APPENDIX

APPENDIX A

LIST OF THE CHEMICALS AND INSTRUMENTS

1. Chemicals

All chemicals used as in this study were analytical grade reagents.

Chemical name	Source
3,3′,5,5′-tetramethylbenzidine (TMB)	Sigma-Aldrich, St. Louis, MO, USA
3-aminopropyltriethoxysilane	Sigma-Aldrich, St. Louis, MO, USA
4′,6-diamidino-2-phenylindole (DAPI)	Molecular Probes, Eugene, OR, USA
Acrylamide	BDH Laboratory Supplies, UK
Agarose (electrophoresis grade)	Sigma-Aldrich, St. Louis, MO, USA
Ammonium persulfate	Amersham Pharmacia Biotech, Buckinghamshire, UK
Ampicillin	Sigma-Aldrich, St. Louis, MO, USA
Bis-acrylamide	BDH Laboratory Supplies, UK
Bromophenol blue	Sigma-Aldrich, St. Louis, MO, USA
Chemiluminescent detection system	Amersham Pharmacia Biotech, Buckinghamshire, UK
CsCl	Roche, IN, USA
CSFE	Molecular Probes, Eugene, OR, USA
DMEM medium	Gibco, Grand Island, NY, USA
EDTA	Sigma-Aldrich, St. Louis, MO, USA
Ethanol	Merck, Darmstadt, Germany

Chemical name	Source
Ethidium bromide	Sigma-Aldrich, St. Louis, MO, USA
Fetal bovine serum (FBS)	Gibco, Grand Island, NY, USA
Formaldehyde	Sigma-Aldrich, St. Louis, MO, USA
FractionPREP™ Cell Fractionation System	BioVision, Mountain View, CA, USA
Glacial acetic acid	BDH Laboratory Supplies, UK
Glycerol	Sigma-Aldrich, St. Louis, MO, USA
Hybond-C membrane	Amersham Pharmacia Biotech, Buckinghamshire, UK
IPTG	Amresco, Solon, OH, USA
IsoPrep solution	Robbins Scientific Corporation, Sunnyvale, CA, USA
MEM medium	Gibco, Grand Island, NY, USA
Methanol	Merck, Darmstadt, Germany
NaCl	Sigma-Aldrich, St. Louis, MO, USA
NaOH	Sigma-Aldrich, St. Louis, MO, USA
PEG MW 8000	Sigma-Aldrich, St. Louis, MO, USA
Penicillin/Streptomycin	Gibco, Grand Island, NY, USA
Plasmid Mini Kit	QIAGEN, Hilden, Germany
Polyvinylidene-fluoride (PVDF) membrane	PALL, East Hills, NY, USA
ProofStart DNA polymerase	QIAGEN, Hilden, Germany

Chemical name	Source
QIAprep spin Miniprep kit	QIAGEN, Hilden, Germany
QIAquick Gel Extraction kit	QIAGEN, Hilden, Germany
QIAquick PCR purification Kit	QIAGEN, Hilden, Germany
RPMI 1640 medium	Gibco, Grand Island, NY, USA
Skimmed milk	Difco Laboratories, Detroit MI, USA
Sodium chloride	Merck, Darmstadt, Germany
T_4 ligase enzyme	Roche Molecular Biochemicals, Manheim, Germany
TEMED	BioRad, Hercules, CA, USA
Triton X-100	Sigma-Aldrich, St. Louis, MO, USA
Trypan blue 0.4%	Sigma-Aldrich, St. Louis, MO, USA
Trypsin-EDTA	Gibco, Grand Island, NY, USA
Tween20	Fluka, Buchs, Switzerland
Versene 1×	Gibco, Grand Island, NY, USA

2. Instruments

Instruments	Source
37 °C incubator	JP Selecta, Barcelona, Spain
37 °C CO_2 incubator EG 115 IR	Jouan GmbH, Unterhaching, Germany
Amicon Ultra centrifugal filter units	Millipore, Cork, Ireland
AXIOVISION 4.4 software	Carl Zeiss Canada Ltd., Toronto, ON, Canada
Beckman Coulter EPICS ALTRA	Beckman Coulter, Fullerton, CA, USA
BECKMAN L-60 ultracentrifuge	Beckman Coulter, Fullerton, CA, USA
ELISA plate reader	TECAN, Austria
Confocal microscope	Olympus, Japan
Electrophoretic power supply 3000Xi	BioRad, Hercules, CA, USA
Fluo-Link UV transluminator	Vilber Lourmat, Marne-la-Vallée Cedex, France
FluoVIEW software	Olympus, Japan
Inverted fluorescence microscope	Nikon eclipse TE2000-S, Japan
Inverted microscope	Olympus, Japan
Microcentrifuge	Eppendorf AG, Hamburg, Germany
Microplate	NUNC, Roskilde, Denmark
MiniVE vertical electrophoresis system	Amersham Pharmacia Biotech, Buckinghamshire, UK
MRX-150 Refrigerated microcentrifuge	Tomy Tech USA Inc., CA, USA
MyLab orbital shaker OS-20	BioSan Ltd., Riga, Latvia

