ZFP64 – a predictive RNA biomarker for cancer treatment with the HDAC-inhibitor Resminostat

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Biomarker Discovery at IMGM

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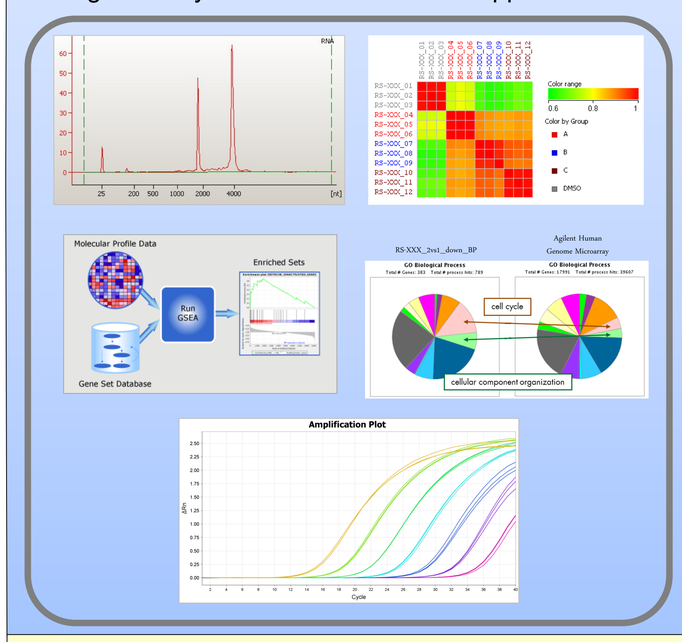


Analysis of differential gene expression

- Screening for biomarkers
  - Microarray analysis
  - RNA-seq
- Analysis of biomarker gene panels
  - TaqMan® arrays
  - Drug response
  - Disease state
- Development of custom microarrays
- Single cell analysis using qPCR

4SC Clinical Studies & Concept of Resminostat

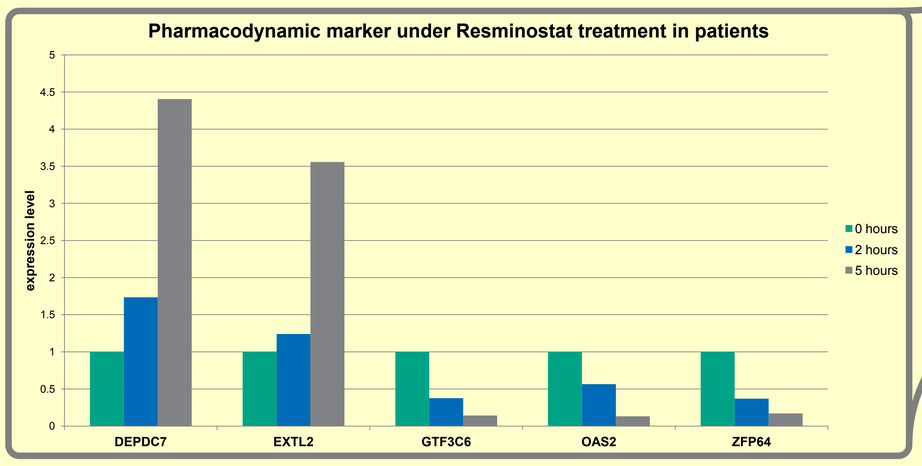
Resminostat is a novel oral pan-HDAC inhibitor with an attractive safety profile as revealed by a phase I FIM study in patients with solid tumors [1]. Subsequently, the compound was evaluated in clinical studies for various cancer indications. It has shown promising results in patients with advanced hepatocellular carcinoma (HCC, SHELTER trial), advanced Hodgkin's lymphoma (HL, SAPHIRE trial), and colorectal carcinoma (CRC, SHORE).

