REFERENCES

ภาษาไทย

ชาญ โพชนุกูล. 2531. งูพิษกัดในประเทศไทย, ใน พิษจากพืช สัตว์ และจุลชีพ, หน้า 1-33. กรุงเทพมหานคร : จุฬาลงกรณ์มหาวิทยาลัย.

ไพบูลย์ จินตกุล และ ลาวัณย์ จันทร์โฮม. 2539. งูพิษในประเทศไทย. พิมพ์ครั้งที่ 1. กรุงเทพมหานคร : สถานเสาวภา สภากาชาดไทย.

วิโรจน์ นุตพันธุ์, นาวาอากาศโท. 2525. งูพิษ. ใน การรักษาผู้ป่วยถูกงูพิษกัดและงูพิษ, หน้า 1-25. กรุงเทพมหานคร : ศูนย์สัตวศาสตร์ไทย.

ภาษาอังกฤษ

Barry, S.G., Richard, C.D., Robert, A.B. 2002. Bites of venomous snakes. N Engl J Med 347(5): 347-356.

Barrett AJ, Rawlings ND. 1995. Families and clans of serine peptidases. Arch Biochem Biophys. 318: 247-250.

Bjarnason, J.B., Barish, A., Direnzo, G.S., Campbell, R., Fox, J.W. 1983. Kallikrein-like enzymes from Crotalus atrox venom. J Biol Chem. 258(20): 12566-12573.

Burkhart, W., Smith, G.F., Su, J.L., Parikh, I., LeVine, H. 1992. Amino acid sequence determination of ancrod, the thrombin-like alpha-fibrinogenase from the venom of *Akistrodon rhodostoma*. FEBS Lett. 297(3): 297-301.

Czapinska H, Otlewski J. 1999. Structural and energetic determinants of the S1-site specificity in serine proteases. Eur J Biochem. 260: 571-595.

Daoud, E., Tu, A.T., el-Asmar, M.F. 1986. Isolation and characterization of an anticoagulant proteinase, cerastase F-4, from *Cerastes cerastes* (Egyptian sand viper) venom. Thromb Res. 1; 42(1): 55-62.

Daoud, E., Tu, A.T., El-Asmar, M.F. 1988. The effect of anticoagulant proteinase (Cerastase) from *Cerastes cerastes* venom on the blood coagulation system. In: Hemostasis and Animal Venoms. Pirkle H, Markland FS, eds. New York: Marcel Dekker. 241-252.

Deshimaru, M., Ogawa, T., Nakashima, K., Nobuhisa, I., Chijiwa, T., Shimohigashi, Y.,Fukumaki, Y., Niwa, M., Yamashina, I., Hattori, S. and Ohno, M. 1996. Accelerated evolution of Crotalinae snake venom gland serine proteases. FEBS Lett. 397: 83-88.

Doolittle, R.F. 1984. Fibrinogen and fibrin. Annu Rev Biochem. 53: 195–229.

Eie, H., Amundsen, E., Ro, J.S. 1972. Thrombolytic treatment with Brinase of dogs with experimental pulmonary embolism. Scand J Thorac Cardiovasc Surg. 6(2): 164-171.

Frisch, E.P. 1972. Clinical experience with brinase. J Clin Pathol. 25(7): 654-655.

Gasmi, A., Karoui, M., Benlasfar, Z., Karoui, H., el Ayeb, M., Dellagi, K. 1991. Purification and characterization of a fibrinogenase from *Vipera lebetina* (desert adder) venom. Toxicon. 29(7): 827-836.

Gasmi, A., Chabchoub, A., Guermazi, S., Karoui, H., Elayeb, M., Dellagi, K. 1997. Further characterization and thrombolytic activity in a rat model of a fibrinogenase from *Vipera lebetina* venom. Thromb Res. 1; 86(3): 233-242.

Henschen-Edman, A.H., Theodor, I., Edwards, B.F., Pirkle, H. 1999. Crotalase, a fibrinogen-clotting snake venom enzyme: primary structure and evidence for a fibrinogen recognition exosite different from thrombin. Thromb Haemost. 81(1): 81-86.