Instruments	Source
RT 6000 D refrigerated centrifuge	Sorvall, Kendro Laboratory Products GmbH, Langenselbold, Germany
UV spectrophotometer	Shimadzu Scientific Instruments Inc, Kyoto, Japan
UV transilluminator	Fotodyne incorporated, Hartland, WI, USA
Vortex-Genie K-550-GE	Scientific Industries Inc, Bohemia, NY, USA
Zeiss Apotome microscope	Carl Zeiss Canada Ltd., Toronto, ON, Canada

APPENDIX B

LIST OF MICROORGANISMS

Microorganism	Source
Escherichia coli BJ5183	Stratagene, CA, USA
Escherichia coli DH10B	Stratagene, CA, USA
Escherichi coli HB2151	kindly provided by Dr. A.D. Griffiths, MRC Cambridge, UK
Escherichi coli Nova Blue	Novagen, WI, USA
Escherichi coli Origami B	Novagen, WI, USA
Escherichia coli TG1	kindly provided by Dr. A.D. Griffiths, MRC Cambridge, UK
Escherichi coli XL-1 Blue	Stratagene, CA, USA
VCSM13 filamentous phage	Stratagene, CA, USA

APPENDIX C

LIST OF CELL LINES

Name	Type of cell lines
293A	Human embryonic kidney cell line
Jurkat	Human acute lymphoblastic leukemia cell line
HeLa	Human cervical carcinoma cell line
HepG2	Human hepatoma cell line
U937	Human leukemic monocyte lymphoma cell line

APPENDIX D

LIST OF ANTIBODIES AND CONJUGATED ANTIBODIES

Antibodies name	Source
Anti-αV integrin (Cloned L230)	kindly provided by Prof. Dr. Andre Lieber
Anti-CAR mAb (Cloned RmcB)	kindly provided by Prof. Dr. Andre Lieber
Anti-CD147 mAb (Cloned M6-1B9)	kindly provided by Prof. Dr. Watchara Kasinrerk
Anti-gpIII mAb	Exalpha Biologicals, Watertown, MA, USA
Anti-gpVIII mAb	Amersham Pharmacia Biotech, Buckinghamshire, UK
Anti-mouse Igs-Alexa 488 antibody	Molecular Probes, Eugene, OR, USA
Anti-survivin mAb (Cloned MT-SVV3)	kindly provided by Prof. Dr. Watchara Kasinrerk
Biotinylated anti-gpIII mAbs	Exalpha Biologicals, Watertown, MA
BCCP-2 mAb	kindly provided by Prof.Dr. Watchara Kasinrerk
Goat-anti-rat Alexa-Fluor 568 antibody	Molecular Probes, Eugene, OR, USA
HRP-conjugated anti-HA antibody	Roche, IN, USA

Antibodies name	Source
HRP-conjugated anti-gpVIII antibody	Amersham Pharmacia Biotech, Buckinghamshire, UK
HRP-conjugated goat anti-mouse Igs antibody	KPL, Gaithersburg, MD, USA
Ms-mAb-CD147 (MEM-M6/1)	Abcam, MA, USA
PE- conjugated anti CD46 antibody	BD Pharmingen, San Diego, CA, USA
Rabbit anti-mouse IgG-HRP	Dako, Dakopatts, High Wycombe, UK
Streptavidin-HRP	ZYMED Laboratories, San Franscisco, CA, USA

APPENDIX E

REAGENT PREPARATIONS

1. 10× Tris-acetate/EDTA electrophoresis buffer (TAE)

Tris-base	48.40	gm
Glacial acetic acid	11.42	ml
0.5 M EDTA, pH 8.0	20	ml

Dissolved all ingredients in deionized distilled water and filled up to 1,000 ml.

