

## REFERENCES

ภาษาไทย

- จุฬารัตน์ จันทระ, สุพรรณ ทิวากรพรรณราย. 2537. การศึกษาสารที่มีผลต่อไวรัสโรคเริม (herpes simplex virus) จากรากพืชสกุล *Derris*. ใน ศุภชัย หล่อโลหการ, บรรณาธิการ. การประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย; ครั้งที่ 20. 19-21 ตุลาคม 2537. กรุงเทพมหานคร: โรงพิมพ์สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์, 324-325.
- ชื่นฤดี ไชยวสุ, ทวีผล เดชาติวงศ์ ณ อยุธยา, เครือวัลย์ พลจันทร์, และคณะ. 2535. การศึกษาฤทธิ์ของสารสกัดจากใบเสลดพังพอนและใบพญาสัตตผลต่อเชื้อ herpes simplex virus type 2 ในหลอดทดลอง. วารสารกรมวิทยาศาสตร์การแพทย์. 34(4):153-8.
- นันทวัน บุญยะประภัศร, 2544. บทบาทของสมุนไพรและกระบวนการจากพืชสู่ยา. ใน คู่มือและบทความย่อประชุมวิชาการประจำปี ครั้งที่ 11 ของสมาคมไวรัสวิทยา (ประเทศไทย), หน้า 3-11. 21 ธันวาคม 2544 ณ โรงแรมอลิซาเบธ กรุงเทพมหานคร.
- นันทวัน บุญยะประภัศรและอรนุช โชคชัยเจริญพร. 2539. สมุนไพรไม้พื้นบ้าน. พิมพ์ครั้งที่ 1. กรุงเทพมหานคร: สำนักงานข้อมูลสมุนไพร คณะเภสัชศาสตร์ มหาวิทยาลัยมหิดล, บุญเกิด คงยิ่งยศ, แจ่มใส เพียรทอง, ทิพย์ เอกลักษณะนันท์, และสนธยา สิมะเสถียรโสภณ. 2533. ฤทธิ์ต้านไวรัสเฮอร์ปีส์ซิมเพลกซ์ของสมุนไพรไทย. ใน ศุภชัย หล่อโลหการ, บรรณาธิการ. การประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย; ครั้งที่ 16. 25-27 ตุลาคม 2533. กรุงเทพมหานคร: โรงพิมพ์สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์, :418-419.
- ประเสริฐ ทองเจริญ, 2528. เริม พิมพ์ครั้งที่ 1. กรุงเทพมหานคร: บริษัทเมดาร์ท.
- วุฒิ วุฒิธรรมเวช. 2540. สารานุกรมสมุนไพร : รวมหลักเภสัชกรรมไทย. พิมพ์ครั้งที่ 1. กรุงเทพมหานคร: โอเดียนสโตร์.
- สมสุข มัจฉาชีพ. 2542. พืชสมุนไพร พิมพ์ครั้งที่ 2. กรุงเทพมหานคร: แพร์พิทยา .
- อัมพวัน อภิสริยะกุล, เยาวลักษณ์ พันธุ์พิสุทธิชัย, และ ปราณีย์ ลีชนะภัย. 2536. การศึกษาฤทธิ์การต้านเชื้อไวรัสของพืชสมุนไพร. ใน ศุภชัย หล่อโลหการ, บรรณาธิการ. การประชุมวิชาการวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย; ครั้งที่ 19. 27-29 ตุลาคม 2536. หน้า 732-3. สงขลา: โรงพิมพ์สมาคมวิทยาศาสตร์แห่งประเทศไทยในพระบรมราชูปถัมภ์

## ภาษาอังกฤษ

- Abad, M. J., Bermejo, P., Gonzales, E., et al. 1999a. Antiviral activity of Bolivian plant extracts. Gen Pharmacol 32: 499-503.
- Abad, M. J., Bermejo, P., Sanchez Palomino, S., et al. 1999b. Antiviral activity of some South American medicinal plants. Phytother Res 13: 142-146.
- Abad, M. J., Guerra, J. A., Bermejo, P., et al. 2000. Search for antiviral activity in higher plant extracts. Phytother Res 14: 604-607.
- Abdel-Kader, M. S . 2001. Phenolic constituents of *Ononis vaginalis* roots. . Planta Med 67: 388-390.
- Abou-Karam M., and Shier W. T. 1990. A simplified plaque reduction assay for antiviral activity agents from plants, demonstration of frequent occurrence of antiviral activity in higher plants. J Nat Prod 53(2):340-44.
- Afolayan, A. J. and Meyer, J. J. M. 1995. Morphology and ultrastructure of secreting and nonsecreting foliar trichomes of *Helichrysum aureonitens* (Asteraceae). Int J Plant Sci 156: 481-487. [Abstract]
- Almeida, A. P. de, Miranda, M. M. F. S., Simoni, I. C., et al. 1998. Flavonol monoglycosides isolated from the antiviral fractions of *Persea americana* (Lauraceae) leaf infusion. Phytother Res 12: 562-567. [Abstract]
- Anani, K., Hudson, J.B., Souza, C. de et al. 2000. Investigation of medicinal plants of Togo for antiviral and antimicrobial activities. Pharm Biol ;38:40-45. [Abstract]
- Andrei, G., Snoeck, R., and De Clercq, E. 1995. Susceptibilities of several drug-resistant herpes simplex virus type 1 strains to alternative compounds. Antimicrob Agents Chemother 39(7): 1632-1635.
- Backer, C.A. and Bakhuizen Van Den Brink , R.C. 1965. Flora of Java 2 vol. Netherlands: N.V.P Noordhoff – Groningen.
- Balfour, H. H., Jr., 1999. Antiviral drugs. Drug Therapy 340(16): 1255-1268.
- Balzarini, J., and De Clercq. E. 1991. 5-Phosphoribosyl 1-pyrophosphate synthetase converts the acyclic nucleoside phosphonates 9-(3-hydroxy-2-phosphonylmethoxypropyl)adenine and 9-(2-phosphonylmethoxyethyl)adenine

