# DAFTAR PUSTAKA

1. Maurizio S. Tonetti, Søren Jepsen, Lijian Jin JOC. Impact of the Global Burden of Periodontal Diseases on Health, Nutrition and Wellbeing of Mankind: a Call for Global Action Maurizio. Int J Lab Hematol. 2016;38(1):42–9.

2. Kementrian Kesehatan RI. Faktor Risiko Kesehatan Gigi dan Mulut. Pus Data dan Inf Kementeri Kesehat RI [Internet]. 2019;1–10. Available from: https://www.kemkes.go.id/resources/download/pusdatin/infodatin/infodatin gigi.pdf

3. Deka N. Tissue engineering approach for periodontal regeneration. J Aplied Dent Sci. 2015;1(4):71–4.

4. Wade B. Essentials of Periodontology and Periodonfics. By. 2014;4(2):100.

5. Abhishek K, Jigyasa B, Sunny MB. Bone Grafts In Periodontal Surgery . A Review. J Dent Her. 2014;1(3):28–9.

6. Jangid MR, Rakhewar PS, Nayyar AS, Cholepatil A. Bone Grafts in Periodontal Regeneration : Factors Impacting Treatment Outcome. Basic Res J Med Clin Sci [Internet]. 2016;2:106–9. Available from: http//www.basicresearchjournals.org

7. SUTARNO S. Biodiversitas Indonesia: Penurunan dan upaya pengelolaan untuk menjamin kemandirian bangsa. 2015;1:1–13.

8. Green DW, Lai WF, Jung HS. Evolving marine biomimetics for regenerative dentistry. Mar Drugs. 2014;12(5):2877–912.

9. Oktawati S, Hamrun N, Asmawati, Irene, Haryo HM, Syafar IF, et al. Effectiveness of Fucoidan Extract from Brown Algae to Inhibit Bacteria Causes of Oral Cavity Damage. Syst Rev Pharm. 2020;11(10):686–93.

10. Adam AM, Thahir H, Achmad H. Effect of channastriata extract on the expression of

tumor necrosis factor-α (Tnf-α) in rat experience periodontitis. Vol. 10, Indian Journal of Public Health Research and Development. 2019. p. 1391–3.

11.    Achmad H, Gani A, Djais AI, Hatta LI, Edith I, Yayang A, et al. White shrimp of (litopenaeus vannamei) scalp waste edible chitosan film as inhibitor effect of porphyromonas gingivalis bacteria growth (in vitro). Int J Pharm Res. 2020;12(sp3):746–52.

12.    Thahir H, Oktawati S, Gani A, Mappangara S, Cangara MH, Patimah, et al. The effectiveness bone graft of snakehead fish bones (Channa striata) in the gelatin form on the osteocalcin (ocn) expressions. Int J Pharm Res. 2020;12(2):4365–9.

13.    Ramakrishna C, Thenepalli T, Young Nam S, Kim C, Whan Ahn J. Oyster Shell Waste Is Alternative Sources For Calcium Carbonate ($CaCo_3$) Instead Of Natural Limestone. J Energy Eng [Internet]. 2018;27(1):59–64. Available from: https://doi.org/10.5855/ENERGY.2018.27.1.059

14.    Liao H, Mutvei H, Sjöström M, Hammarström L, Li J. Tissue Responses To Natural Aragonite (Margaritifera Shell) Implants In Vivo. Biomaterials. 2000;21(5):457–68.

15.    Wang J, Xie L, Wang X, Zheng W, Chen H, Cai L, et al. The effects of oyster shell/alpha-calcium sulfate hemihydrate/platelet-rich plasma/bone mesenchymal stem cells bioengineering scaffold on rat critical-sized calvarial defects. J Mater Sci Mater Med [Internet]. 2020;31(11). Available from: http://dx.doi.org/10.1007/s10856-020-06441-2

16.    Divilia D, Sari RP, Teguh PB. Efektivitas Kombinasi Grafting Cangkang Kerang Darah ( Anadara granosa ) dan Minyak Ikan Lemuru ( Sardinella longiceps ) Terhadap Penurunan Jumlah Osteoklas Pada Proses Bone Repair ( The Effectivity of Grafting Combination Blood Cockle Shell and Sardine F. Dent J Kedokt Gigi. 2015;9(1):20–9.

17.     Silve C, Lopez E, Vidal B, Smith DC, Camprasse S, Camprasse G, et al. Nacre initiates biomineralization by human osteoblasts maintained In Vitro. Calcif Tissue Int. 1992;51(5):363–9.

18.     Katsimbri P. The Biology Of Normal Bone Remodelling. Eur J Cancer Care (Engl). 2017;26(6):1–5.

19.     Walsh MC, Choi Y. Biology Of The RANKL-RANK-OPG System In Immunity, Bone, And Beyond. Front Immunol. 2014;5(OCT):1–12.

20.     Poernomo H. Teknik Bone Tissue Engineering (Bte) Untuk Regenerasi Jaringan Periodontal Dan Estetik Pada Edentulous Ridge. Interdental J Kedokt Gigi. 2019;15(2):56–9.

21.     Usha Kini and B. N. Nandeesh. Physiology of Bone Formation, Remodeling, and Metabolism. Radionucl Hybrid Bone Imaging. 2012;2:29–57.

22.     Suchetha A, Tanwar E, Sapna N, Bhat D, Spandana A. Alveolar bone in health. IP Int J Periodontol Implantol. 2017;2(4):112–6.

23.     Compton JT, Lee FY. A Review Of Osteocyte Function And The Emerging Importance Of Sclerostin. J Bone Jt Surg Am [Internet]. 2014;96(19):1659–68. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4179450/pdf/jbjsam.m01096.pdf

24.     Carranza AF, Newman GM. Periodontología. Newman Carranza's Clin Periodontol [Internet]. 2018;47(6):944. Available from: http://www.izdatgeo.ru/pdf/gig/2006-6/734.pdf

25.     Ljupcho Efremov TK. Perspectives On Regeneration Of Alveolar Bone Defects. 2014;14(4):145–53.

26.     Vandana K, Chandra GNR B. Periodontal Osseous Defects: A Review. CODS J Dent.

2017;9(1):22–9.

27.     Lobprise HB, Stepaniuk K. Oral Surgery - Periodontal Surgery. Wiggs's Vet Dent Princ Pract. 2018;193–228.

28.     Anton Sculean. Periodontal Regenerative Therapy. Br Dent J. 2011;211(6):297–8.

29.     Kumar P, Vinitha B, Fathima G. Bone Grafts In Dentistry. J Pharm Bioallied Sci. 2013;5(SUPPL.1):2–5.

30.     Ngoc N. Basic Knowledge of Bone Grafting. Bone Grafting. 2012;

31.     Kim Y-K, Lee J, Um I-W, Kim K-W, Murata M, Akazawa T, et al. Tooth-derived bone graft material. J Korean Assoc Oral Maxillofac Surg. 2013;39(3):103.

32.     Aghaloo TL, Tencati E, Hadaya D. Biomimetic Enhancement of Bone Graft Reconstruction. Oral Maxillofac Surg Clin North Am. 2019;31(2):193–205.

33.     Kim YK, Lee JH, Um IW, Cho WJ. Guided Bone Regeneration Using Demineralized Dentin Matrix: Long-Term Follow-Up. J Oral Maxillofac Surg [Internet]. 2016;74(3):515.e1-515.e9. Available from: http://dx.doi.org/10.1016/j.joms.2015.10.030

34.     Titsinides S, Agrogiannis G, Karatzas T. Bone Grafting Materials In Dentoalveolar Reconstruction: A Comprehensive Review. Jpn Dent Sci Rev [Internet]. 2019;55(1):26–32. Available from: https://doi.org/10.1016/j.jdsr.2018.09.003

35.     Wardana IK, Sudewi, Muzaki A, Sari Budi Moria. Profile of pearl oyster (Pinctada maxima) seeds resulted from controlled spawning. J Oseanologi Indones. 2014;1(1):6–11.

36.     M.S. Hamzah. Efektifitas Alat Pemeliharaan Terhadap Sintasan Dan Pertumbuhan Anakan Kerang Mutiara (Pinctada Maxima) Di Teluk Kodek, Lombok Utara Effectiveness. J Ilmu dan Teknol Kelaut Trop. 2014;6(2):415–25.

37. Alakpa E V., Burgess KEV, Chung P, Riehle MO, Gadegaard N, Dalby MJ, et al. Nacre Topography Produces Higher Crystallinity in Bone than Chemically Induced Osteogenesis. ACS Nano. 2017;11(7):6717–27.

38. Susi Rahayu, Dian W, Kurniawidi AG. Pemanfaatan Limbah Cangkang Kerang Mutiara (Pinctada Maxima) Sebagai Sumber Hidroksiapatit. J Chem Inf Model. 2018;4(2):226–31.

39. Zhang G, Brion A, Willemin AS, Piet MH, Moby V, Bianchi A, et al. Nacre, a natural, multi-use, and timely biomaterial for bone graft substitution. J Biomed Mater Res - Part A. 2017;105(2):662–71.

40. Oliveira D V., Silva TS, Cordeiro OD, Cavaco SI, Simes DC. Identification of proteins with potential osteogenic activity present in the water-soluble matrix proteins from crassostrea gigas nacre using a proteomic approach. Sci World J. 2012;2012(May 2012).

41. Lamghari M, Berland S, Laurent A, Huet H, Lopez E. Bone reactions to nacre injected percutaneously into the vertebrae of sheep. Biomaterials. 2001;22(6):555–62.

42. Pereira Mouriès L, Almeida MJ, Milet C, Berland S, Lopez E. Bioactivity of nacre water-soluble organic matrix from the bivalve mollusk Pinctada maxima in three mammalian cell types: Fibroblasts, bone marrow stromal cells and osteoblasts. Comp Biochem Physiol - B Biochem Mol Biol. 2002;132(1):217–29.

43. Green DW, Kwon HJ, Jung HS. Osteogenic potency of nacre on human mesenchymal stem cells. Mol Cells. 2015;38(3):267–72.

44. Brundavanam RK, Fawcett D, Poinern GEJ. Synthesis of a bone like composite material derived from waste pearl oyster shells for potential bone tissue bioengineering applications. Int J Res Med Sci. 2017;5(6):2454.

45. Coringa R, de Sousa EM, Botelho JN, Diniz RS, de Sá JC, Nogueira da Cruz MCF, et al. Bone substitute made from a Brazilian oyster shell functions as a fast stimulator for bone-forming cells in an animal model. PLoS One. 2018;13(6):1–13.