Sterilized by autoclave and kept at room temperature.

2. 1 or 2 % Agarose gel

Agarose	1 or 2	gm
1× TAE	100	ml

Melted by microwave oven until the agarose was completely dissolved.

3. Ethidium bromide working solution (10 mg/ml)

Ethidium bromide	1.0	gm
Distilled water	100	ml

Dissolved and kept in dark bottle at 4 °C.

4. 6× gel loading buffer

Bromphenol blue	0.25 %
Glycerol	30 %

Mixed thoroughly and stored at -20 °C.

5. Phosphate buffer saline (PBS), pH 7.2

NaCl	8.00 gm
KCl	0.20 gm
Na_2HPO_4	1.15 gm
KH_2PO_4	0.20 gm

Dissolved all ingredients in deionized distilled water and filled up to 900 ml.

Adjusted pH to 7.2 with 1 N HCl or 1 N NaOH.

Added distilled water to adjust the volume to 1,000 ml and kept at room temperature.

6. 50% glucose

D-glucose	5 gm

Added distilled water to 10 ml and boiled in boiling water.

Filtered through 0.2 µm Millipore filter and stored at 4 °C.

7. Reagents for using in ELISA

7.1 0.05 M carbonate buffer, pH 9.6

Na_2CO_3	0.159	gm
$NaHCO_3$	0.293	gm
NaN_3	0.02	gm

Dissolved all ingredients in deionized distilled water and filled up to 90 ml.

Adjusted pH to 9.6.

Adjusted the volume to 100 ml with deionized distilled water and kept at room temperature.

7.2 0.05% Tween20 in PBS (washing buffer for ELISA and Western blot)

Tween20	0.5	ml

Dissolved in 1,000 ml PBS.

Mixed well and stored at room temperature.

7.3 Stop reaction solution (1N HCl)

Concentrate HCl	8.3	ml
Distilled water	91.7	ml

Slowly dropped HCl to distilled water, stored at room temperature

8. Reagents for SDS-polyacrylamide gel electrophoresis (SDS-PAGE)

~~8.1~~ 1.5 M Tris-HCl, pH 8.8

จัดรูปแบบ: สัญลักษณ์แสดงหัวข้อย่อยและลำดับเลข

Tris-base	18.15	gm

Dissolved in 75 ml deionized distilled water.

Adjusted pH to 8.8 with concentrated HCL.

Adjusted the volume to 100 ml with deionized distilled water and stored at 4 °C.

~~8.2~~ 0.5 M Tris-HCl, pH 6.8

จัดรูปแบบ: สัญลักษณ์แสดงหัวข้อย่อยและลำดับเลข

Tris-base	6.0	gm

Dissolved in 75 ml deionized distilled water.

Adjusted pH to 6.8 with concentrated HCl.

Adjusted the volume to 100 ml with deionized distilled water and stored at 4 °C.

~~8.3~~ Running buffer

จัดรูปแบบ: สัญลักษณ์แสดงหัวข้อย่อยและลำดับเลข

Tris-base	1.51	gm
Glycine	7.20	gm
Sodium dodesyl sulfate	0.5	gm

Dissolved in 500 ml deionized distilled water and kept at 4 °C.

~~8.4~~ Blotting buffer

จัดรูปแบบ: สัญลักษณ์แสดงหัวข้อย่อยและลำดับเลข

Tris-base	3.03	gm
Glycine	14.41	gm
SDS	0.5	gm

Added deionized distilled water to 700 ml and mixed well.

Added 200 ml of methanol

Adjusted the volume to 1,000 ml with deionized distilled water and kept at 4 °C.

~~8.5~~ Copolymerization of 4% stacking gel (5 ml)

จัดรูปแบบ: สัญลักษณ์แสดงหัวข้อย่อยและลำดับเลข

Stock acrylamide 30%	0.83	ml
0.5 M Tris-HCl pH 6.8	0.63	ml
10% SDS	0.05	ml
DW	3.40	ml
10% Ammonium persulfate	0.05	ml
TEMED	0.01	ml

8.6 Copolymerization of 12% stacking gel (10 ml)

Stock acrylamide 30%	4.00	ml
Gel buffer pH 8.8	2.50	ml
10% SDS	0.10	ml
DW	3.30	ml
10% Ammonium persulfate	0.10	ml
TEMED	0.01	ml

9. Media for bacterial culture

9.1 LB broth

Yeast extract	5.0	gm
Tryptone	10.0	gm
NaCl	10.0	gm

Dissolved all ingredients in 1,000 ml distilled water.