Hettasch, J.M., Greenberg, C.S. 1994. Fibrin formation and stabilization. In: Loscalzo J, Schafer AI, eds. Thrombosis and Hemorrhage. Baltimore: Williams & Wilkins. 106–126.

Hillis, D. M. and Bull, J. J. 1993. An empirical test of bootstrapping as a method assessing confidence in phylogenetic analysis. Syst. Biol. *42*: 182-192.

Hung, C.C., Huang, K.F., Chiou, S.H. 1994. Characterization of one novel venom protease with beta-fibrinogenase activity from the Taiwan habu (*Trimeresurus mucrosquamatus*): purification and cDNA sequence analysis. Biochem Biophys Res Commun. 205(3): 1707-1715.

Hung, C.C., and Chiou, S.H. 2001. Snake venom fibrinogenolytic and fibrinolytic enzymes: an updated inventory. Registry of Exogenous Hemostatic Factors of the Scientific and Standardization Committee of the International Society on Thrombosis and Haemostasis. Biochem Biophys Res Commun. 9;281(4): 1012-1018.

Hutton, R.A., and Warrell, D.A. 1993. Action of snake venom components on the haemostatic system. Blood Rev. 7(3): 176-189.

Itch N, Tanaka N, Funakoshi I, Kawasaki T, Mihashi S, Yamashina I. 1988. Organization of the gene for batroxobin, a thrombin-like snake venom enzyme. J Biol Chem. 263: 7628-7631.

Itoh, N., Tanaka, N., Mihashi, S., Yamashina. I. 1987. Molecular cloning and sequence analysis of cDNA for batroxobin, a thrombin-like snake venom enzyme. J Biol Chem. 5; 262(7): 3132-3135.

Janin J, Chothia C. 1976. Stability and specificity of protein-protein interactions: The case of the trypsin-trypsin inhibitor complexes. J Mol Biol. 100: 197-211.

Jiao, H.M., Yang, L.X., Lu, B., Wu, Y.Q., Zhou, Y.C. 2005. Shedaoenase, a novel fibrinogenase from the venom of *Agkistrodon shedaoenthesis Zhao*. Acta Biochim Biophys Sin (Shanghai). 37(12): 835-842.

Karalliedde L. 1995. Animal toxins. Br J Anaesth. 74(3): 319-327.

Kini, R.M. Iwanaga, S. 1986. Structure-function relationships of phospholipases I: Prediction of presynaptic neurotoxicity. Toxicon 24: 527.

Krochmal AR, Bakken GS. 2003. Thermoregulation is the pits: use of thermal radiation for retreat site selection by rattlesnakes. The Journal of Experimental Biology 206:2539-2545.

Krem MM, Di Cera E. 2001. Molecular markers of serine protease evolution. EMBO J. 20: 3036-3045.

Lee, J.W., Seu, J.H., Rhee, I.K., Jin, I., Kawamura, Y., Park, W. 1999. Purification and characterization of brevinase, a heterogeneous two-chain fibrinolytic enzyme from the venom of Korean snake, *Agkistrodon blomhoffii brevicaudus*. Biochem Biophys Res Commun. 14;260(3): 665-670.

Markland, F.S., and Damus, P.S. 1971. Purification and properties of a thrombin-like enzyme from the venom of *Crotalus adamanteus* (Eastern diamondback rattlesnake). J Biol Chem. 246(21): 6460-6473.

Markland, F.S. Jr. 1991. Inventory of alpha- and beta-fibrinogenases from snake venoms. Thromb Haemost. 65(4): 438-443.

Markland, F.S. Jr. 1998. Snake venom fibrinogenolytic and fibrinolytic enzymes: an updated inventory. Thromb Haemost. 79(3): 668-674.

Markland, F.S. Jr. 1976. Crotalase. Methods Enzymol. 45: 223-236.

Marsh, N.A. 1994. Snake venoms affecting the haemostatic mechanism--a consideration of their mechanisms, practical applications and biological significance. Blood Coagul Fibrinolysis. 5(3): 399-410.

Matsui, T., Fufimura, Y., Titani, K. 2000. Snake venom proteases affecting hemostasis and thrombosis. Biochimica et Biophysica Acta 1477: 146-156.