46. Xiao W, Wang Y, Pacios S, Li S, Graves DT. Cellular and Molecular Aspects of Bone Remodeling. Front Oral Biol. 2015;18:9–16.

47. MI A. Bone healing in femoral fracture of white rat with intramedullary wire fixation and additional medullary bone marrow. J Indones Orthop. 2012;40(2):13–6.

48. Shapiro F. Bone development and its relation to fracture repair. The role of mesenchymal osteoblasts and surface osteoblasts. Eur Cells Mater. 2008;15:53–76.

49. Tobeiha M, Moghadasian MH, Amin N, Jafarnejad S. RANKL/RANK/OPG Pathway: A Mechanism Involved in Exercise-Induced Bone Remodeling. Biomed Res Int. 2020;2020.

50. Nagy V, Penninger JM. The RANKL-RANK Story. Gerontology. 2015;61(6):534–42.

51. Hikmah N, Shita ADP. Peran RANKL pada Proses Resorpsi Tulang Alveolar Kondisi Diabetes. Stomatognatic. 2013;10(3):105–9.

52. Darby I. Periodontal materials. Aust Dent J. 2011;56(SUPPL. 1):107–18.

53. Khrunyk Y, Lach S, Petrenko I, Ehrlich H. Progress in Modern Marine Biomaterials Research. Mar Drugs. 2020;18(12):1–47.

54. Zikri A, Amri A, Yelmida Z. Sintesa Precipitated Calcium Carbonate (PCC) dari Cangkang Kerang Darah (Anadara granosa) dengan variasi Jenis Asam dan Waktu Karbonisasi. Jom Fteknik. 2015;2(2):1–6.

55. Tiffani Qalbi, Yelmida Azis ZH. Sintesis Hidroksiapatit Melalui Precipitated Calcium Carbonate (PCC) Cangkang Telur Ayam Ras Dengan Metode Presipitasi Pada Variasi Konsentrasi Pelarut HNo3 Dan Rasio CA/P. Jom Fteknik. 2018;5(1–6):2013–5.

56. Octavianty D, Amri A, Zultiniar, Yelmida. Sintesa Precipitated Calcium Carbonate (Pcc) Dari Kulit Kerang Darah (Anadara Granosa) Dengan Variasi Konsentrasi Asam Dan Rasio CaO/HNO3. J Chem Inf Model. 2013;53(9):1689–99.

57. Lee H, Hwang-Bo H, Ji SY, Kim MY, Kim SY, Woo M, et al. Effect of fermented oyster extract on growth promotion in Sprague–Dawley rats. Integr Med Res [Internet]. 2020;9(4):100412. Available from: https://doi.org/10.1016/j.imr.2020.100412

58. Hemabarathy B, Zakaria MZAB, Perimal EK, Yusof LM, Hamid M. Mineral and physiochemical evaluation of Oyster Shell and other selected Molluscan shell as potential biomaterials. Sains Malaysiana. 2014;43(7):1023–9.

59. Faisal A, Retno K, S.Jamil M. Sintesis Limbah Kerang dengan Metode Solvothermal. Jom Fteknik. 2019;15(3):110–3.

60. Resaldi MF, Prananingrum W, Cevant TA. Karakteristik CaCO3 dari Hasil Sintesis Cangkang Kerang Darah (Anadara granosa) dengan Variasi Suhu Kalsinasi. 2018;1–11.

61. Kontonasaki E, Chatzistavrou X, Savu B, Sandulescu I, Paraskevopoulos K, Koidis P. Investigation of the Hydroxyapatite Growth on Bioactive Glass Surface. J Biomed Pharm Eng. 2007;1:34–9.

62. Sianipar JS, Azis Y, Zultiniar. Sintesis Hidroksiapatit Melalui Precipitated Calcium Carbonate (PCC) Kulit Kerang Darah dengan Metode Hidrotermal. Fteknik. 2016;3(2):2066–72.

63. Warastuti Y, Abbas B. Sintesis dan Karakterisasi Pasta Injectable Bone Substitute Iradiasi Berbasis Hidroksiapatit. A Sci J Appl sotopes Radiat. 2011;7(2):73–82.

64. Baradaran S, Moghaddam E, Nasiri-Tabrizi B, Basirun WJ, Mehrali M, Sookhakian M, et al. Characterization of nickel-doped biphasic calcium phosphate/graphene nanoplatelet

composites for biomedical application. Mater Sci Eng C [Internet]. 2015;49:656–68. Available from: http://dx.doi.org/10.1016/j.msec.2015.01.050

65. Kohli S, Kohli V. Role of RANKL-RANK/osteoprotegerin molecular complex in bone remodeling and its immunopathologic implications. Indian J Endocrinol Metab. 2011;15(3):175.

66. Kapasa E, Giannoudis P, Jia X, Hatton P, Yang X. The Effect of RANKL/OPG Balance on Reducing Implant Complications. J Funct Biomater. 2017;8(4):42.

67. Boyce BF, Xing L. Functions of RANKL/RANK/OPG in bone modeling and remodeling. Arch Biochem Biophys. 2008;473(2):139–46.

68. Sheikh Z, Hamdan N, Ikeda Y, Grynpas M, Ganss B, Glogauer M. Natural graft tissues and synthetic biomaterials for periodontal and alveolar bone reconstructive applications: A review. Biomater Res. 2017;21(1):1–20.

69. Blaggana V, Gill A, Blaggana A. A clinical and radiological evaluation of the relative efficacy of demineralized freeze-dried bone allograft versus anorganic bovine bone xenograft in the treatment of human infrabony periodontal defects: A 6 months follow-up study. J Indian Soc Periodontol. 2014;18(5):601–7.

70. Eriksen EF. Cellular mechanisms of bone remodeling. Rev Endocr Metab Disord. 2010;11(4):219–27.

71. Rinaldo Florencio-Silva, Gisela Rodrigues da Silva Sasso, Estela Sasso-Cerri, Manuel Jesus Simões 1 and Paulo Sérgio Cerri2. Biology of Bone Tissue: Structure, Function, and Factors That Influence Bone Cells. Immuno-analyse Biol Spécialisée. 2015;7(6):17–24.

72. Kenkre JS, Bassett JHD. The bone remodelling cycle. Vol. 55, Annals of Clinical Biochemistry. 2018. 308–327 p.

**FOTO PELAKSANAAN PENELITIAN**

**Pemeliharaan Hewan**
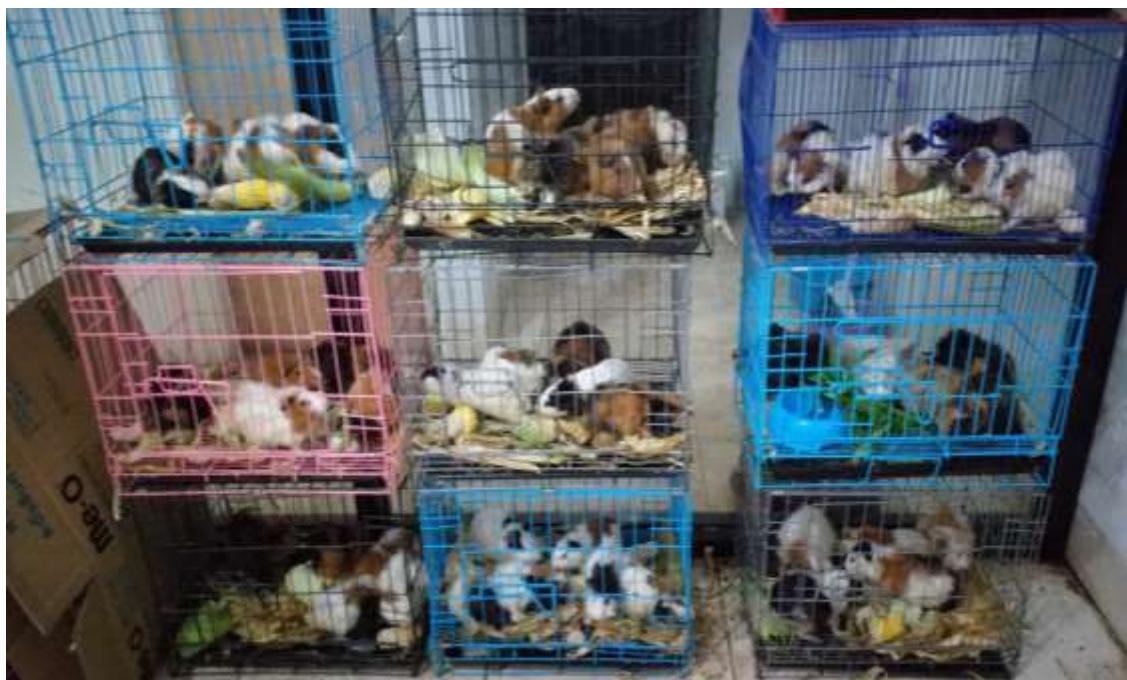


**Gambar 10.Proses pengandangan hewan coba, maksimal 5 hewan coba satu kandang dan pemberian makanan yang cukup**

# Pembuatan Sediaan Bone Graft Yang Mengandung

## Cangkang Kerang Mutiara



1. Cangkang kerang disikat hingga bersih dan dikeringkan dengan panas matahari



2. Cangkang yang sudah kering dipecah menjadi ukuran lebih kecil dan di haluskan menggunakan mortar, kemudian ayak -50 sampai +60 mesh



3. Kemudian kalsinasi selama 3 jam, furnace dengan suhu 900° C , maka di dapat Kalsium Oksida (CaO)

4. Selanjutnya CaO yang telah di dapat di larutkan dengan asam nitrat ($HNO_3$) dengan konsentrasi 2 M, kemudian rasio 17 gr CaO banding 300 ml $HNO_3$ diaduk menggunakan *stirrer* selama 30 menit setelah itu disaring.

5. Filtrat yang didapatkan akan dikarbonasi dengan menambahkan gas CO2 selama 90 menit sehingga terlihat endapan Presipitasi Kalsium Karbonat yang berwarna putih susu.

6.Endapan presipitasi kalsium karbonat kemudian disaring dan dicuci dengan aquades sampai pH 7

7. Selanjutnya keringkan dalam oven pada suhu 105° C untuk menghilangkan sisa air dari proses pengendapan.

**Gambar 11.  Pembuatan Sediaan Bone Graft Yang Mengandung Cangkang Kerang Mutiara**

**Proses Implantasi**



Gambar 12 ( A- I). Proses implantasi pada hewan coba. A. Alat dan Bahan, B.Proses Penimbangan, C. Anastesi hewan coba, D. Proses mencukur bulu pada area femur, E. proses insisi, F. Proses elevasi otot dan pemboran defek femur, G. Bentuk defek H.Proses implantasi pada defek femur heawan coba, I.Pemberian antibiotik, J.Proses suturing dan aplikasi salep.

