

## **BAB 5 SIMPULAN**

### **5.1. Simpulan**

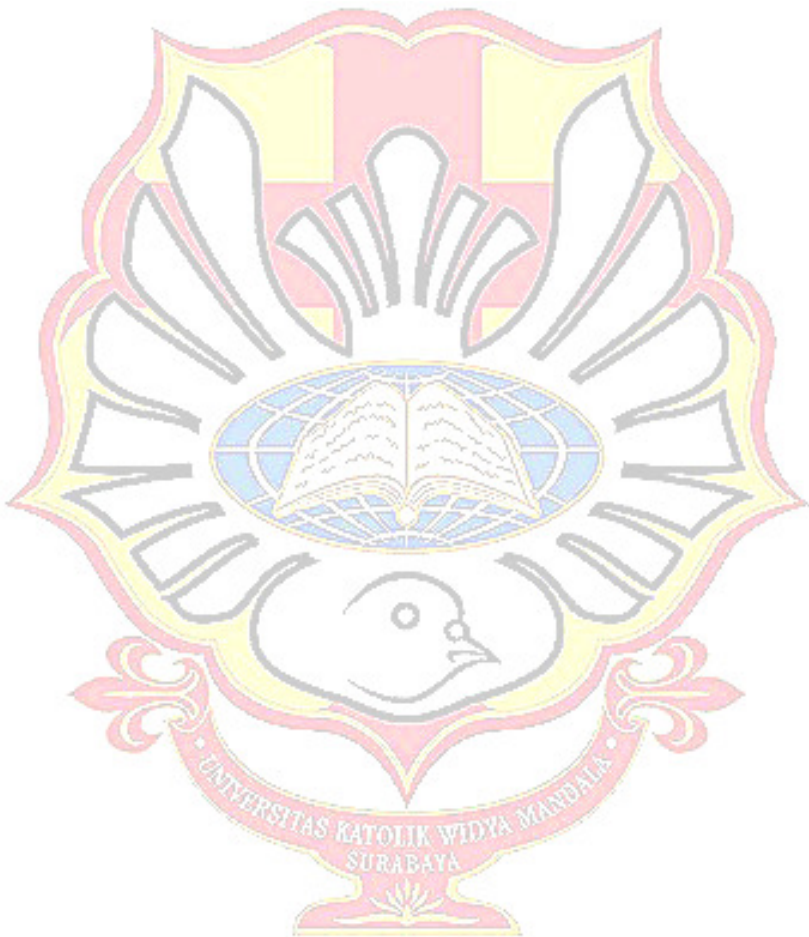
Konsentrasi carbopol dan xanthan gum yang digunakan sebagai polimer sediaan nasal gel mempunyai pengaruh terhadap pH, kekuatan gel, lama melekat, dan uji pelepasan. Carbopol dapat meningkatkan kekuatan gel dan lama melekat, serta menurunkan pH dan menurunkan pelepasan salbutamol sulfat. Sedangkan xanthan gum dapat meningkatkan kekuatan gel dan lama melekat, serta meningkatkan pH dan meningkatkan pelepasan salbutamol sulfat. Interaksi antara carbopol dan xanthan gum memberikan pengaruh menurunkan pelepasan salbutamol sulfat dan menaikkan pH, kekuatan gel, dan lama melekat.

Bagian akhir dari analisis dengan desain faktorial adalah menentukan formula optimum dengan prediksi yang diinginkan. Ditentukan beberapa hasil prediksi respon optimum dengan konsentrasi carbopol dan xanthan gum. Salah satunya adalah dengan menggunakan carbopol 0,1 % dan xanthan gum 0,5 % akan memberikan prediksi hasil respon pH 4,50, respon kekuatan gel 9,46 detik, respon lama melekat 3,5 jam, dan respon fluks pelepasan  $183,86 \mu\text{g}/\text{cm}^2/\text{jam}$  dengan demikian terbentuklah sediaan nasal gel dengan respon-respon yang diinginkan. Pada penelitian ini kadar carbopol 0,1 % dan xanthan gum 0,5 % merupakan konsentrasi terpilih yang diharapkan mampu memberikan prediksi respon pH, kekuatan gel, lama melekat, dan pelepasan yang paling baik dari sediaan nasal gel salbutamol sulfat.