Matsui, T., Sakurai, Y., Fujimura, Y., Hayashi, I., Oh-Ishi, S., Suzuki, M., Hamako, J., Yamamoto, Y., Yamazaki, J., Kinoshita, M., Titani, K. 1998. Purification and amino acid sequence of halystase from snake venom of *Agkistrodon halys blomhoffii*, a serine protease that cleaves specifically fibrinogen and kininogen. Eur J Biochem. 15; 252(3): 569-575.

Meier, J., and Stocker, K. 1991. Effects of snake venoms on hemostasis. Crit Rev Toxicol. 21(3): 171-182.

Nikai, T., Mori, N., Kishida, M., Kato, Y., Takenaka, C., Murakami, T., Shigezane, S., Sugihara, H. 1985. Isolation and characterization of hemorrhagic factors a and b from the venom of the Chinese habu snake (*Trimeresurus mucrosquamatus*). Biochim Biophys Acta. 28; 838(1): 122-131.

Nikai, T., Katano, E., Komori, Y., Sugihara, H. 1988. Beta-fibrinogenase from the venom of *Agkistrodon p. piscivorus*. Comp Biochem Physiol B. 89(3): 509-515.

Nolan, C., Hall, L.S., Barlow, G.H. 1975. Experimental pneumococcal meningitis: III. Chemotactic activity in cerebrospinal fluid. Proc Soc Exp Biol Med. 150(1): 134-136.

Nuchprayoon, I., Sai-Ngam, A., Suntrarachun, S., Noiphrom, J., Pakmanee, N., Chanhome, L., Nuchprayoon, S., Sitprija, V. 2001. Molecular cloning of phospholipase A2 from a Thai Russell's viper venom gland cDNA library. J Med Assoc Thai. 84 Suppl 1: S99-S105.

Ouyang, C., and Huang, T.F. 1979. Alpha and beta-fibrinogenases from *Trimeresurus gramineus* snake venom. Biochim Biophys Acta. 7; 571(2): 270-283.

Ouyang, C., and Teng, C.M. 1976. Fibrinogenolytic enzymes of *Trimeresurus mucrosquamatus* venom. Biochim Biophys Acta. 20; 420(2): 298-308.

Ouyang, C., Teng, C.M., Chen, Y.C. 1977. Physicochemical properties of alpha- and beta-fibrinogenases of *Trimeresurus mucrosquamatus* venom. Biochim Biophys Acta. 12; 481(2): 622-630.

Ouyang, C., Teng, C.M., Chen, Y.C. 1979. Properties of fibrinogen degradation products produced by alpha- and beta- fibrinogenases of *Trimeresurus mucrosquamatus* snake venom. Toxicon. 17(2): 121-126.

Ouyang, C., Teng, C.M., Huang, T.F. 1992. Characterization of snake venom components acting on blood coagulation and platelet function. Toxicon. 30(9): 945-966.

Pandya, B.V., Budzynski, A.Z. 1984. Anticoagulant proteases from western diamondback rattlesnake (*Crotalus atrox*) venom. Biochemistry. 31; 23(3): 460-470.

Pandya, B.V., Cierniewski, C.S., Budzynski, A.Z. 1985. Conservation of human fibrinogen conformation after cleavage of the B beta chain NH2 terminus. J Biol Chem. 10; 260(5): 2994-3000.

Park, D., Kim, H., Chung, K., Kim, D. S. and Yun, Y. 1998. Expression and characterization of a novel plasminogen activator from *Agkistrodon halys* venom. Toxicon 36: 1807-1819.

Phillips, R.E., Theakston, R.D., Warrell, D.A., Galigedara, Y., Abeysekera D.T., Dissanayaka, P., Hutton, R.A., Aloysius, D.J. 1988. Paralysis, rhabdomyolysis and haemolysis caused by bites of Russell's viper (*Vipera russelli pulchella*) in Sri Lanka: failure of Indian (Haffkine) antivenom. Q J Med 68: 691-716.

Retzios, A.D., and Markland, F.S. 1988. Two-step HPLC purification of a fibrinolytic enzymes from Florida cottonmouth venom. Abstract of 2nd Symp of the Protein Society, San Diego, CA. p77.

Sapru, Z.Z., Tu, A.T., Bailey, G.S. 1983. Purification and characterization of a fibrinogenase from the venom of Western Diamondback rattlesnake (*Crotalus atrox*). Biochim Biophys Acta. 28; 747(3): 225-231.

Serrano, S. M. T., Hagiwara, Y., Murayama, N., Higuchi, S., Mentele, R., Sampaio, C. A. M., Camargo, A. C. M. and Fink, E. 1998. Purification and characterization of a kinin-releasing and fibrinogen-clotting serine proteinase (KN-BJ) from the venom of *Bothrops jararaca*, and molecular cloning and sequence analysis of its cDNA. Eur. J. Biochem. 251: 845-853.

Siigur E, Aaspollu A, Siigur J. 2003. Anticoagulant serine fibrinogenases from *Vipera lebetina* venom:structure-function relationships. Thromb Haemost. 89(5): 826-831.

Siigur E, Mähar A, Siigur J. 1991. ß-Fibrinogenase from the venom of Vipera lebetina. Toxicon.29: 107-118.

Siigur, E., and Siigur, J. 1992. The direct-acting alpha -fibrin(ogen)olytic enzymes from snake venoms. J Toxicol Toxin Rev. 11: 91-113.

Stocker, K., Barlow, G.H. 1976. The coagulant enzyme from Bothrops atrox venom (batroxobin). Methods Enzymol. 45: 214-223.

Stocker, K., Fischer, H., Meier, J., Brogli, M., Svendsen, L. 1987. Characterization of the protein C activator Protac from the venom of the southern copperhead (*Agkistrodon contortrix*) snake. Toxicon. 25(3): 239-252.

Sugihara, H., Kishida, M., Nikai, T., Azuma, H., Yamamoto, F., Mori, N. 1986. Comparative study of four arginine ester hydrolases, ME-1, 2, 3 and 4 from the venom of *Trimeresurus mucrosquamatus* (the Chinese habu snake). Comp Biochem Physiol B. 83(4): 743-750.

Sugihara, H., Mori, N., Nikai, T., Kishida, M., Akagi, M. 1985. Comparative study of three proteinases from the venom of the Chinese habu snake (*Trimeresurus mucrosquamatus*). Comp Biochem Physiol B. 82(1): 29-35.

Teng, C. M., Hsu, M. F. and Wang, J. P. 1992. Comparison of kinin-forming and amidolytic activities of four trimucases, oedema-producing and kinin-releasing enzymes, from *Trimeresurus mucrosquamatus* venom. J. Pharm. Pharmacol. 44, 306-310.

Teng, C.M., Ouyang, C., Lin, S.C. 1985. Species difference in the fibrinogenolytic effects of alpha- and beta-fibrinogenases from *Trimeresurus mucrosquamatus* snake venom. Toxicon. 23(5): 777-782.

Tsai, I. H., Lu, P.J., Su, J.C. 1996. Two types of Russell's viper revealed by variation in phospholipase A2 from venom of the subspecies. Toxicon 34(1): 99-109.

Than-Than, Hutton, R.A., Myint-Lwin, Khin-Ei-Han, Soe-Soe, Tin-Nu-Swe, Phillips, R.E., Warrell, D.A. 1988. Heamostatic disturbances in patients bitten by Russell's viper (*vipera russelli siamensis*) in Burma. Br J Haematol 69: 513-520.

Wang D, Bode W, Huber R. Bovine chymotrypsinogen A. 1985. X-ray crystal structure analysis and refinement of a new crystal form at 1.8 A resolution. J Mol Biol. 185: 595-624.

Wang Y-M, Wang S-R, Tsai I-H. 2001. Serine protease isoforms of Deinagkistrodon acutus venom: cloning, sequencing and phylogenetic analysis. Biochem J. 354: 161-168.

Warrell, D. A. 1989. Snake venoms in science and clinical medicine-1. Russell's viper: biology, venom and treatment of bites. Trans R Soc Trop Med Hyg 83: 732-740.

Zhang, Y., Wisner, A., Xiong, Y., Bon, C. 1995. A novel plasminogen activator from snake venom. Purification, characterization, and molecular cloning. J Biol Chem. 270(17): 10246-10255.

