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The association between genetic polymorphism combination and cellular/molecular damage in dyestuff manufacturing workers

› pe‰ s „ ¡№SC 91-2320-B-038-012

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GSTT1 ¡B GSTP1 ƒ]« ‹ ⁄ §¿ ⁄ ⁄ §fi æ ˘' ¶ ¸

fi ' « …— 8- hydroxy- deoxyguanosine

¡]8-OH-dG¡ ^ ¥» ₱ c§¿ ⁄ W ¥ † ›M¶ g· ` « …—

⁄ §¶ ¡ ‟”‹ ^ ' °¡A· ` fl § ¥ X » P » H fl ø‹ ^ ⁄ §

ƒ MI ƒ] l¡C‹ ª s † ‟G¯ ¥ ƒ] u§ @.. ¯S' ` p

› f i ^‹ Ì ˜ ⁄ U¡A„ ' ‟ c § ‡ ¶ Ø ¥ ` † § ' ƒ †

, ß ‟”ƒ MI' °¡A ¥ B › Y‹ GSTM1 » P GSTT1

fi ˜ ƒ]« ‹ ‟ c § ‡ ¶ Ø ¥ ` ¨† § ‟”ƒ MI

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⁄]† s‟ ‟ c § ‡ ¶ Ø ¥ ` › ¨† § ' † v, ß ‟¡A › Y

ƒ P fi ‹ GSTP1 § C fi † v « ‹ ¡ B GSTT1 ⁄ ¸ GSTM1

fi ˜ « ‹ ⁄] ƒ †, ß ‟”ƒ MI' °¡C§¿ ⁄ ‟”

8-OH-dG ¿@« § e † {¤ k' ° ‟' ⁄ k' °¡B§ l ‟

‟' « § l ‟ ¡C§¿ ⁄ ‟” 8-OH-dG › ¨» P ‰ §¿

† ›M¶ g· ` › ¨† § ' ¤ ^ L¯ª ‹ ^ ¡A ;œ§¿ ⁄

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8-OH-dG ¡B‟ §¿ ⁄ W ¥ † ›M

Abstract

In the past study, the latent period of bladder cancer caused by occupational exposure is six months to fourty eight years. Benzidine- based dyes have been produced and used in Taiwan until 1992. It can be expected that new patients with urothelial cancer in the near future. About human cancerization process, academic world formerly just to probe into the environment factors. But under the same exposure, human shows differential susceptibility to diseases.The reason is the variations of genotype and enzyme activity between man to man which inherited.This study was designed to investigate the association of GSTT1 ¡A GSTM1 and GSTP1 genotype with the urothelial cells cycle in dye workers, who were working in a dyestuff manufactoring factory which established over twenty years and located at northern part of Taiwan. We hope to more define the risk factors about bladder cancer. The other part of this study is to measure urinary 8-hydroxy- deoxy-guanosine, which is a marker of oxidative damage. We hope to investigate the association between urinary 8-hydroxy-deoxyguanosine and urothelial cell damage in dyestuff manufacturing workers.As a result of our study exhibited those who carries genotype of GSTM1 null and GSTT1 null would influence the DNA ploidy of urothelial cells to become abnormal under the exposure

of benzidine. In smoking group, who carries genotype of GSTM1 null¡BGSTT1 null and slow GSTP1 would in higher risk of abnormal urothelial cells.Urinary 8-hydroxy-deoxyguanosine is not statiscally significant related with abnormal urothelial cells.
Keywords ¡Gglutathione S-transferase, polymorphism, 8-OH-dG, urothelial cells

