		Pericarditis	1
		Abscess of the anal margin	1
<b>TOTAL</b>	<b>36</b>	<b>TOTAL</b>	<b>35</b>

# Trial outcomes (1) - safety & adverse events

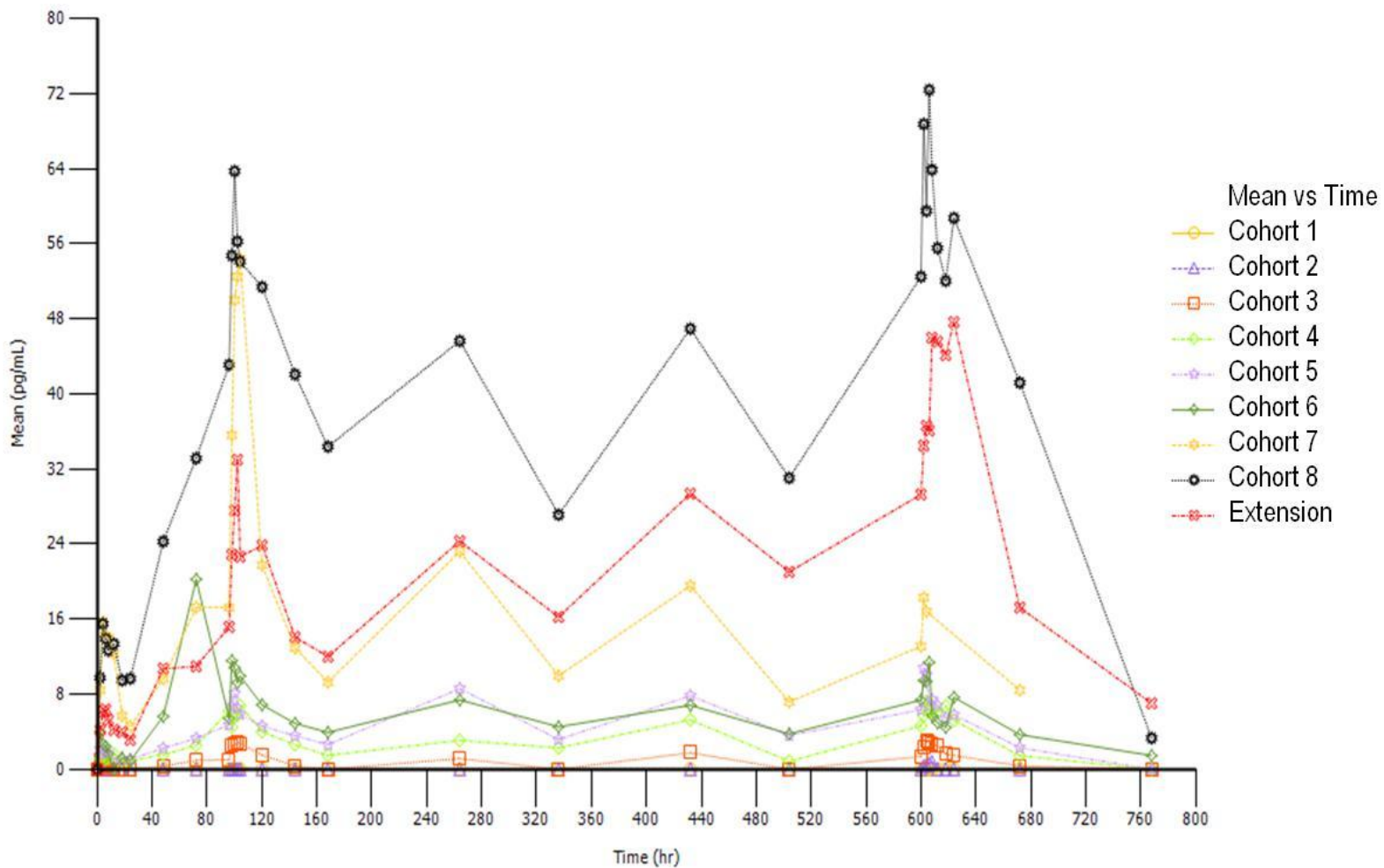
## Preliminary Expected ADR Reported

Frequency	Preferred Term	All Grades n (%)	Grade 3 n (%)	Grade 4 n (%)	Grade 5 n (%)
System / Organ Class		Blood and lymphatic system disorders			
<i>Very common</i>	Thrombocytopenia	5 (16.7)	0 (0.0)	5 (16.7)	0 (0.0)
<i>Common</i>	Febrile neutropenia	2 (6.7)	1 (3.3)	0 (0.0)	1 (3.3)
	Neutropenia	2 (6.7)	0 (0.0)	2 (6.7)	0 (0.0)
System / Organ Class		Nervous system disorders			
<i>Common</i>	Dysgeusia	2 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)
	Lethargy	2 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)
System / Organ Class		Skin and subcutaneous tissue disorders			
<i>Common</i>	Petechiae	2 (6.7)	0 (0.0)	0 (0.0)	0 (0.0)

# SECONDARY OUTCOMES



## Trial outcomes (2) - pharmacokinetics all cohorts



## Trial outcomes (2) – preliminary pharmacokinetics Extension arm

Parameters	Cohort: Extension arm- 140 ug/m <sup>2</sup> /d		