- directly to their antivirally active diphosphate derivatives. J Biol Chem 266:8686–8689.
- Batista, O., Simoes, M. F., Duarte, A., et al. 1995. An antimicrobial abietane from the root of *Plectranthus hereroensis*. Phytochemistry 38: 167-169. [Abstract]
- Beghe D. A. V. D., Ieven M., Mertens F., et al. 1978. Screening of higher plants for biological activities. II Antiviral activity. Lloydia 41(5):463-71. [Abstract]
- Beswick, T.S. 1962. The origin and use of DAO herpes. Med Hist 6:214.
- Betancur-Galvis, L. A., Saez, J., Granados, H., et al. 1999. Antitumor and antiviral activity of Colombian medicinal plant extracts. Memorias do Instituto Oswaldo Cruz 94: 531-535. [Abstract]
- Birch, C.J., Tachedjian, G., Doherty, R.R., Hayes, K., Gust, I.D. 1990. Altered sensitivity to antiviral drugs of herpes simplex virus isolates from a patient with the acquired immunodeficiency syndrome. J Infect Dis 162:731-734.
- Bloor, S. J. and Qi, L. 1994. Cytotoxic saponins from New Zealand *Myrsine* species. J Nat Prod 57: 1354-1360.
- Blumberg, B.S., Millman, I., Venkateswaran, P.S., Thyagarajan, S.P. 1989. Hepatitis B virus and hepatocellular carcinoma-treatment of HBV carriers with *Phyllanthus amarus*. Cancer Detect Prevent 14:195-201.
- Blumberg, B.S., Millman, I., Venkateswaran, P.S., Thyagarajan, S.P. 1990a. Hepatitis B virus and primary hepatocellular carcinoma: treatment of HBV carriers with *Phyllanthus amarus*. Vaccine 8:S86-92.
- Blumberg, B.S., Millman, I., Venkateswaran, P.S., Thyagarajan, S.P. 1990b. Hepatitis B and hepatocellular carcinoma treatment of HBV carriers with *Phyllanthus amarus*. Asean J Clin Sci 11:35-47.
- Brooks, G.F., Butel, J.S., Morse, S.A. 2001. Jawetz, Melnick and Adelberg's medical microbiology 22<sup>nd</sup> ed. New York: McGraw-Hill.
- Brook, M.G. 1988. Effect of *Phyllanthus amarus* on chronic carriers of hepatitis B virus. Ibid 86(18): 1017-8.



- Bryson, Y.J., Dillon, M., Lovett, M., et al. 1983. Treatment of first episodes of genital herpes simplex virus infection with oral acyclovir: a randomized double-blind controlled trial in normal subjects. N Engl J Med 308:916-921.
- Buchman, T.G., Roizman, B., Adams, G., Stover, B.H. 1978. Restriction endonuclease fingerprinting of herpes simplex DNA: a novel epidemiological tool applied to a nosocomial outbreak. J Infect Dis 138:488-498.
- Bulfour, Jr. H.H. 1988. Acyclovir. In: Peterson, P.K., Verhoef, J. (eds). The antimicrobial agents annual/3, pp. 345-360. NY: Elsevier Science.
- Bunyapraphatsara, N., Dechsree, S. Yoosook, C., et al. 2000. Anti-herpes simplex virus component isolated from *Maclura cochinchinensis*. Phytomedicine 6:421-424. [Abstract]
- Cabrera, G. M., Deluca, M. E., Seldes, A. M., et al. 1993. Cardenolide glycosides from the roots of *Mandevilla pentlandiana*. Phytochemistry 32: 1253-1259.
- Cassady, K. A. and Whitley, R. J. 1997. New therapeutic approaches to the alphaherpesvirus infections. J Antimicrob Chemother 39: 119-128.
- Cavallaro, L., Garcia, G., Broussalis, A., et al. 1995. Antiherpetic *in vitro* activity of *Gamochaeta simplicicaulis* extract. Phytother Res 9: 176-179. [Abstract]
- Chalobon Yoosook, Wasun Chantratita, and Pongpen Rimdusit. 1989. Recovery frequencies of herpes simplex virus types 1 and 2 from symptomatic and asymptomatic genital herpes cases and antiviral sensitivities of isolates. J Med Assoc Thai 72 (10): 572-576.
- Chansakaow, S., Ruangrungsi, N., and Ishikawa, T. 1996. Isolation of pyropheophorbide a from the leaves of *Atalantia monophylla* (Roxb.) Corr. (Rutaceae) as a possible antiviral active principle against herpes simplex virus type 2. Chem Pharm Bull 44: 1415-1417. [Abstract]
- Chutinan Kantasuk, C. 1992. Preliminary test for- Anti-herpes simplex virus activity of extracts from some Thai medicinal plants Master's Thesis, Department of Microbiology, Graduate School, Chulalongkorn University.
- Cimanga, K., Bruyne, T. de, Lasure, A., et al. 1996. *In vitro* biological activities of alkaloids from *Cryptolepis sanguinolenta*. Planta Med 62: 22-27.