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⁄ H ¯ Ø M`¤¥~" « ‰ Ł " " † ~ ╫⁄ ‹ ¤ › ¶ ¥ ‹ q ¡ A † ˜ ⁄ @ › ¶ ¥ ‹ q " " ˃ †‹ ⁄˘¡B` › ⁄ ¸⁄ , ¡ A ¥ †phase ◊»^fl enzyme¡ ^ ъ†ÇA¥ D › n ‹ O M †fl ›Ñ450 ¡]cytochrom P450¡ ˆ ¥D¡F† ˜ ⁄ G › ¶¥¥Dq"" ›n⁄ ˘ †‹– ƒX⁄ ˘ †¡A £"† ˃@¶ ¥ ‹ q˘«Æ †£" « ™⁄• »°¡A¥HS Q ¯¥X Ø~¡A†o› ¶‹ q "" › ŧd» ^ fl‹ † ˜ ⁄ G · »^ phase ¢" enzyme¡ˆA¥ D › nO¥H¢ i †,» fl ¡]glutathione S-transferase¡‹ ¥D¡£Ketter, B. and Christodoulides L.G. 1994¡ ⁄ ¡ C › ¤¯^ " ℵ" GSTs » fl ¤ ¤ †J¥ ‴c"‴fi t † $ ⁄ ¥ ‡Q⁄ ‹ ¥ ┤j^ ¡G£\¡B£k¡B£g¡B£c¡Af ¤^ « D 'ƒ†H¤ › ⁄ ₩£ŧd" » fl ‹ ¡'°"™" †{ ¡£Bell et al. 1992¡⁄¡ ₣o¤ ·» fl ‹O¤ x ƒ⁄¥D ›n" ‴ ‹ r» fl , s¡Aƒ†† \ ƒ ⁄hP¥\^ fl⁄S ŒÞb ⁄ £ ƒ P † ´¡·F†⁄ ¥h⁄˘ƒX"«ƒ pP ø"«¡B› P ¯ "« ¥¥i´·¥ 'M ¢ i "‴– ƒX⁄ ˘†– ¥X ¯ Ø ¥¡ÆJ„GST S Œ ″ t S⁄¤ ·™ ‰Ł› Pø '°"™›«›n¤⁄ƒ ¡£Armstrong, R.N. 1997¡ ƒC ¥ Shinka et al.¡£1998¡⁄"‴‹ ª ß«¥X GSTM1 ⁄fi˜ ƒ]« ‹ „ Vfi⁄ÆU"" c §¤t †¸⁄W¥ † ›M øƒ† 29.6%"‴´kƒ]ƒ°⁄ ⁄æ¡A"Ł ·`... ¯ S " ⁄ $ ™"„Fæ§051¡]95%CI¡ 1.37-18.61¡¡Ÿfi ¥H'„"‴‹ ªs¯ ¥ ¡AGSTM1 ⁄fi˜ ƒ]«‹" ¿ ' – ₩HfløS‹ „ ƒ MI'°‹ 1~2 ⁄S¶¡¡£Lin et al. 1991¡FZhong et al. 1993¡FBell et al. 1993¡FBrockmoller et al. 1994¡⁄¡A›Y„ ' "‴... ¯SS@‹ ªs¡A‹ „ ƒM I'°S · £"‹ 5.6¡A¥i¤ £ ¥⁄ ƒ]«‹'M‹Æ⁄ "" „ ƒ]⁄ ‡|‹ ⁄‹S@¥¸¡£Soni et al. 1995¡ ƒCDeakin et al.¡]1996¡^ƒ ⁄h" œflg "‴‹ ªs¯ ¥ GSTT1 ⁄fi˜ ƒ]«‹ƒ†¯ª "‴ƒM I¡A¥B»PGSTM1 ƒ@ƒP⁄ " ⁄fi ¡Afb GSTM1 ⁄fi˜ ƒ]«‹»P GSTT1 ⁄fi˜ ƒ]«‹"‴† ƒX ⁄U¡A‹ , ß ¤ ¥L"‴† ƒXƒ†,ß "‴" œflgƒ MI ' ¦F` M GST£c„⁄ H Ø"Ÿ˜ †¥ifl ƒ] £ƒP " ″˘ ·™ ‰Łƒ ⁄ £P¡Af ·™ ⁄ · "'₩GSTT1 »P GSTM1 ⁄@...¸•|... ¯T› PØ"‴' •P'° ¡£Rebbeck, T.R. 1997¡ ƒCfi ¥H'„"‴‹ ªs ¯ ¥ GSTP1 Ile105Val ƒP«‹ƒX⁄l„ » ⁄fl ø ⁄¸, AY øƒ†,ß "‴"ƒ MI'°¡£Harries et al. 1998¡⁄¡Ffb⁄@¤·^ ' œflg"‴... ƒ¡⁄ "R⁄⁄¡A »{‹ GSTP1 ‰ –→ ^ fl"„ ₭ " †¥i‡‹ •s ¥ ˝ ¸‰F"¥˝"«« ...—¡£Sato, K. 1989¡⁄¡A¤^¥B »P" v‡„ ‰F^˜" ℵ"S ^˜'°ƒ†‹ ^ ¡£Black, S.M. and Wolf, C.R. 1991¡⁄¡ M « e ₩ b ¢ ¯N¥~¤ "«‰£fiæ ƒb›G¡B" ⁄z¡B» fl ¡B¤¯—¡B¥ ‰S⁄¸"˝, ‰F † £†„ ₭ " †{"‴– S¸¡£Moscow et al. 1989¡FHowie et al. 1990¡FPeter et al. 1990¡F Singh et al. 1990¡FPeter et al. 1992¡FSingh et al. 1994¡FMulder et al. 1995¡FMulder et al. 1995¡FShimizu et al. 1995¡⁄¡FWatson et al. ¡£1998¡⁄»{‹ ... ¯S' ¥ ¤ „ " ″˘ ·‹r"« ⁄U⁄]•|†£¥˝GSTP1 ‰ –→ ^ fl"„ ₭ " †{¡A ¤^¸– ·œ† ·ƒS¸ƒ¤, ‰Ffi ¡A›Y‹ ‰ –→ fl fl ⁄O, ßfit"‴S Cfi˜†vGSTP1 ƒ]«‹⁄U† ‹ ƒM I¡C

