

- May 27-30, 2007
122. Shiraishi T, Yasui W, et al. The effect of activity outside the field of view in estimation of human neuroreceptor binding with PET. 2007 Annual Congress of the European Association of Nuclear Medicine, Copenhagen (Denmark), October 10-17, 2007
 123. Oue N, Yasui W, et al. Serum Concentration of Reg IV in patients with colorectal cancers. The 17th International Symposium of the Hiroshima Cancer Seminar "Radiation Therapy of Cancer", Hiroshima (Japan), November 11, 2007
 124. Sentani K, Yasui W, et al. Gene expression profiling with microarray and SAGE identifies PLUNC as a marker for hepatoid adenocarcinoma of the stomach. The 17th International Symposium of the Hiroshima Cancer Seminar "Radiation Therapy of Cancer", Hiroshima (Japan), November 11, 2007
 125. Ohara S, Yasui W, et al. Reg IV is an independent prognostic indicator of relapse of prostate cancer. The 17th International Symposium of the Hiroshima Cancer Seminar "Radiation Therapy of Cancer", Hiroshima (Japan), November 11, 2007
 126. Yasui W Transcriptome dissection of gastric cancer through serial analysis of gene expression to identify novel diagnostic and therapeutic targets. The 14th Seoul International Cancer Symposium "Gastric carcinogenesis and clinical implication", Seoul (Korea), November 19, 2007
 127. Yasui W, et al. Recent Topics: Molecular Pathobiology of gastric cancer. Japan-Korea Gastrointestinal Pathology Joint Meeting, Short Lecture, The 80th Annual Meeting of the Japanese Gastric Cancer Association, Yokohama (Japan), February 28, 2008
 128. 安井 弥. がん登録資料はどのように活用されるのかー 広島県でがんは増えているのか?ー. 第16回地域がん登録全国協議会総会研究会, 市民公開講座, 2007年9月7日, 広島
 129. 大上直秀, 安井 弥, 他. 転移遺伝子: 胃がんにおいてWnt-5aは β -catenin異常蓄積のない症例で高発現しており予後不良と相関している. 第16回日本がん転移学会総会, ワークショップ1, 2007年7月9-10日, 富山
 130. 大上直秀, 安井 弥, 他. 血清腫瘍マーカーとしてのRegIVの有用性: 大腸がんにおいてRegIV高値は肝転移と関連している. 第27回日本分子腫瘍マーカー研究会, ワークショップ1, 2007年10月2日, 東京
 131. 山本英喜, 安井 弥, 他. Cell migration and invasion induced by Wnt-5a in gastric cancer. ワークショップ5, 第66回日本癌学会総会, 2007年10月3-5日, 横浜
 132. 大上直秀, 安井 弥, 他. SAGE-based microarray for gastric cancer identifies SEC11A as a marker for tumor progression. ワークショップ14, 第66回日本癌学会総会, 2007年10月3-5日, 横浜
 133. 安井 弥. がんの分子診断学. 日本がん治療学会第13回教育セミナー, 2007年10月26日, 京都
 134. 仙谷和弘, 安井 弥, 他. 網羅的遺伝子解析法で同定されたPLUNCは胃原発 hepatoid adenocarcinomaの新規マーカーである. 第18回日本消化器癌発生学会, シンポジウム1, 2007年11月8-9日, 札幌
 135. 大上直秀, 安井 弥, 他. SAGE法で同定したRegIV遺伝子の上流/下流の解析と診断への応用. 第18回日本消化器癌発生学会, シンポジウム1, 2007年11月8-9日, 札幌
 136. 坂本直也, 安井 弥, 他. 大腸がんにおける血清RegIVの解析: RegIVは肝転移と関連している. 第18回日本消化器癌発生学会, ワークショップ3, 2007年11月8-9日, 札幌
 137. 安井 弥. がんの生物学. 2007年度第1回日本がん治療認定医機構教育セミナー, 2008年1月13-14日, 東京
 138. 大上直秀, 安井 弥. 胃がんの新規血清診断マーカーRegIV. 第80回日本胃癌学会総会, シンポジウム, 2008年2月27-29日, 横浜
 139. Miyamoto K, et al. MDFI (MyoD family inhibitor), which regulates myogenic and Wnt/ β -catenin signaling pathways, is inactivated in human breast cancer by epigenetic gene silencing. The 98th Annual Meeting of the American Association for