### **5.2. Alur Penelitian Selanjutnya**

Sebaiknya dilakukan penelitian lebih lanjut untuk mengetahui konsentrasi dari carbopol dan xanthan gum yang dapat memberikan nilai

optimal pada uji pH, uji viskositas, uji lama merekat, uji pengembangan gel, dan uji pelepasan sediaan nasal gel *in-situ* agar dapat memenuhi persyaratan.



## DAFTAR PUSTAKA

- Addicks, W. J., N. D. Weiner, R. L. Curl, and G. L. Flynn, 1990, Drug Delivery from Topical Formulation : Theoretical Prediction and Experimental Assessment, in : **Topical Drug Delivery Formulation**, vol. 42, D.W. Osborne and A H. Amman (Eds.), Marcel Dekker, Inc., New York, 237-241.
- Agoes, G., 2008, Sistem Penghantaran Obat Mukoadhesif, dalam: **Desain Bentuk Sediaan Obat**, Penerbit ITB, Bandung.
- Ahuja, A., R. K. Khar, and J. Ali, 1997, *Mucoadhesive Drug Delivery System*, **Drug Delivery, Ind.Pharm.**, 23(5) : 489 -515.
- Anonim, *water structure and behavior: Xanthan Gum*, 2005, <http://www.isbu.ac.uk/water/hyxan.html>
- Balasubramaniam, J., S. Kant., and J. K. Pandit, 2003, In vitro and In Vivo Evaluation of The Gelrite Gellan Gum Based Ocular Delivery System for Indomethacin, **Acta. Pharm**, 53, 251-261.
- Ballenger, J. J., 1994. **Aplikasi Klinis Anatomi dan Fisiologi Hidung dan Sinus Paranasal dalam Penyakit Telinga Hidung, Tenggorokan, Kepala, dan Leher**. ed. 13, Binarupa Aksara, Jakarta, 1-25.
- Barry, B. W., 1983, **Dermatological Formulation Percutaneous Absorption**, vol. 18, Marcel Dekker, Inc., New York, 78-81, 106-107, 160-161, 234-329.
- Basu, S., C. Subrata, and K. B. Amal, 2009, Development and Evaluation of A Mucoadhesive Nasal Gel of Midazolam Prepared with Linum usitatissimum L. Seed Mucilage, **Sci Pharm**, 77, 899-910.
- Bernkop-Schnurch, A., C. E. Kast, and A. E. Clausen, 2002, The role of Glutathione in The Permeation Enhancing Effect of Thiolated Polymers, **Pharm. Res**, 19, 602-608.
- Bolton, S., 1990, **Pharmaceutical Statistics, Pratical and Clinical Application**, Marcel Dekker, New York, 309-319.
- Boylan, J. C., E. T. Copper, and Chowman, 1986. **Handbook of Pharmaceutical Excipients**. American Pharmaceutical Association, Washington, 41-42, 123-124.

Bronough, R.L., and H.I. Maibach, 2005, **Percutaneous absorption Drug-Cosmetics-Mechanisms-Methodology**, 5<sup>th</sup> ed., Taylor and Francis Group, USA., 177-183.

Carnali, J. O., and M. S. Naser, 1992, The use of Dilute Solution Viscosity to Characterize the Network Properties of Carbopol Microgels, **Colloid and Polymer Science**, 270(2), 183-193.

Chaudhari, P. D., P. Sharma, P. Kolsure, A. Ajab, and N. Varia, 2006, Sebuah Tinjauan Terakhir Tren dalam Sistem Pengiriman Obat Hidung, **Pharmainfo.net**, Pad.Dr.DYPatil Institute of Pharmaceutical Sciences and Research, Pimpri, Pune- 18, Maharashtra, India.

