AVIXGEN

1. Technology Overview

1.1. Background of Technology

1.1.1. Current global HIV market.

Deduced market size of HIV/AIDS therapeutics *(Datamonitor in U.K)*

→ 10,600 million USD by 2015 (7,100 million USD by 2005) → Grow 5~10% annually

1.1.2. The problems and solution with current AIDS therapy.

1) The generation of HIV drug resistant mutant strains

The number of commercialized anti-HIV/AIDS drug is about 20. The recent emergence of a case of AIDS in New York that is resistant to 17 of the 20 marketed drugs, however, is a reminder that major problems with current therapy is the generation of new HIV strains that acquires resistance. Endless war against resistant mutant seems likely as it is in the field of antibiotics. It is estimated that 78% of patients are resistant to at least one of the four classes of drugs and 50% are resistant to at least two. Emerging therapy to fight the war is highly anticipated. *Biocentury "New focus on HIV pipeline" Published 02/2005*

2) To solve it

Developing new drugs or therapy & identifying a target free of drug resistance are highly needed.

3) Emergence of HIV-NC protein as a new drug target

Since 1990 researchers have revealed that the HIV Nucleocapsid(NC) protein involved in almost all of the viral life cycle, especially in packaging of viral RNA genome into virus particle which is highly conserved process n all kinds of retroviruses including HIV. In addition, as being "mutation non-permissive" in its nature, the NC protein is regarded as a highly promising new target for AIDS/HIV drugs that could overcome the resistance problems (see below references). Moreover, the NC protein is known to involve not only in the viral genomic RNA packaging, but also in many other important steps in the viral replication, such as in reverse transcription, translocation of PIC (pre-integration complex) into host nucleus, and integration stage.

References:

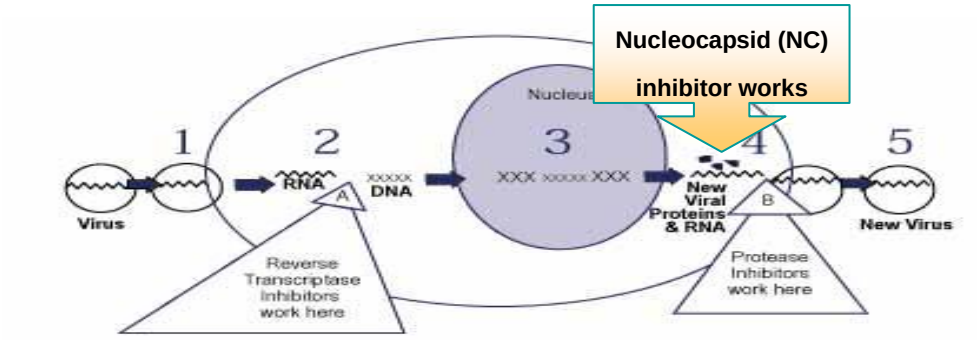
1. Inhibition of HIV-1 infectivity by zinc-ejecting aromatic C-nitroso compounds. *Nature. 361(6411):473-5, 1993.*

2. Inhibitors of HIV nucleocapsid protein zinc fingers as candidates for the treatment of AIDS. *Science. 270(5239):1194-7, 1995.*

3. Azodicarbonamide(ADA) inhibits HIV-1 replication by targeting the nucleocapsid protein. *Nature Medicine. 3(3):341-5, 1997.*

4. Characterization of a novel degradation product of 2,2'-dithiobis[N-isoleucylbenzamide], an inhibitor of HIV nucleocapsid protein zinc fingers.

J Pharm Biomed Anal. 15;23(2-3):395-402, 2000.



<Mechanism of current anti-HIV inhibitors and NC inhibitor in HIV Life Cycle>

1.1.3. The progress & status of current drug development against HIV-NC protein.

1) Toxicity

Up until now, a number of NC zinc chelators only against the NC protein have been generated and shown to be very effective for inhibiting HIV as shown in the references above. However, they have shown a limitation and failed in a clinical trial phase II due to its cell toxicity.

2) Present Status: lack of effective and efficient HTS screening method and no inhibitors other than zinc chelators are found

One of main obstacles, however, in pursuing this promising target has been lack of an efficient HTS screening method specifically targeted for the NC protein or the packaging reaction in part because the NC protein is a structural protein, not an enzyme like HIV-RT or protease.

1.1.4. Future directions.

1) Development of novel screening assay system specific for the HIV-NC

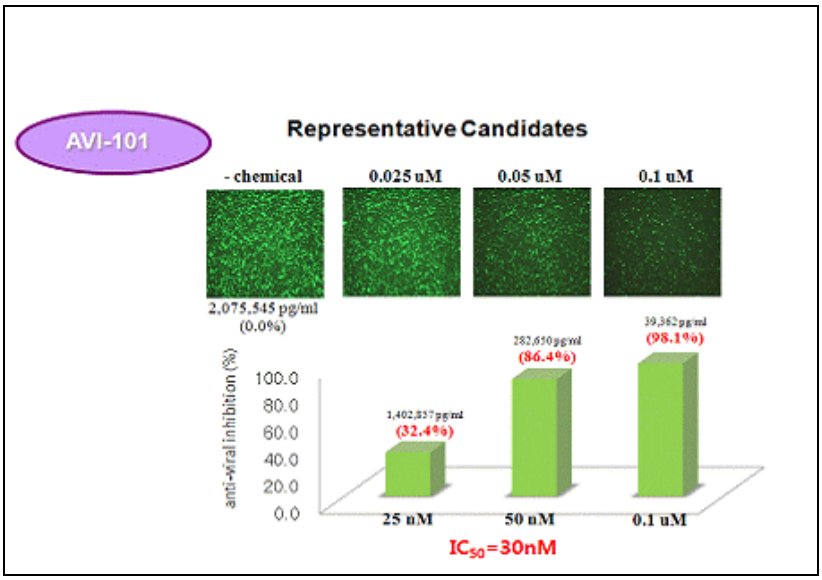
2) Discover of new types of inhibitors other than zinc chelators for the NC