Sterilized by autoclave, poured on Petri dish (plate) and kept at 4 °C.

9.2 LB agar

LB agar	15	gm

Dissolved all ingredients in 1,000 ml distilled water.

Sterilized by autoclave, poured on Petri dish (plate) and stored at 4 °C.

9.3 2×TY broth

Tryptone	16	gm
Yeast extract	10	gm
NaCl	5	gm

Dissolved in 1,000 ml distilled water.

Sterilized by autoclave and kept at 4 °C.

9.4 TYE

Tryptone	10	gm
Yeast extract	5	gm
NaCl	8	gm

Dissolved in 1,000 ml distilled water.

Sterilized by autoclave and kept at 4 °C.

9.5 Solid TYE medium

Tryptone	10	gm
Yeast extract	5	gm
NaCl	8	gm
Agar	10	gm

Dissolved in 1,000 ml distilled water.

Sterilized by autoclave, poured on Petri dish (plate) and kept at 4 °C.

10. Reagents for using in plasmid mini-preparation

10.1 3 M Sodium Acetate pH 7.0

$NaAcet.3H_2O$	40.8	gm

Adjust pH to 7.0 with NaOH/HCl

Dissolve in 100 ml DW and keep at 4 °C

10.2 Potassium Acetate

Potassium Acetate	29.4 gm
Glacial acetic acid	11.5 ml

Dissolve in 100 ml DW and keep at 4 °C.

10.3 10 M NaOH

NaOH	200 gm

Dissolve in 500 ml DW and keep at 4 °C.

10.4 10% SDS

SDS	5 gm

Dissolve in 50 ml DW and store at room temperature.

10.5 7.5 M NH_4 Acetate

NH_4 Acetate	57.8 gm

Dissolve in 100 ml DW and keep at 4 °C.

10.6 1 M glucose buffer

D-glucose	18.02 gm

Dissolve all ingredients in DW and fill up to 100 ml.

Autoclave and keep at 4 °C.

10.7 0.5 M EDTA pH 8.0

EDTA	37.22 gm
DW	100 ml

Adjust pH to 8.0, add DW to 200 ml and keep at 4 °C.

10.8 10 × glucomix

1 M glucose buffer	50 ml
0.5 M EDTA pH 8.0	20 ml
1 M Tris pH 8.0	25 ml
DW	5 ml

Autoclave and keep at 4 °C.

10.9 1 × glucomix-lysozyme solution

10 × glucomix	300 µl
Lysozyme stock (50mg/ml in DW)	300 µl
DW	2.4 ml

Keep on ice or store at 4 °C for 7 days.

10.10 0.1 M $CaCl_2$

$CaCl_2$	1.11 gm

Dissolved in 100 ml distilled water.

Sterilized by autoclave and kept at 4 °C.

10.11 85% glycerol

Glycerol	42.5	ml

Added distilled water to 100 ml.

Mixed well, sterilized by autoclave and stored at room temperature.

11. Reagents for indirect immunofluorescence staining

11.1 Phosphate buffer saline (PBS)

NaCl	8	gm
KCl	0.2	gm
Na_2HPO_4	1.15	gm
KH_2HPO_4	0.2	gm
DW	900	ml

Adjusted pH to 7.2 by 5N NaOH

Adjusted volume to 1000 ml, stored at room temperature.

11.2 1% BSA-0.02% NaN_3 in PBS

Bovine serum albumin fraction V	10	gm
PBS pH 7.2	1000	ml
10% NaN_3 in PBS	200	µl

Mixed well until BSA completely dissolved, stored at 4˚C.

11.3 1% Paraformaldehyde in PBS

Paraformaldehyde	5	gm
PBS pH 7.2	500	ml

Heat at 56˚C until dissolved

Filtrated with 0.2 μm Millipore filter, stored at 4˚C.

12. Reagents for cell culture

12.1 DMEM medium

DMEM powder	1	pack
$NaHCO_3$	3.7	gm
ddH_20	800	ml
Penicillin (10,000 units/ml)/Streptomycin (10,000 μg/ml)	1	ml

Stirred until dissolved and adjust pH with acetic acid.

Dissolved in ddH_20 and adjust volume to 1,000 ml.

Filtrated through 0.2 μm Millipore membrane filter.

Mixed and stored at 4 ºC.

