Fighting the Enemy Within

Basic Life Science and Issues : Presentation

Group 4

November, 2019

Chungnam National University

Group Members

- **Chaeeun Kim**
  College of Medicine, 19’
- **Jongkwan Bae**
  Dept of EE Comm. Engineering Education, 17’
- **Seungmin Lee**
  College of Medicine, 19’
- **Kangjun Heo**
  Dept of Computer Science and Engineering, 17’

Chapter Abstraction

Fighting the Enemy Within

11th chapter of *The Epigenetics Revolution*

”Epigenetic perspective of Cancer and its treatment”

Introduction: Cancer

Healthy cells, have two types of genes:

- proto-oncogenes for cell proliferation
- tumor suppressor genes for regulation

Introduction: Cancer

Healthy cells, have two types of genes:

- proto-oncogenes for cell proliferation
- tumor suppressor genes for regulation

However, cancer cells lost balance of these, For example,

- proto-oncogenes is over-activated
- tumor suppressor genes is inactivated

Introduction: Cancer

Healthy cells, have two types of genes:

- proto-oncogenes for cell proliferation
- tumor suppressor genes for regulation

However, cancer cells lost balance of these, For example,

- proto-oncogenes is over-activated
- tumor suppressor genes is inactivated

Characteristics of Oncogenesis

- Multi-step process
- Defections must be accumulated

  Inherited oncogenes are slowly expressed
  e.g.) BRCA1 mutation

- Tumour suppressor gene - Switched off
- Alteration with epigenetic access

Epigenetic Approach for Oncogenesis

- DNA Methylation

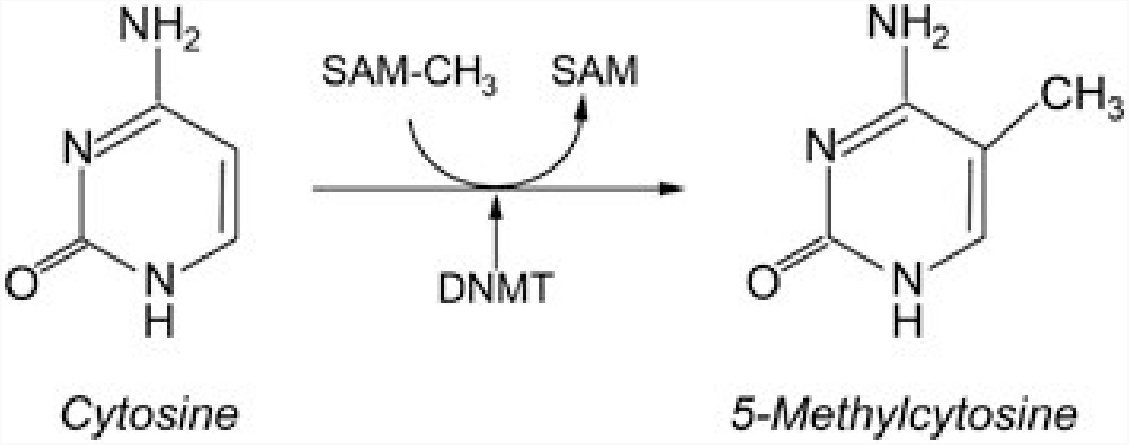
  Hypermethylation of CpG island

- Repressive Histone Modification

  Histone deacetylation

DNA Methylation

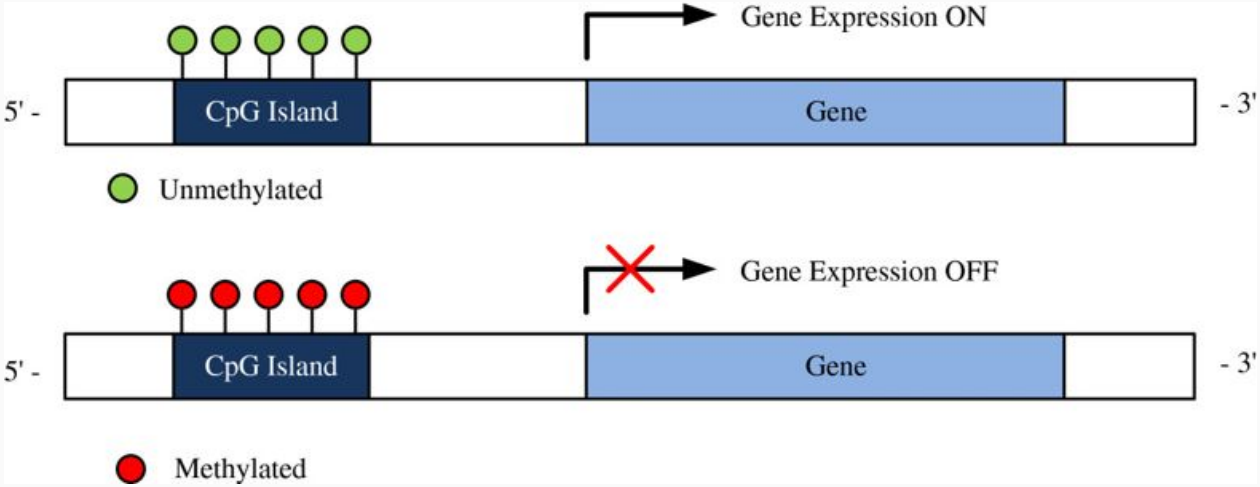
Cytosine before Guanine can be methylated



Methyl group is bond on 5’ carbon atom

DNA Methylation

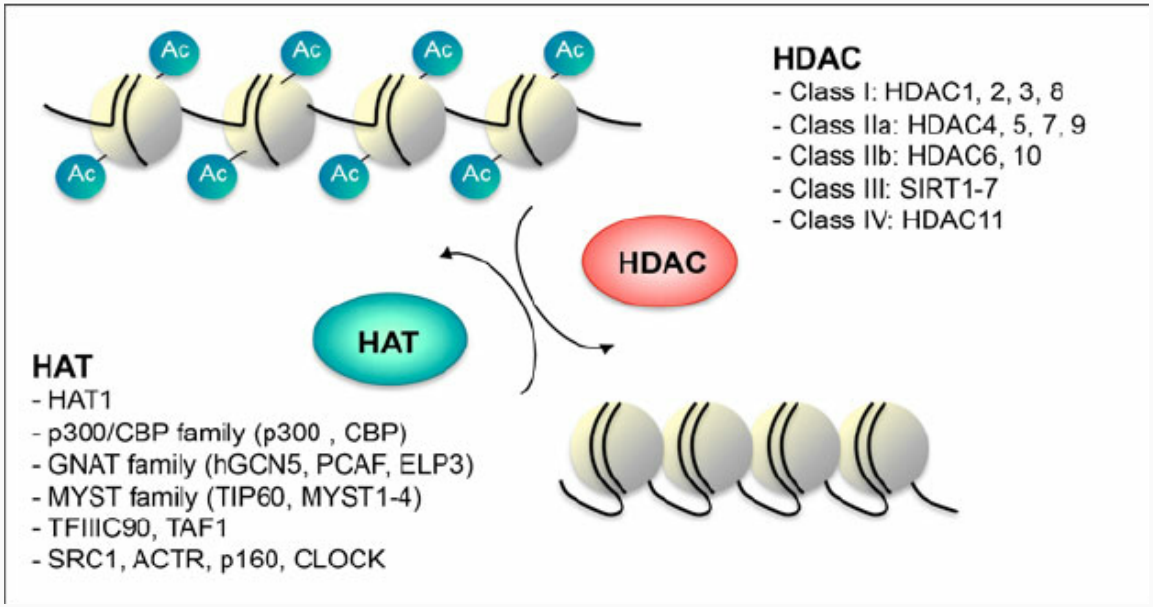
CpG dinuclotide cluster (CpG island, CGI) are usually located in the promoter regions of genes in a DNA sequence.