„ ⁄⁄ƒsƒb †\ƒhSŧfiæƒ ¥ ¡Afp O2¡F–¡BH2O2¡B¡EOH¡BO2 ¥¥¡A¥˝" «Ø , ęʼn... ¯S' ¤ ⁄⁄¡£Kanofsky et al. 1988¡⁄¡A †o¤·fiæƒ ¥ •|¶ ŧJ† ›M"‴¥¿– '¥ Ñ´‹ ¡ °¡Af ⁄]ƒ†† ¥ •|'M⁄ ⁄lfp DNA¡Blipid¡B protein ¶if ⁄ ˘ †¡¶Aif ›Pfi æ˘'°¶ fi ‘¡F †o¤·⁄ ˘ †"‴o¥˝ Wŧv‹O 9¡104 hits/cell/day ¡£Fraga et al. 1990¡⁄¡Af 8-OH-dG ‹Of ¥ »P DNA ⁄ ˘†«Æ† –'¤£" " fl⁄˃ø‹q ¡£Kasai, H. and Nishimura, S. 1984¡ ƒC ªs « ¥X" › » ˆƒw•|⁄ _¯Ø⁄"„Ifi æ˘ƒ ¥ ⁄ ¸ fl⁄˘£⁄Q.. ₩[¡ A@fl°»{‹ »Hfl † ·⁄·I Stƒ†Prostaglandin H synthase¡A` pf i‹ ¤ † A "⁄¤ ‰ ŁA¥ i ⁄‹⁄¡ ‹ diimmine »Pƒ ¥ "⁄‰˘ƒX"«¡£Whysner et al. 1996¡⁄¡Af„ ¶ „q'°fi æ⁄ "«‰Ł L" k ₭ £A«h' S »† ›Mƒ †yƒ¤DNA "⁄"¶ fi¸¡Cfi æ˘'° £⁄⁄¤˘DNA ¤ ¤ fi æ˘'°¶ fi¸¡A8-OH-dG ·N‹⁄¤ ¥ ›fl › , «Æ"⁄"¥ Dn†£"«¡CS¿⁄"⁄"8-OH-dG ‹O¥ ⁄ HØ† ´·⁄¸ƒ †G¥ Ñ´ƒ ¤ ¡]¤£„˘ 2-6-3¡ˆA ·œ¶qS¿⁄"⁄"8-OH-dG S†¶q⁄ ⁄@,ß⁄£¤ ₭I⁄J '°"⁄", ¯ ¡A⁄]†\ L"k´ ƒ„⁄F, œflg⁄¸ƒ ⁄˘ "⁄" ¤ ¡Af –N¥i·£¤ ⁄@¶ ⁄H^ ƒMfi "⁄"¥˝"«