- Claus, J. D., Coto, C. E., and Torres, R. A. de. 1998. Natural resistance of BALB/c mice to herpes simplex virus-type 1 intraperitoneal infection is abrogated by a plant extract with *in vitro* anti-herpes activity. Phytother Res 12: 250-254.
- Corey, L., Benedetti, J., Crichlow, C., et al. 1983. Treatment of primary episodes of genital herpes virus infections with acyclovir: results of topical, intravenous, and oral therapy. J Antimicrob Chemother; 12: 79.
- Corey, L. and Spear, P.G. 1986. Infections with herpes simplex viruses, part I. N Eng J Med 314(11): 686-691.
- Corthout, J., Pieters, L., Claeys, M., et al. 1992. Antiviral caffeoyl esters from *Spondias mombin*. Phytochemistry 31: 1979-1981. [Abstract]
- Cristoni, A., Morazzoni, P., Bombardelli, E., et al. 1996. Activity of *Piliostigma thonningii* root bark extract against herpes simplex virus type 1. In Conference Title: Proceedings of the VIII Congresso nazionale della Societa Italiana di Farmacognosia and 1st joint meeting of Belgian, Dutch, Spanish and Italian research groups on pharmacognosy, Naples, Italy, 9-14 June 1996. Phytother Res 10: S135-S137.
- Cunningham, A. L. and Mikloska, Z., 2001. The holy grail: Immune control of human herpes simplex virus infection and disease. Herpes 8 (suppl 1): 6A-10A.
- Del Barrio, G. and Parra, F. 2000. Evaluation of the antiviral activity of an aqueous extract from *Phyllanthus orbicularis*. J Ethnopharmacol 72: 317-322.
- De Luca, N.A., Schaffer, P.A. 1988. Physical and function domains of the herpes simplex virus transcriptional regulatory protein ICP4. J Virol 62: 732-743.
- Elanchezhian M., Rajarajan S., Rajendran P., et al. 1993. Antiviral properties of the seed extract of an Indian medicinal plant, *Pongamia pinnata* Linn, against HSV: *in vitro* studies on vero cells. J Med Microbiol 38: 262-4. [Abstract]
- Ellis, M. N., Keller, P. M. Fyfe, J. A., et al. 1987. Clinical isolate of herpes simplex virus type 2 that induces a thymidine kinase with altered substrate specificity. Antimicrob Agent Chemother 31: 1117-1125.
- Farnsworth, N.R. and Bunyapraphatsara, N. 1992. Thai medicinal plants. Prachachon Co.,Ltd. Bangkok. 1992: 57-62.



- Ferrea, G., Canessa, A., Sampietro, F., et al. 1993. *In vitro* activity of a *Combretum micranthum* extract against Herpes simplex virus types 1 and 2. Antiviral Res 21: 317-325. [Abstract]
- Gadler, H. 1983. Nucleic acid hybridization for measurement of effects on antiviral compounds on human cytomegalovirus DNA replication. Antimicrob Agent Chemother 24: 370-374.
- Garcia, G. H., Campos, R., Torres, R. A. de, et al. 1990. Antiherpetic activity of some Argentine medicinal plants. Fitoterapia 41: 542-546. [Abstract]
- Garcia, G., Cavallaro, L., Broussalis, A., et al. 1995. Antiviral activity of *Achyrocline flaccida* Wein DC aqueous extract. Phytother Res 9: 251-254. [Abstract]
- Garcia, G., Cavallaro, L., Broussalis, A., et al. 1999. Biological and chemical characterization of the fraction with antiherpetic activity from *Achyrocline flaccida*. Planta Med 65: 343-346. [Abstract]
- Gasperi-campani, A., Barbieri, I., Battelli, M.G., Stirpe F. 1985. On the distribution of ribosome-inactivating proteins amongst plants. J Nat Prod 48(3):446-454.
- Gelman, I.H. and Silverstein, S. 1987. Herpes simplex virus immediate-early promoters are responsive to virus and cell trans-acting factors. J Virol 61: 2286-2296.
- Ginsberg, H. S. 1980. Herpesviruses. In H. S. Ginsberg and R. Dulbecco (eds.), Virology, 3<sup>rd</sup> ed., pp. 161-168. Philadelphia: Harper & Row Press.
- Girre, L., Amoros, M., Kaij-A-Kamb, M., Baril, F., Simoes, C.M.O. 1990. *In vitro* antiherpetic activity of the leaves of red grape vine (*Vitis vinifera*). Fitoterapia 61 (3):201-5.
- Glatthaar-Saalmuller, B., Sacher, F., Esperester, A. 2001. Antiviral activity of an extract derived from roots of *Eleutherococcus senticosus*. Antiviral Res 50; 223-228.
- Gruter, W. 1920. Experimentelle und Klinische untersuchungen uber den sogenannten herpes comea. Ber Dtsch Ophthalmol Ges 42:162.
- Harmenberg, J., Abele, G., Wahren, B. 1985. Nucleoside pools of acyclovir-treated herpes simplex type 1 infected cells. Antiviral Res 5:75-81.
- Harmenberg, J., Wahren, B., Oberg, B. 1980. Influence of cells and virus multiplicity on the inhibition of herpesvirus with acyclovir guanosine. Intervirology 14: 23-224.

- Hasegawa, T. and Kaeagushi, T. 1994. Future of prodrugs in antiviral therapy. Clin Pharmacokinet; 27: 331-336.
- Hattori, M., Nakabayashi, T. and Lim, Y., et al. 1995. Inhibition effects of various Ayurvedic and Panamanian medicinal plants on the infection of herpes simplex virus-1 *in vitro* and *in vivo*. Phytother Res 9:270-276.
- Hayashi K., Hayashi T., Morita N., et al. 1990. Antiviral activity of an extract of *Cordia salicifolia* on HSV type 1. Planta Med 56:439-43.
- Hayashi, K., Kamiya, M., and Hayashi, T. 1995. Virucidal effects of the steam distillate from *Houttuynia cordata* and its components on HSV-1, influenza virus, and HIV. Planta Med 61: 237-241.
- Hayashi, K., Niwayama, S., Hayashi, T. *In vitro* and *in vivo* antiviral activity of scopadulcic acid B from *Scoparia dulcis*, Scrophulariaceae, against herpes simplex virus type 1. Antiviral Res 9(6): 345-54.
- Hokyoung, K., EunJung, K., BongJoo, K., et al. 1998. Isolation of anti-herpes simplex virus type 1 (HSV-1) component from *Thujae orientalis* Semen. Korean Journal of Pharmacognosy 29: 277-282. [Abstract]
- Honess, R.W. and Roizman, B. 1974. Regulation of herpesvirus macromolecular synthesis. I. Cascade regulation of the synthesis of the three groups of viral proteins. J Virol 14: 8-19.
- HongXi, X., Lee, S.H.S., Lee, S.F., et al. 1999. Isolation and characterization of an anti-HSV polysaccharide from *Prunella vulgaris*. Antiviral Res 44: 43-54. [Abstract]
- Hudson, J.B., Lee, M., and Rasoanaivo, P. 2000. Antiviral activities in plants endemic to Madagascar. Pharm Biol 38:36-39. [Abstract]
- Huszar, D., and Bacchetti, S. 1981. Partial purification and characterization of the ribonucleotide reductase induced by herpes simplex virus infection of mammalian cells. J Virol 37: 580-588.
- Jarikasem, S. 2000. A phytochemical study on anti-herpes simplex components from *Gynura procumbens* Merr. Doctoral dissertation, Department of Pharmaceutical chemistry and phytochemistry, Graduate School, Mahidol University.

