



Kolmogorov Readings 2020

The effect of antiretroviral therapy on long non-coding RNA transcription in Thai HIV-1 infected individuals

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HIV basics

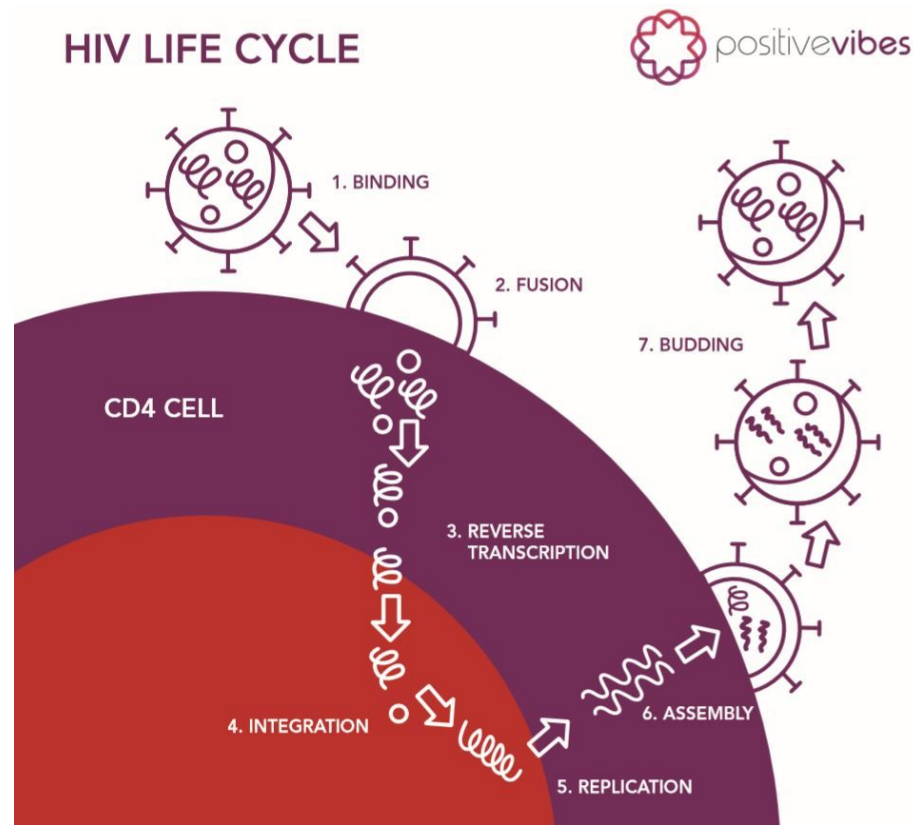
HIV

The **human immunodeficiency viruses (HIV)** are two species of *Lentivirus* that causes HIV infection and **acquired immunodeficiency syndrome (AIDS)**. It is treated with antiretroviral treatment (ART).

CHARACTERISTICS	HIV-1	HIV-2
Infectivity	High	Low
Virulence	High	Low
Prevalence	Global	West Africa
Origin	Common Chimpanzee	Sooty Mangabey

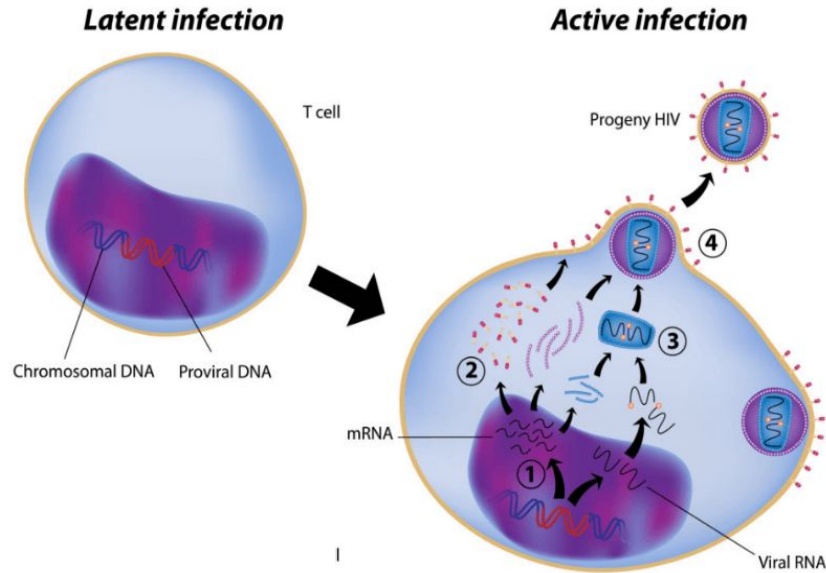
Why is HIV so hard to cure?

HIV basics



**Its infection
mechanism**

Why is HIV so hard to cure? (2)

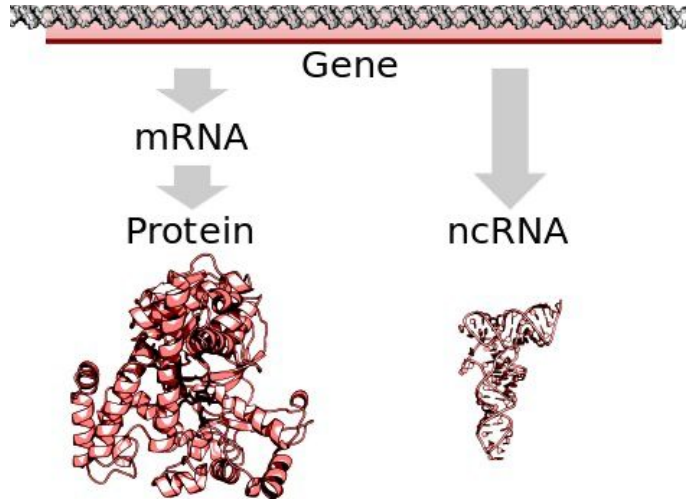


Viral latency

Our project

What we are doing

The villain's tool



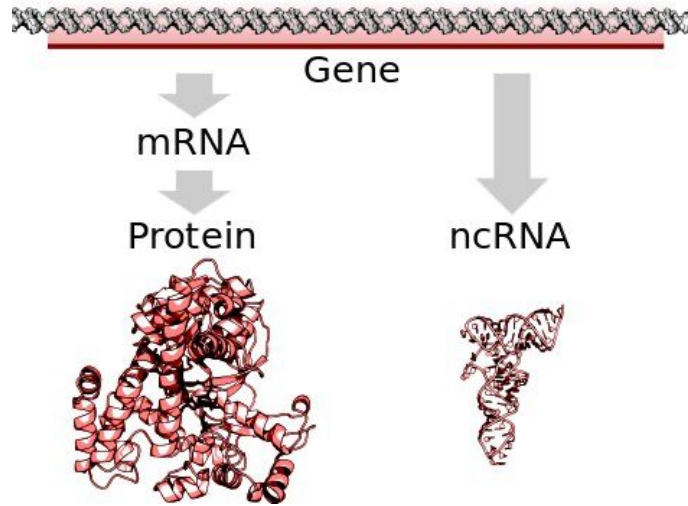
ncRNA = non-coding RNA

= RNA not translated into protein



Lazar, D. C., Morris, K. V., & Saayman, S. M. (2016). The emerging role of long non-coding RNAs in HIV infection. *Virus research*, 212, 114–126. doi:10.1016/j.virusres.2015.07.023

The villain's tool



ncRNA = non-coding RNA

= RNA not translated into protein

From previous research...

ncRNAs may play a role in establishing viral latency.

Lazar, D. C., Morris, K. V., & Saayman, S. M. (2016). The emerging role of long non-coding RNAs in HIV infection. *Virus research*, 212, 114–126. doi:10.1016/j.virusres.2015.07.023

*Our
project*

...so we decide to examine it in a different subtype found in
Thai HIV patients: subtype CRF01_AE,

and the effects of

**antiretroviral
therapy!**

Objectives of research

To examine the relationship between antiretroviral therapy duration and lncRNA expression in HIV-1 subtype CRF01_AE.

Hypothesis

The differential expression margin of lncRNA would decrease proportionately to viral load throughout the duration of antiretroviral treatment.

How we did it

work flowchart
and related processes

*Our
project:
how we
did it*

Experiment design

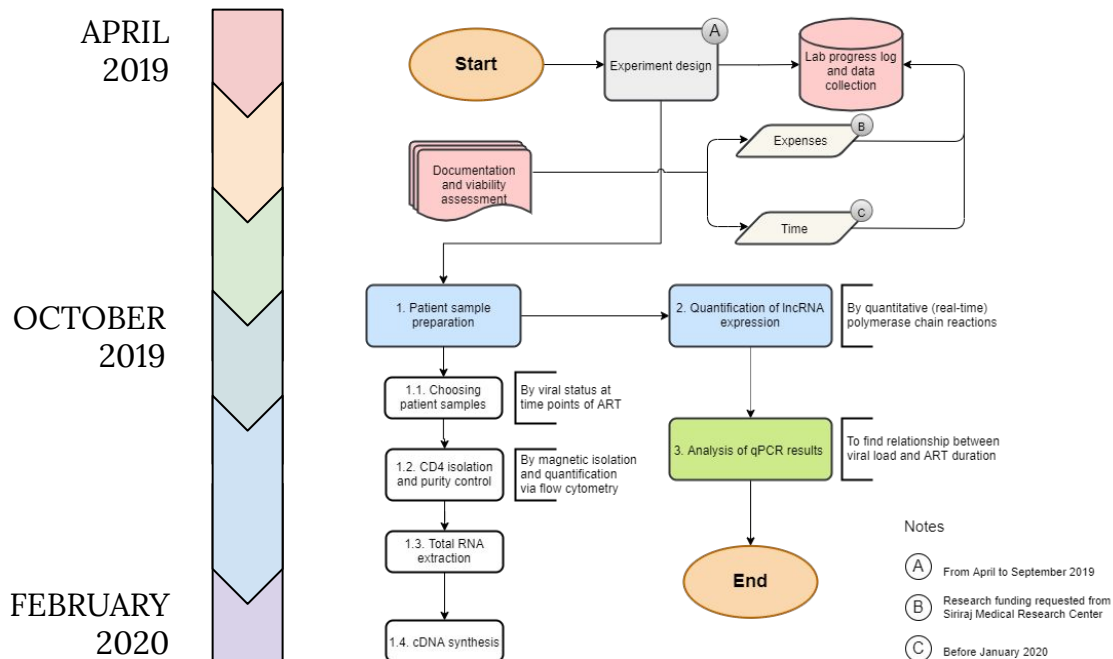
Based on previous research on lncRNA expression, **several lncRNAs** are differentially expressed between stages of the HIV-1 replication cycle.

We had selected the most significant lncRNAs for the experiment.

Trypsteen, W., et al. (2016). Differential expression of lncRNAs during the HIV replication cycle: an underestimated layer in the HIV-host interplay. *Scientific reports*, 6, 36111. <https://doi.org/10.1038/srep36111>

Our
project:
how we
did it

Project workflow

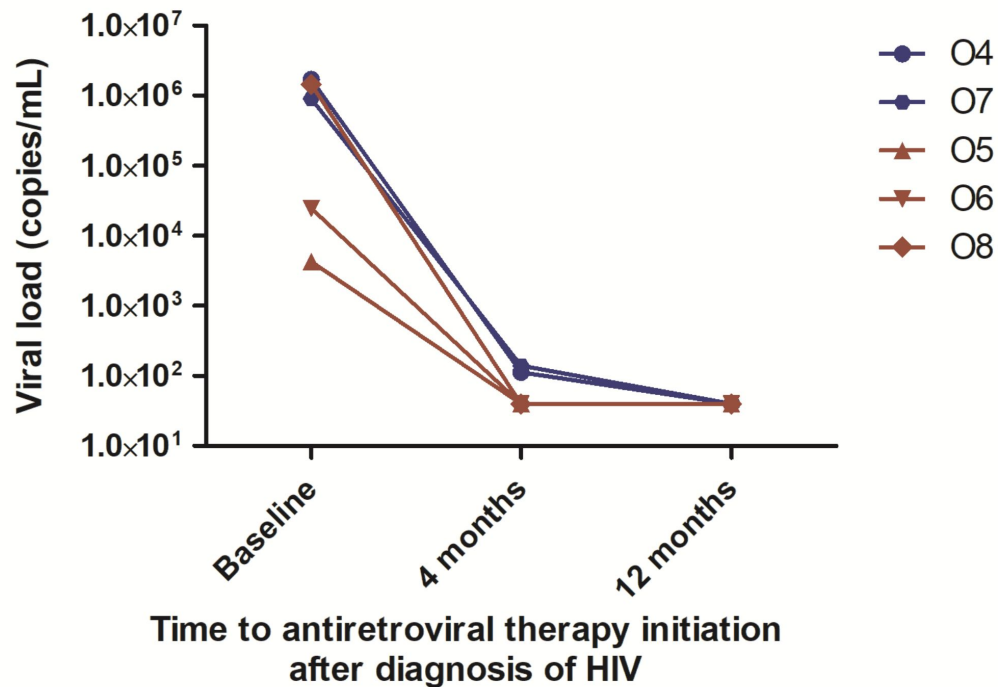


Our results

lncRNA quantification
gene expression analysis

*Our
results*

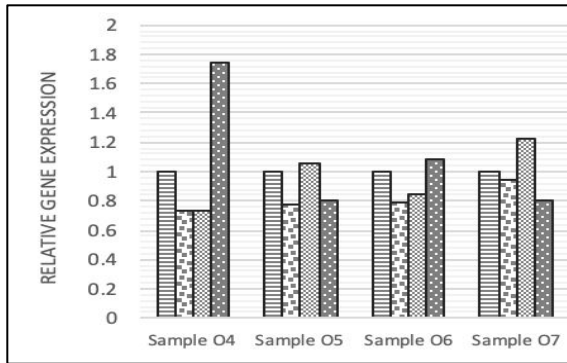
Patient status



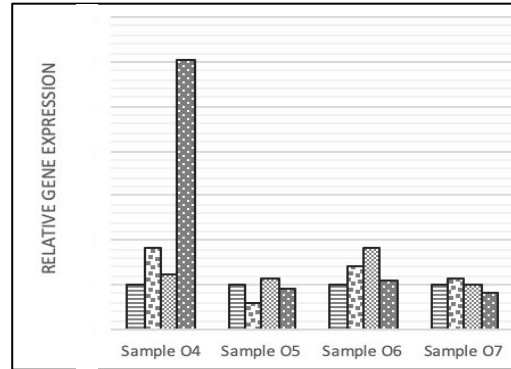
Results: lncRNA expression

Data analyzed with $\Delta\Delta C_t$ method

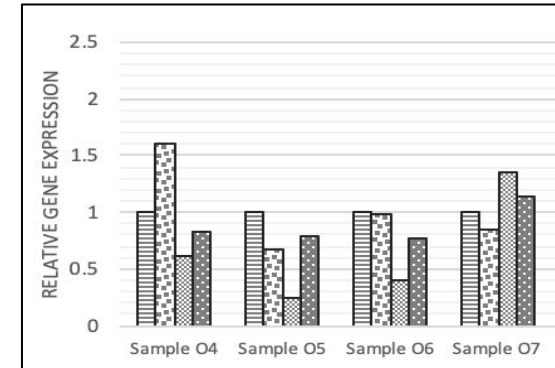
lnc-SYF2-1:1



lnc-NEAT1-2

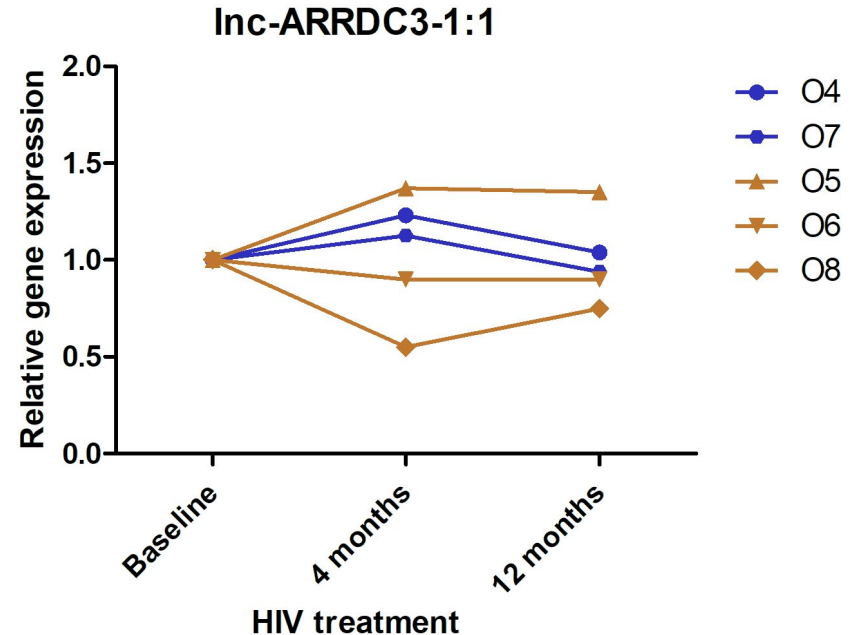
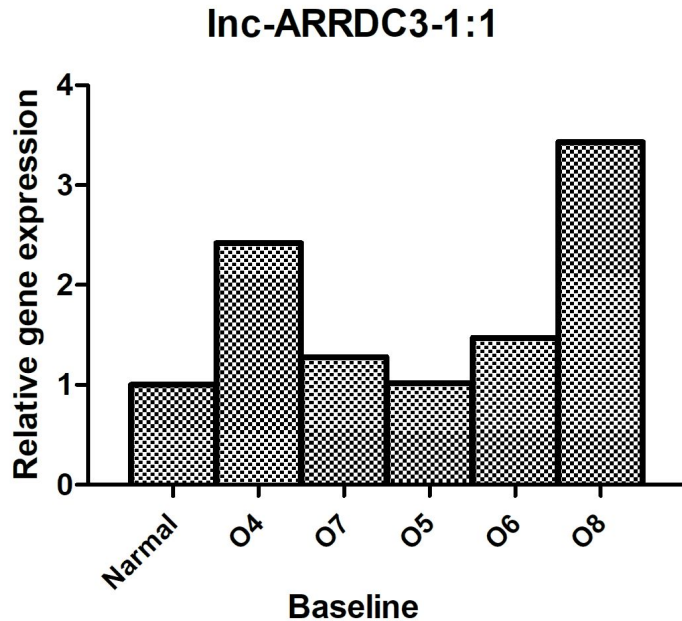


lnc-ARRDC3-1:1



Results: lncRNA expression

Data analyzed with $\Delta\Delta C_t$ method



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lncRNA expression in HIV-1 is partly involved with **viral load** and altered by **antiretroviral therapy duration**.

Discussion

- Various factors aside from antiretroviral therapy may play a role in lncRNA expression.
- lncRNAs such as lncNEAT1-2 and lnc-ARRDC3-1:1 expression demonstrates the similarity of lncRNA expression in two subtypes.

Conclusion

The downregulation of viral load in patients, one of the effects of antiretroviral therapy, contributes to changes in lncRNA expression and its approach on regulating HIV viral latency.

lncRNA expression in HIV-1 subtype CRF01_AE is indirectly involved with antiretroviral therapy duration, highlighting the importance of lncRNA in this field of research.

Further work and research

- Expand experiment to work on examining more lncRNAs and analyzing relationships in their differential expressions.

Gene	Incipedia TranscriptID	lncRNA class	transcript size (bp)	primers		Annealing Temp (°C)	
				forward	reverse		
GAPDH				5'-AGCCTCAAGATCATCAGCAATGCC-3'	5'-TGTGGTCATGAGTCCTCCACGAT-3'		
ACTB				5'-TTCCTTCCTGGGCATGGAGT-3'	5'-TACAGGTCTTTGCGGATGTC-3'		
UBC				5'-TTGGGTCGCACTTCTGTTTGTGG-3'	5'-TGACATTCTCGATGGTGTCACTGG-3'		
	lnc-C7orf44-1:1	NO DATA	NO DATA	5'-ATGGCAACTCTGTGGGAATC-3'	5'-CCCTGCTAGTCCATCCAGAA-3'	52	
	lnc-COX10-4:1	intronic	2140	5'-GGGAGGTTGGGCTTACTTTT-3'	5'-ACATGGCAATGTCAATGGAA-3'	49	
	lnc-PABPN1L-1:1	intronic	2873	5'-ACTTCCACAGGGGCCAGAC-3'	5'-AGGACGGTCCCAATAGCAT-3'	53	
	lnc-GKN2-1:1	intergenic	898	5'-AGATGACAGAAGCACTGGATTCA-3'	5'-ACAAGCAGCGGCCTTCTAAC-3'	52	
	lnc-LTBP3-1:1	NO DATA	NO DATA	5'-CTCAGTGCGCCGACTATGT-3'	5'-TCTCTGCTATGTGGGGATATG-3'	51	
	lnc-AMZ2-1:2	intergenic	456	5'-AGTGAGGCAGGATGTCACT-3'	5'-AATCTCAGGCGACAGCAAT-3'	54	
	lnc-LEF1-3:2	antisense	2810	5'-ACATCTCTTCAGCCAGCAC-3'	5'-TGCCACATTCATTCAACTGC-3'	51	
	lnc-ALDH1A2-4:1	antisense	255	5'-GGCAGAAAGAGGTCCCTGTA-3'	5'-ATTTTGAGCCAGTTGGGTTT-3'	49	
	lnc-ARRDC3-1:1	NO DATA	NO DATA	5'-TGACATAAAACATGGGGCAATT-3'	5'-GATGGCCCACTACACAGA-3'	49	
	lnc-ZBTB20-1:1	intronic	1679	5'-CAAGGTTTCTGTTTGTGTGA-3'	5'-TTCCTCATATTCAAACTTCACAA-3'	46	
	lnc-SYF2-1:1	intronic	777	5'-ACCACCGTTGGAGGAACTC-3'	5'-TAATCCACAAGCCCAAGGT-3'	52	
	lnc-TRDMT1-1:1	NO DATA	NO DATA	5'-TGAAGCATTTGGATTACCAAGA-3'	5'-GAGTCAGCACTAAAAGGCAGA-3'	49	
	lnc-EXT1-1:1	intergenic	772	5'-TGCTTTCCTCTGTGTAGAGCA-3'	5'-AGCCACCTCTACAGCCATGT-3'	53	
	lnc-GSDMC-1:2	NO DATA	NO DATA	5'-TGCAGGTTCACTGGAATGA-3'	5'-AGCGAAGAGTGTGGAGAACA-3'	51	unvalidated
	lnc-BHLHE41-2:10	NO DATA	NO DATA	5'-TATGCCAACTCCACTTTGC-3'	5'-GCTCAGAGTTCTCAGAGCTTA-3'	53	
	lnc-GLB1L2-4:1	intergenic	3684	5'-CCACTGGCAATCAGAGTTGTT-3'	5'-CAGAGGCAGGTCTGCAAGAG-3'	53	no validation
Paper and data from : https://www.nature.com/articles/srep36111#1							
GADPH	from BT lab			5'-GTCTCCTCTGACTTCAACAGCG-3'	5'-ACCACCTGTGTGTAGCCAA-3'	55	



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Thank you for listening to

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