Hepatocellular Carcinoma (HCC)	*Hodgkin´s Lymphoma (HL)*	*Colorectal Cancer (CRC)*
The SHELTER trial	**The SAPHIRE trial**	**The SHORE trial**
Standard of care, i.e. sorafenib, has opened up enormous HCC market	Very low survival rate among relapsed/refractory HL patients resistant to 2nd-line therapy	CRC patients with KRAS-mutant tumors have limited treatment options
Resminostat applied in combination with sorafenib in 2nd-line HCC therapy has achieved a median OS value of **8.1 months**, thus proving its sensitization potential.	Resminostat induced tumor lesion reductions in **69%** of patients, including complete and partial responses, and achieved a disease control rate of **54%**.	Resminostat can be applied safely with full dose FOLFIRI; up to the highest Resminostat TDD tested of 800 mg + FOLFIRI no DLT and no PK interferences recorded.

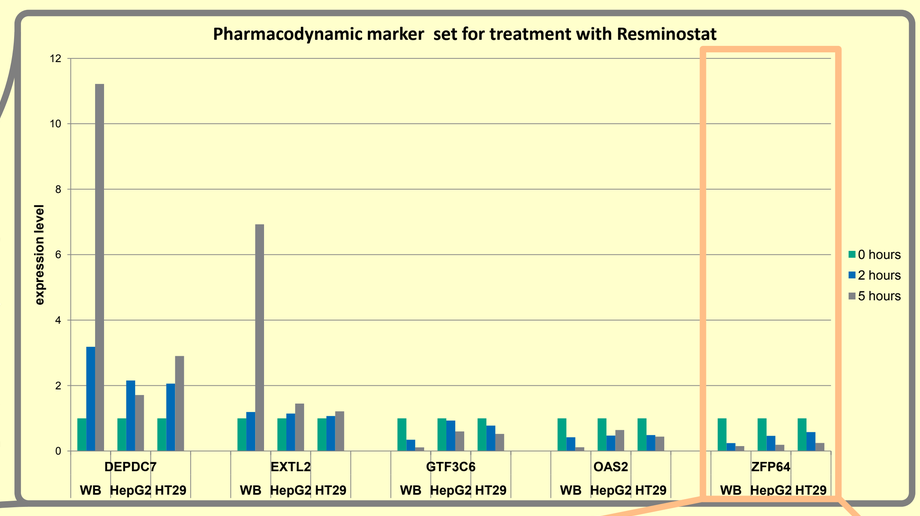
Based on its epigenetic mode of action and supported by pre-clinical data, Resminostat is an ideal candidate for development in combination therapy with classical cancer drugs in a broad variety of potential cancer indications.

Identification of a Pharmacodynamic Biomarker Panel

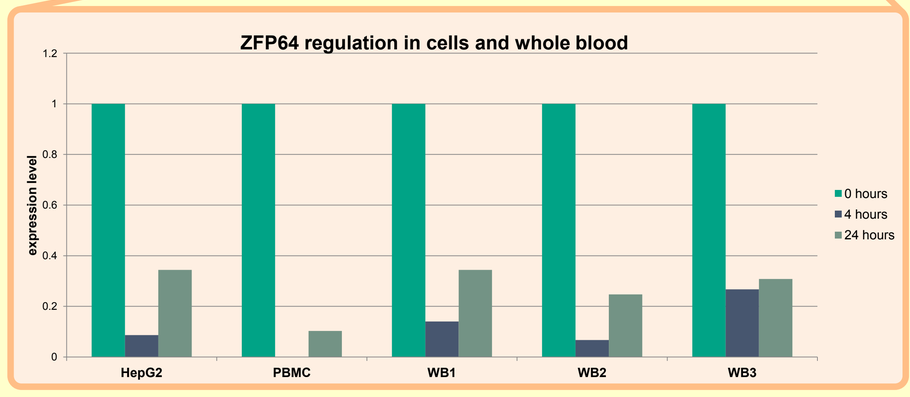
A microarray experiment was conducted to identify mRNA biomarkers for monitoring Resminostat's inhibitory effects on transcription of cells and human blood. Biomarker selection criteria were robust up- and down-regulation of the genes of interest with high amplitude and stable expression signals. After thorough analysis, the identified pharmacodynamic marker genes demonstrated solid regulation of gene expression in e.g. HT29 and HepG2 cells as well as in samples from healthy donors.



