A rational approach for the discovery of inhibitors of NSD2 for the treatment of cancer

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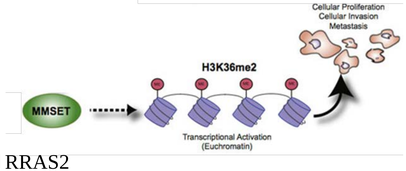
Abstract # 4524

BACKGROUND

The NSD2

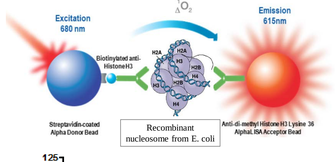
- Belongs to the histone-lysine methyltransferase protein family
- Known to dimethylate histone H3 on lysine 36 (H3K36)
- H3K36 dimethylation is most associated with active transcription



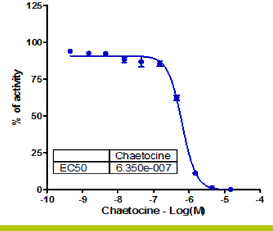
Rationale in cancer

- NSD2 triggers the expression of oncogenes, including TGFA, MET, PAK1 and RRAS2
- 20% of Multiple Myeloma cases caused by the t(4;14) chromosomal translocation resulting in increased NSD2 expression
- NSD2, harboring a functional SET domain, drives tumorigenesis by increasing H3K36me2, and knockdown of NSD2 leads to regression of multiple myeloma tumors carrying the t(4;14) translocation in mice
- The unmet clinical need and patient population size of t(4;14) multiple myeloma represents a key driver for drug discovery and development of NSD2 inhibitors

ASSAY PRINCIPLE AND VALIDATION



The assay is based on AlphaLISA technology and relies on the detection of H3K36me2 marks on nucleosome by a specific antibody



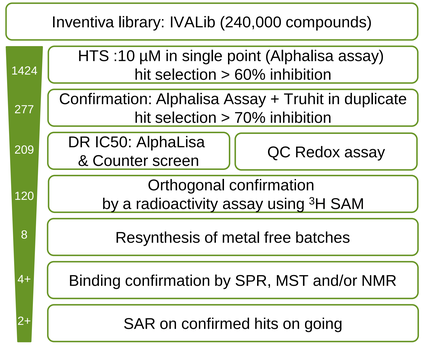
Chaetocin, a non specific inhibitor, is able to block NSD2 activity in a dose dependent manner, with an IC50 of 635 nM, similar to the ones described in the literature

IVALib

- 240,000 Compounds
- IVALib has been designed over years for drug discovery programs
- More than 70% of the compounds are original when compared to Zinc library
- Regular quality controls are performed and a collection enrichment to maintain diversity and originality is in place
- Good hit rate on internal screening programs achieved
- Library available for external drug discovery partnerships

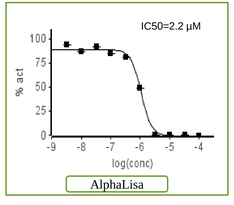
FROM HTS TO VALIDATED HITS

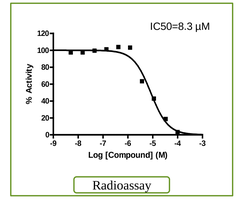
Screening funnel

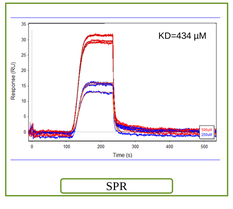


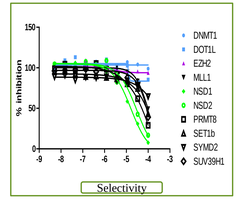
- Hits from our HTS NSD2 campaign stem from INVENTIVA's exclusive compound collection
- Identification of at least 2 validated novel chemical series: IC50 in the µM range

Examples of one series









- Inhibition activity was demonstrated on the two different biochemical assays for all members of this series
- Binding was shown for a selection of compounds by two biophysic technics : SPR and NMR

CONCLUSIONS

- Using the AlphaLisa™ technology followed by a subsequent orthogonal counter-screen based on ^{3}H SAM incorporation, we have identified and selected chemical matters to enter into H2L phase
- The biomolecular interaction of our hits with NSD2 has been confirmed by several biophysic technics such as SPR, MST and NMR
- NSD2 homology model has been set up from the active NSD1 co-crystal structure.
- In parallel, we are developing secondary cellular assays based on the H3K36me2 methylation, targeted gene expression and proliferation to further confirm the on-target activity.
- NSD2 program is available for setting-up a drug discovery partnership
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