Chien, Y. W., 1992, **Transdermal Drug Delivery System in Novel Drug Delivery System**, Marcell Dekker, New York, 302-304.

Colaizzi, J. L., 1985, **Transnasal Systemic Medications**, Y. W. Chien (ed.), Elsevier, Amsterdam, 107-119.

Demam, J.M., 1997, **Kimia Makanan**, Bandung : Penerbit ITB.

Devissauquet, J., and Aiache, J. M., 1993. **Biofarmasi**, ed. 2, terjemahan W. Soeratri, Airlangga University Press, Surabaya, 443-483.

Dhingra, P.L., 2007, **Disease of Ear Nose and Throat**, 4<sup>th</sup> ed., Elsevier, New Delhi, 129-135, 145-148.

Ditjen POM Depkes RI, 1979, **Farmakope Indonesia**, ed. 4, Depkes RI, Jakarta, 710, 999-1000, 1086-1087.

Fisher, A.N., K. Brown, S.S. Davis, G.D. Parr, and D.F. Smith, 1987, **J. Pharm. Pharmacol.**, 39, 357-362.

Gannu, R., V. Kishan, Y. Rao, and Y.V. Vishnu, 2007, Development of Nitrendipine Transdermal Patch : In vitro and In vivo characterization, **Current Drug Delivery**, 69-76.

Goldstein, D.A., Y.K. Tan, and S.J. Soldin, 1987, Pharmacokinetics and Absolute Bioavailability of Salbutamol in Healthy Adult Volunteers, **European Journal of Clinical Pharmacology**, 32, 631-634.

Gonjari, I.D., 2007, Solid In Situ Gelling Nasal Formulations : A Tool for Systemic Drug Delivery, **Pharmainfo.net**, Govt. College of Pharmacy., India.

Green, J.M., 1996, A Pratical Guide to Analytical Method Validation, **Analytical Chemistry**, 68, 305-309.



Heilger, P.A., 1997, *Hidung : Anatomi dan Fisiologi Terapan Dalam : Boies Buku Ajar Penyakit THT*, ed. 6., Penerbit Buku Kedokteran EGC, Jakarta, 173-189.

Hendriati, L., 2008, **Pengaruh Asam Oleat, Propilen Glikol dan Intensitas Arus Terhadap Transpor Transdermal Propranolol HCL in vitro**, tesis S-2, Universitas Gajah Mada, Yogyakarta.

Kamath. K.R & K. Park, 1992, Mucosal Adhesive Preparation, in: **Encyclopedia of Pharmaceutical Technology**, Vol. X, Marcel Dekker Inc., New York, 133-159.

Krishna, V., and Rao Y, M., 2010, Formulation And Evaluation Nasal Insulin Gel, **International Journal of Pharmacy and Pharmaceutical Sciences**, 2(3).

Lund, W., 1994, **The Pharmaceutical Codex, Principles Practice of Pharmaceutics**, 12<sup>th</sup> ed., The Pharmaceutical Press, London, 134-135.

Martin, A. J., A. Swarbick, and Cammarata, 1993, **Farmasi fisik : Dasar-dasar Farmasi Fisik dalam ilmu Farmasetik**, ed. 3, jilid 2, terjemahan Yoshita, UI Press, Jakarta, 827-849, 888-896.

Martin A. N ,Suargick , J. , dan cammarata , J. 1990 . **Farmasi Fisika : Dasar-dasar farmasi fisika dalam ilmu farmasetika**, terjemahan oleh Yoshita , edisi III , jilid II , penerbit UI ,Jakarta , 724-817.

Murtaza, G., M. Ahmad, M. Asadullah, and M. Waheed, 2009, **A New Reverse Phase HPLC Method with Fluorescent Detection for The Determination of Salbutamol Sulfate in Human Plasma**, Univesitas Bahawalpur, Pakistan, 23(1), 1-8.