- Jayavasud C., Balachandra K., Sankitjaporn S., et al. 1992. Clinical trial in the treatment of genital herpes patient with *Clinacanthus nutans* extract. Com Dis J 18(3):152-61. [Abstract]
- Jiratchariyakul, W., Wiwat, C., Vongsakul, M., Somanabandhu, A., Leelamanit, W., Suwannaroj, N. 2001. HIV inhibitor from Thai bitter gourd. Planta Med 67; 350-353.
- Kirtikan, K.R., Basu, B.D. and An I.C.S. 1975. Indian medicinal plants 2nd ed. Delhi: M/S Periodical Experts.
- Kirtikar, K.R., Basu, B.D., and An I.C.S. 1980. Indian Medicinal Plants 2<sup>nd</sup> ed. India: Bishen Singh Mahendra Pal Singh.
- Konowalchuk, J., Speirs, JI. 1976. Antiviral activity of fruit extracts. J Food Sci 41:1013.
- Kott, V., Barbini, L., Cruanes, M., et al. 1999. Antiviral activity in Argentine medicinal plants. J Ethnopharmacol 64: 79-84.
- Kuo, Y. C., Chen, C. C., Tsai, W. J., et al. 2001. Regulation of herpes simplex virus type 1 replication in Vero cells by *Psychotria serpens*: relationship to gene expression, DNA replication, and protein synthesis. Antiviral Res 51: 95-109.
- Kurokawa M, Ohyama H, Hozumi T, et al. 1996. Assay for antiviral activity of herbal extracts using their absorbed sera. Chem Pharm Bull 44(6):1270-2.
- Lagrotta, M. H. C., Wigg, M. D., Santos, M. M. G., et al. 1994. Inhibitory activity of extracts of *Alternanthera brasiliana* (Amaranthaceae) against the herpes simplex virus. Phytother Res 8: 358-361. [Abstract]
- Lee, C.D., Ott, M., Thyagarajan, S.P., Shafritz, D.A. Burk, R.D., Gupta, S. 1996. *Phyllanthus amarus* downregulates hepatitis B virus mRNA transcription and replication. Eur J Clin Invest 26(12):1069-76.
- Lee-Huang, S., Huang, P. L., Nara, P. L., Chen, H. C., Kung, H. F., Huang, P., Huang, H. I., Huang, P. L. 1990. MAP 30: a new inhibitor of HIV-1 infection and replication [from *Momordica charantia* seeds and fruits]. FEBS Letters 272; 12-18



- Leung, D. T. and Sacks, S. L. 2000. Current recommendations for the treatment of genital herpes. Drugs 60(6): 1329-1352.
- Leung, K. C., Meng, Z. Q., Ho, W. K. K. 1997. Antigenic determination fragments of alpha-momorcharin. Biochimica et Biophysica Acta, General Subjects 1336; 419-424.
- Lipschitz, B. 1921. Untersuchugen uber die atilogic der krankheiten der herpesgruppe (herpes zoster, genitalis and febrilis). Arch Dermatol Res 136: 428.
- Lowenstein, A. 1919. Aetiologische untersuchgen uber den fieberhaften, herpes. Munch Med Wochenschr 66: 769-770.
- Macrae, W.D., Hudson, J.B., Towers, G.H.N. 1988. Studies on the pharmacological activity of Amazonian Euphorbiaceae. J Ethnopharmacol 22(2): 143-72.
- Marchetti, M., Pisani, S., Pietropaolo, V., et al. 1996. Antiviral effect of a polysaccharide from *Sclerotium gluconicum* toward herpes simplex virus type 1 infection. Planta Med 62: 303-307.
- Mattison, H. R., Eisenberg, R. J., and Reichman, R. C. 1991. Herpes simplex virus. In: Belshe, R.B., editor. Textbook of human virology. 2<sup>nd</sup> ed. pp. 822-41. St Louis (MO): Mosby-year book.
- Mavromara-Nazos, P., Ackerman, M., and Roizman, B. 1986. Construction and properties of a viable HSV-1 recombinant lacking coding sequences for the  $\alpha$  47 gene. J Viro 60: 801-812.
- McCutcheon, A.R., Roberts, T.E., Gibbons, E., et al. 1995. Antiviral screening of British Columbian medicinal plants J Ethanopharmacol 49:101-10.
- Mehrotra, R., Rawat, S., Kulshreshtha, D.K., Patnaik, G.K., Dhawan, B.N. 1990. *In vitro* studies on the effect of certain natural products against hepatitis B virus. Indian J Med Res (B) 92(2):133-8.
- Mehrotra, R., Rawat, S., Kulshrehtha, D.K., Goyal, P., Patnaik, G.K., Dhawan, B.N. 1991. *In vitro* effect of *Phlanthus amarus* on hepatitis B virus. Indian J Med Res 93 (2):71-3.
- Metcalf, J.F., Koga, J., Chatterjee, S., Whitley, R.J. 1987. Protection against herpetic ocular disease by immunotherapy. Intervirology 185:1-11.

