BAB 5
SIMPULAN DAN ALUR PENELITIAN SELANJUTNYA

5.1. Simpulan

Dari data hasil penelitian yang telah diinterpretasikan, dapat ditarik kesimpulan bahwa HPMC merupakan faktor yang berpengaruh dominan terhadap pelepasan propranolol HCl berdasarkan nilai koefisien dalam persamaan. Berdasarkan analisis anava, bahwa pengaruh HPMC terhadap pelepasan propranolol HCl adalah bermakna. Sedangkan menthol mempunyai pengaruh yang tinggi dan bermakana terhadap penetrasi propranolol HCl namun relatif kecil, hal ini di duga karena konsentrasi menthol yang kecil.

Berdasarkan hasil penelitian, didapatkan formula optimum pelepasan dan penetrasi *patch* propranolol HCl, yaitu pada konsentrasi X1 (HPMC) 1,00 dan X2 (Menthol) pada konsentrasi 1,00. dari konsentrasi formula optimum tersebut dihasilkan pelepasan sebesar 176,333 µg/ml dan penetrasi sebesar 44,55µg/ml.

5.2. Alur Penelitian Selanjutnya

Penelitian lanjutan terhadap kondisi uji optimum yang di formulasi dengan durasi yang lebih panjang sehingga diperoleh *fluks* tunak.

Penelitian farmakokinetik dan farmakodinamik formula optimum secara *in vivo* untuk mengetahui parameter farmakokinetik.

DAFTAR PUSTAKA

Amnuaikit, C., I. Ikeuchi., K. Ogawara., K. Higaki., and H. Kimura., 2005, Skin Permeation of Propranolol from Polymeric Film Containing Terpene Enhancers for Transdermal Use, **International Journal of Pharmaceutics,** 289, 167–178.

Badan Pengawasan Obat dan Makanan, 2001, **Petunjuk Operasional Penerapan cara Pembuatan Obat Yang Baik**, Jakarta, 412-429.

Barry, W., 2006, Penetration Enhancer Classification, in: **Percutaneous Penetration Enhancers**, Smith, E.W., and H. I. Maibach., (Ed), 2nd eds, taylor & Francis, New York, 8.

Benson, H.A., 2005, Transdermal Drug Delivery: Penetration Enhancement Techniques, **Current Drug Delivery**, 2, 23-33.

Bolton, S., 1990, **Pharmaceutical Statistics, practical and Clinical Applications**, 2nd eds, Marcel Dekker, Inc, New York, 309-319.

Departemen Kesehatan Republik Indonesia, 1979, **Farmakope Indonesia**. Edisi III, Jakarta, 15.

Gannu, R., Y. Vishnu., V. Kishan., and M. Rao., 2007, Development of Nifendipine Transdermal Patches: In vitro and Ex vivo Characterization, **Current Drug Delivery**, 4, 69-76.

Garala, K.C., A. Shinde., and P. Shah., 2009, Formulation and in vivo Characterization of Monolithic Matrix Transdermal System Using HPMC/Eudragit S 100 Polymer Blends, **International Journal of Pharmacy and Pharmaceutical Sciences**, 1 (1), 108-120.

Guy, R., and J. Hadgraff., 1989, Selection of Drug Candidates for Transdermal Drug Delivery, in : **Transdermal Drug Delivery**, Guy, R., and J. Hadgraff (Eds), Marcel Dekker, New York, 59-62.

Harahap, M., 1990, **Penyakit Kulit**, PT. Gramedia, Jakarta, 1-4.

Hendriati, L., and Akhmad. K. N., 2009, Pengaruh campuran asam oleat-propilen glikol dan iontoforesis terhadap transport transdermal propranolol, **Majalah Farmasi Indonesia**, 20(4), 217-223.

Idson, B., and J. Lazarus, 1994, Semipadat, dalam ; **Teori dan Praktek Farmasi Industri**, edisi 3, Terjemahan S. Suyatmi, UI Press, Jakarta, 1091-1100.

Kleinschmidt, G., 2005, Case Study: Validation of an HPLC– Method for Identity, assay, and Related Impurities, in: **Method Validation in Pharmaceutical Analysis**, J. Erner and J. H. McB. Miller (eds), WILEY-VCH Verlag GmbH & C0. KGaA, Weinheim, 195-212.

Kumar, R., and A. Philip., 2007, Modified Transdermal Technologies: Breaking the Barriers of Drug Permeation via the Skin, **Tropical Journal of Pharmaceutical Research**, 6 (1), 633-644.

Kunta, JR., Vr. Goskonda., HO. Brotherton., MA. Khan., and IK. Reddy., 1997, Effect of menthol and Related Terpenes on The Percutaneous Absorption of Propranolol Across Excised Hairless Mouse Skin, **J Pharm Sci**, 86 (12), 1369 – 1373.

Limpongsa, E., and K. Umparyn., 2008, Preparation and Evaluation of Diltiazem Hydrochloride Diffusion-Controlled Transdermal Delivery System, **AAPS PharmSciTech**, 9 (2), 464-470.

Liu, P., and T. J. Qiu., 2006, Diffusion Contolled Drug Delivery Systems, in : **Design of Controlled Release drug Delivery System**, Li. X., and B. R. Jasti, 116-117.

Lund, W., 1994, **The Pharmaceutical Codex, Principles and Practice of Pharmaceutics**, 12th eds., The Pharmacutical press, London, 136-145, 1025-1026.

Machida, Y., K.Yamato, Y.takahashi, H. Akiyama., and Tsuji., 2009, Effect of Penetration Enhancers on Transdermal Delivery of Propofol, **Biol. Pharm. Bull** , 32(4) 677-683.