- Cancer Research, Los Angeles, California (USA), April 14-18, 2007
140. Saito A, Miyamoto K, et al. Epigenetic alteration of SMAD4 in human breast, lung, and ovarian cancers. 第66回日本がん学会学術総会, 2007年10月3-5日, 横浜
141. Terada k, Miyamoto K, et al. Association between the CpG island methylator phenotype and clinicopathological findings in human breast cancers. 第66回日本がん学会学術総会, 2007年10月3-5日, 横浜
142. 川上洋介, 宮本和明, 他. 卵巣がんにおける腫瘍抑制遺伝子RUNX3のエピジェネティックな異常 第45回日本癌治療学会総会, 2007年10月24-26日, 京都
143. 吉田裕, 宮本和明. 乳がんにおける多剤耐性遺伝子MDR1のエピジェネティックな異常第6回日本臨床腫瘍学会学術集会, 2008年3月20-21日, 福岡
144. Nakachi K, Hayashi T, Hamatani K, Eguchi H, Kusunoki Y. HIROSHIMA 60 YEARS: Monitoring of Survivors – Current Progress in Molecular Epidemiology Studies. 5th International Conference on Environmental Mutagens in Human Populations, Antalya (Turkey), May 20-24, 2007
145. Hamatani K, Nakachi K, et al. Gene alterations preferentially occurred in adult-onset papillary thyroid cancer among atomic bomb survivors. 13th International Congress of Radiation Research, San Francisco, California (USA), July 8-12, 2007
146. Eguchi H, Hamatani K, Yasui W, Nakachi K, et al. Microsatellite instability in colorectal cancers among atomic-bomb survivors. 13th International Congress of Radiation Research, San Francisco, California (USA), July 8-12, 2007
147. Takahashi K, Eguchi H, Nakachi K, Hamatani K, et al. Gene alterations preferentially occurred in adult-onset papillary thyroid cancer among atomic-bomb survivors. 8th Korea-Japan Cancer and Aging Symposium, Gifu (Japan), August 10-11, 2007
148. 濱谷清裕, 江口英孝, 中地 敬, 他. 原爆被爆者に発生した成人甲状腺がんにおいて優先的に選択される遺伝子変異. 第66回日本癌学会学術総会, 2007年10月3-5日, 横浜
149. 江口英孝, 濱谷清裕, 安井 弥, 中地 敬, 他. 原爆被爆者に発生した大腸がんにおけるマイクロサテライト不安定性に関連した遺伝子変異. 第66回日本癌学会学術総会, 2007年10月3-5日, 横浜
150. 多賀正尊, 江口英孝, 濱谷清裕, 安井 弥, 中地 敬, 他. 原爆被爆者で発生した非小細胞肺癌におけるp53遺伝子変異(第2報). 第66回日本癌学会学術総会, 2007年10月3-5日, 横浜
151. Yoshida K, Kusunoki Y, Nakachi K, et al. A genome approach to inter-individual variations in cancer susceptibility among atomic-bomb survivors. The 12th Congress of the International Association of Biomedical Gerontology (IABG), Spetses island (Greece), May 20-24, 2007
152. Hamasaki K, Kusunoki Y, Nakachi K, et al. Cytogenetic instability in peripheral blood T lymphocytes cultured in vitro from A-bomb survivors. The 13th International Congress of Radiation Research, San Francisco, California (USA), July 8-12, 2007
153. Hayashi T, Kusunoki Y, Nakachi K, et al. Effects of inflammation-related gene polymorphisms and atomic-bomb radiation exposure on gastric cancer risk. The 13th International Congress of Radiation Research, San Francisco, California (USA), July 8-12, 2007
154. Hayashi T, Kusunoki Y, Nakachi K, et al. Gastric cancer risks among atomic-bomb survivors differ by HLA class I genotype. Joint ESTP/IFSTP Congress of Toxicologic Pathology, Basel (Switzerland), September 16-19, 2007
155. Nagamura H, Kusunoki Y, Nakachi K, et al. Effects of inflammation-related cytokine gene polymorphisms on gastric cancer risk among atomic bomb survivors. Joint ESTP/IFSTP Congress of Toxicologic Pathology, Basel (Switzerland), September 16-19, 2007
156. Morishita Y, Kusunoki Y, Nakachi K, et al. Elevated levels of plasma reactive oxygen species and inflammatory markers among atomic-bomb survivors. Joint

- ESTP/IFSTP Congress of Toxicologic Pathology, Basel (Switzerland), September 16-19, 2007
157. Hayashi T, Kusunoki Y, Nakachi K, et al. Effects of inflammation-related gene polymorphisms and atomic-bomb radiation exposure on gastric cancer risk. The 12th World Congress on Advances in Oncology and the 10th International Symposium on Molecular Medicine and Cancer Chemoprevention Symposium, Crete (Greece), October 11-13, 2007
158. Ohishi W, Kusunoki Y, Nakachi K, et al. Immunological profiles in the persistence and disease progression of hepatitis C virus infection. The 18th Conference of the Asian Pacific Association for the Study of the Liver, Seoul (Korea), March 23-26, 2008
159. Hamasaki K, Kusunoki Y, Nakachi K, et al. Chromosome tests in clonally proliferated T lymphocytes in vitro from A-bomb survivors do not suggest presence of genetic instability. 8th International Symposium on Chromosome Aberrations, Awaji (Japan), October 4-6, 2007
160. 濱崎幹也, 楠 洋一郎, 中地 敬, 他. 原爆被爆者末梢血リンパ球の in vitro 長期培養クローンにおける染色体不安定性について. 第48回原子爆弾後障害研究会, 2007年6月3日, 広島
161. 今井一枝, 中地 敬, 他. 発がんリスクを高める喫煙がおよぼす炎症・免疫関連生体指標への影響. がん予防大会 in Tokyo 2007, 2007年7月12-13日, 東京
162. 今井一枝, 中地 敬, 他. 一般住民コーホートで観察された喫煙の生体影響と生活習慣病の分子疫学研究. 平成18年度喫煙科学研究財団研究発表会, 2007年7月12日, 東京
163. 高橋恵子, 江口英孝, 中地 敬, 濱谷 清裕, 他. 原爆被爆者に発生した成人甲状腺乳頭がんにおいて優先的に起こった遺伝子変異. 第8回日韓がん老化シンポジウム, 2007年8月10-11日, 岐阜
164. 林 奉権, 中地 敬, 他. 血清・血液細胞における活性酸素種の分光光度法およびフローサイトメトリー法によるハイスループットな測定システム. 第8回日韓がん老化シンポジウム, 2007年8月10-11日, 岐阜
165. 吉田健吾, 楠 洋一郎, 中地 敬, 他. 放射線によって誘発される細胞死: ヒト白血球細胞におけるアポトーシスとネクローシス. 第8回日韓がん老化シンポジウム, 2007年8月10-11日, 岐阜
166. 濱谷清裕, 江口英孝, 中地 敬, 他. 原爆被爆者に発生した成人甲状腺がんにおいて優先的に選択される遺伝子変異. 第66回日本癌学会学術総会, 2007年10月3-5日, 横浜
167. 今井一枝, 楠 洋一郎, 中地 敬, 他. 炎症およびがん関連免疫におよぼす喫煙の影響. 第66回日本癌学会学術総会, 2007年10月3-5日, 横浜
168. 濱崎幹也, 楠 洋一郎, 中地 敬, 他. 試験管内でクローン増殖させた原爆被爆者Tリンパ球は染色体調査において遺伝的不安定性を示さない. 第8回国際染色体異常シンポジウム, 2007年10月4-6日, 淡路
169. 林 奉権, 楠 洋一郎, 中地 敬. 炎症関連サイトカイン遺伝子多型と原爆放射線被曝が胃がんリスクに及ぼす影響. 第37回日本免疫学会総会・学術集会, 2007年11月20-22日, 東京
170. 濱崎幹也, 楠 洋一郎, 中地 敬, 他. 試験管内でクローン増殖させた原爆被爆者Tリンパ球における染色体不安定性の研究. 第5回広島大学21世紀COEプログラム国際シンポジウム, 2008年1月23-24日, 広島
171. 楠 洋一郎, 中地 敬, 他. 原爆被爆者集団における末梢血ナイーブCD4T細胞比率の加齢あるいは被ばく線量依存性の低下にCD45遺伝子多型との関連性は見られない. 第17回日本サイトメトリー学会, 2007年7月5-6日, 浦安
172. 濱崎幹也, 中地 敬, 楠 洋一郎, 他. X線を全身照射したBALB/cおよびC57BL/6マウスにおける小核網状赤血球のフローサイトメトリーによる解析: 遺伝的不安定性が照射後長期にわたって生体内で持続する証拠. 第50回日本放射線影響学会, 2007年11月14-17日, 千葉
173. 楠 洋一郎, 中地 敬, 他. 慢性C型肝炎ウイルス感染の肝病態の進行にともなうTh1優位の免疫応答. 第37回日本免疫学会総会・学術集会 2007年11月20-22