87 ／ H ¡ C … ƒ ¡ ／ @ ¯ ª ¥ ‰ ª„L／µ‰ƒ‡56%œ¡¯B›»ESWatson et al. ¡£1998¡／„ ƒ ~ ‚ Œ ¡ B ' ¡ B×Š‹Œ‰ƒ‡Š‹Œ‰ƒ‡Š‹Œ‰ƒ‡

mechanism, and evolution of the glutathione transferases. [Review] [121 refs] *Chemical Research in Toxicology*, **10**(1), 2-18.

2. Bell, D.A., Thompson, C.L., Taylor, J., Miller, C.R., Perera, F., Hsieh, L.L. and Lucier, G.W. (1992) Genetic monitoring of human polymorphic cancer susceptibility genes by polymerase chain reaction: application to glutathione transferase mu. Environmental Health Perspectives, 98, 113-117.

3. Bell, D.A., Taylor, J.A., Paulson, D.F., Robertson, C.N., Mohler, J.L. and Lucier, G.W. (1993) Genetic risk and carcinogen exposure: a common inherited defect of the carcinogen-metabolism gene glutathione S-transferase M1 (GSTM1) that increases susceptibility to bladder cancer. Journal of the National Cancer Institute, 85(14), 1159-1164.

4. Black, S.M. and Wolf, C.R. (1991) The role of glutathione-dependent enzymes in drug resistance. [Review] [149 refs] Pharmacology & Therapeutics, 51(1), 139-154.

5. Brockmoller, J., Kerb, R., Drakoulis, N., Staffeldt, B. and Roots, I. (1994) Glutathione S-transferase M1 and its variants A and B as host factors of bladder cancer susceptibility: a case-control study. Cancer Research, 54(15), 4103-4111.

6. Chenevix-Trench, G., Young, J., Coggan, M. and Board, P. (1995) Glutathione S-transferase M1 and T1 polymorphisms: susceptibility to colon cancer and age of onset. Carcinogenesis, 16(7), 1655-1657.

7. Deakin, M., Elder, J., Hendrickse, C., Peckham, D., Baldwin, D., Pantin, C., Wild, N., Leopard, P., Bell, D.A., Jones, P., Duncan, H., Brannigan, K., Alldersea, J., Fryer, A.A. and Strange, R.C. (1996) Glutathione S-transferase GSTT1 genotypes and susceptibility to cancer: studies of interactions with GSTM1 in lung, oral, gastric and colorectal cancers. Carcinogenesis, 17(4), 881-884.

8. Fraga, C.G., Shigenaga, M.K., Park, J.W., Degan, P. and Ames, B.N. (1990) Oxidative damage to DNA during aging: 8-hydroxy-2'-deoxyguanosine in rat organ DNA and urine. Proceedings of the National Academy of Sciences of the United States of America, 87(12), 4533-4537

9. Fraga, C.G., Shigenaga, M.K., Park, J.W., Degan, P. and Ames, B.N. (1990) Oxidative damage to DNA during aging: 8-hydroxy-2'-deoxyguanosine in rat organ DNA and urine. Proceedings of the National Academy of Sciences of the United States of America, 87(12), 4533-4537

10. Kasai, H. and Nishimura, S. (1984) Hydroxylation of deoxyguanosine at the C-8 position by ascorbic acid and other reducing agents. Nucleic Acids Research, 12(4), 2137-2145.

11. Ketterer, B. and Christodoulides, L.G. (1994) Enzymology of cytosolic glutathione S-transferases. [Review] [126 refs] Advances in Pharmacology (New York), 27, 37-69.

12. Lin, H.J., Han, C.Y., Bernstein, D.A., Hsiao, W., Lin, B.K. and Hardy, S. (1994) Ethnic distribution of the glutathione transferase Mu 1-1 (GSTM1) null genotype in 1473 individuals and application to bladder cancer susceptibility. Carcinogenesis, 15(5), 1077-1081.

13. Liu, Y.H., Taylor, J., Linko, P., Lucier, G.W. and Thompson, C.L. (1991) Glutathione S-transferase mu in human lymphocyte and liver: role in modulating formation of carcinogen-derived DNA adducts. Carcinogenesis, 12(12), 2269-2275.

14. Mulder, T.P., Manni, J.J., Roelofs, H.M., Peters, W.H. and Wiersma, A. (1995) Glutathione S-transferases and glutathione in human head and neck cancer. Carcinogenesis, 16(3), 619-624.

15. Mulder, T.P., Verspaget, H.W., Sier, C.F., Roelofs, H.M., Ganesh, S., Griffioen, G. and Peters, W.H. (1995) Glutathione S-transferase pi in colorectal tumors is predictive for overall survival. Cancer Research, 55(12), 2696-2702.

16. Murphy, W.M., Emerson, L.D., Chandler, R.W., Moinuddin, S.M. and Soloway, M.S. (1986) Flow cytometry versus urinary cytology in the evaluation of patients with bladder cancer. Journal of Urology, 136(4), 815-819.

17. Moscow, J.A., Fairchild, C.R., Madden, M.J., Ransom, D.T., Wieand, H.S., O'Brien, E.E., Poplack, D.G., Cossman, J., Myers, C.E. and Cowan, K.H. (1989) Expression of anionic glutathione-S-transferase and P-glycoprotein genes in human tissues and tumors. Cancer Research, 49(6), 1422-1428.

18. Peters, W.H., Wormskamp, N.G. and Thies, E. (1990) Expression of glutathione S-transferases in normal gastric mucosa and in gastric tumors. Carcinogenesis, 11(9),1593-1596.

19. Peters, W.H., Boon, C.E., Roelofs, H.M., Wobbes, T., Nagengast, F.M. and Kremers, P.G. (1992) Expression of drug-metabolizing enzymes and P-170 glycoprotein in colorectal carcinoma and normal mucosa. Gastroenterology, 103(2), 448-455.

20. Pilger A. Germadnik D. Formanek D. Zwick H. Winkler N. Rudiger HW. Habitual long-distance running does not enhance urinary excretion of 8-hydroxydeoxyguanosine. [Journal Article] European Journal of Applied Physiology & Occupational Physiology. 75(5):467-9, 1997.

21. Rebbeck, T.R. (1997) Molecular epidemiology of the human glutathione S-transferase genotypes GSTM1 and GSTT1 in cancer susceptibility. [Review] [121 refs] Cancer Epidemiology, Biomarkers & Prevention, 6(9), 733-743.

22. Sato, K. (1989) Glutathione transferases as markers of preneoplasia and neoplasia. [Review] [367 refs] Advances in Cancer Research, 52, 205-255.

23. Shimizu, K., Toriyama, F., Zhang, H.M. and Yoshida, H. (1995) The expression of placental-type glutathione S-transferase (GST-pi) in human cutaneous carcinoma in situ, that is, actinic keratosis and Bowen's disease, compared with normal human skin. Carcinogenesis, 16(10), 2327-2330.

24. Singh, S.V., Brunnert, S.R., Roberts, B. and Krishan, A. (1990) Differential expression of glutathione S-transferase, glutathione peroxidase and glutathione reductase in normal and malignant human breast tissues.Cancer Letters, 51(1), 43-48.

25. Singh, S.V., Xu, B.H., Tkalcevic, G.T., Gupta, V., Roberts, B. and Ruiz, P. (1994) Glutathione-linked detoxification pathway in normal and malignant human bladder tissue. Cancer Letters, 77(1), 15-24.

26. Smith, C.M., Kelsey, K.T., Wiencke, J.K., Leyden, K., Levin, S. and Christiani, D.C. (1994) Inherited glutathione-S-transferase deficiency is a risk factor for pulmonary asbestosis. Cancer Epidemiology, Biomarkers & Prevention, 3(6), 471-477.

27. Soni, M.G., Krishna, T.P. and Krishnaswamy, K. (1995) Human leukocyte glutathione S-transferase isozyme (class mu) and susceptibility to smoking-related cancers. Journal of Toxicology & Environmental Health, 46(1), 1-8.

28. Watson, M.A., Stewart, R.K., Smith, G.B., Massey, T.E. and Bell, D.A. (1998) Human glutathione S-transferase P1 polymorphisms: relationship to lung tissue enzyme activity and population frequency distribution. Carcinogenesis, 19(2), 275-280.

29. Whysner, J., Verna, L. and Williams, G.M. (1996) Benzidine mechanistic data and risk assessment: species- and organ-specific metabolic activation. [Review] [146 refs] Pharmacology & Therapeutics, 71(1-2), 107-126.

30. Zhong, S., Wyllie, A.H., Barnes, D., Wolf, C.R. and Spurr, N.K. (1993) Relationship between the GSTM1 genetic polymorphism and susceptibility to bladder, breast and colon cancer. Carcinogenesis, 14(9), 1821-1824.

" 1¡B‹ Vfi˘…t›ß⁄u⁄§ ¥»⁄H⁄f ˙,Œfi˘

¯ ¶	¤k ' °		⁄k ' °		` ` ›p	
	⁄H..˘	ƒ ° ⁄⁄æ	⁄H..˘	ƒ ° ⁄⁄æ	⁄H..˘	ƒ ° ⁄⁄æ
ƒ ≈ *	35.8±5.3[a]		31.9±5.4[a]		35.3±5.4[a]	
<30	21	10.71	10	34.48	31	13.78
30~34	60	30.61	10	34.48	70	31.11
35~39	74	37.76	7	24.14	81	36.00
¡ 40	41	20.92	2	6.90	43	19.11
⁄u§ @ ‡ "*ø						
ƒ ‹ F	9	4.59	1	3.45	10	4.44
« D {‡ı	69	35.20	24	82.76	93	41.33
† ‡ı	118	60.20	4	13.79	122	54.22
⁄u§@ƒ~,Œ						
<5	56	28.57	11	37.93	67	29.78
5~9	90	45.92	13	44.83	103	45.78
¡ 10	50	25.51	5	17.24	55	24.44
… ¯ S{*«						
§C… ¯S	91	46.44	21	72.41	112	49.78
"… ¯S	105	53.57	8	27.59	113	50.22
' † *"D	92	46.94	0	0.00	92	40.89
‡ s† "D*	47	23.98	0	0.00	47	20.89
‡ ' @ † "D	18	9.18	3	10.34	21	9.33
‡ flø† "D	87	44.39	13	44.83	100	44.44
‹ V v	3	1.63	0	0.00	3	1.41
– ˜ "f£ ^	1	0.54	0	0.00	1	0.47
§¿† "D#	105	53.57	18	62.07	123	54.67
ƒ §¿† "D	3	1.53	1	3.45	4	1.78
¥	10	5.10	0	0.00	10	4.44