12.2 Complete DMEM culture medium

DMEM medium	90	ml
Fetal bovine serum (FBS)	10	ml

Checked sterility before used.

12.3 Incomplete IMDM medium

IMDM powder	1	pack
$NaHCO_3$	3.024	gm
Gentamycin (40 μg/ml)	1	ml

Dissolved in ddH_20 and adjust volume to 1,000 ml

Filtrated through 0.2 μm Millipore membrane filter.

Mixed and stored at 4 ºC.

12.4 Complete IMDM medium

Incomplete IMDM medium	90	ml
Fetal calf serum	10	ml

Checked sterility before used

12.5 RPMI 1640 medium

RPMI powder	1	pack
$NaHCO_3$	2	gm
ddH_20	800	ml
Penicillin (10,000 units/ml)/Streptomycin (10,000 μg/ml)	1	ml

Stirred until dissolved and adjust pH with acetic acid.

Dissolved in ddH_20 and adjust volume to 1,000 ml.

Filtrated through 0.2 μm Millipore membrane filter.

Mixed and stored at 4 ºC.

12.6 Complete RPMI culture medium

RPMI 1640 medium	90	ml
Fetal bovine serum (FBS)	10	ml

Checked sterility before used.

12.7 Freezing medium (10%DMSO in 90%FCS)

Fetal calf serum	9	ml
DMSO	1	ml

Freshly preparation before use.

12.8 Turk's solution

Glacial acetic acid	3	ml
1% gential violet	1	ml

Adjusted volume to 100 ml with ddH_2O

Filtrated by Whatman filter paper No. 1 and stored at room temperature.

12.9 Trypan blue (0.2%)

Trypan blue powder	0.2	gm
PBS pH 7.2	100	ml

Filtrated by Whatman filter paper No. 1 and stored at room temperature.

13. Reagents for adenovirus preparation

13.1 Cesium chloride gradient

Density 1.50 gm/cm^3

CsCl	45.41	gm
DW	54.49	ml

Density 1.35 gm/cm^3

CsCl	35.18	gm
DW	64.82	ml

Density 1.25 gm/cm^3

CsCl	26.99	gm
DW	73.01	ml

13.2 Dialysis buffer

10 mM Tris pH 7.5

10 mM $MgCl_2$

10% glycerol

Stored at 4 °C.

13.3 Pronase stock

5 mg/ml Pronase

10 mM Tris pH 7.5

Preincubated at 56 °C for 15 min and followed by 37 °C for 1 h.

Aliquotted and stored at -20 °C.

13.4 Pronase buffer

10 mM Tris HCl pH 7.4

10 mM EDTA pH 8.0

1% SDS

Stored at room temperature.

13.5 TE pH 8.0

10 mM Tris HCl pH 8.0

1 mM EDTA pH 8.0

Stored at room temperature**.**

14. Denaturing RNA electrophoresis

14.1 0.5 M EDTA, pH 8.0

EDTA	186.1	gm
Deionize distilled water	1,000	ml

Sterile by autoclave.

14.2 DEPC treated water

Diethylpyrocarbonate (DEPC)	400	µl
Deionize distilled water	4,000	ml

Shake it vigorously and store at room temperature, overnight.

Sterile by autoclave.

14.3 5 × formaldehyde gel running buffer

MOPS	20.6	gm
50 mM Sodium acetate pH 7.0	800	ml

Adjust pH by 2N NaOH

0.5 M EDTA pH 8.0	10	ml

Adjust volume to 1,000 ml with DEPC-treated water.

Incubate at room temperature for 24 h and store at 4 °C.

Sterile by autoclave.

14.4 50 mM Sodium acetate pH 7.0

Sodium acetate	3.28 ml
DEPC-treated water	800 ml

14.5 1% formaldehyde gel

Agarose	1 gm
DEPC-treated water	62.5 ml
5 × formaldehyde running buffer	19.6 ml
Formaldehyde	17.9 ml

15. Reagent for phage precipitation

15.1 PEG/NaCl

4% PEG-8000

3% NaCl

APPENDIX F

ADDITIONAL FILES

Additional file 1

Colocalization of CD147 and intrabody. Colocalization of CD147 (red) and intrabody (white) in the transfected 293A cell was demonstrated in pink. Image acquisition and analysis is as described in Materials and Methods.

Additional file 2

Colocalization of CD147 and intrabody. Colocalization of CD147 (green) and intrabody (red) in the transduced HeLa cell was demonstrated in yellowish-orange. Image acquisition and analysis is as described in section 3.8.2.

APPENDIX G

PRESENTATION AND PUBLICATIONS

List of presentation

1. Intracellular expression of a single-chain variable fragment against CD147 inhibiting surface expression of CD147 in 293A cell. The 18th Annual Meeting of the Thai Society for Biotechnology on "Biotechnology: Benefits & Bioethics" at The Montein Riverside Hotel, Bangkok, Thailand, November 2-3, 2006 (Poster presentation).
2. Controlling of CD147 surface molecule expression by intrabody strategy. The Academic Meeting in The 12th Year Anniversary of the Faculty of Allied Health Sciences at Thammasat University, Prathumthani, Thailand, February 20, 2008 (Oral presentation).
3. Efficient inhibition of OKT3-induced T cell proliferation and suppression of CD147 cell surface expression in HeLa cells by scFv-M6-1B9. The 33rd Annual Meeting of the Association of Medical Technologists of Thailand, at The Empress Hotel, Chiang Mai, Thailand, April 29- May 1, 2009 (Poster presentation).

List of publications

1. Tragoolpua K, Intasai N, Kasinrerk W, Mai S, Yuan Y, Tayapiwatana C. Generation of functional scFv intrabody to abate the expression of CD147 surface molecule of 293A cells. BMC Biotechnol. 2008 Jan 29;8:5.

   Impact factor 2.38

2. Intasai N, Tragoolpua K, Pingmuang P, Khunkaewla P, Moonsom S, Kasinrerk W, Lieber A, Tayapiwatana C. Potent inhibition of OKT3-induced T cell proliferation and suppression of CD147 cell surface expression in HeLa cells by scFv-M6-1B9. Immunobiology. 2009 Mar 3.

   Impact factor 3.461

3. Tuve S, Liu Y, Tragoolpua K, Jacobs JD, Yumul RC, Li ZY, Strauss R, Hellström KE, Disis ML, Roffler S, Lieber A. *In situ* adenovirus vaccination engages T effector cells against cancer.Vaccine. 2009 Jun 24;27(31):4225-39.

   Impact factor 3.298

CURRICULUM VITAE

Name Mr. Khajornsak Tragoolpua

Date of birth June 19, 1970

Place of birth Phichit province, Thailand

Address 199/150 Moo 3, Tambol Mae-Hia, Amphur Muang, Chiang Mai 50100 Tel 084-0411600

Education

1985-1987 High school, Taphanhin School, Phichit, Thailand.

1988-1991 Bachelor of Science (Medical Technology), Faculty of Associated Medical Sciences, Chiang Mai University, Chiang Mai, Thailand

1993-1996 Master of Science (Biology), Faculty of Science, Chiang Mai University, Chiang Mai

Employment history

Jan 2003 to present Assistant Professor at Department of Clinical Microbiology, Faculty of Associated Medical Sciences Chiang Mai University, Chiang Mai, Thailand

Aug 1996 to Dec 2002 Lecturer at Department of Clinical Microbiology Faculty of Associated Medical Sciences Chiang Mai University, Chiang Mai, Thailand

Jun 1993 to Feb 1994 Head of Central Laboratory Section, Central Chiang Mai Memorial Hospital, Chiang Mai, Thailand

Nov 1991 to May 1993	Head of Central Laboratory Section, Ruampath Chiang Mai Hospital, Chiang Mai, Thailand
Apr 1991 to Oct 1991	Medical Technologist, Radioimmunoassay company, Bangkok, Thailand

List of publications

1. Tragoolpua K, Intasai N, Kasinrerk W, Mai S, Yuan Y, Tayapiwatana C. Generation of functional scFv intrabody to abate the expression of CD147 surface molecule of 293A cells. BMC Biotechnol. 2008 Jan 29;8:5.
2. Intasai N, Tragoolpua K, Pingmuang P, Khunkaewla P, Moonsom S, Kasinrerk W, Lieber A, Tayapiwatana C. Potent inhibition of OKT3-induced T cell proliferation and suppression of CD147 cell surface expression in HeLa cells by scFv-M6-1B9. Immunobiology. 2009 Mar 3.
3. Tuve S, Liu Y, Tragoolpua K, Jacobs JD, Yumul RC, Li ZY, Strauss R, Hellström KE, Disis ML, Roffler S, Lieber A. *In situ* adenovirus vaccination engages T effector cells against cancer.Vaccine. 2009 Jun 24;27(31):4225-39.