	Day 1	Day 5	Day 26
AUC <sub>0-24hr</sub> * (pg*hr/mL)	98.76 ± 85.46 (3.38-321.31)	664.636 ± 722.734 (71.18-2995.80)	937.69 ± 542.04 (335.40-1763.80)
C <sub>max</sub> * (pg/mL)	7.49 ± 6.46 (1.17-22.10)	35.01 ± 40.08 (5.49-166.00)	54.93 ± 32.44 (16.00-107.00)
T <sub>max</sub> (hr)**	5.00 (4.00-6.50)	5.00 (4.00-8.00)	6.00 (4.00-8.00)
AUC Inf (pg*hr/mL)*	-	-	5523.265 ± 5060.258 (1126.97-13.660.00)
HL_Lambda_z (hr)**	-	-	55.70 (39.39-117.69)

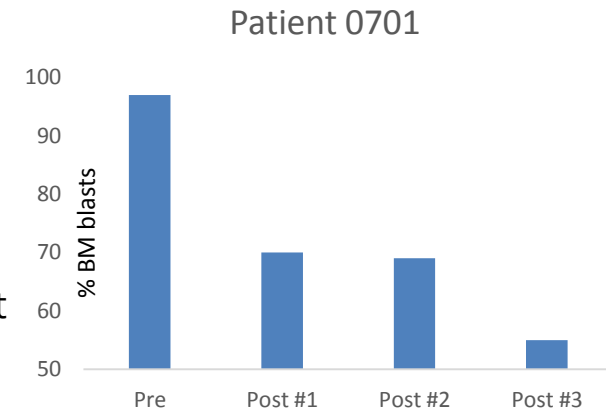
\* Mean ± SD (min;max)

\*\* Median (P25;P75)

# Trial outcomes (3) - Therapeutic effects

## MLL fusion gene patients (n=6)

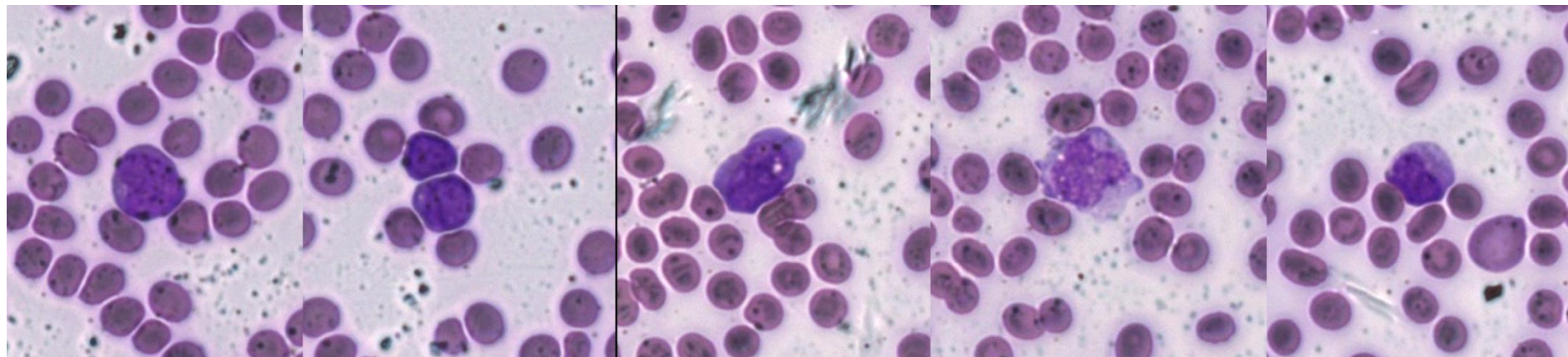
- In vivo blast differentiation (including differentiation syndrome) observed in 4/6 patients (67%)
- Falling BM blasts following each cycle in 1/6 patient (0701)
- Blast cells cleared from blood & stable disease in BM in 1/6 patient (0207)