- Mettler, C. 1947. History of medicine. New York: McGraw-Hill (Blakiston).
- Meyer, J. J. M., Afolayan, A. J., Taylor, M. B., et al. 1996. Inhibition of herpes simplex virus type 1 by aqueous extracts from shoots of *Helichrysum aureonitens* (Asteraceae). J Ethnopharmacol 52: 41-43.
- Meyers, J.D., Flournoy, N. Thomas, E.D. 1980. Infection with herpes simplex virus and cell-mediated immunity after marrow transplant. J Infect Dis 142:338-346.
- Miranda, M. M. F. S., Almeida, A. P., Costa, S. S., et al. 1997. *In vitro* activity of extracts of *Persea americana* leaves on acyclovir-resistant and phosphonoacetic resistant Herpes simplex virus. Phytomedicine 4: 347-352.[Abstract]
- Morse, L. S., Pereira, L., Roizman, B., et al. 1978. Anatomy of HSV DNA. XI. Mapping of viral genes by analysis of polypeptides and functions specified by HSV-1 x HSV-2 recombinants. J Virol 26: 389-410.
- Munshi, A., Mehrotra, R., Ramesh, R., Panda, S.K. 1993. Evaluation of anti-hepa DNA virus activity *Phyllanthus amarus* and *Phyllanthus maderaspatensis* in duck hepatitis B virus carrier pekin ducks. J Med Virol 41(4): 275-81.
- Naesens, L. and De Clercq, E. 2001. Recent developments in herpesvirus therapy. Herpes 8(1): 12-16.
- Nahmias, A. J. and Dowdle, W. R. 1968. Antigenic and biologic differences in herpesvirus hominis. Prog Med Virol 10:110-159.
- Narayanasamy, P., Ramiah, M. 1983. Screening of non-hosts of tomato spotted wilt virus for the presence of antiviral principles. Proceedings of the National Seminar on management of diseases of oilseed crops : 13-15.
- Nawawi, A., Ma-ChaoMei, Nakamura, N., et al. 1999. Anti-herpes simplex virus activity of alkaloids isolated from *Stephania cepharantha*. Biol Pharm Bull 22: 268-274. [Abstract]
- Nawawi, A., Nakamura, N., Hattori, M., et al. 1999. Inhibitory effects of Indonesian medicinal plants on the infection of herpes simplex virus type 1. Phytother Res 13: 37-41.
- Neyts, J., Andrei, G., Snoeck, R., Jähne, G., Winkler, I., Helsberg, M., Balzarini, J., and De Clercq, E. 1994. The N-7-substituted acyclic nucleoside analog 2-amino-7-

- [(1,3-dihydroxy-2-propoxy)methyl]purine is a potent and selective inhibitor of herpesvirus replication. Antimicrob Agents Chemother 38:2710-2716.
- O'Brien, J.J. and Campoli-Richards, D.M. 1989. Acyclovir: an updated review of its antiviral activity, pharmacokinetic properties and therapeutic efficacy. Drugs 37:233-309.
- Ott, M., Thyagarajan, S.P., Gupta, S. 1997. *Phyllanthus amarus* suppresses hepatitis B virus by interrupting interactions between HBV enhancer I and cellular transcription factors. Eur J Clin Invest 27(11):908-15.
- Pacheco, P., Sierra, J., Schmeda-Hirschmann, G., et al. 1993. Antiviral activity of Chilean medicinal plant extracts. Phytother Res 7: 415-418. [Abstract]
- Padma, P., Pramod, N. P., Thyagarajan, S. P., and Khosa, R. L. 1998. Effect of the extract of *Annona muricata* and *Petunia nyctaginiflora* on Herpes simplex virus. J Ethnopharmacol 61: 81-83. [Abstract]
- Plummer, G. 1964. Serological comparison of the herpesviruses. Br J Exp Pathol 45: 135.
- Pottage, J.C., and Kessler, H.A. 1995. Herpes simplex virus resistance to acyclovir: clinical relevance. Infectious Agent & Disease; 4(3): 115-124.
- Prichard, M. N., Turk, S. R., Coleman, L. A., et al. 1990. A microtiter virus yield reduction assay for the evaluation of antiviral compounds against human cytomegalovirus and herpes simplex virus. J Virol Methods 28: 101-106.
- Putnam, C. D., Tainer, J. A. 2000. The food of sweet and bitter fancy. Nat Struct Biol 7; 17-18.
- Quisumbing, E. 1951. Medicinal plants of the Philippines. Manila: Bureau of Print.
- Rabalais, G. P., Levin, M. J., and Berkowitz, F. C. 1987. Rapid herpes simplex susceptibility testing using an enzyme-linked immunosorbent assay performed *in situ* on fixed virus-infected monolayers. Antimicrob Agent Chemother 31: 946-948.
- Rajbhandari, M., Wegner, U., Julich, M., et al. 2001. Screening of Nepalese medicinal plants for antiviral activity. J Ethnopharmacol 74: 251-255.



- Reed, J.L. and Muench, H. 1938. A simple method of estimating fifty percent endpoints. Am J Hyg ; 27: 493-497.
- Richards, D.M., Carmine, A.A., Brogden, R.N., Heel, R.C. Speight, T.M., et al. 1983. Acyclovir: a review of its pharmacodynamic properties and therapeutic efficacy. Drugs 26: 378-438.
- Roizman, B. 1996. *Herpesviridae*. In B. N. Fields, D. M. Knipe, P. M. Howley, et al. (eds.), Fields virology, pp.2221-2230. Philadelphia: Lippincott-Raven Publisher.
- Roizman, B., Carmichael, L.E., Deinhardt, F., de The, G., Nahmias, A. J., Plowright, W., Rapp, F. Sheldrick, P., Takahashi, M., and Wolf, K. 1981. Herpesviridae: definition, provisional nomenclature and taxonomy. Intervirology 16:201-17.
- Roizman, B. Hayward, G., Jacob, R., et al. 1975. Human herpesvirus 1: A model for molecular organization and regulation of herpesvirus. A review. In G. de The , M.A. Epstein, and H. Zur Hausen (eds.), Oncogenes and herpes viruses III, part 1, No 11, pp.3-38. Lyon: IARC.
- Roizman, B., Jenkins, F.J. 1985. Genetic engineering of novel genomes of large DNA viruses. Science 229:1208-1214.
- Roizman, B., Norrild, B., Chan, C., Pereira, L. 1984. Identification and preliminary mapping with monoclonal antibodies of a herpes simplex virus 2 glycoprotein lacking a known type 1 counterpart. Virology 133:242-247.
- Roizman, B. and Sears, A.E. 1993. Herpes simplex viruses and their replication. In: Roizman, B., Whitley, R.J., Lopez, C. (eds). The human herpesviruses, pp. 11-68. New York: Raven.
- Roizman, B. and Sears, A.E. 1996. Herpes simplex virus and their replication. In B.N. Fields, D.M., Knipe, P.M. Howley, et al. (eds), Fields of virology. pp. 2231-2240. Philadelphia: Lippincott-Raven.
- Roizman, B. and Whitley, R. 2001. The nine ages of herpes simplex virus. Herpes 8(1): 23-27.
- Sandri-Goldin, R. 1991. Analysis of the regulatory activities of the HSV-1 protein ICP27. In E. Wagner (ed.), Herpesvirus transcription and its regulation, pp. 77-104. Boca Raton: CRC Press.