Matin, A., J. Swarbrick., and A. Cammarata, 1993, **Farmasi Fisik, Dasar-Dasar Kimia Fisik dalam Ilmu Farmasetik**, edisi Ketiga, jilid kedua, Terjemahan Yoshita, UI-Press, Jakarta, 827-857, 874-896.

Murtiastuti, R.P., 2008, **Pnetrasi perkutan *In Vitro* kompleks Inklusi Pentagamavunon-0 (PGV-0) dengan β-Silokdekstrin dalam Sediaan Gel Hidroksipropil Metil Cellulose (HPMC)**, Skripsi Sarjana, Universitas Muhammadiyah, Surakarta, 5-8.

Nairn, J.G., 1997, Topical Preparation, in : **Encyclopedia of Pharmaceutical Technology**, Swarbrick, J., and J. C. Boylan (Eds), vol.15, Marcel Dekker. Inc, New York, 213-222.

Namdeo, A., and N.K. Jain., 2002, Liquid Crystalline Pharmacogel based Enhanced Transdermal Delivery of Propranolol Hydrochloride, **Journal Controled Release**., 82, 223-236.

Neubert, H.T., 2006, Overcoming the Stratum Corneum: The Modulation of Skin Penetration, **Skin Pharmacol Physiol**, 19, 106-121.

Olivella, MS., L. Lhez., NB. Papano., and NB. Debattista., 2007, Effects of Dimethylformamide and L-menthol Permeation Enhancers on Transdermal delivery of Quercetin, **pharm Dev Technol**, 12 (5), 481.

Omray, LK., S. Kohli., AJ. Khopade., S. Patil., A. Gajbhiye., and GP. Agrawal., 2008, Development of Mesophasic Microreservoir-Based Transdermal Drug Delivery System of Propranolol, **Indian Journal of Pharmaceutical Sciences**, 70 (5), 578-584.

Pathan, I.B., and C. Setty., 2009, Chemical Penetration Enhancers for Transdermal Drug Delivery Systems, **Tropical Journal of Pharmaceutical Research**, 9 (2), 173-179.

Quan, A., X. Hui., and H. I. Maibach, Chemical Enhancements of Transdermal Drug Delivery Systems: Advantages and Challenges, in : **Transdermal**, **Exclusively for the Delivery of Pharmaceuticals Through the Tkin,** vol 2 (2), Nitto Denko Group, Philadelphia, 5-8.

Ramirez, M., C. L. villafuerte., and Robles, 2004, Effect of Formulation Variables on Verapamil Hydrochloride Release From Hydrated HPMC Matrices, **Rev. Soc. Quím. Méx**, 48, 326-331.

Rao, P.R., M. Reddy., S. Ramakrishna., and P.V. Diwan., 2003, Comparative *in vivo* Evaluation of Propranolol hydrochloride After Oraland Transdermal Administration in Rabbits, **European Journal of Pharmaceutics and Biopharmaceutics**., 56, 81-85.

Rowe, R.C., P. Sheskey., and S. Owen., 2006, **Handbook of Pharmaceutical Excipients**, 5th eds, Pharmaceutical Press, London, 346-348, 459-460, 580-584.

Setiawati, A., and S. Gan., 2005, Penghambat Adrenergik, dalam: **Farmakologi dan Terapi**, Ganiswara, S.G, edisi IV., Fakultas Kedokteran-Universitas Indonesia, Jakarta, 86-90.

Shivaraj, A., R. P. Selvam., T. T. mani., and T. Sivakumar., 2010, Design and Evaluation of Transdermal Drug delivery of Ketotifen Fumarate, **International Journal of Pharmaceutical and Biomedical Research**, 1 (2), 42-47.

Sinha, V.R., and M. Kaur., 2000, Permeation Enhancers for Transdermal Drug Delivery, **Drug Development and Industrial Pharmacy**, 26(11), 1131–1140.

Sloane, E., 1995, **Anatomi dan Fisiologi untuk Pemula**, terjemahan P. Widyastuti, Penerbit Buku Kedokteran EGC, Jakarta, 84-86.

Sweetman, S.C., 2009, **Martindale, The Complete Drug Reference**, 36th eds, Pharmaceutical Press, London, 1380.

Thakur, R., Y. Wang., and B.B. Michaniak., 2006, essential Oils and Terpenes, in: **Percutaneous Penetration Enhancers**, Smith, E.W., and H. I. Maibach., (Ed), 2th eds, Taylor & Francis Group, New York, 165.

The United States Pharmacopeial Convention, 2005, **United State Pharmacopeia**, 28nd ed., United States Pharmacopeial Convention Inc., 546- 547.

Tiwary, A.K., B. Sapra., and S. Jain., 2007, Innovations in Transdermal Drug Delivery: Formulations and Techniques, **Recent Patents on Drug Delivery & Formulation**, 1, 23-36.

Walker, R.B., and E. Smith., 1996, The Role of Percutaneous Penetration Enhancers, **Advanced Drug Delivery Reviews**, 18, 295-301.

Williams, A.C., 2003, **Transdermal and Topical Drug Delivery From Theory to Clinical Practice**, Pharmaceutical Press, London, 2-10, 60-63, 86-87, 98-99, 180-187.

Winek, C. L., W. Wahba., and T. Balzer., 2001. **Winek's Drug and Chemical Blood-Level Data**., 1-17.

Yennywati S., 2010, **Pengaruh HPMC dan PEG 400 terhadap Transport Transdermal Propranolol HCl dalam Sediaan Matriks Patch**, Skripsi Sarjana, Unika Widya Mandala, Surabaya, 48.