**Proses *sacrificed* dan pengambilan jaringan tulang untuk dibawa ke Laboratorium PA**



**Gambar 13. Sacrificed Hewan Coba**



**Gambar 14. Pengambilan Blok Jaringan**



**Gambar 15. Penempatan Jaringan Pada Box Formalin**

**Lampiran 2.**

## HASIL ANALISIS UJI BAHAN DENGAN *ATOMIC ABSORPTION SPECTROPHOTOMETRY* (AAS)

# KEMENTERIAN KESEHATAN RI
### DIREKTORAT JENDERAL PELAYANAN KESEHATAN
### BALAI BESAR LABORATORIUM KESEHATAN MAKASSAR
JL. Perintis Kemerdekaan KM.11 Tamalanrea Makassar 90245

**LAPORAN HASIL UJI**
*Report of Analysis*
No : 21008733 / LHU / BBLK-MKS / IV / 2021

Nama Customer : PROF. DR. DRG. HENDRA CHANDRA, M.S
*Customer Name* :
Alamat : Fakultas Kedokteran Gigi / Periodonsia
*Address* :
Jenis Sampel : Bubuk Kering
*Type of Sample (S)* :
No. Sampel : 21008733
*No. Sample* :
Tanggal Penerimaan : 20 April 2021
*Received Date* : April 20, 2021

### HASIL PEMERIKSAAN

| NO. | PARAMETER | SATUAN | HASIL PEMERIKSAAN | SPESIFIKASI METODE |
|---|---|---|---|---|
| 1 | Kalsium (Ca) | µg/g | 321389,92 | Atomisasi |

Catatan : 1 Hasil uji ini berlaku untuk sampel yang diuji
Note : The analytical result are only valid for the tested sample
2 Laporan hasil uji ini tediri dari 1 halaman
The report of analysis consists of 1 page
3 Laporan hasil uji ini tidak boleh digandakan kecuali secara lengkap dan seizin tertulis Laboratorium Penguji
Balai Besar Laboratorium Kesehatan Makassar
This report of analysis shall not be reproduced (copyed) except for the completed one and with their written permission
of the testing Laboratory Balai Besar Laboratorium Kesehatan Makassar.

Makassar, 6 Mei 2021
Kepala Seksi Labkesmas,

ASNAZ KARYANEGARA, S.Farm
NIP : 19810212000121002

DP/5.10.3/KL/BBLK - Mks; Rev 1; 15 Oktober 2012

**Lampiran 3.**

**Hasil Analisis Uji Bahan dengan** *X-Ray Fluorescence* **(XRF)**

## LABORATORIUM PENELITIAN DAN PENGEMBANGAN SAINS
## FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
## UNIVERSITAS HASANUDDIN

Jl. Perintis Kemerdekaan Km. 10, Tamalanrea, Makassar 90245
Telepon 0411-586016, Fax. 0411-588551 Email: lpps.fmipa.unhas@gmail.com

### LAPORAN PENGUJIAN
Nomor: LPPS.XI-2104-10/1

| | |
|---|---|
| **Nama Pleanggan** | : Gustivanny Dwipa A, drg |
| *Customer Name* | |
| **Alamat** | : FKG UNHAS |
| *Address/University* | |
| **Jenis Sampel** | : Serbuk Cangkang Kerang |
| *Type of Sample (s)* | |
| **Tanggal Penerimaan** | : 25 Mei 2021 |
| *Received Date* | |
| **Tanggal Analisis** | : 26 Mei 2021 |
| *Analysis Date* | |
| **Email** | : gustivannydwipa@gmail.com |
| *Email* | |

Setelah dilakukan pengujian diperoleh hasil sebagai berikut

| Parameter | Satuan | Hasil |
|---|---|---|
| Ca | m/m% | 99.66 |
| Si | m/m% | 0.26 |
| Nb | m/m% | 0.0253 |
| Mo | m/m% | 0.0159 |
| Sb | m/m% | 0.0089 |
| Ru | m/m% | 0.0066 |
| Te | m/m% | 0.0059 |
| In | m/m% | 0.0059 |
| Sn | m/m% | 0.0059 |

| Parameter | Satuan | Hasil |
|---|---|---|
| CaO | m/m% | 99.49 |
| SiO2 | m/m% | 0.45 |
| Nb2O5 | m/m% | 0.0225 |
| MoO3 | m/m% | 0.0148 |
| Sb2O3 | m/m% | 0.0071 |
| RuO4 | m/m% | 0.0054 |

Makassar, 7 Juni 2021
Penanggung Jawab Teknis

S.Si, M.Si
NIP. 197508261996012001

**Hasil Analisis Uji Bahan dengan** *Fourier-Transform Infrared* **(FTIR)**

KEMENTERIAN PENDIDIKAN DAN KEBUDAYAAN
**POLITEKNIK NEGERI UJUNG PANDANG**
. Perintis Kemerdekaan Km. 10 Tamalanrea, Makassar 90245
Telepon: (0411)-585365,585367,585368; Faksimili (0411)-586043
Website: http://www.poliung.ac.id/
E-mail: pnup@poliung.ac.id

## LAPORAN HASIL PENGUJIAN

### INTERPRETASI SPEKTROSKOPI INFRAMERAH CaCO₃



CaCO3
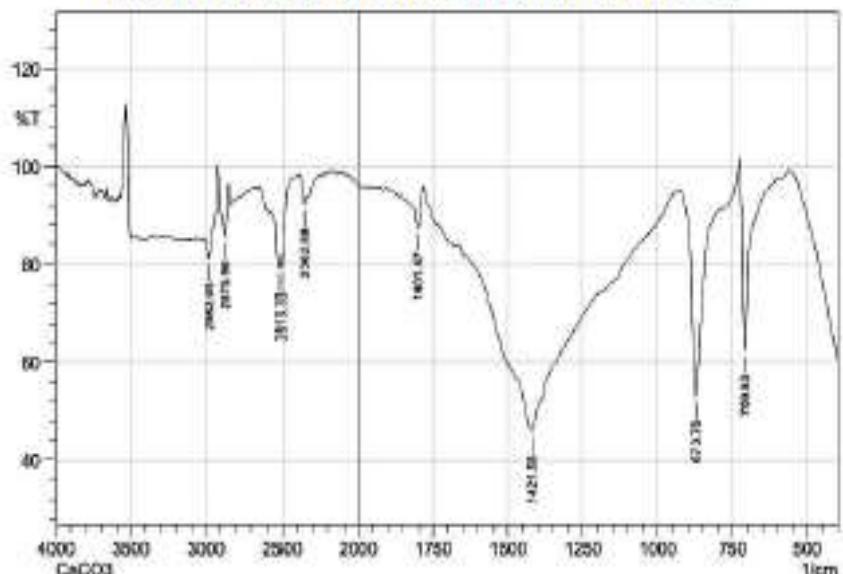
| | Peak | Intensity | Corr. Intensity | Base (H) | Base (L) | Area | Corr. Area |
|---|---|---|---|---|---|---|---|
| 1 | 708.83 | 82.43 | 38.71 | 727.10 | 633.74 | 8.72 | 8.49 |
| 2 | 873.74 | 53.06 | 43.97 | 893.72 | 727.10 | 16.95 | 13.56 |
| 3 | 1421.58 | 46.1 | 7.6 | 1496.51 | 1394.58 | 22.33 | 2.39 |
| 4 | 1801.57 | 97.48 | 7.67 | 1957.51 | 1702.28 | 2.75 | 1.00 |
| 5 | 2362.86 | 92.33 | 3.26 | 2392.76 | 2345.52 | 1.16 | 4.3 |
| 6 | 2513.35 | 74.35 | 17.55 | 2559.07 | 2390.74 | 9.33 | 5.72 |
| 7 | 2878.96 | 86.79 | 11.94 | 2922.28 | 2894.08 | 2.55 | 2.41 |
| 8 | 2982.05 | 81.34 | 11.59 | 3046.7 | 2922.28 | 7.97 | 3.65 |

| Area Frekuensi (cm⁻¹) | Gugus Fungsi |
|---|---|
| 1421.58 | CaCO₃ |
| 873.78 | C-O |
| 709.83 | C-O |

Kesimpulan:
Berdasarkan pita spektrum inframerah, senyawa bahan uji mengandung kalsium karbonat murni

**Lampiran 5**

## Hasil Analisis Uji Bahan dengan *X-Ray Diffraction* (XRD)

LABORATORIUM PENELITIAN DAN PENGEMBANGAN SAINS
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
UNIVERSITAS HASANUDDIN
Jl. Perintis Kemerdekaan Km. 10, Tamalanrea, Makassar 90245
Telepon 0411-586016, Fax. 0411-588551 Email: lpps.fmipa.unhas@email.com

### LAPORAN HASIL PENGUJIAN
Nomor: LPPS.XJ-2104-10/2

Nama Pelanggan : Gustivanny Dwipa A
*Customer Name*

Alamat : FKG UNHAS
*Address/University*

Jenis Sampel : Serbuk Cangkang Kerang
*Type of Sample (s)*

Tanggal Penerimaan : 25 Mei 2021
*Received Date*

Tanggal Analisis : 26 Mei 2021
*Analysis Date*

Email : gustivannydwipa@gmail.com
*Email*

Setelah dilakukan pengujian diperoleh hasil sebagai berikut:

Group : Standard (Crystallinity)

Data : LPPS.XJ-2104-10/2

# Strong : 3 peaks

| No. | Peak No. | 2Theta (deg) | d (A) | I/I1 | FWHM (deg) | Intensity (Counts) | Integrated Int (Counts) |
|---|---|---|---|---|---|---|---|
| 1. | 2 | 29.8259 | 2.99319 | 100 | 0.48120 | 392 | 10600 |
| 2. | 7 | 48.9166 | 1.86049 | 29 | 0.43330 | 112 | 2601 |
| 3. | 6 | 47.7986 | 1.90136 | 25 | 0.60720 | 99 | 3137 |

Makassar, 7 Juni 2021
Penanggung Jawab Teknis

S.Si, M.Si
NIP. 19750826199601200l

**Lampiran 6**

## Hasil *Print out* analisis data SPSS

```
EXAMINE VARIABLES=OPG BY KELOMPOK
  /PLOT NPPLOT
  /STATISTICS DESCRIPTIVES
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.
```