in vivo

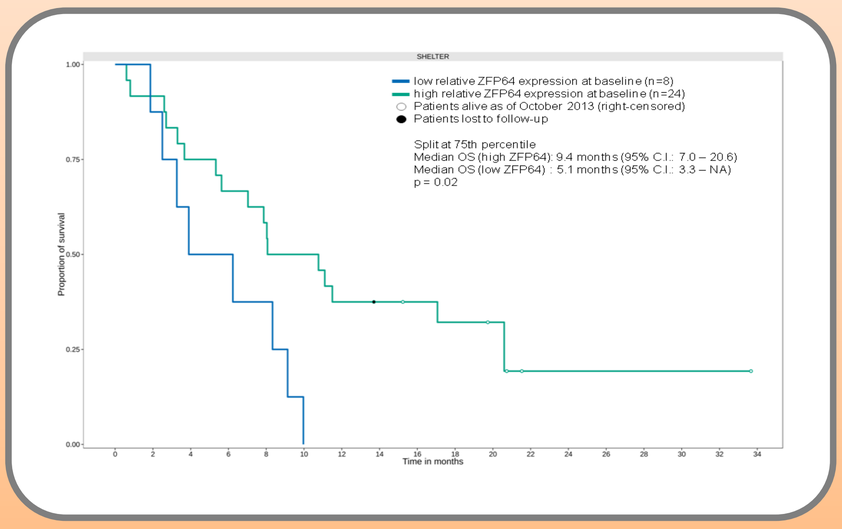


in vitro



ZFP64 was identified among a set of the pharmacodynamic marker genes and showed a robust down-regulation in various cancer cell lines, peripheral blood cells, and whole blood samples from healthy donors as well as in patients from three different clinical trials. The regulation is dose-dependent and reaches the maximum change about 5 hours post-dose in human blood samples, very well correlating with Resminostat's pharmacokinetic profile.

Biological Aspects & Summary



ZFP64 expression is observed in liver cancer, lymphoma, pancreatic cancer and thyroid cancer [2]. In the literature ZFP64 is described as a co-stimulatory molecule for NFkB signaling [3]. Other publications hint at a role in the Notch signaling pathway. ZFP64 is described to be involved in the differentiation of myogenic progenitor cells by co-activation of Notch1 [4]. ZFP64 gene expression at baseline (**C**ycle **1** **D**ay **1** **H**our **0**) in clinical trials was investigated for a potential use in patient stratification retrospectively. Baseline ZFP64 expression levels allow for separating patients with radiologically confirmed progression (PD) from those with stable disease (SD). In order to gain deeper insight and to correlate ZFP64 with accepted clinical endpoints (PFS, OS), time-to-event analysis was performed. Intriguingly, the analysis of the SHELTER data revealed a statistically significant correlation of baseline mRNA levels of ZFP64 with overall survival. High baseline ZFP64 expression, as observed in about 75% of the patients, correlated with an extended median OS value in comparison to patients with low baseline ZFP64 expression. Importantly, this correlation was observed in the SAPHIRE trial as well, indicating a predictive character of this biomarker for response to Resminostat treatment. Given the fact that the third clinical trial with Resminostat also gave hints of a comparable correlation, although based only on a small number of patients, this is a strong indication of ZFP64's marker potential and a promising signal for a personalized medicine approach with Resminostat. Further clinical development of Resminostat will incorporate the focus to confirm ZFP64's role to serve as a prognostic or predictive biomarker.

References

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