- Safrin, S. Palacios, E., and Leahy, B. J. 1996. Comparative evaluation of microplate enzyme-linked immunosorbent assay versus plaque reduction assay for antiviral susceptibility testing herpes simplex virus isolates. Antimicrob Agent Chemother 40: 1017-1019.
- Scholar, E. M. and Pratt, W. B., eds. 2000. The antimicrobial drugs. 2<sup>nd</sup> New York: Oxford University Press.
- Sear, A.E., Halliburton, I.W., Meignier, B., et al. 1985. Herpes simplex virus mutant deleted in the  $\alpha$  22 gene: Growth and gene expression in permissive and restrictive cells, and establishment of latency in mice. J Virol 55: 338-346.
- Selvaraj, C., Narayanasamy, P. 1991. Effect of plant extracts in controlling rice tungro. International Rice Research Newsletter 16: 21-22 .
- Serkedjjeva, J. and Ivancheva, S. 1999. Antiherpes virus activity of extracts from the medicinal plant *Geranium sanguineum* L. J Ethnopharmacol 64:59-68. [Abstract]
- Shin, Y.K., Cai, G.Y. Weinberg, A., Leary, J.J., Levin, M.J. 2001. Frequency of acyclovir-resistant herpes simplex virus in clinical specimens and laboratory isolates. J Clin Microbiol 39(3): 913-7.
- Silver, S. and Roizman, B. 1985. Thymidine kinase chimeras are identically transcribed but regulated as  $\gamma$ 2 genes in herpes simplex virus genomes and as  $\beta$  genes in cell genomes. Mol Cell Biol 5: 518-528.
- Sindambiwe, J. B., Calomme, M., Cos, P., et al. 1999. Screening of seven selected Rwandan medicinal plants for antimicrobial and antiviral activities. J Ethnopharmacol 65: 71-77
- Sindambiwe, J. B., Calomme, M., Geerts, S., et al. 1998. Evaluation of biological activities of triterpenoid saponins from *Maesa lanceolata*. J Nat Prod 61: 585-590.
- Sivarajan, V.V. and Balachandran, I. 1994. Ayurvedic Drugs and Their Plant Sources. USA: International Science Publisher.
- Song, M.J., Kim, D.H. 1998. Inhibitory effect of herbal medicines on rotavirus infection. Korean J Pharmacog 29(2):125-128.

- Steeke-Mortimer, O. A., Meier-Ewert, H., Loser, R., et al. 1990. Flow cytometric analysis of virus-infected cells and its potential use in screening antiviral agents. J Virol Methods 27: 241-252.
- Stevens, J., Wagner, E., Devi-Rao, O., Godi, M., Seldman, L. 1987. RNA complementary to a herpesvirus alpha mRNA is prominent in latently infected neurons. Science 235: 1056-1059.
- Sudarat Dechsree. 1998. Isolation of active components against herpes simplex virus from *Maclura cochinchinensis* (Lour.) Corner heartwood. Master's Thesis, Department of Pharmacy, Graduate School, Mahidol University.
- Suganda, A.G., Amoros M, and Girre L. 1983. Effects inhibiteurs dequelques extraits Bruts et semipurifies de plantes indigenes francaises surla multiplication de L' Herpesvirus Human 1 et d.v. poliovirus humanzen culture cellulaire. J Nat Prod 46(5):626-32.
- Sydiskis R. J., Owen D. G., Lohr J. L., et al. 1991. Inactivation of enveloped viruses by anthraquinones extracted from plants. Antimicrob Agents Chemother 35 (12):2463-6.
- Taylor, R. S. L., Hudson, J. B., Manandhar, N. P., et al. 1996. Antiviral activities of medicinal plants of southern Nepal. J Ethnopharmacol 53: 97-104. [Abstract]
- Taylor, R. S. L., Manandhar, N. P., Hudson, J. B., et al. 1996. Antiviral activities of Nepalese medicinal plants. J Ethnopharmacol 52: 157-163.
- Tebas, P., Stabell, E. C., and Olivo, P. D. 1995. Antiviral susceptibility testing with a cell line which express beta-galactosidase after infection with herpes simplex virus. Antimicrob Agent Chemother 39: 1287-1291.
- Thongkon, N. 1995. The chemical constituents of the leaves of *Bridelia ovata* Decne. Master's Thesis, Department of Chemistry, Graduate School, Chulalongkorn University.
- Thyagarajan, S.P., Subramanian, S., Thirunalasundari, T., Venkateswaran, P.S., Blumberg, B.S. 1988. Effect of *Phyllanthus amarus* on chronic carriers of hepatitis B virus. Lancet 8614:764-6.