APPENDICES

APPENDIX

1. Research Instruments

Automatic adjustable micropipette (Eppendorf, Germany)

Balance (Precisa, Switzerland)

Beaker (Pyrex)

DNA Thermal cycler 2400 (Perkin Elmer, Cetus USA)

Electrophoresis Chamber set (BIO-RAD, USA)

Flask (Pyrex)

Chemi Doc (BIO-RAD, USA)

Glass Pipette (Witeg, Germany)

Heat block (Bockel)

Parafilm (American National Can, USA)

Pipette boy (Tecnomara, Switzerland)

Pipette rack (Autopack,USA)

Pipette tip (Axygen, USA)

Plastic wrap

Polypropylene conical tube (Elkay, USA)

Power supply model

pH meter (Eutech Cybernataics)

Microcentrifuge (Eppendorf, USA)

Microcentrifuge tube (BIO-RAD, Elkay, USA)

Reagent bottle (Duran)

Spectrophotometer (BIO-RAD, USA)

Thermometer (Precision, Germany)

Vortex (scientific Industry, USA)

Water bath

2. General Reagents

Absolute ethanol (Merck)

Acetic acid (Merck)

Acrylamide:Bisarylamide (Phamacia Amersham)

Agar (Scharlau)

Agarose (USB)

Ampicillin (M&H manufacturing)

Calcium chloride (Merck)

Chloroform (Merck)

EDTA (Merck)

Ethidium bromide (Sigma)

Guanidine (USB)

Glucose (Merck)

Glycerol (Phamacia Amersham)

Glycine (USB)

Hydrochloric acid (Merck)

Hydrogen peroxide (Sigma)

IPTG (USB)

Isoamyl alcohol (Merck)

Magnesium chloride (Fluka)

Magnesium sulphate (Sigma)

2-Mercaptoethanol (Phamacia Amersham)

Methanol (Merck)

NZY (Gibco)

Phenol (Sigma)

Potassium acetate (BDH)

RNase A

Sodium acetate (Merck)

Sodium chloride (Scharlau)

SDS (Sigma)

Tris base (USB)

Tryptone (Scharlau)

Urea (USB)

Yeast extract (Scharlau)

100 bp DNA ladder (Biolabs)

1 kb DNA ladder (Gibco)

3. Bacterial Media

3.1 LB Medium (per liter)

10g	Bacto®-tryptone
5g	Bacto®-yeast extract
5g	NaCl

Adjust pH to 7.0 with NaOH.

3.2 LB Plates with Ampicillin

Add 15g agar to 1 liter of LB medium. Autoclave. Allow the medium to cool to 50 °C before adding ampicillin to a final concentration of 100 µg/ml. Pour 30-35 ml of medium into 85 mm petri dishes. Let the agar harden. Store at 4 °C for up to 1 month or at room temperature for up to 1 week.

3.3 LB Plates with Ampicillin/IPTG/X-Gal

Make the LB plates with ampicillin as above; then supplement with 0.5 mM IPTG and 80 µg/ml X-Gal and pour the plates. Alternatively, 100µl of 100 mM IPTG and 20 µl of 50 mg/ml X-Gal may be spreaded over the surface of an LB ampicillin plate and allowed to absorb for 30 minutes at 37 °C prior to use.

3.4 SOC Medium (100ml)

2.0 g	Bacto®-tryptone
0.5 g	Bacto®-yeast extract
1 ml	1M NaCl
0.25 ml	1M KCl
1 ml	2M Mg^{2+} stock, filter sterilized
1 ml	2M glucose, filter sterilized

Add Bacto®-tryptone, Bacto®-yeast extract, NaCl and KCl to 97 ml distilled water. Stir to dissolve. Autoclave and cool to room temperature. Add 2 M Mg^{2+} stock and 2 M glucose, each to a final concentration of 20 mM. Bring to 100 ml with sterile, distilled water. The final pH should be 7.0.