[a] ¥ › §›Ë… — •»~

* P<0.05

" 2¡B› fi ¤k⁄k›ß⁄uS¿†G† ›M⁄ ¿¥N ´"«·œ'w›¨⁄ "R

	¤k'°›ß⁄u		⁄k'°›ß⁄u		¥ ¯Ø›ß⁄u	
	⁄ H˘	¡]%¡^	⁄ H˘	¡]%¡^	⁄ H˘	¡]%¡^
† ›M I g`⁄ "R	196	¡]100.0¡^	29	¡]100.0¡^	225	¡]100.0¡^
G_0G_1¡]%¡^	80.73 ± 21.00 ¡]5.2-98.2¡^		81.16 ± 17.75 ¡]11.4-98.0¡^		80.78 ± 20.69[a] ¡]5.2-98.2¡^	
¡ 83%	55	¡]28.1¡^	12	¡]41.4¡^	67	¡]29.8¡^
¡ 83%	141	¡]71.9¡^	17	¡]58.6¡^	158	¡]70.2¡^
S¡]%¡^	16.27 ± 20.17 ¡]0.7-92.2¡^		16.29 ± 16.32 ¡]0.4-67.3¡^		16.27 ± 19.68[a] ¡]0.4-92.2¡^	
¡ 17%	153	¡]78.1¡^	20	¡]69.0¡^	173	¡]76.9¡^
¡ 17%	43	¡]21.9¡^	9	¡]31.0¡^	52	¡]23.1¡^
G_2M¡]%¡^	2.99 ± 5.57 ¡]0.2-74.3¡^		2.54 ± 3.96 ¡]0.1-21.3¡^		2.93 ± 5.39[a] ¡]0.1-74.3¡^	
¥N ´"« " R	87¡]100.0¡^		12¡]100.0¡^		99¡]100.0¡^	
8-OH-dG[@] ¡]ng / ml¡^	2.18 ± 2.12 ¡]0.02-8.62¡^		1.81 ± 2.35 ¡]0.07-7.80¡^		2.13 ± 2.14[a] ¡]0.02-8.62¡^	
¡ 0.74	26	¡]29.9¡^	4	¡]33.3¡^	30	¡]30.3¡^
0.74~2.19	31	¡]35.6¡^	5	¡]41.7¡^	36	¡]36.4¡^
¡ 2.20	30	¡]34.5¡^	3	¡]25.0¡^	33	¡]33.3¡^

[a] ¥ S¡›¨¡ … •·›]† ⁄p›¨-† ⁄j›¨¡^

[@]8-hydroxy-deoxyguanosine

" 3¡B¤k'°›ß⁄u"c§¿† ›M¶g·`›¨†§–`»P GSTP1¡B GSTT1¡B GSTM1 ƒ]«‹† ƒX⁄§‡ ¡B ƒh¯ ¶ „ …˘ j´k⁄ "R¡]n=186¡^

	G_0G_1				OR	95%CI	‰ ª«Æ OR[a]	95%CI
	¡ 83%¥ ¿ –`"		¡ 83%†§– "					
ƒ«‹	⁄ H˘	¡]%¡^	⁄ H˘	¡]%¡^				
GSTP1 " fi†«‹	91	68.94	39	72.22	1			
§Cfi †v«‹	41	31.06	15	27.78	0.85	0.42-1.72	0.75	0.35-1.58
GSTT1 « DIfi˜«‹	74	56.06	27	50.00	1			
Ifi˜«‹	58	43.94	27	50.00	1.28	0.68-2.41	1.40	0.71-2.76
GSTM1 « D fi˜«‹	64	48.48	18	33.33	1			
L fi«‹	68	51.52	36	66.67	1.88[#]	0.97-3.65	1.52	0.76-3.06
GSTP1 "fi˜†v«‹»P GSTM1 « D fi˜«‹	45	34.09	14	25.93	1			
Others	65	49.24	29	53.70	1.43	0.68-3.01	1.14	0.51-2.54
GSTP1 §Cfi ˜«‹† »P GSTM1 L fi«‹	22	16.67	11	20.37	1.61	0.63-4.11	1.17	0.43-3.20
GSTP1 "fi˜†v«‹»P GSTT1 « D fi˜«‹	52	39.39	21	38.89	1			
Others	61	46.21	24	44.44	0.97	0.49-1.95	0.98	0.47-2.04
GSTP1 §Cfi ˜«‹† »P GSTT1 L fi«‹	19	14.39	9	16.67	1.17	0.46-3.01	1.13	0.42-3.05
GSTT1 « D fi˜»R GSTM1 « D fi˜«‹	34	25.76	12	22.22	1			
Others	70	53.03	21	38.89	0.85	0.38-1.93	0.75	0.31-1.80
GSTT1 L fi«»P GSTM1 L fi«‹	28	21.21	21	38.89	2.13[#]	0.89-5.06	1.87	0.74-4.75
GSTT1¡B GSTM1 « D Lfi˜ «‹»P GSTP1 "fi˜†v«‹	25	18.94	10	18.82	1			
Others	98	74.24	37	72.58	0.94	0.41-2.15	0.83	0.34-2.01
GSTT1¡B GSTM1 fi˜ «‹»P GSTP1 §Cfi˜†v«‹	9	6.82	7	8.60	1.94	0.57-6.65	1.83	0.49-6.85

¥ h ƒ §B¿ † ¥ ¥ §–`› fi

a ‰ ƒ~¡˜B⁄ u § ®ı¡'B⁄ u § ƒ~¡,K¶ …s¡B' ¡B x§¿

[#] 0.05<P<0.1

" 4¡B¤k'°›ß⁄u"c$¿⁄W¥ † ›M‖g·`›¨⁄$ƒh¯ ¶ „ …‰˘ j´k⁄ "R(n=87)

¯ ¶	… ƒ⁄@ OR	95%CI	… ƒ⁄G OR	95%CI	… ƒ⁄T OR	95%CI	… ƒ¥| OR	95%CI
ƒ ≈								
<36					1		1	
¡ 36					0.24#	0.05-1.03	0.24#	0.06-1.06
⁄ u $ @¡"ø								
« D …¯S	1		1		1		1	
… ¯S	1.09	0.34-3.51	0.86	0.25-2.95	0.78	0.22-2.73	0.61	0.16-2.31
⁄ $@ƒ~,Œ								
0~4	1		1		1		1	
5~9	1.29	0.36-4.57	1.16	0.31-4.30	1.96	0.48-7.97	1.78	0.41-7.70
¡ 10	0.48	0.11-2.04	0.43	0.10-1.81	0.99	0.16-6.06	0.90	0.14-5.65
' † "D								
L	1		1		1		1	
ƒ‡	1.58	0.50-5.03	1.72	0.54-5.43	1.35	0.40-4.53	1.42	0.42-4.82
‡ s† "D								
L					1		1	
ƒ‡					2.54	0.69-9.38	2.52	0.67-9.49
$¿† "D								
L	1		1		1		1	
ƒ‡	3.56*	1.07-11.89	3.75*	1.12-12.56	5.52*	1.37-22.25	5.63*	1.41-22.53
8OHdG ›·@								
¡ 2.20ng/ml	1		1		1		1	
¡ 2.20ng/ml	1.29	0.39-4.25	1.21	0.37-4.01	1.02	0.29-3.59	0.96	0.21-3.43
ƒ † ‡X								
GSTT1¡GSTM1 «D Ifi ‹«			1				1	
Others			0.71	0.18-2.88			0.82	0.19-3.60
GSTT1¡GSTM1 Ifi ‹«			2.15	0.53-8.75			2.22	0.49-4.02
trend			p=0.27				p=0.28	
ƒ]«‹† ƒX2								
GSTT1¡GSTM1 «D Lfi ‹« »P GSTP1 "fi ‹«	1				1			
Others	0.99	0.26-3.85			1.12	0.26-4.79		
GSTT1¡GSTM1 Lfi ‹« »P GSTP1 $Cfi ‹«	2.79	0.38-20.58			2.53	0.30-21.45		
trend	p=0.44				p=0.47			

¥ h £ƒ$¿¡B † ¥ ¥ $–'›@8-hydroxy-deoxyguanosine

0.05<P<0.1 * P<0.05