- Unander D.W., Webster, G.L., Blumberg, B.S. 1995. Usage and bioassays in *Phyllanthus* (Euphorbiaceae). IV. Clustering of antiviral uses and other effects. J Ethnopharmacol 45(1): 1-18.
- Unna, P.G. 1886. The histopathology of the diseases of the skin. New York: MacMillan.
- Vanden Berghe, D. 2001. Chemical and biological investigations on *Zizyphus spinachristi* L. Phytotherapy Research 15: 593-597. [Abstract]
- Venkateswaran, P.S., Millman, I., Blumberg, B.S. 1987a. Effects of an extract from *Phyllanthus niruri* on hepatitis B and wood chuck hepatitis viruses: *in vitro* and *in vivo* studies. Proc Nat Acad Sci (USA) 84(1):274-8.
- Venkateswaran, P.S., Millman, I., Blumberg, B.S. 1987b. Composition, pharmaceutical preparation and method for treating viral hepatitis. Patent: US 4,673,575, :10pp.
- Venkateswaran, P.S., Millman, I., Blumberg, B.S. 1990. Method of treating retrovirus infection. Patent: US 4,937,074 :59-65.
- Vimolmas Lipipun, Thitima Pengsuparp, and Rutt Suttisri. 1999. Activity of acyclovir and some medicinal plant extracts against clinical isolates of herpes simplex virus type 2. Bangkok: Faculty of Pharmaceutical Sciences, Chulalongkorn University. (Unpublished Manuscript)
- Vlietinck, A. J. and Vanden Berghe, D. A. 1991. Can ethnopharmacology contribute to the development of antiviral drugs?. J Ethnopharmacol 32: 141-153.
- Vlietinck A. J., Van Hoof L., Totte J., et al. 1995. Screening of hundred Rwandese medicinal plants for antimicrobial and antiviral properties. J Ethnopharmacol 46:31-47. [Abstract]
- Vogler, B. K., Pittler, M. H., Ernst, E. 1999. The efficacy of ginseng. A systematic review of randomised clinical trials. Eur J Clin Pharmacol 55; 567-575.
- Wang, M.X., Cheng, H.W., Li, Y.J., Meng, L.M., Zhao, G.L., Mai, K. 1995. Herbs of the genus *Phyllanthus* in the treatment of chronic hepatitis B: observation with three preparations from different geographic sites. J Lab Clin Med 126(4):350-2.
- Weber, N. D., Andersen, D. O., North, J. A., et al. 1992. *In vitro* virucidal effects of *Allium sativum* (garlic) extract and compounds. Planta Med 58: 417-423.

- Wellcome Co.Ltd., 1983. Zovirax-Acyclovir for the treatment of genital herpes and other mucocutaneous herpes simplex infections.
- Whitley, R. J.1996. Herpes simplex viruses. B. N. Fields, D. M. Knipe, P. M. Howley, et al. (eds.), Fields virology, pp.2297-2342. Philadelphia: Lippincott-Raven Publisher.
- Whitley, R. J. and Roizman, B. 2001. Herpes simplex virus infections. Lancet 357 (9267): 1513-1518.
- Whitley, R.J. Soong, S.J, Dolin, R., Galasso, G.J. Chien, L.T., Alford, C.A.,Jr.,1977. NIAID Collaborative Antiviral Study Group. Adenine arabinoside therapy of biopsy-proved herpes simplex encephalitis: National Institute of Allergy and Infectious Diseases Collaborative Antiviral Study. N Engl J Med 297:289-294.
- Wildy, P. 1973. Herpes:history and classification. In A.S. Kaplan (ed.), The herpesviruses, pp. 1-25.New York: Academic Press.
- World Health organization. 1989. Medicinal Plants in Viet Nam. Hanoi: Institute of Materia Medica, Viet Nam.
- Wyde, P.R., Ambrose, M.W., Meyerson, L.R., Gilbert, B.E., 1993. The antiviral activity of SP-303, a natural polyphenolic polymer, against respiratory syncytial and parainfluenza type 3 viruses in cotton rats. Antiviral Res 20(2): 145-154.
- Yawalak Punpisutchai, 1999. Investigation of anti-herpes simplex virus activities of *Barleria lupulina* Lindl. and *Clinacanthus nutans* (Burm.F.) Lindau extracts using plaque inhibition and yield reduction assays. Master's Thesis, Department of Microbiology, Graduate School, Mahidol University.
- Yingmanee Boonyakiat,1994. Activities of extracts from Thai medicinal plants, *Centella asiatica* L., *Mangifera indica* L. and *Cudrania javanensis* Frec., against herpes simplex virus type 2. Master's Thesis, Department of Microbiology, Graduate School, Mahidol University.

- Yip, L. Pei, S. Hudson, J. B., and Towers, G. H. N. 1991. Screening of medicinal plants from Yunnan province in southwest China for antiviral activity. J Ethnopharmacol 34: 1-6.
- Yoosook C, Bunyapraphatsara N, Boonyakiat, Y. et al. 2000. Anti-herpes simplex virus activities of crude water extracts of Thai medicinal plants. Phytomedicine 6:411-419. [Abstract]
- Yu, L.A., Xu, Q.L. 1989. Treatment of infectious hepatitis with an herbal decoction. Phytother Res 3(3):13-4.
- Yue-Yu, H., Ju-Lan, W., Yifeng, Z., Nian-He, W., et al. 1998. Inhibition activity of fresh leaf juice and flavone components from *Lychnis coronata* to simple herpes virus I cultured *in vitro*. Journal of Plant Resources and Environment 7:24-28. [Abstract]
- Zheng, M.S. 1989. An experimental study of the anti-HSV-II action of 500 herbal drugs. J Tradit Chin Med 9(2):113-6. [Abstract]
- Zheng, Y. T., Ben, K. L., Jin, S. W. 1999. alpha -Momorcharin inhibits HIV-1 replication in acutely but not chronically infected T-lymphocytes. Acta Pharmacol Sin 20; 239-243.