# Explore

| Notes | | |
|---|---|---|
| Output Created | | 13-AUG-2021 10:35:10 |
| Comments | | |
| Input | Data | C:\Users\Panasonic\Documents\ihc.sav |
| | Active Dataset | DataSet1 |
| | Filter | <none> |
| | Weight | <none> |
| | Split File | <none> |
| | N of Rows in Working Data File | 31 |
| Missing Value Handling | Definition of Missing | User-defined missing values for dependent variables are treated as missing. |
| | Cases Used | Statistics are based on cases with no missing values for any dependent variable or factor used. |
| Syntax | | EXAMINE VARIABLES=OPG BMP TGF BY KELOMPOK /PLOT NPPLOT /STATISTICS DESCRIPTIVES /CINTERVAL 95 /MISSING LISTWISE /NOTOTAL. |
| Resources | Processor Time | 00:00:10,89 |
| | Elapsed Time | 00:00:16,61 |

```
[DataSet1] C:\Users\Panasonic\Documents\ihc.sav
```

# KELOMPOK

**Case Processing Summary**

| | KELOMPOK | Cases | | | | | |
|---|---|---|---|---|---|---|---|
| | | Valid | | Missing | | Total | |
| | | N | Percent | N | Percent | N | Percent |
| OPG | K (-) 14 | 5 | 100,0% | 0 | 0,0% | 5 | 100,0% |
| | K (+) 14 | 5 | 100,0% | 0 | 0,0% | 5 | 100,0% |
| | P 14 | 5 | 100,0% | 0 | 0,0% | 5 | 100,0% |
| | K (-) 21 | 5 | 100,0% | 0 | 0,0% | 5 | 100,0% |
| | K (+) 21 | 5 | 100,0% | 0 | 0,0% | 5 | 100,0% |
| | P 21 | 5 | 100,0% | 0 | 0,0% | 5 | 100,0% |

**Descriptives**

| | KELOMPOK | | | Statistic | Std. Error |
|---|---|---|---|---|---|
| OPG | K (-) 14 | Mean | | 4,00 | ,707 |
| | | 95% Confidence Interval for Mean | Lower Bound | 2,04 | |
| | | | Upper Bound | 5,96 | |
| | | 5% Trimmed Mean | | 4,00 | |
| | | Median | | 4,00 | |
| | | Variance | | 2,500 | |
| | | Std. Deviation | | 1,581 | |
| | | Minimum | | 2 | |
| | | Maximum | | 6 | |
| | | Range | | 4 | |
| | | Interquartile Range | | 3 | |
| | | Skewness | | ,000 | ,913 |
| | | Kurtosis | | -1,200 | 2,000 |
| | K (+) 14 | Mean | | 10,60 | ,812 |
| | | 95% Confidence Interval for Mean | Lower Bound | 9,14 | |
| | | | Upper Bound | 13,66 | |
| | | 5% Trimmed Mean | | 11,39 | |
| | | Median | | 11,00 | |
| | | Variance | | 3,300 | |
| | | Std. Deviation | | 1,817 | |

| | | | | |
|---|---|---|---|---|
| | Minimum | | 9 | |
| | Maximum | | 14 | |
| | Range | | 5 | |
| | Interquartile Range | | 3 | |
| | Skewness | | ,267 | ,913 |
| | Kurtosis | | 1,074 | 2,000 |
| | Mean | | 6,60 | 1,077 |
| | 95% Confidence Interval for Mean | Lower Bound | 7,41 | |
| | | Upper Bound | 13,39 | |
| | 5% Trimmed Mean | | 10,44 | |
| | Median | | 11,00 | |
| | Variance | | 5,800 | |
| P 14 | Std. Deviation | | 2,408 | |
| | Minimum | | 7 | |
| | Maximum | | 13 | |
| | Range | | 6 | |
| | Interquartile Range | | 5 | |
| | Skewness | | -,601 | ,913 |
| | Kurtosis | | -,945 | 2,000 |
| | Mean | | 6,80 | ,374 |
| | 95% Confidence Interval for Mean | Lower Bound | 5,76 | |
| | | Upper Bound | 7,84 | |
| | 5% Trimmed Mean | | 6,78 | |
| | Median | | 7,00 | |
| | Variance | | ,700 | |
| K (-) 21 | Std. Deviation | | ,837 | |
| | Minimum | | 6 | |
| | Maximum | | 8 | |
| | Range | | 2 | |
| | Interquartile Range | | 2 | |
| | Skewness | | ,512 | ,913 |
| | Kurtosis | | -,612 | 2,000 |
| | Mean | | 11,40 | ,678 |
| K (+) 21 | 95% Confidence Interval for Mean | Lower Bound | 8,72 | |
| | | Upper Bound | 12,48 | |
| | 5% Trimmed Mean | | 10,56 | |

| | | | |
|---|---|---|---|
| | Median | 10,00 | |
| | Variance | 2,300 | |
| | Std. Deviation | 1,517 | |
| | Minimum | 9 | |
| | Maximum | 13 | |
| | Range | 4 | |
| | Interquartile Range | 3 | |
| | Skewness | 1,118 | ,913 |
| | Kurtosis | 1,456 | 2,000 |
| | Mean | 10,40 | ,970 |
| | 95% Confidence Interval for Mean — Lower Bound | 8,51 | |
| | 95% Confidence Interval for Mean — Upper Bound | 13,89 | |
| | 5% Trimmed Mean | 11,17 | |
| | Median | 10,00 | |
| | Variance | 4,700 | |
| P 21 | Std. Deviation | 2,168 | |
| | Minimum | 9 | |
| | Maximum | 14 | |
| | Range | 5 | |
| | Interquartile Range | 4 | |
| | Skewness | ,559 | ,913 |
| | Kurtosis | -2,368 | 2,000 |

**Tests of Normality**

| | KELOMPOK | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | | Statistic | df | Sig. | Statistic | df | Sig. |
| OPG | K (-) 14 | ,136 | 5 | ,200[*] | ,987 | 5 | ,967 |
| | K (+) 14 | ,254 | 5 | ,200[*] | ,914 | 5 | ,492 |
| | P 14 | ,273 | 5 | ,200[*] | ,852 | 5 | ,201 |
| | K (-) 21 | ,231 | 5 | ,200[*] | ,881 | 5 | ,314 |
| | K (+) 21 | ,213 | 5 | ,200[*] | ,963 | 5 | ,826 |
| | P 21 | ,237 | 5 | ,200[*] | ,961 | 5 | ,814 |

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

**OPG**

**Normal Q-Q Plots**



Normal Q-Q Plot of OPG
for KELOMPOK= K (-) 14
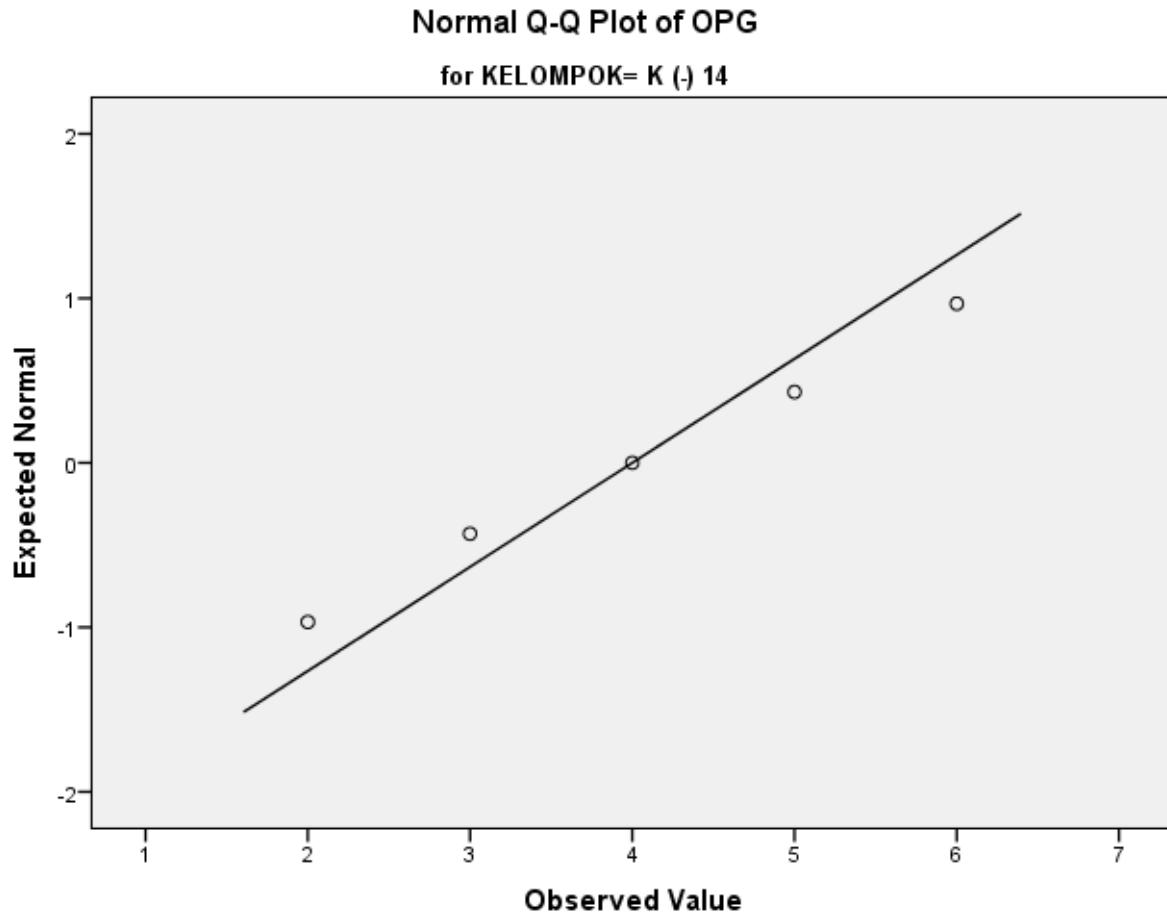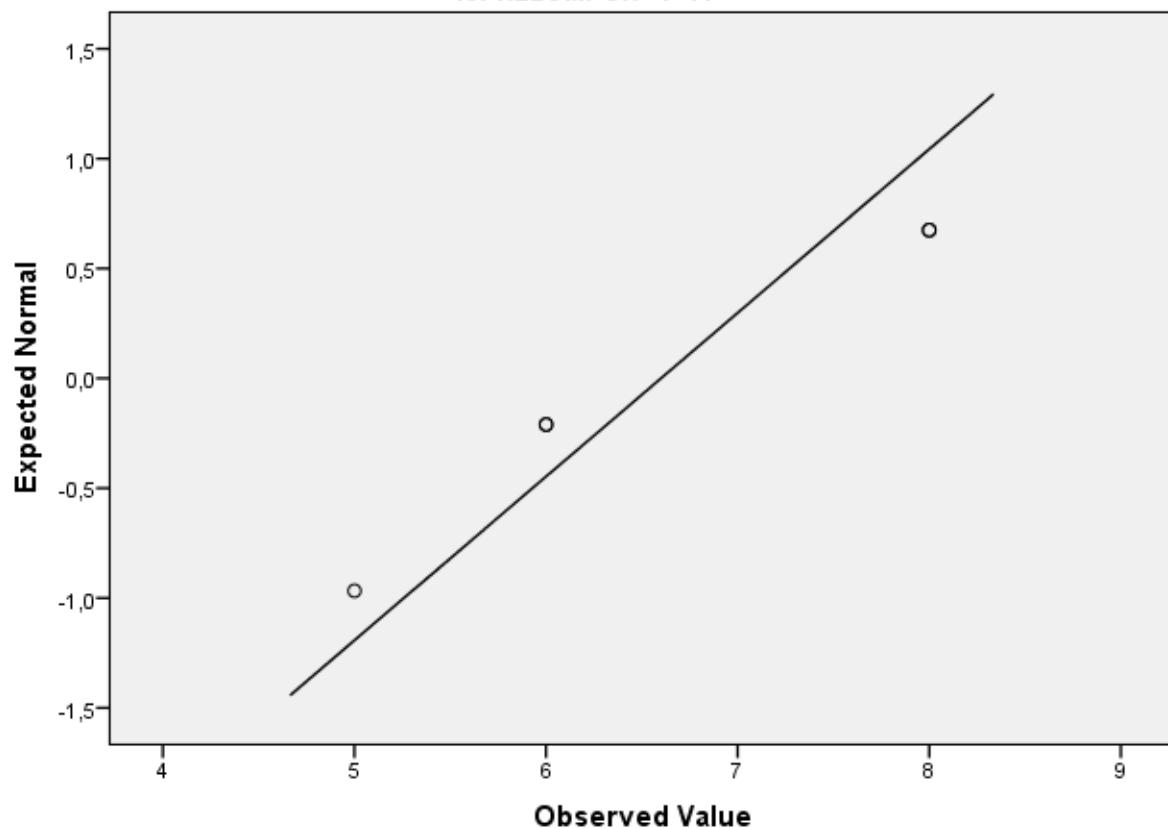
Normal Q-Q Plot of OPG

for KELOMPOK= K (+) 14

Normal Q-Q Plot of OPG

for KELOMPOK= P 14

Normal Q-Q Plot of OPG
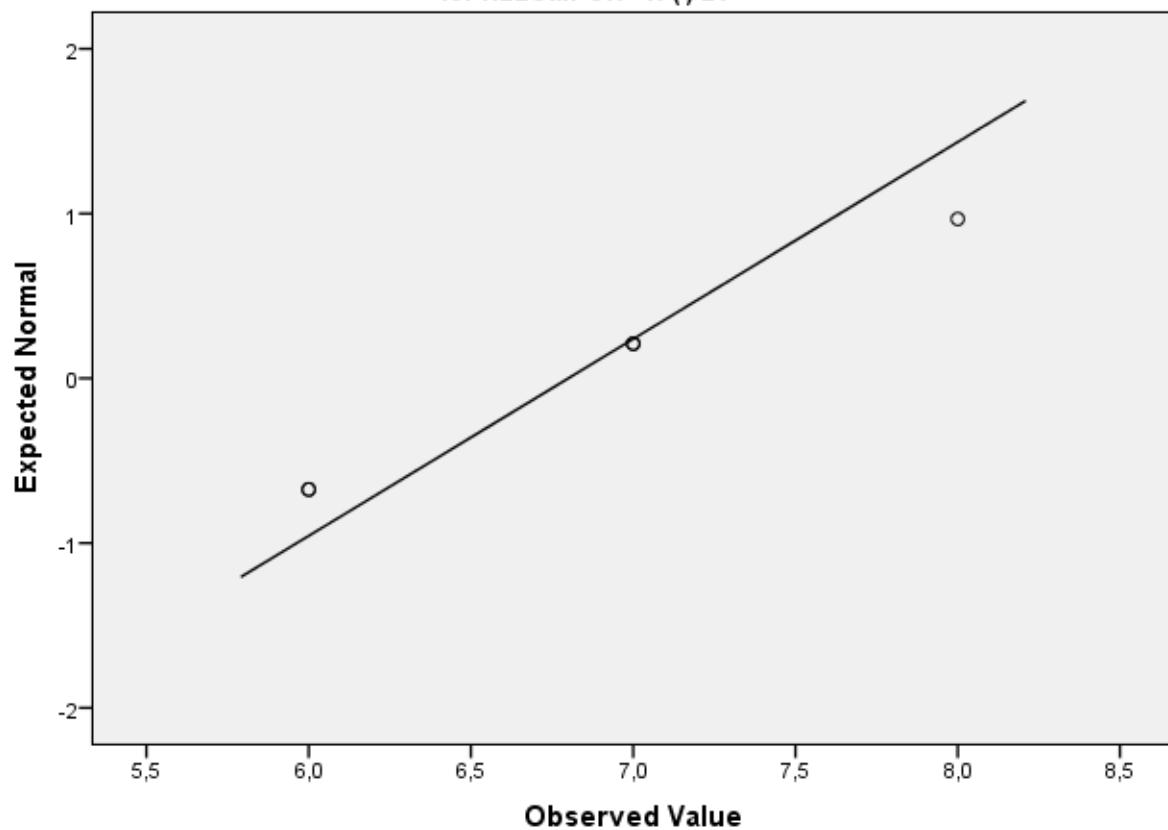
for KELOMPOK= K (-) 21

Normal Q-Q Plot of OPG
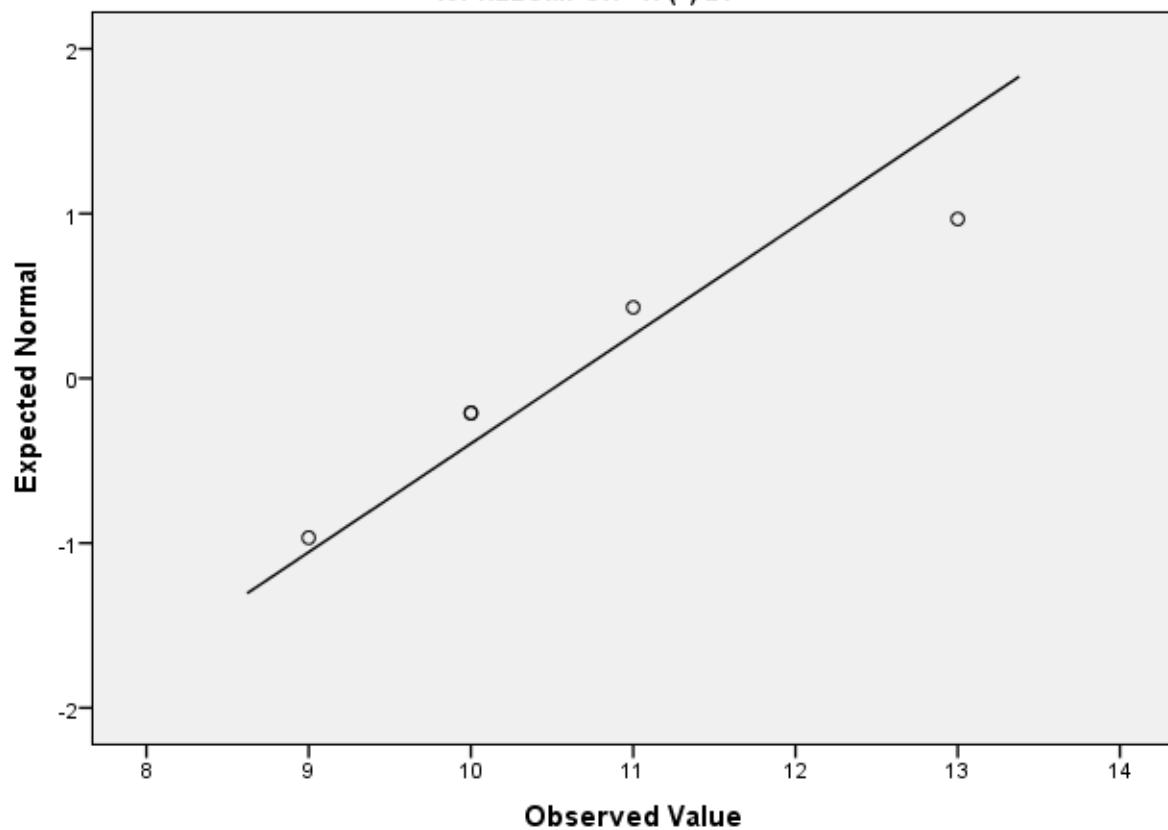
for KELOMPOK= K (+) 21

Normal Q-Q Plot of OPG
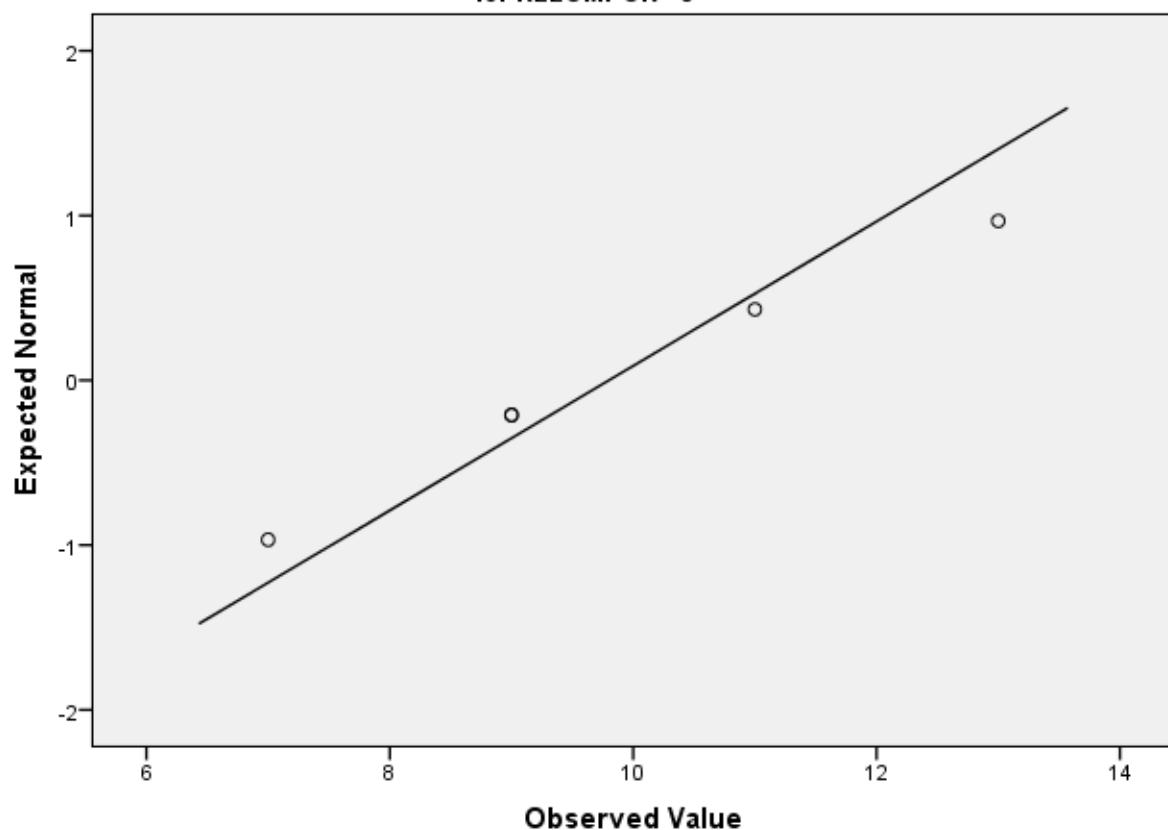
for KELOMPOK= 6

Detrended Normal Q-Q Plot of OPG
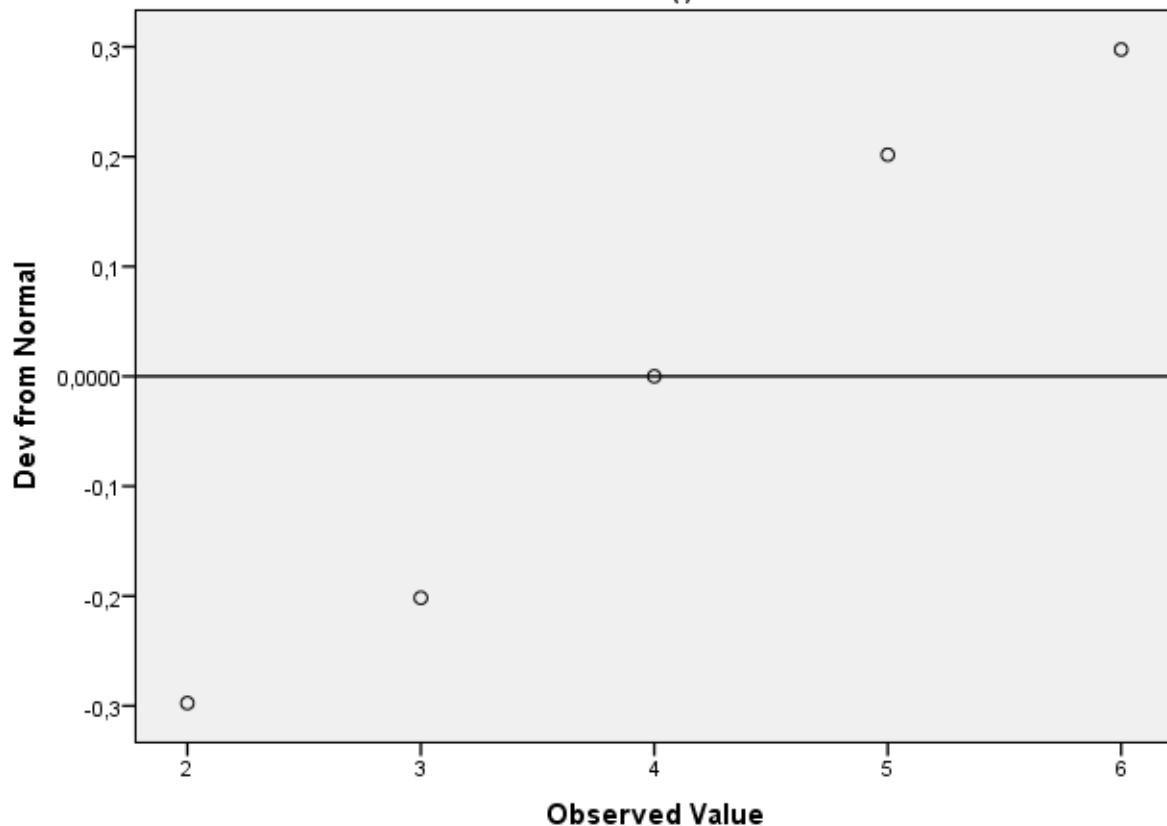
for KELOMPOK= K (-) 14

Detrended Normal Q-Q Plot of OPG
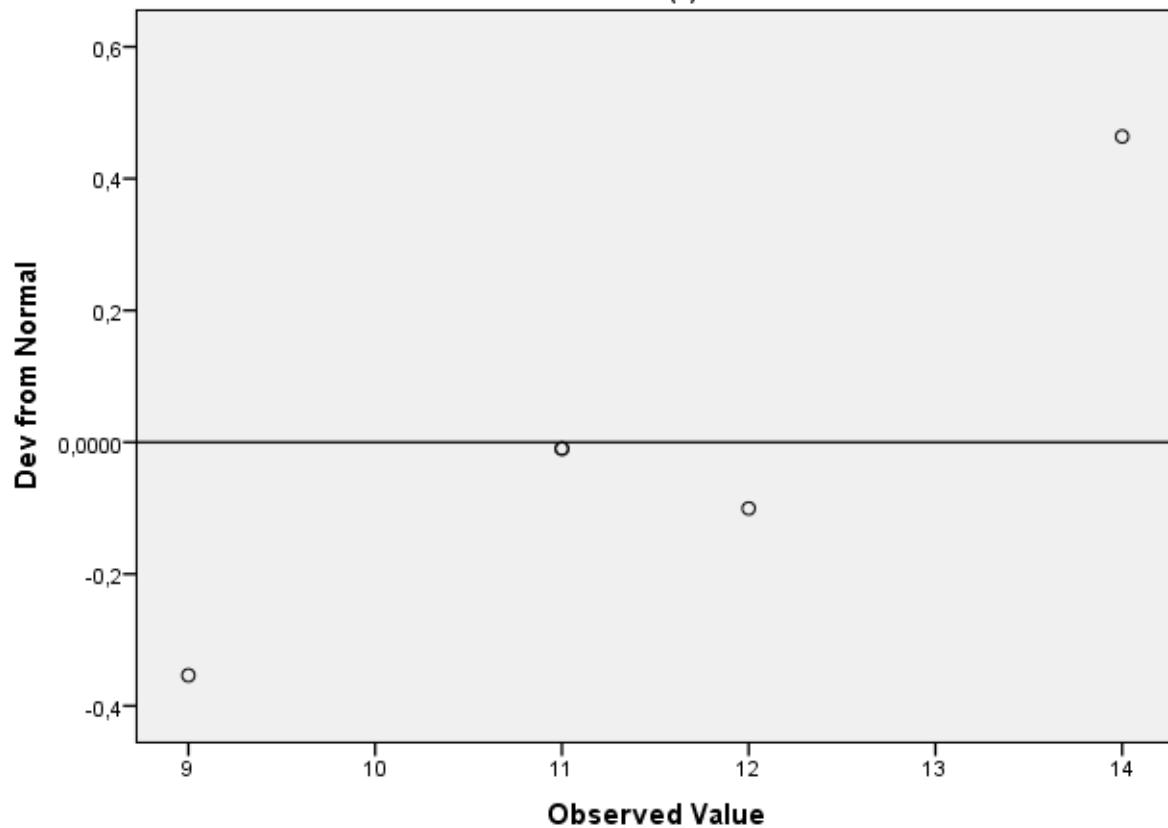
for KELOMPOK= K (+) 14

## Detrended Normal Q-Q Plot of OPG
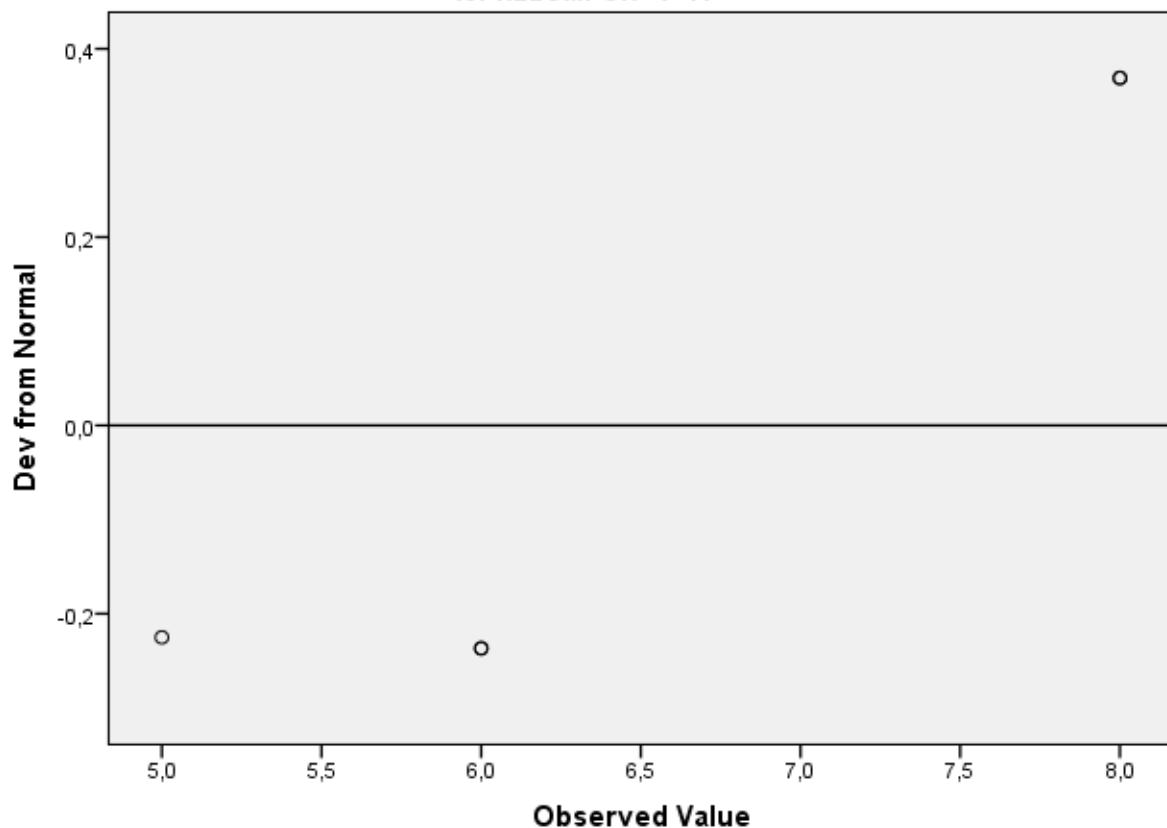
### for KELOMPOK= P 14

# Detrended Normal Q-Q Plot of OPG
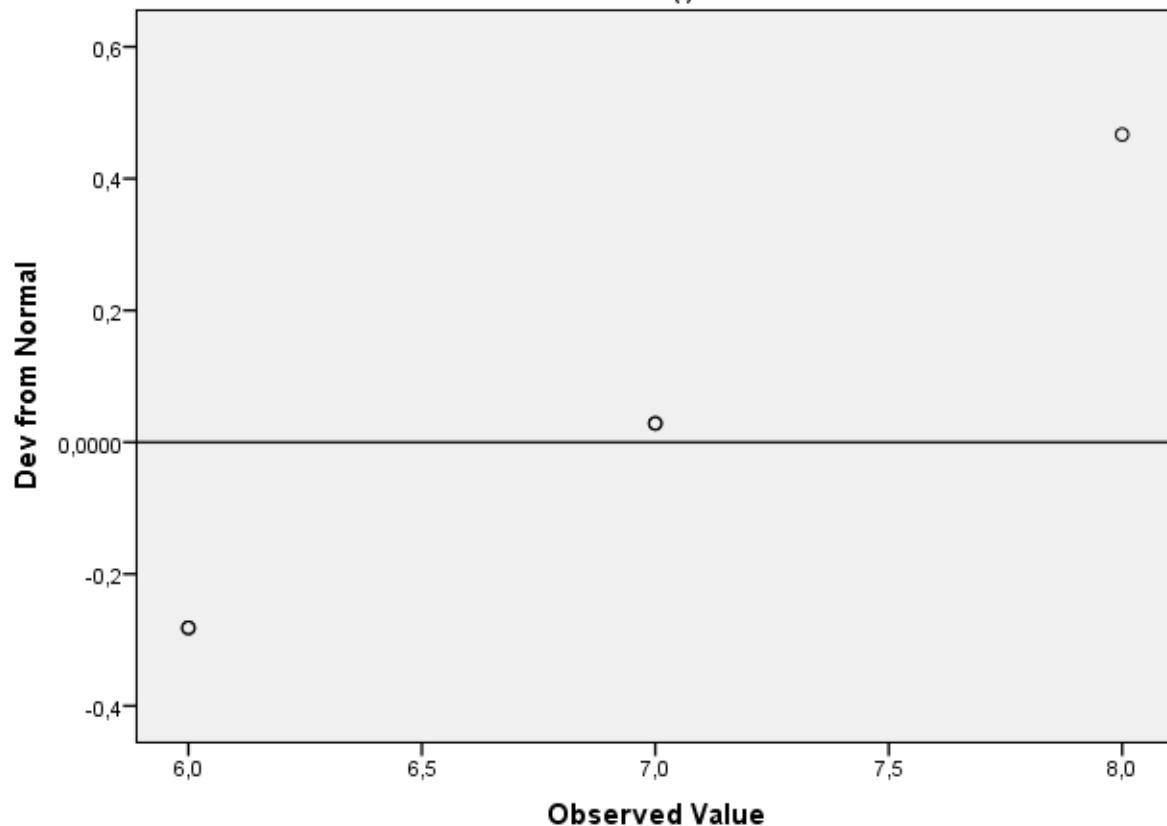
## for KELOMPOK= K (-) 21

Detrended Normal Q-Q Plot of OPG
for KELOMPOK= K (+) 21
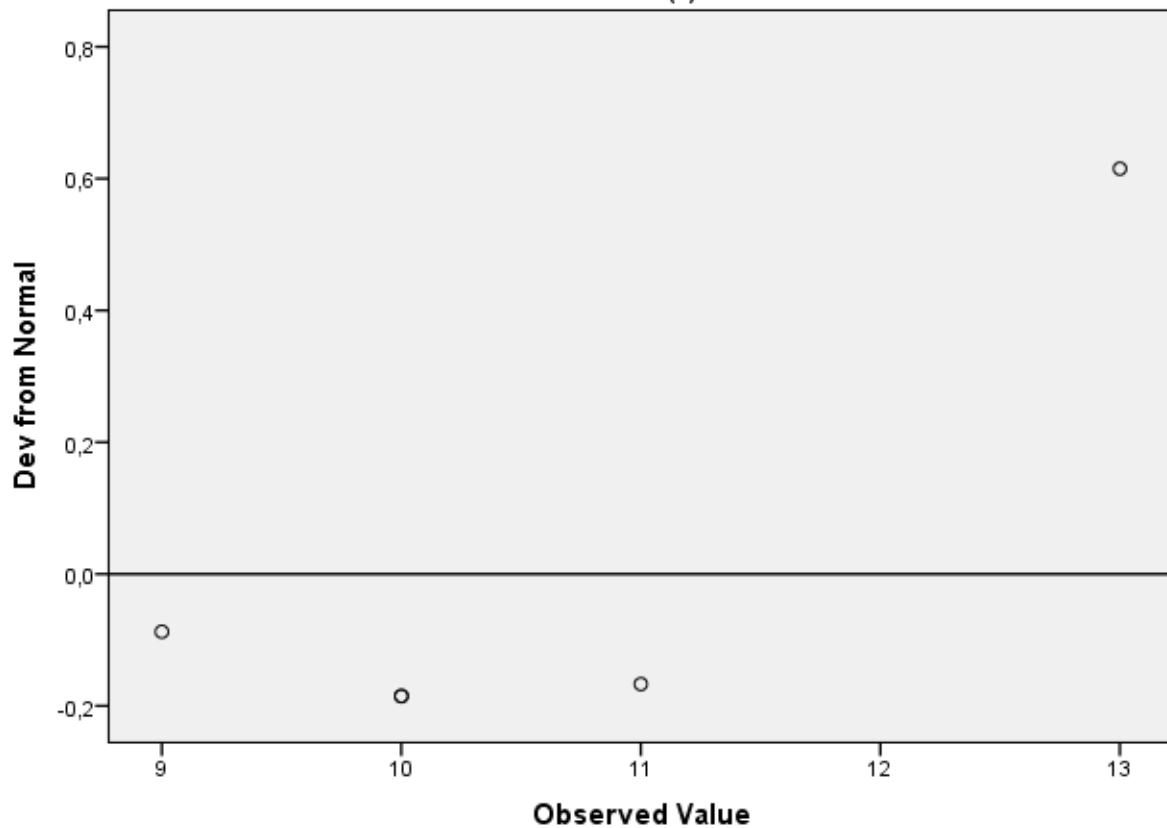
## Detrended Normal Q-Q Plot of OPG

### for KELOMPOK= 6
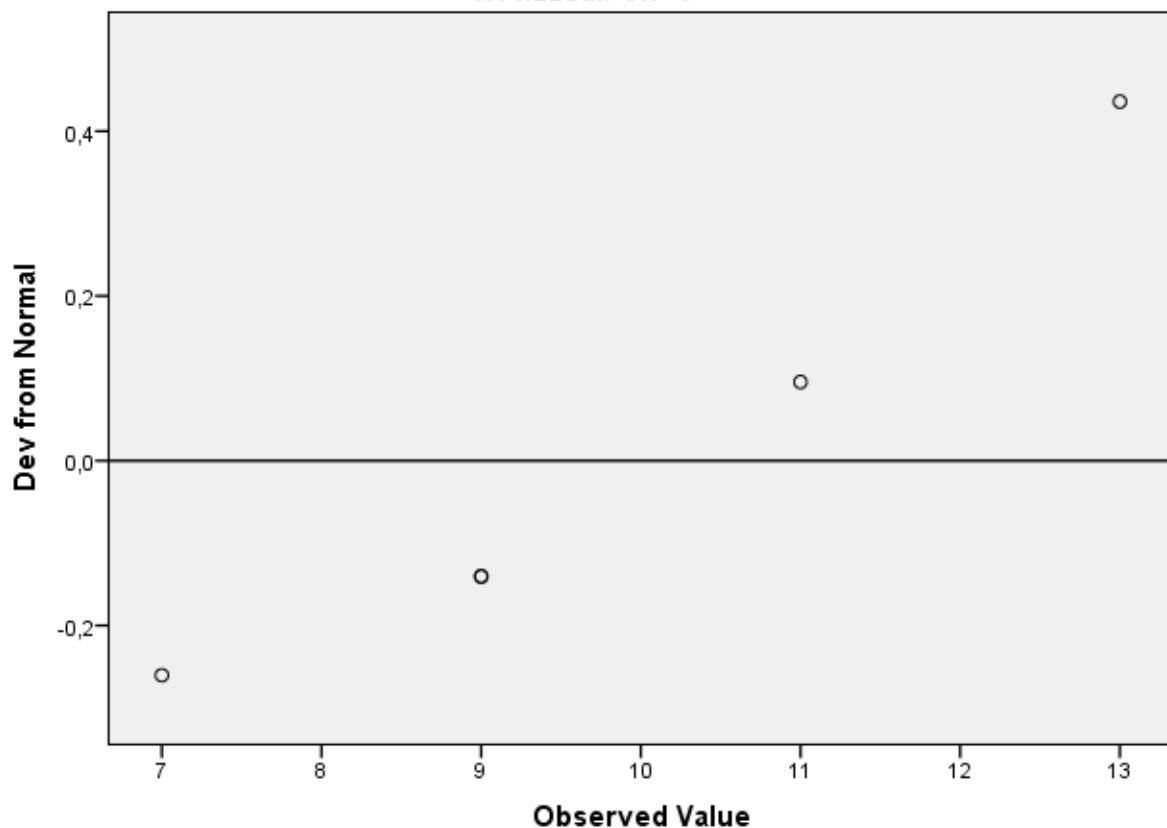
## Post Hoc Test

## Oneway

| Notes | | |
|---|---|---|
| Output Created | | 13-AUG-2021 10:50:25 |
| Comments | | |
| Input | Data | C:\Users\keu\Desktop\Untitled1. sav |
| | Active Dataset | DataSet0 |
| | Filter | <none> |
| | Weight | <none> |
| | Split File | <none> |
| | N of Rows in Working Data File | 30 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as missing. |
| | Cases Used | Statistics for each analysis are based on cases with no missing data for any variable in the analysis. |
| Syntax | | ONEWAY OPG_H14 BY Kelompok_H14 /MISSING ANALYSIS /POSTHOC=LSD ALPHA(0.05). |
| Resources | Processor Time | 00:00:00,02 |
| | Elapsed Time | 00:00:00,01 |

[DataSet0] C:\Users\keu\Desktop\Untitled1.sav

**ANOVA**

OPG_H14

|  | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 110,533 | 2 | 55,267 | 25,121 | ,000 |
| Within Groups | 26,400 | 12 | 2,200 | | |
| Total | 136,933 | 14 | | | |

## Post Hoc Tests

**Multiple Comparisons**

Dependent Variable: OPG_H14

LSD

| (I) Kelompok_H14 | (J) Kelompok_H14 | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Kelompok Kontrol Negatif | Kelompok Kontrol Positif | -6,60000* | ,93808 | ,000 | -8,6439 | -4,5561 |
| | Kelompok Uji P | -2,60000* | ,93808 | ,017 | -4,6439 | -,5561 |
| Kelompok Kontrol Positif | Kelompok Kontrol Negatif | 6,60000* | ,93808 | ,000 | 4,5561 | 8,6439 |
| | Kelompok Uji P | 4,00000* | ,93808 | ,001 | 1,9561 | 6,0439 |
| Kelompok Uji P | Kelompok Kontrol Negatif | 2,60000* | ,93808 | ,017 | ,5561 | 4,6439 |
| | Kelompok Kontrol Positif | -4,00000* | ,93808 | ,001 | -6,0439 | -1,9561 |

*. The mean difference is significant at the 0.05 level.

```
ONEWAY OPG_H21 BY Kelompok_H21
  /MISSING ANALYSIS
  /POSTHOC=LSD ALPHA(0.05).
```

# Oneway

**Notes**

| | | |
|---|---|---|
| Output Created | | 13-AUG-2021 10:50:25 |
| Comments | | |
| Input | Data | C:\Users\keu\Desktop\Untitled1.sav |
| | Active Dataset | DataSet0 |
| | Filter | <none> |
| | Weight | <none> |
| | Split File | <none> |
| | N of Rows in Working Data File | 30 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as missing. |
| | Cases Used | Statistics for each analysis are based on cases with no missing data for any variable in the analysis. |
| Syntax | | ONEWAY OPG_H21 BY Kelompok_H21 /MISSING ANALYSIS /POSTHOC=LSD ALPHA(0.05). |
| Resources | Processor Time | 00:00:00,02 |
| | Elapsed Time | 00:00:00,01 |

[DataSet0] C:\Users\keu\Desktop\Untitled1.sav

**ANOVA**

OPG_H21

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 56,933 | 2 | 28,467 | 9,816 | ,003 |
| Within Groups | 34,800 | 12 | 2,900 | | |
| Total | 91,733 | 14 | | | |

# Post Hoc Tests

**Multiple Comparisons**

Dependent Variable: OPG_H21

LSD

| (I) Kelompok | (J) Kelompok | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Kelompok Kontrol Negatif | Kelompok Kontrol Positif | -4,60000* | 1,07703 | ,001 | -6,9467 | -2,2533 |
| | Kelompok Uji P | -3,40000* | 1,07703 | ,008 | -5,7467 | -1,0533 |
| Kelompok Kontrol Positif | Kelompok Kontrol Negatif | 4,60000* | 1,07703 | ,001 | 2,2533 | 6,9467 |
| | Kelompok Uji P | 1,20000 | 1,07703 | ,287 | -1,1467 | 3,5467 |
| Kelompok Uji P | Kelompok Kontrol Negatif | 3,40000* | 1,07703 | ,008 | 1,0533 | 5,7467 |
| | Kelompok Kontrol Positif | -1,20000 | 1,07703 | ,287 | -3,5467 | 1,1467 |

*. The mean difference is significant at the 0.05 level.

```
T-TEST GROUPS=hari(2 1)
  /MISSING=ANALYSIS
  /VARIABLES=Kontrol_Negatif
  /CRITERIA=CI(.95).
```
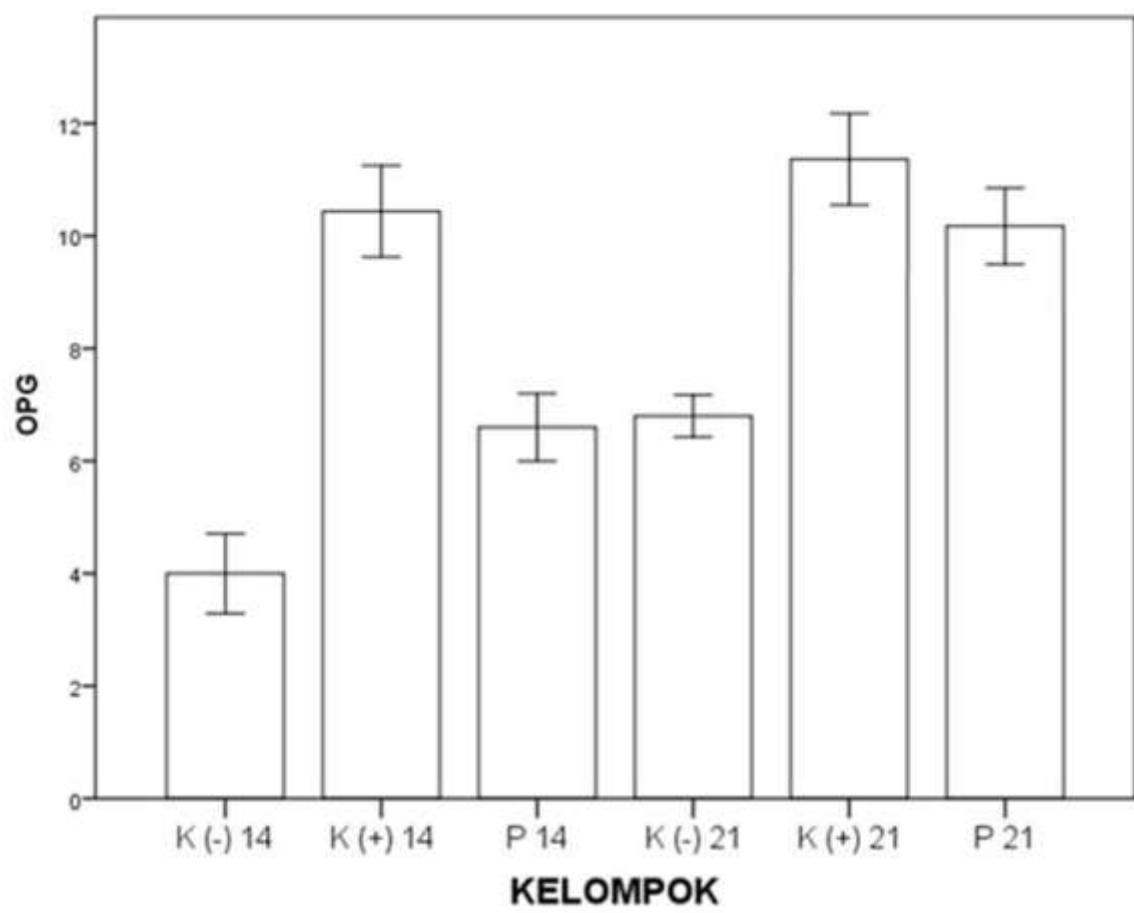
## Lampiran 7.

## Surat Etik Penelitian

KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI
UNIVERSITAS HASANUDDIN
FAKULTAS KEDOKTERAN GIGI
RUMAH SAKIT GIGI DAN MULUT
KOMITE ETIK PENELITIAN KESEHATAN
Sekretariat : Lantai 2, Gedung Lama RSGM Unhas
Jl. Kandea No. 5 Makassar

**RSGMP**

### REKOMENDASI PERSETUJUAN ETIK
Nomor: 0046/PL.09/KEPK FKG-RSGM UNHAS/2021

Tanggal: 17 Mei 2021

Dengan ini menyatakan bahwa protokol dan dokumen yang berhubungan dengan protokol berikut ini telah mendapatkan persetujuan etik:

| No. Protokol | UH 17120450 | No Protokol Sponsor | |
|---|---|---|---|
| Peneliti Utama | Drg. Gustivanny Dwipa A | Sponsor | Pribadi |
| Judul Peneliti | Efektivitas Bone Graft yang Mengandung Cangkang Kerang Mutiara terhadap Regenerasi Tulang Melalui Analisis Osteoprotegerin (OPG) | | |
| No. Versi Protokol | 1 | Tanggal Versi | 03 Mei 2021 |
| No. Versi Protokol | | Tanggal Versi | |
| Tempat Penelitian | 1. Laboratorium Politeknik Kimia Unhas 2. Laboratorium Hewan-entomologi FK Unhas 3. Balai Besar Laboratorium Kesehatan Makassar 4. Laboratorium Penelitian dan Pengembangan Science FMIPA Unhas 5. Klinik Hewan Lacoste 6. Laboratorium Patologi Anatomi RSPTN Unhas 7. Laboratorium Biokimia-Biomolekuler FK Universitas Brawijaya | | |
| Dokumen Lain | | | |
| Jenis Review | ☐ Exempted  ☒ Expedited  ☐ Fullboard | Masa Berlaku 17 Mei 2021-17 Mei 2022 | Frekuensi Review Lanjutan |
| Ketua Komisi Etik Penelitian | Nama: Dr. drg. Marhamah, M.Kes | Tanda Tangan | Tanggal |
| Sekretaris Komisi Etik Penelitian | Nama: drg. Muhammad Ikbal, Sp.Pros | Tanda Tangan | Tanggal |

Kewajiban peneliti utama:
- Menyerahkan Amandemen Protokol untuk persetujuan sebelum diimplementasikan
- Menyerahkan laporan SAE ke Komisi Etik dalam 24 Jam dan dilengkapi dalam 7 hari dan lapor SUSAR dalam 72 jam setelah peneliti utama menerima laporan.
- Menyerahkan laporan kemajuan (*progress report*) setiap 6 bulan untuk penelitian resiko tinggi dan setiap setahun untuk penelitian resiko rendah.
- Menyerahkan laporan akhir setelah penelitian berakhir.
- Melaporkan penyimpangan dari protokol yang disetujui (*protocol deviation/violation*)
- Mematuhi semua aturan yang berlaku.