4. Buffer

4.1 Alkaline Lysis Solution I

50 mM	Glycine
25 mM	Tris-Chloride, pH 8.0
10 mM	EDTA, pH 8.0

4.2 Alkaline Lysis Solution II

0.2 N	NaOH
1 % (w/v)	SDS

4.3 Alkaline Lysis Solution III

60 ml	5 M Potassium Acetate
11.5 ml	Glacial Acetic Acid
28.5 ml	dH_2O

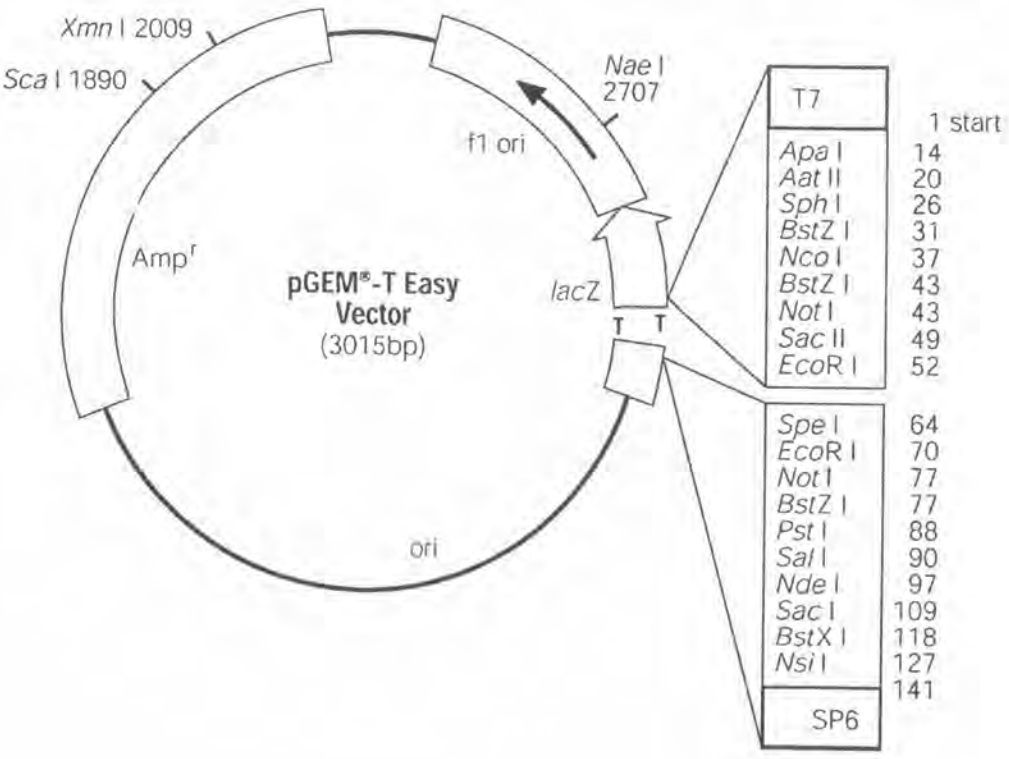
4.4 Buffer of enzymes

4.2.1 *Taq* DNA Polymerase 10X buffer (50 mM KCl, 10 mM Tris-HCl (pH9.0 at 25°C), 1.5 mM $MgCl_2$ and 0.1% TritonX-100 when diluted 1:10)

4.2.2 T4 DNA Ligase 10 X buffer (660 mM Tris-HCl (pH 7.6), 66 mM $MgCl_2$, 100 mM DTT, 660 μM ATP)

5. Vector

pGEM®-T Easy Vector Circle Map and Sequence Reference Points.



pGEM®-T Easy Vector sequence reference points:

T7 RNA polymerase transcription initiation site	1
multiple cloning region	10–128
SP6 RNA polymerase promoter (–17 to +3)	139–158
SP6 RNA polymerase transcription initiation site	141
pUC/M13 Reverse Sequencing Primer binding site	176–197

lacZ start codon	180
lacoperator	200–216
β-lactamase coding region	1337–2197
phage f1 region	2380–2835
lacoperon sequences	2836–2996, 166–395
pUC/M13 Forward Sequencing Primer binding site	2949–2972
T7 RNA polymerase promoter (–17 to +3)	2999–3

BIOGRAPHY

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Snake bite and venomResearch Unit supported by Rachadapiseksompoch Endowment Fund. Chulalongkorn Universiy	2004-2007
The Affairs Thesis Grants for Graduate Students in public University, Graduate School, Chulalongkorn University	2004-2006