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย





APPENDIX

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

## APPENDIX

### Growth Medium

Dissolved 9.5 g MEM powder with Earle's balance salts (Hyclone, Lot No. AJJ10788D, USA.), with L-glutamine (Sigma, Lot. No. 69H0740, USA.) without sodium bicarbonate in deionized distilled water and added 2.2g/l sodium bicarbonate (Sigma, USA). The solution was mixed well and adjusted pH to 7.2 with 6N HCl. Then, the solution was adjusted volume to 1,000 ml. This solution was sterilized by filtration (0.22  $\mu$ m millipore filter membrane). Before use, this solution was supplemented with with 10% fetal bovine serum (FBS, Biochrom AG, Lot No. 230B, Berlin, Germany) and 1% antibiotic-antimycotic agents (Gibco BRL, Lot. No. 1106811, USA.) which contained 10,000 units/ml penicillin G sodium, 10,000  $\mu$ g/ml streptomycin sulfate and 25  $\mu$ g/ml fungizone).

### Maintenance Medium

This is similar to growth medium except the amount of FBS is reduced to 5%.

### Phosphate Buffer Saline Solution (PBS)

NaCl (Merck, Lot No. K27736104021, Germany)	8.00	g
KCl (May&Baker, England)	0.20	g
KH <sub>2</sub> PO <sub>4</sub> (Merk, Lot No. 547A17873, Germany)	0.20	g
Na <sub>2</sub> HPO <sub>4</sub> (May&Baker, Lot No. 50028, England)	1.15	g
Deionized distilled water to	1,000	ml

This solution is sterilized by autoclave (121<sup>0</sup>C, 15 psi for 15 min).

### Trypsin-EDTA (1X)

Trypsin-EDTA (10X) (Biochrome AG, Lot. No. 521B, Germany)	10	ml
PBS	90	ml

### Plaque Overlay medium

#### Solution A

2x MEM with 20% FBS and 2% antibiotic

This solution was sterilized by filtration (0.22  $\mu$ m millipore filter membrane).

#### Solution B

Tragacanth (BP, 1973, Lot. No. TEC12 ศรีจันทร์สหโอสถ, กรุงเทพฯ) 2 g

Dionized distilled water 100 ml

This solution is sterilized by autoclave (121<sup>0</sup>C, 15 psi for 15 min).

The solution A and B are mixed at a ratio of 1 : 1 before use.

### 1% Crystal violet in 10% formalin

Crystal violet (Schmid GMBH&Co., Lot No. 1B345, Stuttgart) 5 g

40% Formalin (Vidhyasom, Thailand) 125 ml

Deionized distilled water to 500 ml

### Calculation of median cytotoxic dose (CD<sub>50</sub>) by Reed-Muench method

The toxicity of medicinal plant extracts were expressed as the median cytotoxic dose (CD<sub>50</sub>). This value indicated the concentration of extract that caused toxic effect to 50% of the cell population calculated by Reed-Muench method.



Table 9 Example of data arrangement for calculation of  $CD_{50}$  from extract by Reed-Muench

Extract		Number of wells		Accumulated values			
concentration ( $\mu\text{g/ml}$ )	dilution n	dead cell (a)	Survival cell (b)	dead cell (c)	Survival cell (d)	Ratio (e)	Percent (f)
1,000	$10^0$	4	0	4	0	4/4	100
500	$10^{-0.3}$	0	4	0	4	0/4	0
250	$10^{-0.6}$	0	4	0	8	0/8	0
125	$10^{-0.9}$	0	4	0	12	0/12	0
62.5	$10^{-1.2}$	0	4	0	16	0/16	0
31.25	$10^{-1.5}$	0	4	0	20	0/20	0

Accumulated values for the total number of cells that died or survived are obtained by adding in the directions indicated by the arrows. The accumulated mortality ratio (column e) represents the accumulated total number of dead cells (column c) over the accumulated total number inoculated (column c + column d).

From the table, the percent of accumulated values of cells mortality in the presence of extract at concentration of 1,000  $\mu\text{g/ml}$  (dilution =  $10^0$ ) was higher than 50%; and at the next lower concentration of 500  $\mu\text{g/ml}$  (dilution =  $10^{-0.3}$ ) was lower than 50%. The proportionate distance of the 50% cytotoxicity, which obviously lied between these two dilutions, can be obtained as followed.

$$\frac{(\% \text{ mortality at dilution next above } 50\%) - 50\%}{(\% \text{ mortality at dilution next above } 50\%) - (\% \text{ mortality at dilution next below } 50\%)}$$

$$\text{So that proportionate distance} = \frac{100\% - 50\%}{100\% - 0\%} = 0.5$$

Since the proportionate distance between any two dilutions is a function of the incremental steps used in preparing the series; for example, 2-fold, 5-fold, 10-fold, etc; it

is necessary to correct (multiply) the proportionate distance by the dilution factor, which is the logarithm of the dilution steps employed. For example the serial 10-fold dilutions, the factor is 1 ( $\log 10 = 1$ ), in a 2-fold dilution series, the factor is 0.3 ( $\log 2$ ), and the factor is to be negative.

$$\begin{aligned}\text{Therefore, correct proportional distance} &= \text{proportional distance} \times \text{dilution factor} \\ &= 0.5 \times (-0.3) \\ &= -0.15\end{aligned}$$

$$\begin{aligned}\text{Negative logarithm of } CD_{50} &= \text{negative logarithm of the dilution above the 50\% mortality} \\ &\quad + \text{correct proportional distance} \\ &= -0 + (-0.15) = -0.15\end{aligned}$$

$CD_{50}$  is at dilution  $10^{-0.15}$  which is at the concentration of 707.95  $\mu\text{g/ml}$ .

#### Computation of $ED_{50}$

$ED_{50}$  is the concentration of an antiviral agent which can inhibit plaque formation by 50% calculated from the regression formula  $Y = a + bX$  or  $Y = a + b \log X$ ; when  $Y =$  number of plaque,  $X =$  concentration of antiviral agent in  $\mu\text{g/ml}$ ,  $a =$  intercept or the distance between  $X$  axis and the point where the regression line comes across  $Y$  axis, and  $b =$  slope.

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

## Biography

Miss Sakulrat Rattanakiat was born on February 16, 1978 in Roi-Et province, Thailand. She received her Bachelor Degree of Science in Pharmacy in 2000 from the Faculty of Pharmaceutical Sciences, Chulalongkorn University, Thailand.



ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย