

DAFTAR PUSTAKA

- Adhami, V.M., Syed, D.N., Khan, N., Afaq, F. 2008. Phytochemicals for prevention of Solar Ultraviolet Radiation Induced Damages. *Photochem Photobiol*,84 : 489-500.
- A.Adriani, S.A Armin. MN Massi, K Djawad., 2014. Protective effects of daily topical cocoa extract to the expression of 8-OHdG and PCNA on UVB exposed albino mice. *Int. J Biol Med Res* 5(4): 4607-4611.
- Akao, Y., Nakagawa, Y., Linuma, M. and Nozawa, Y., 2008. Anti-Cancer Effects of Xanthones from pericarps of Mangosteen. *International Journal of Molecular Sciences* 9, 355-370
- Ames, B, N., Shigenaga M.K., and Hagen T.M. 1993. Oxidant and Antioxidant and the Generative of Disease of aging. *Proc natl acad Sci. Usa.* Vol 90 : 7915-22.
- Ardhie, A.M., 2011. Radikal Bebas dan Peran Antioksidan dalam Mencegah Penuaan. *Medicinus.* Vol. 24(1): 4-9
- Baron, E.D. & Suggs, A.K. 2014. Introduction to photobiology. *Dermatologic clinics*, 32, 255-266
- Baumann, L., 2002. Antioksidant in : *Cosmetic Dermatology. Prinsip and Practise.* Hongkong : Mc Graw Hill. P. 105-6
- Blagoev, K.B., Goodwin, E.H., Bailey S.M. 2010. *Aging.* Albany NY, 2 (10): 727-30

- Chairungrilerd, N.K., Takeuchi, Y., Ohizumi, S., Nozoe and T. Ohta., 2007. Mangostanol, a prenyl xanthone from *garcinia manostana*. *Journal Phytochemistry* 43 (5) ; 1099-1102
- Chen, L., Hu, J.Y and Wang, S.Q., 2012. The Role Antioxidant in Photoprotection : a critical review. (cited 2012 Maay 15). *J. Am. Acad. Dermatol* July. Vol 496907.
- Cho ES, Lee KW, Lee HJ. 2008. Cocoa procyanidins protect PC12 cells from hydrogen-peroxide-induced apoptosis by inhibiting activation of p38 MAPK and JNK. *Mutation Research* 640 : 123-30.
- Costa, A., Dahirel, A. S., Grigoriou, F, M. (2014) The role of reactive oxygen species and metabolism on cancer cells and their microenvironmenty. *Sem. Canc Biol*, 25, 23-22 b
- Darr, D., Pinsel, S.R. 1997. Reactive oxygen species and antioxidant protection in photodermatology.In: Lowe NJ, Shaath NA, Pathak MA. *Sunscreens development, evaluation and aspects*. 2nd ed Marcel Dekker. New York. 155-173
- Dhanalaksmi, S., Malikarjuna G.U., Singh, R.P., Agarwal, P. 2004. Silibinin prevents ultraviolet radiation-caused skin damages in SKH-1 hairless mice via a decrease in thymine dimmer positive cell and an up-regulation of p53-p21/Cip1 in epidermis. *Carcinogenesis*. 25(8):1459-1464.

- Djawad, K. 2008. Protective effects of curcumin on the expression CPD, 8OHdG, apoptosis and hyperplasia of the epidermis. Medical Faculty Makassar, Hasanuddin University
- Diffey, B.L. 1999. Human exposure to ultraviolet radiation. Dalam: Hawk JLM. Photodermatology. Arnold. London.: 5-21
- Epstein, J.H. Biological effects of sunlight. Dalam: Lowe, N.J., Shaath N.A., Pathak, M.A. Sunscreens development, evaluation and regulatory aspects. 2nd ed Marcel Dekker. New York. 1997: 83-100.
- Ericson, YL. 2014. Pemberian Solutio Ekstrak Etanol Kulit Manggis (*Garcinia mangostana*) Meningkatkan Jumlah Kolagen Dermis dan Menurunkan Ekspresi Matriks Metalloproteinase-1 Pada Kulit Mencit Yang Dipapar UVB (Tesis). Denpasar: Universitas Udayana.
- Fisher, G.J., Wang, Z.Q., Datta, S.C., Varani J. 1997. Pathophysiology of premature skin aging induced by ultraviolet. *N Engl J Med.* 337:1419-28.
- Fisher, G.J., Kang, S., Varani J. 2002. Mechanism of Photoaging and Chronological skin aging. <http://www.arch.dermatol.com.vol138>.
- Fisher, G.J., Choi, H.C., Batta-C., Sorgo Z., Shao, Datta, ZQ Kang, S., 2007. Ultraviolet Irradiation Increase Matrix Metalloproteinase-8 Protein in Human Skin Invitro. *J. Invest Dermatol* 117-26.

- Fitri, E. W., Anwar, A.I., Djawad, K., Seweng , A., Changara, H. & Alam, G. 2016. The Effectiveness of topical Mangosteen Perivcarp Extract on the Collagen of Mice skin Exposed to Ultraviolet B. *American Journal of Clinical and Experimental Medicine*, 4, 88-93
- Gonzales, S. Fernandes-Lorente, M., Gilaberte-Calzada, Y. 2008. The latest of skin photoprotection. *Clinics in Dermatology*, 26: 614-26.
- Haliwell, b. and Gutteridge, J.M.C., 2006. *Free Radicals in Biology and Medicine*. London : Oxford University Press.
- Ichihashi, M., ando, h., Yoshida, M., Niki, y., matsui, M., 2009. Photoaging of the Skin. *JAAM*. 6(6) : 46 - 59
- Katiyar, S.K., Korman, N.J., Mukhtar, H., Agarwal, L. 1997. Protective effect of silymarin against photocarcinogenesis in a Mouse skin model. *J Natl Cancer Inst*. 89: 556-565
- Katiyar, S.K, Challa, A., McCormick, T.S., Cooper, K.D., Mukhtar H.. 1999. Prevention of UVB-induced immunosuppression in mice by the green tea polyphenol (-) epigallocatechin 3-gallate may be associated with alterations in IL-10 and IL-12 production. *Carcinogenesis*. 20(11): 2117-2124
- Kochevar, I.E., Pathak, M.A., Parrish, J.A. 2008. Photophysics, photochemistry and photobiology. In: Fitzpatrick, T.B, Eisen, A.Z ,

- Wolff, K. . Austen K.F.Goldsmith L.A. Katz S.I. Dermatology in General Medicine. 7th ed. McGraw-Hill Inc. New York. 1267-75
- Kraemer, K. H., Lee, M.-M., Andrews A, A.D & Lambert, W.C. 1994. The Role of sunlight and DNA repair in melanoma and nonmelanoma skin cancer: the xeroderma pigmentosum paradigm. Archives of dermatology, 130, 1018-1021.
- Kunwar A., Priyadarsini, K.L. (2011) Free Radicals, oxidative stress and importance of antioxidants in human health. *J.Med Allied Sci*, 1, 53-60
- Lim, H.W.2012. Photoprotection. In : Goldsmith LA, Katz SI, Gilchrest BA, Paller AS, Leffeell DJ, Wolff K, editors. Fitzpatrick's Dermatology in General Medicine. 8 ed. USA. Mc Graw Hill. 2707-13
- Lin, J.K., Shiau, S.Y. 2001. Mechanisms of cancer chemoprevention by curcumin. *Pro Natl Sc* . 25 (2):59-66.
- Lowe, N.J., Friedlander, J.1997. Sunscreens: Rationale for use to reduce photodamage and phototoxicity.In: Lowe, N.J., Shaath, N.A., Pathak, M.A. Sunscreens development, evaluation and regulatory aspects. 2nd ed Marcel Dekker. New York. 35-58.
- Marshall, PT and Huges GM., 2013. The Physiology of mammal and other vertebrata. Cambridge. University Press

- Masaki, H., 2010. Role of antioxidant in the skin : Anti aging effects. *J Dermatol Science*. Vol 58 : 85-90
- Matsumoto, K., Akao, Y., Kobayashi, E., Ohguchi, K., Ito, T., Tanaka, T., Iinuma, M. and Nozawa Y., 2003. Induction of apoptosis by xanthones from mangosteen in human leukemia cell lines. *Journal Nature Product*, 66(8) : 1124-1127
- Melia S, Novia D, Juliyarsi I, Purwati E. 2019 The characteristics of the pericarp of *garcinia mangostana* (mangosteen) extract as natural antioxidants in rendang. *InIOP Conference Series: Earth and Environmental Science*. (Vol. 287, No. 1, p. 012028). IOP Publishing. doi:10.1088/1755-1315/287/1/012028
- N Khairi, S As'ad, K. Djawad, G. Alam. 2019. Effects of *Klika Faloak* (*Sterculia Popufolia*) Extract Cream Toward MMP-1 Expression of Albino Mice Against Ultraviolet B Radiation. *Egyptian Journal of Basic and Clinical Pharmacology* 9.
- Patrick, M.H. 1977. Studies on thymine-derived UV photoproducts in DNA. Formation and biological role of pyrimidine adducts in DNA. *Photochemistry and photobiology* 25, 357-372.
- Pinnel, S.R., 2003. Cutaneous Photodamage, Antioxidant Stress and Topical Antioxidant. *J.Am. Acad Dermatol*. Vol 48 : 1-19.
- Priya, V., Jainu., Mohan, S.K., Saraswati, P and Gopan, C.S., 2010. Antimicrobial activity of pericarp extract of *garcinia mangostan* linn.

International Journal of Pharma Sciences and research vol. 1 (8)
p.278-281.

Seite, S., Fourtainer, A., Moyal D. & Young, A. 2010. Photodamage to human skin by suberythermal exposure to solar ultraviolet radiation can be attenuated by sunscreens : a review. *British Journal of Dermatology*, 163, 903-914

Supiyanti, W., Endang, D.W., Lia, K., 2010. Uji aktivitas Antioksidan dan Penentuan Kandungan Antosianin pada kulit buah manggis (*Garcinia Mangostana*). *Majalah Obat Tradisional* 15 (2). 64-70.

Susanti, M. & Putra, D.P 2012. Aktivitas perlindungan sinar UV kulit buah *Garcinia mangostana* Linn secara in vitro.

Suttirak W, Manurakchinakorn S. 2014. In vitro antioxidant properties of mangosteen peel extract. *J Food Sci Technol.* ;51(12):3546-3558.
doi:10.1007/s13197-012-0887-5

Travascio F. 2017. The Role of Matrix Metalloproteinase in Human Body Pathologies. *InTech Publisher*. Doi: <http://dx.doi.org/10.5772/66560>

Wang H, Guo B, Hui Q, Lin F, Tao K. 2020 CO2 lattice laser reverses skin aging caused by UVB. *Aging (Albany NY)*. Apr 30;12(8):7056.

Waspodo, N. N. 2012. Peran Ekstrak Biji Kakao Terhadap Penuaan Dini Kulit Setelah Pajanan Sinar Ultraviolet B (Eksresi Transforming Growth Factor β dan Matriks Metalloproteinase I (Disertasi). Makassar: Universitas Hasanuddin.