Before treatment

During treatment

(patient 0206)

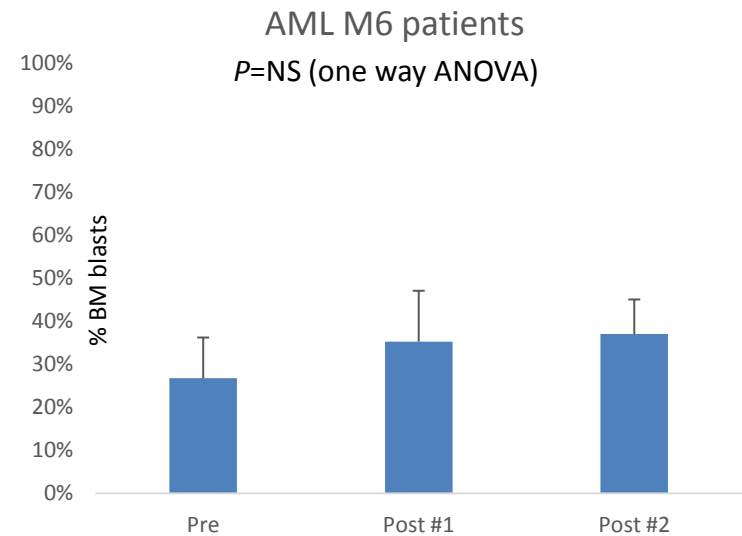


## AML M6 patients (n=4)

Stable disease in all 4 patients

## Other MLL patients (n=4)

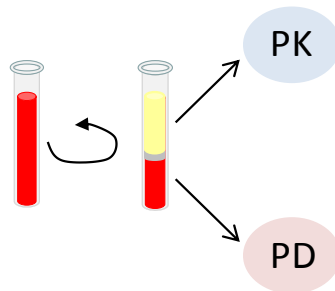
Differentiation (n=1)  
Skin disease only (n=1)  
Withdrew D8 - unevaluable (n=1)  
Progressive disease (n=1)



## Trial outcomes (4) - Pharmacodynamics

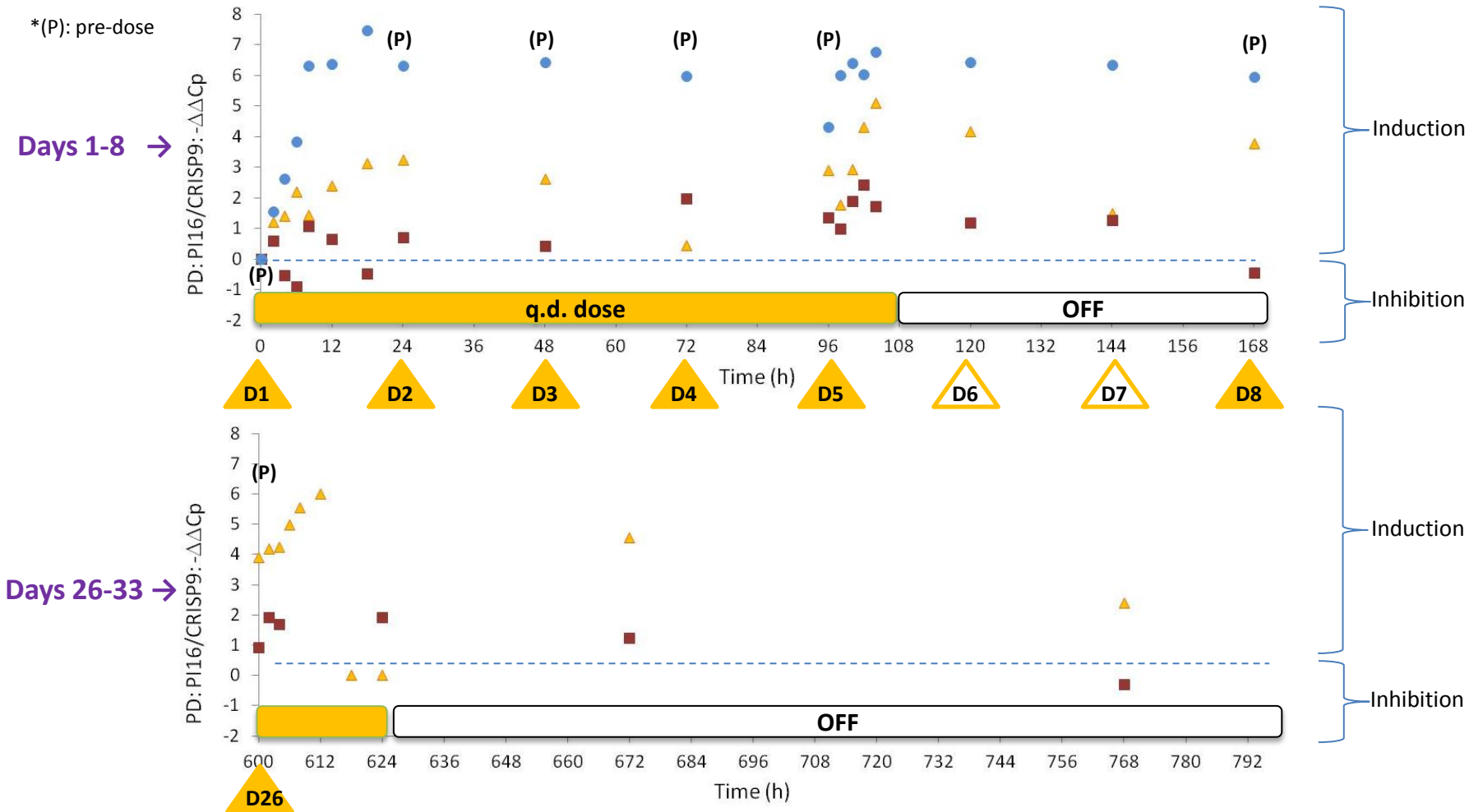
12 genes associated with monocyte/macrophage differentiation were monitored by qRT-PCR in the peripheral blood cells of treated patients

Gene	Protein	Gene	Protein
VCAN	Versican core protein	ANXA2	Annexin A2
LYZ	Lysozyme C	CRISP9/PI16	Peptidase inhibitor 16
GPR65B	Psychosine receptor	VIM	Vimentin
S100A12	S100-A12	CAMSAP2	Calmodulin-regulated spectrin-associated protein 2
Ly96	Lymphocyte antigen 96	CD86	T-lymphocyte activation antigen CD86
CTSG	Cathepsin G	ITGAM	Integrin alpha-M



# Trial outcomes (4): Pharmacodynamics (dose escalation)

▲ 0504 45 ug/m2/d      ■ 0203 80 ug/m2/d      ● 0105 140 ug/m2/d



As expected from preclinical data, **variability** in the biomarker induction profile is seen:

- ✓ Examples of the time course of **PI16/CRISP9** induction in selected patients
- ✓ **Early induction** (day 1), which remained high on day 5 and **sustained** during the 2-day off period (day 6-8), and later until 7 days after last dosing (day 26)

## Trial outcomes (4): Pharmacodynamics (extension arm)

- ✓ Variability in gene expression response due to differences in disease etiology:
  - ✓ **M4/M5** (monocytic) => induction of nearly all differentiation marker genes (except CTSG and CAMSAP2) when both blast morphological differentiation and decrease in the blast % was observed.
    - ✓ No morphological differentiation or no effect/increase in the blast % => some of the gene markers appeared inhibited (LYZ, GPR65, S100A12, ANXA2, CRISP9, VIM)
  - ✓ **M2/M6** (granulocytic/erythroblastic) => High variability and non consistency in gene modulation profile
- ✓ VCAN and S100A12 showed an exacerbated induction pattern in patients developing differentiation syndrome.

Blast morphol. different. <sup>a</sup>	Blast % variation <sup>a</sup>	Patient Id.	FAB Subtype <sup>b</sup>	Time period (h)	Maximum response ( $\Delta\Delta\text{Cp}$ )											
					VCAN	LYZ	GPR65	S100A12	Ly96	CTSG	ANXA2	CRISP9	VIM	CAMSAP2	CD86	ITGAM
✓	↓ <sup>c</sup>	0206 <sup>d</sup>	M4	600-768	-6,6	-4,9	-3,2	-7,1	-7,0	-5,2	-3,1	-2,6	-1,9	-4,6	-5,3	-4,0
✓	↓	0701	M4	600-768	-2,2	-0,9	-4,8	-2,8	-5,9	-2,3	-3,2	-4,4	-0,7	-3,0	-3,9	-3,7
✓	↓	0703 <sup>d</sup>	M5a	98-168	-9,1	-1,2	-0,9	-5,0	-3,3	3,3	-2,6	-3,5	-0,5	1,2	-2,9	-2,3
✓	=	0208	M4	98-168	-1,2	2,4	4,4	3,9	-4,1	-2,5	3,2	2,5	1,3	-2,9	-2,8	-2,8
✗	↓ <sup>e</sup>	0706	M2	98-168	-2,2	-2,3	-3,0	2,4	-3,1	-1,8	-2,0	-3,5	-2,4	-3,7	-2,0	-1,3
✗	↑	0902	M2	98-168	-2,1	-2,2	-2,3	2,1	2,4	na	-1,6	-3,1	na	-2,5	0,8	3,2
✗	↑	0901	M6a	600-768	-2,6	-2,5	-2,3	3,6	-3,4	9,1	-2,5	3,3	-3,5	-4,8	-2,8	-1,3

Induction

Inhibition

<sup>a</sup> In bone marrow and/or peripheral blood

<sup>b</sup> Grey background indicates chromosome alterations involving MLL; dark grey MLL fusion

<sup>c</sup> Between D5 and D12 of treatment

<sup>d</sup> Differentiation syndrome diagnosed

<sup>e</sup> Concomitant hydroxyurea medication

## Preliminary Conclusions (I)

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- ✓ ORY-1001 is a highly active LSD1 inhibitor with strong differentiation-inducing activity in patients with MLL leukaemia
- ✓ An excellent safety profile in AL patients
- ✓ Well tolerated and has been administered to 41 patients in total up to a maximum of three cycles
- ✓ Excellent oral bioavailability in humans and excellent pharmacokinetic parameters
- ✓ Pharmacodynamic biomarkers S100A12, VCAN, ITGAM, LY96, CD86, GPR65, CRISP9, ANXA2 and LYZ permit monitoring of response to ORY-1001 treatment in M4/M5 AML patients



## Preliminary Conclusions (II)

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- ✓ Promising clinical responses were observed mandating further clinical research and investigation
- ✓ Taking the four M6 patients together, there was no significant rise in blast cell count after two cycles of therapy – suggesting the possibility of disease stabilization.
- ✓ 4/6 patients with MLL leukaemia showed evidence of morphological blast cell differentiation
- ✓ 2 of these exhibited a differentiation syndrome
- ✓ 100% (5/5) of patients with MLL gene Fusion with evaluable PD samples showed evidence of blast differentiation by qRT-PCR analysis in PD analyses
- ✓ 23% of BM responses (3/13)
  - ✓ 2 partial Bone Marrow responses in M6 patients (falling blast percentage with treatment) (2/4)
  - ✓ 1/6 MLL patient – falling blast count with each cycle (3 cycles)
- ✓ 1/6 MLL patient – blast clearance from blood on treatment
- ✓ ORY-1001 might be a potential combinatorial therapeutic option in treatment of several types of acute myeloid leukemia
- ✓ As a potent and safe LSD1 inhibitor, ORY-1001 is also of potential interest in treatment of solid tumors such as small cell lung cancer, and possibly others in the future

# Thank you



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