Hypermethylated CGI disables specific gene expression.

Histone deacetylation

Histones are related with gene regulation.

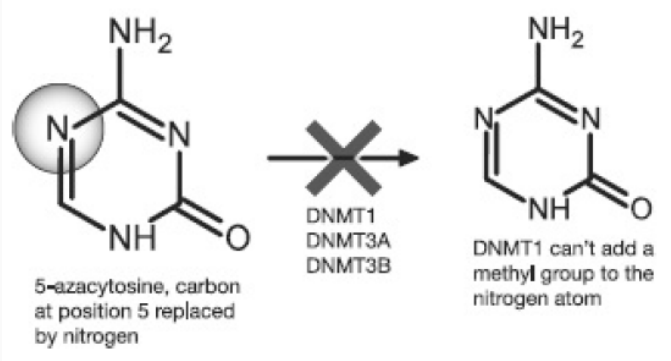


Less acetylated histones lead less expression.

Approach for Treatment

- DNMT enzyme inhibitors

  5-azacytidine, 2-aza-5'-deoxycytidine

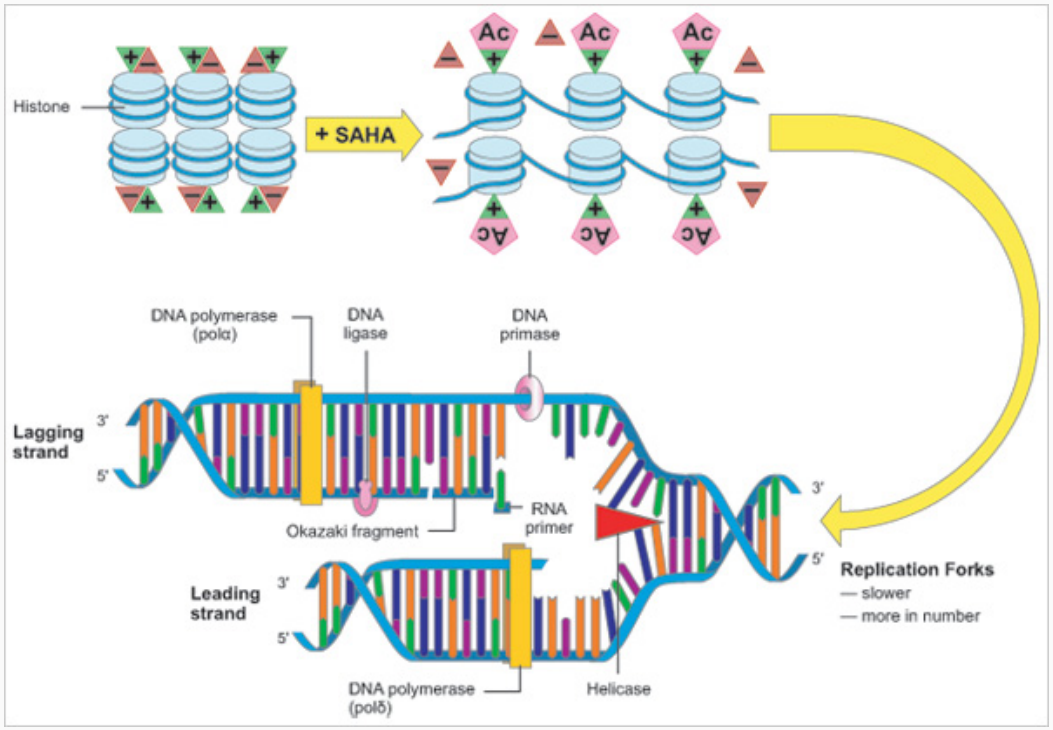


methylation inhibited by 5-azacytidine

Approach for Treatment

- HDAC inhibitor

  SAHA, Romidepsin



No easy wins

- Oncogenesis has numorous mechanisms

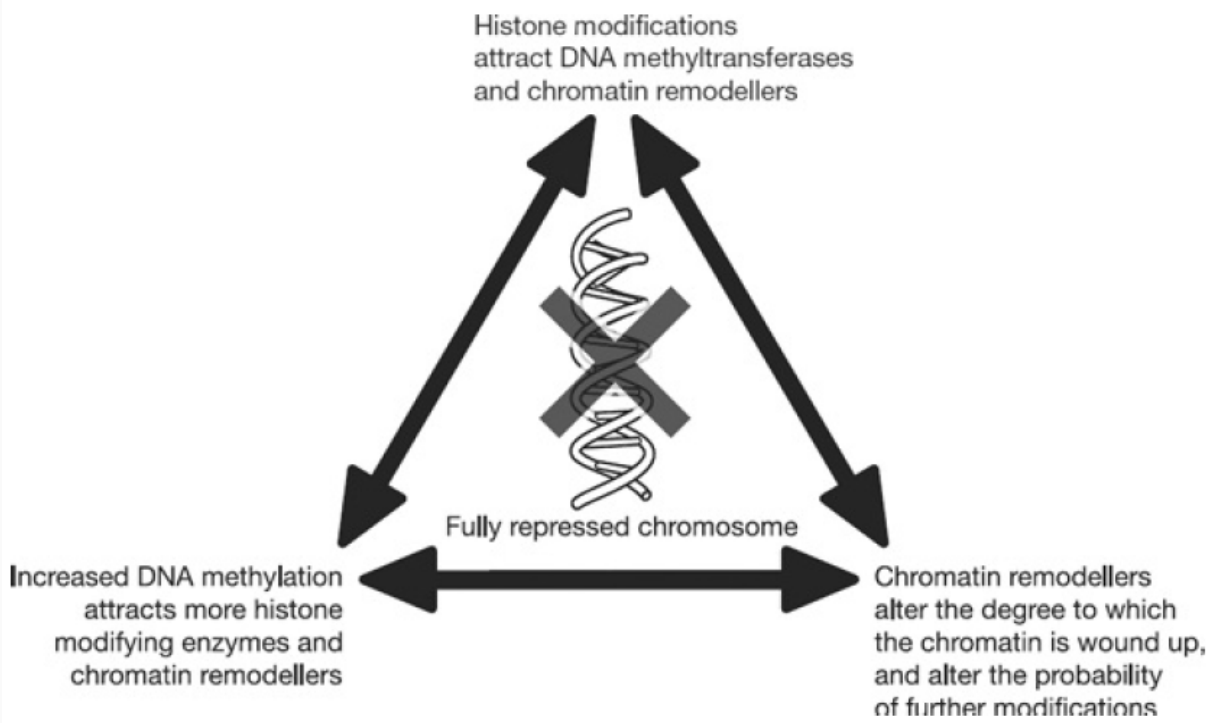
  Case by case, person by person

- The solutions are preferrable for haematological cancer
- Also these solutions should be used in different fields

  DMNT inhibitors for bone marrow, HDAC inhibitors for T-cell lymphoma

Chromosome Repression Model

There are many enzymes that involved in histone alteration



And these interact each other, forms vicious cycle.

Alternative Approach

Conclusion

Epigenetical approach in Oncology...

- Needs to be improved
- However, several agents are currently effective
- It can open new way to curing cancer

References

[1] Carey, N. (2012). *The Epigenetics Revolution*. Columbia University Press

[2] Kakumani, R.; et al. (2012). *Identification of CpG islands in DNA sequences using statistically optimal null filters*, EURASIP Journal on Bioinformatics and Systems Biology

[3] Kazantsev, Aleksey G; et al. (2008). *Therapeutic application of histone deacetylase inhibitors for central nervous system disorders*, Nature Reviews. Drug Discovery London Vol. 7 Iss. 10 854-68.

Q & A

Thank you!