- Young, A.R.1999. The molecular and genetic effects of ultraviolet radiation exposure on skin cells. In: Hawk, J.L.M. Photodermatology.Arnold.London. : 25-38
- Young, A.R., Claveau, J. & Rossi, A.B. 2017. Ultraviolet radiation and the skin : Photobiology and sunscreen photoprotection. Journal of the American Academy of Dermatology, 76, S100-S109.g

LAMPIRAN



Kulit Manggis Telah dikeringkan



jBasis Krim dan Krim Ekstrak Kulit Manggis



Kelompok Mencit

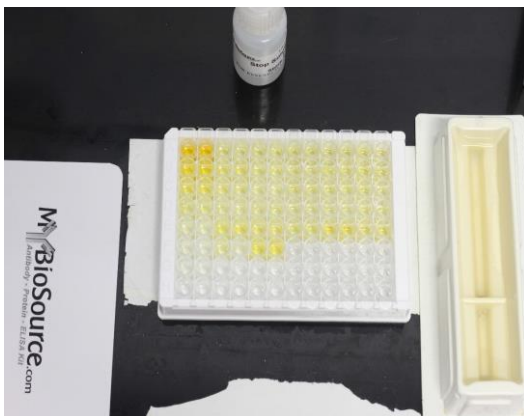
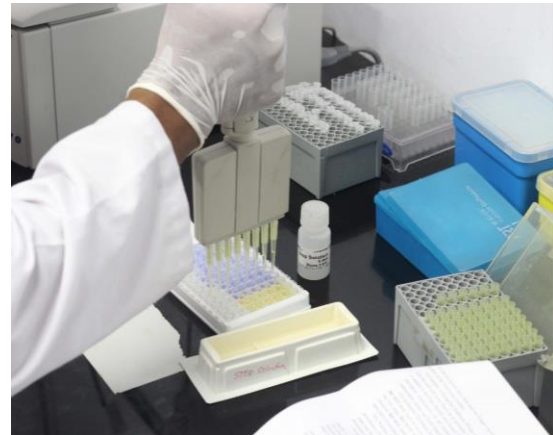
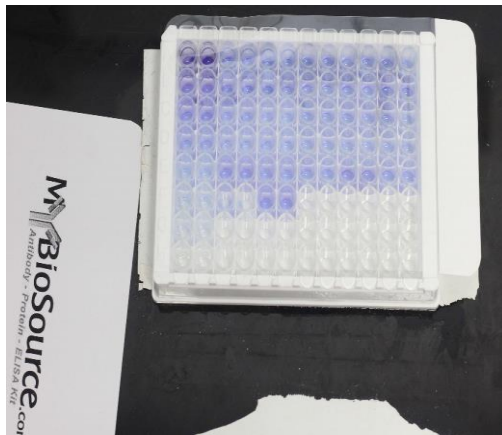


Primer RTPCR Gen MMP-1 / Housekeeping Gen GAPDH



ELISA KIT

- Mouse Carboxypeptidase D (CPD) Cat. No. MBS283314
- Mouse 8-Hydroxy-2-deoxyguanosine (8-OHdG) Cat. No. MBS263767



Elisa Assay

Hasil pemeriksaan ELISA Mouse Carboxypeptidase D (CPD) Cat. No. MBS283314

Setelah Perlakuan

No	No Sampel	Konsentrasi (ng/ml)	No	No Sampel	Konsentrasi (ng/ml)
1	SA01	97,123	1	SB01	104,17
2	SA02	98,781	2	SB02	94,221
3	SA03	101,682	3	SB03	92,148
4	SA04	106,242	4	SB04	113,289
5	SA05	108,729	5	SB05	114,947
6	SA06	105,413	6	SB06	44,062
7	SA07	100,024	7	SB07	55,669
8	SA08	96,293	8	SB08	34,114
9	SA09	112,046	9	SB09	52,353
10	SA10	110,802	10	SB10	39,917
11	SA11	107,071	11	SB11	102,926
12	SA12	114,118	12	SB12	100,853
13	SA13	109,559	13	SB13	95,464
14	SA14	93,392	14	SB14	91,319
15	SA15	112,875	15	SB15	108,315
16	SA16	91,584	16	SB16	87,881
17	SA17	111,742	17	SB17	59,907
18	SA18	96,521	18	SB18	63,61
19	SA19	113,799	19	SB19	84,59
20	SA20	100,634	20	SB20	74,717
21	SA21	94,464	21	SB21	61,964
22	SA22	104,748	22	SB22	58,262
23	SA23	109,273	23	SB23	71,837
24	SA24	102,28	24	SB24	65,255
25	SA25	93,229	25	SB25	42,218

Hasil pemeriksaan ELISA Mouse 8-hydroxy-desoxyguanosine (8-OHdG) Cat. No. MBS263767

			Setelah Perlakuan		
No	No Sampel	Konsentrasi ng/ml	No	No Sampel	Konsentrasi ng/ml
1	SA01	104,747	1	SB01	95,501
2	SA02	112,926	2	SB02	102,258
3	SA03	94,079	3	SB03	97,279
4	SA04	108,658	4	SB04	111,148
5	SA05	105,458	5	SB05	102,969
6	SA06	98,346	6	SB06	54,606
7	SA07	109,725	7	SB07	36,47
8	SA08	101,191	8	SB08	44,293
9	SA09	107,592	9	SB09	52,117
10	SA10	99,057	10	SB10	41,804
11	SA11	112,215	11	SB11	107,236
12	SA12	104,036	12	SB12	96,568
13	SA13	106,169	13	SB13	100,479
14	SA14	97,99	14	SB14	94,79
15	SA15	110,792	15	SB15	100,124
16	SA16	96,082	16	SB16	68,87
17	SA17	107,692	17	SB17	76,852
18	SA18	104,789	18	SB18	51,455
19	SA19	114,586	19	SB19	66,693
20	SA20	99,347	20	SB20	57,986
21	SA21	113,134	21	SB21	43,836
22	SA22	111,32	22	SB22	63,791
23	SA23	100,798	23	SB23	47,101
24	SA24	106,603	24	SB24	45,65
25	SA25	97,896	25	SB25	58,711

Hasil pemeriksaan RTPCR Gen MMP-1 / Housekeeping gen GAPDH

			Setelah Perlakuan		
NO	Sampel	Ekspresi (Fold change)	NO	Sampel	Ekspresi (Fold change)
1	LA01	13,404	1	LB01	13,685
2	LA02	11,595	2	LB02	11,331
3	LA03	14,494	3	LB03	14,281
4	LA04	12,839	4	LB04	13,111
5	LA05	15,106	5	LB05	15,662
6	LA06	14,605	6	LB06	7,957
7	LA07	13,331	7	LB07	8,822
8	LA08	14,748	8	LB08	9,492
9	LA09	15,505	9	LB09	8,678
10	LA10	13,722	10	LB10	7,481
11	LA11	14,717	11	LB11	13,654
12	LA12	12,973	12	LB12	12,597
13	LA13	14,397	13	LB13	11,646
14	LA14	15,69	14	LB14	12,463
15	LA15	13,431	15	LB15	11,843
16	LA16	14,549	16	LB16	9,518
17	LA17	12,773	17	LB17	8,67
18	LA18	11,56	18	LB18	8,134
19	LA19	15,913	19	LB19	9,309
20	LA20	13,78	20	LB20	9,747
21	LA21	13,357	21	LB21	7,161
22	LA22	15,331	22	LB22	9,751
23	LA23	14,667	23	LB23	7,846
24	LA24	12,69	24	LB24	7,565
25	LA25	14,167	25	LB25	8,654

**PERBANDINGAN NILAI CPD, MMP-1, DAN 8OHdG SETELAH
PERLAKUAN
PADA SETIAP KELOMPOK PERLAKUAN**

Uji normalitas data

		Tests of Normality					
		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Kelompok	Statistic	df	Sig.	Statistic	df	Sig.
OHdGsetelah	1	.226	5	.200*	.930	5	.595
	2	.199	5	.200*	.950	5	.734
	3	.247	5	.200*	.929	5	.592
	4	.193	5	.200*	.978	5	.925
	5	.303	5	.152	.856	5	.213
CPDsetelah	1	.218	5	.200*	.883	5	.323
	2	.190	5	.200*	.960	5	.806
	3	.165	5	.200*	.985	5	.960
	4	.203	5	.200*	.915	5	.496
	5	.241	5	.200*	.931	5	.602
MMPsetelah	1	.176	5	.200*	.988	5	.974
	2	.197	5	.200*	.974	5	.901
	3	.221	5	.200*	.925	5	.564
	4	.238	5	.200*	.930	5	.599
	5	.233	5	.200*	.933	5	.617

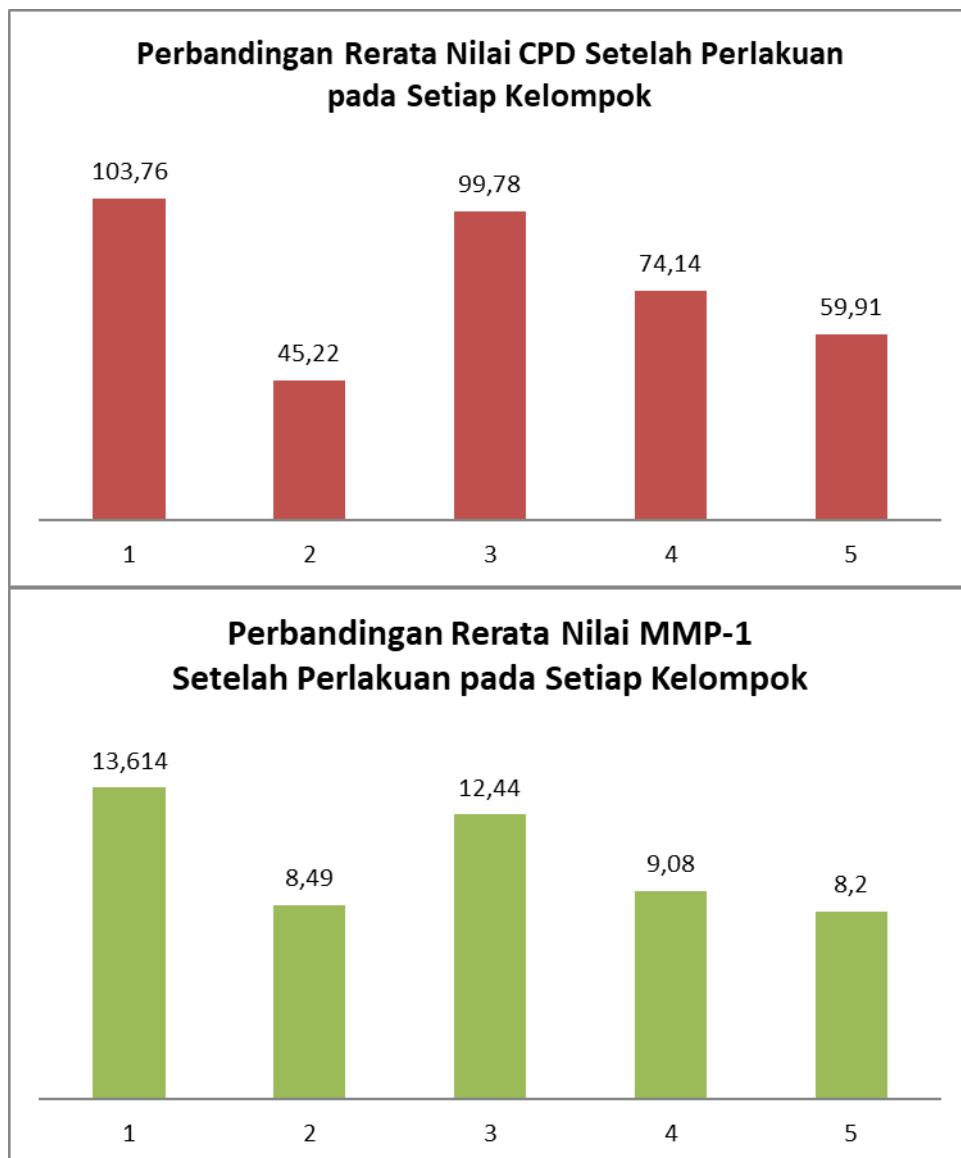
a. Lilliefors Significance Correction

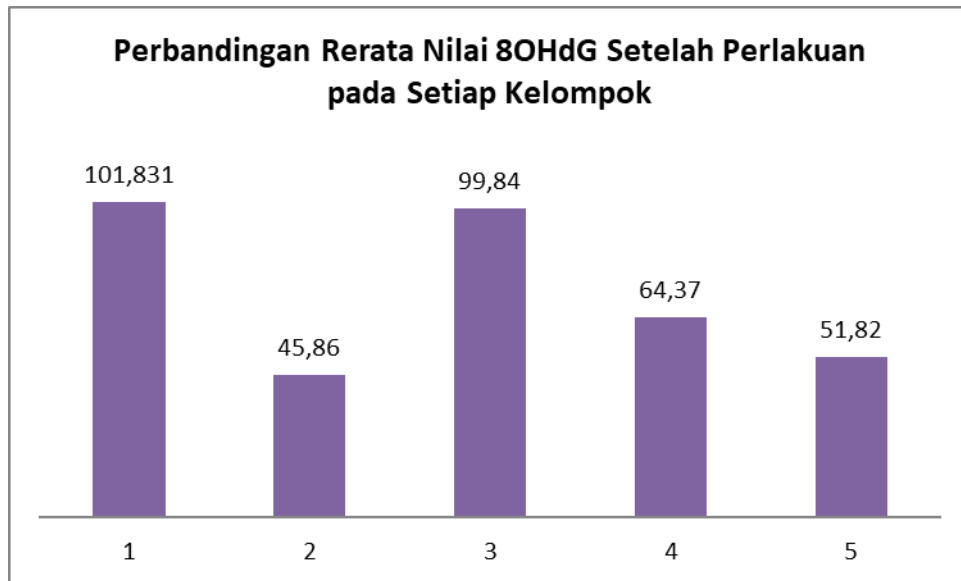
*. This is a lower bound of the true significance.

Data CPD, MMP-1, dan 8OHdG berdistribusi normal di seluruh kelompok perlakuan.

Nilai rerata dan simpang baku CPD, MMP-1, dan 8OHdG setelah perlakuan di seluruh kelompok perlakuan

Variabel	Kelompok	Rerata	Simpang baku
CPD	1	103.760	10.511
	2	45.22	8.844
	3	99.78	6.598
	4	74.14	12.367
	5	59.91	11.077
MMP-1	1	13.614	1.5898
	2	8.49	0.783
	3	12.44	0.788
	4	9.08	0.662
	5	8.20	1.027
8OHdG	1	101.831	6.1048
	2	45.86	7.462
	3	99.84	4.780
	4	64.37	9.862
	5	51.82	8.872





Uji Anova

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
OHdGsetelah	Between Groups	14055.404	4	3513.851	60.217	.000
	Within Groups	1167.065	20	58.353		
	Total	15222.470	24			
CPDsetelah	Between Groups	12718.488	4	3179.622	31.303	.000
	Within Groups	2031.502	20	101.575		
	Total	14749.990	24			
MMPsetelah	Between Groups	123.822	4	30.956	29.455	.000
	Within Groups	21.019	20	1.051		
	Total	144.841	24			

Multiple Comparisons

LSD

Dependent Variable	(I) Kelomp ok	(J) Kelomp ok	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
MMPsetelah	1	2	5.128*	.648	.000	3.78	6.48
		3	1.173	.648	.085	-.18	2.53
		4	4.538*	.648	.000	3.19	5.89
		5	5.419*	.648	.000	4.07	6.77
	2	1	-5.128*	.648	.000	-6.48	-3.78
		3	-3.955*	.648	.000	-5.31	-2.60
		4	-.590	.648	.374	-1.94	.76
		5	.291	.648	.659	-1.06	1.64
	3	1	-1.173	.648	.085	-2.53	.18
		2	3.955*	.648	.000	2.60	5.31
		4	3.365*	.648	.000	2.01	4.72
		5	4.245*	.648	.000	2.89	5.60
	4	1	-4.538*	.648	.000	-5.89	-3.19
		2	.590	.648	.374	-.76	1.94
		3	-3.365*	.648	.000	-4.72	-2.01
		5	.880	.648	.190	-.47	2.23
	5	1	-5.419*	.648	.000	-6.77	-4.07
		2	-.291	.648	.659	-1.64	1.06
		3	-4.245*	.648	.000	-5.60	-2.89
		4	-.880	.648	.190	-2.23	.47

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

Multiple Comparisons

LSD

Dependent Variable	(I) Kelomp ok	(J) Kelomp ok	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
CPDsetelah	1	2	58.532*	6.374	.000	45.24	71.83
		3	3.980	6.374	.539	-9.32	17.28
		4	29.614*	6.374	.000	16.32	42.91
		5	43.848*	6.374	.000	30.55	57.14
	2	1	-58.532*	6.374	.000	-71.83	-45.24
		3	-54.552*	6.374	.000	-67.85	-41.26
		4	-28.918*	6.374	.000	-42.21	-15.62
		5	-14.684*	6.374	.032	-27.98	-1.39
	3	1	-3.980	6.374	.539	-17.28	9.32
		2	54.552*	6.374	.000	41.26	67.85
		4	25.634*	6.374	.001	12.34	38.93
		5	39.868*	6.374	.000	26.57	53.16
	4	1	-29.614*	6.374	.000	-42.91	-16.32
		2	28.918*	6.374	.000	15.62	42.21
		3	-25.634*	6.374	.001	-38.93	-12.34
		5	14.234*	6.374	.037	.94	27.53
	5	1	-43.848*	6.374	.000	-57.14	-30.55
		2	14.684*	6.374	.032	1.39	27.98
		3	-39.868*	6.374	.000	-53.16	-26.57
		4	-14.234*	6.374	.037	-27.53	-.94

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

Multiple Comparisons

LSD

Dependent Variable	(I) Kelomp ok	(J) Kelomp ok	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
OHdGsetelah	1	2	55.973*	4.831	.000	45.90	66.05
		3	1.992	4.831	.685	-8.09	12.07
		4	37.460*	4.831	.000	27.38	47.54
		5	50.013*	4.831	.000	39.94	60.09
	2	1	-55.973*	4.831	.000	-66.05	-45.90
		3	-53.981*	4.831	.000	-64.06	-43.90
		4	-18.513*	4.831	.001	-28.59	-8.44
		5	-5.960	4.831	.232	-16.04	4.12
	3	1	-1.992	4.831	.685	-12.07	8.09
		2	53.981*	4.831	.000	43.90	64.06
		4	35.468*	4.831	.000	25.39	45.55
		5	48.022*	4.831	.000	37.94	58.10
	4	1	-37.460*	4.831	.000	-47.54	-27.38
		2	18.513*	4.831	.001	8.44	28.59
		3	-35.468*	4.831	.000	-45.55	-25.39
		5	12.553*	4.831	.017	2.48	22.63
	5	1	-50.013*	4.831	.000	-60.09	-39.94
		2	5.960	4.831	.232	-4.12	16.04
		3	-48.022*	4.831	.000	-58.10	-37.94
		4	-12.553*	4.831	.017	-22.63	-2.48

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