Nandgude T, R. Thube. N. Jaiswal, P. Deshmukh, V. Chatap, and N. Hire, 2010, Formulation and Evaluation of pH induced *In-Situ* Nasal Gel of Salbutamol Sulphate. **Int J Pharm Sci Nanotechnol**, 1, 177-82.

Newman, S., D. Pavia, and S. Clarke, 1981, How Should Pressurized Beta-Adrenergic Bronchodilator Be Inhaled?, **Eur J Respir Dis**, 62, 3-21.

Paranjothy, K.L.K., 1993. Gels As Topical Applications, **Indian Drugs**, 31(6), 224-228.

Peckana, O., S. Karab, 2000, Lattice Heterogeneities at Various Crosslinker Contents-A Gel Swelling Study, **Polymer communication**, 41, 8735-8739.

Pena, L.E., 1990. Gel Dosage Form : Theory, Formulation and Processing, in: *Topical Drug Delivery Formulation*, D.W. Osborn (Ed.), Marcel Dekker, Inc., New York, hal 218.

Reynold, J.E.F., 1982, **Martindale The Extra Pharmacopoeia**, 28<sup>th</sup> ed., The Pharmaceutical Press, London, 956.

Rowe, R.C., Sheskey, P.J., Weller, P.J., 2003. **Hand Book Of Pharmaceutical Expiant 4<sup>th</sup> edition**. American Pharmaceutical Association, Washington, pp 663-664

Shah RA, M.R. Mehta, D.M. Patel, and C.N. Patel , 2011, Design and Optimization of Mucoadhesive Nasal *In Situ* Gel Containing Sodium Cromoglycate Using Factorial Design. **Asian J Pharm.**, 5, 65-74.

Soetjipto, D., dan R.S. Wardani, 2007, Hidung, dalam: Buku Ajar Ilmu Kesehatan Telinga, Hidung, Tenggorokan, Kepala, dan Leher, ed. 6, FK UI, Jakarta, 118-122.

Srividya, B., M. Rita, and P. D. Cardoza, 2001, *Sustained Ophthalmic Delivery of Ofloxacin from A pH Triggered In Situ Gelling Systems*, **J. Control. Rel.**, 73, 205-211.

Sugianti, N., 2007, **Penggunaan Kortikosteroid Inhalasi dalam Terapi Asma**, Wordpress, <http://www.wordpress.com/December> 2007 farmakoterapi-info.htm.

Tanwar, Y. S., C. S. Chauhan, and A. Sharma, 2007, Development and Evaluation of Carvedilol Transdermal Patches, **Acta Pharm**, 57, 151-159.

*The Pharmaceutical Society of Great Britain*, 1986, **Clarke's Isolation and Identification of Drugs**, 2<sup>nd</sup> ed., The Pharmaceutical Press, London, 963-964.

Ubaidulla, U., F. J. Ahmad., K. Ruckmani, M. V. S. Reddy, and R. K. Khar, 2007, Transdermal Therapeutic System of Caervedilol : Effect of Hydrophilic and Hydrophobic Matrix on In vitro and In vivo characteristics, **AAPs Pharm Sci. Tech.**, 8 (1) article 2, 1-8.

**USP 32 – NF 27** , 2009, United States Pharmacopeia and The National Formulary. Rockville (MD): The United States Pharmacopeial Convention.

Winarno, F.G., 1990, **Misteri Gizi dari Jawa, Info Pangan**, Teknologi Pangan dan Gizi, Fatameta, IPB, Bogor.

Winarno, F.G., 1994, **Bahan Tambahan Makanan**, Gramedia Pustaka Utama, Jakarta.

William, A., 2003, **Transdermal and Topical Drug Delivery Form Theory to Clinical Practise**, Pharmaceutical Press, London, 37-84.

Yuliani, S. R., 2005, Formulasi Gel Repelan Minyak Atsiri Tanaman Akar Wangi (*Vetivera zizanioidesi* (L) Nogh) : Optimasi Komposisi Carbopol 3% b/v-propilenglikol, **Majalah Farmasi Indonesia**, 16(4), 197-203.