1.2. Description on Technology Applied

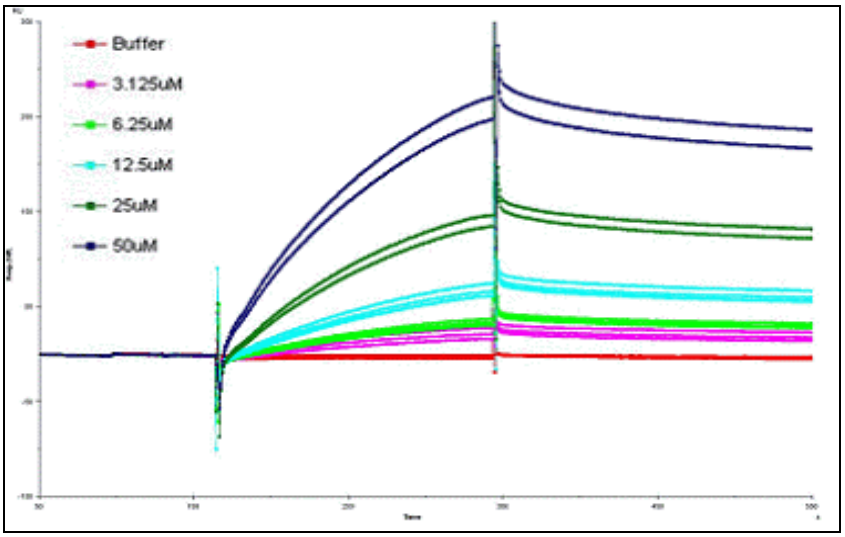
We have screened chemical compounds from a number of various chemical libraries like

1) Korea Chemical compound bank : 7,000 compounds
2) AMRI(CGX) : 60,000 compounds
3) ChemDiv : 3,000 compounds
4) TimTec : 25,000 compounds

<An example of Anti-HIV effect of our HIT chemical>



<AVI-101 has strong Affinity to NC>



AVI-101 was applied Biacore assay. NC was immobilized to Biacore sensor chip CM5. And then AVI101 was analyzed with Biacore 3000. KA and KD were 2.2 X 10^{8}(1/M) and 4.6 X 10^{-9} (M), respectively.

1.3. Differential Point, Superiority or Characteristics of Technology Applied

1. We have found a number of novel anti-HIV hit molecules using our novel-screening technology: For the first time in the world, only in Avixgen Inc.
2. The anti-HIV hit molecules are comprised of novel types of inhibitors
3. It is the validation and proof of our technology & concept against HIV-NC
4. Development of the novel anti-HIV inhibitors against HIV-NC, which could be the first and only one to overcome the resistance problems of current HIV/AIDS drugs, would be highly plausible: Demonstration of Avixgen's future outlooks and prospects.

2. Specific Patent Information

No.	Name of Patent	Application No.	Date of application /approval	Country	Status (Applied/approval)	Cost for patent (KRW)
1	Transforment for Screening of HIV drug	2000-0018489	2000.04.08	Korea	Approval	
2	HIV-1 Nucleocapsid Binding RNA	10-2001-0052594	2004.06.02	Korea	Approval	
3	HIV-1 Nucleocapsid Binding Protein	10-2002-0020805	2002.04.17	Korea	Approval	
4	Vector and Methods for Expression and Production of HIV-1 Nucleocapsid in Mammalian cell	10-2002-0064380	2002.10.21	Korea	Approval	
5	Codon-optimized HIV NC poly-nucleotide, vector containing said poly-nucleotide and method for producing NC using the same.	10-2006-0131392	2006.12.20	Korea	Applied	
6	Vector and Methods for Production of Codon Optimized HIV-1 Nucleocapsid Protein.	10-2006-0131393	2006.12.20	Korea	Applied	
7	Composition for preventing and treating AIDS comprising HIV NC protein.	10-2007-0016786	2007.02.16	Korea	Applied	
8	Recombinant mammalian cell for screening a substance preventing and treating AIDS and screening method using the	10-2007-0019328	2007.02.27	Korea	Applied	

	same.					
9	Screening, Recombinant Mammalian cell and Meyhod for Anti-AIDS Therapeutic agent	10-2008-0013918	2008.02.15	Korea	Applied	
10	Vector for expressing NC Protein of HIV and method for producing NP protein using the same.	PCT/KR2007/006694	2007	PCT	Applied	
11	Novel use of HIV NC protein.	PCT/KR2008/000827	2008	PCT	Applied	

※ *Please provide accurate information for Application No and Date of application/approval. It will be used for patent search.*

※ *In case of Cost for patent, please consider administrative cost for patent application only.*

※ *In case of PCT or overseas patent (application) except domestic patent, Please attach a certificate of application/approval (or patent abstract) as a separate file.*