- 日, 東京
174. 西 信雄. Risk of second primary cancers among atomic bomb survivors. 第66回日本癌学会学術総会, 2007年10月3-5日, 横浜
175. 西 信雄, 他. 結腸の詳細部位別にみたがん罹患の放射線関連リスク. 第50回日本放射線影響学会, 2007年11月14-17日, 千葉
176. 顧永清, 神谷研二, 他. Characterization of a human DNA helicase, PIF1, which is responsible for chromosomal integrity. 13th International Congress of Radiation Research, San Francisco, California (USA), July 8-12, 2007
177. 朴金蓮, 神谷研二, 他. Deoxycytidyl transferase activity of human REV1 and its substrate specificity. 13th International Congress of Radiation Research, San Francisco, California (USA), July 8-12, 2007
178. 増田雄司, 神谷研二, 他. Dynamic properties of human replication factors in the elongation of DNA replication. CSHL Meeting-Eukaryotic DNA Replication & Genome Maintenance, New York (USA), September 5-9, 2007
179. 増田雄司, 神谷研二, 他. ヒトDNA複製装置のダイナミクス. 日本遺伝学会第79回大会, 2007年9月19-21日, 岡山
180. 増田雄司, 神谷研二, 他. 損傷乗り越えDNA合成におけるポリメラーゼ交換反応と複製装置のダイナミクス. 第66回日本癌学会学術総会, 2007年10月3-5日, 横浜
181. 豊島めぐみ, 神谷研二, 他. 損傷乗り越えDNA合成酵素Rev1の発がんにおける役割. 第66回日本癌学会学術総会, 2007年10月3-5日, 横浜
182. 増田雄司, 神谷研二, 他. ヒトDNA複製装置のダイナミクスとポリメラーゼ交換反応. 第50回日本放射線影響学会, 2007年11月14-17日, 千葉
183. 豊島めぐみ, 神谷研二, 他. 損傷乗り越えDNA合成酵素Rev1の発がんにおける役割. 第50回日本放射線影響学会, 2007年11月14-17日, 千葉
184. 顧永清, 神谷研二, 他. 染色体の恒常性維持に必要とされるDNAヘリカーゼPIF1の生化学的機能解析. 第50回日本放射線影響学会, 2007年11月14-17日, 千葉
185. 朴金蓮, 神谷研二, 他. 損傷乗り越えDNA合成におけるREV1のdCMP転移活性の生化学的解析. 第50回日本放射線影響学会, 2007年11月14-17日, 千葉
186. 増田雄司, 神谷研二, 他. ヒトDNA複製装置のダイナミクスとPCNAのユビキチン化. 第30回日本分子生物学会年会・第80回日本生化学会大会合同大会 (BMB2007), 2007年12月11-15日, 横浜

G. 知的財産権の出願・登録状況

1. 特許取得

なし

2. 実用新案登録

なし

3. その他

なし

II. 研究成果の刊行に関する一覧表

<平成21年度>

書籍

著者氏名	論文タイトル名	書籍全体の 編集者名	書 籍 名	出版社名	出版地	出版年	ページ
Yasui W, Sentani K, Sakamoto N, Motoshita J and Oue N	Histological and serological tumor markers of gastric cancer	Dan Hellberg M	Histological and serological tumor markers and their clinical usefulness in cancers	Nova Science Publishers	New York	2009	93-111

雑誌

発表者氏名	論文タイトル名	発表誌名	巻号	ページ	出版年
Ueda T, Volinia S, Okumura H, Shimizu M, Taccioli C, Rossi S, Alder H, Liu C-G, Oue N, Yasui W, Yoshida K, Sasaki H, Nomura S, Seto Y, Kaminishi M, Calin G and Carlo CM	Relation between microRNA expression and progression and prognosis of gastric cancer: a microRNA expression analysis	Lancet Oncol	11	136-146	2010
Sakamoto N, Oue N, Noguchi T, Sentani K, Anami K, Sanada Y, Yoshida K and Yasui W	Serial analysis of gene expression of esophageal squamous cell carcinoma: ADAMTS16 is up- regulated in esophageal squamous cell carcinoma	Cancer Sci	in press		2010 2009 Dec 16. [Epub ahead of print]
Yamamoto H, Oue N, Sato A, Hasegawa Y, Yamamoto H, Matsubara A, Yasui W and Kikuchi A	Wnt5a signaling is involved in aggressiveness of prostate cancer and expression of metalloproteinase	Oncogene	in press		2010 2010 Jan 18. [Epub ahead of print]
Sentani K, Oue N, Noguchi T, Sakamoto N, Matsusaki K and Yasui W	Immunostaining of gastric cancer with neuroendocrine differentiation: Reg IV- positive neuroendocrine cells are associated with gastrin, serotonin, somatostatin and pancreatic polypeptide	Pathol Int	in press		2010

Seko N, Oue N, Noguchi T, Sentani K, Sakamoto N, Hinoi T, Okajima M and Yasui W	Olfactomedin 4 (GW112, hGC-1) is an independent prognostic marker for survival in patients with colorectal cancer	Exp Ther Med	1	73-78	2010
Oue N, Sentani K, Noguchi T, Ohara S, Sakamoto N, Hayashi T, Anami K, Motoshita J, Ito M, Tanaka S, Yoshida K and Yasui W	Serum olfactomedin 4 (GW112, hGC-1) in combination with Reg IV is a highly sensitive biomarker for gastric cancer patients	Int J Cancer	125	2382-2392	2009
Sugiyama H, Nishi N, Kuwabara M, Ninomiya M, Arita K, Yasui W, Kasagi F and Kodama K	Incidence and survival of childhood cancer cases diagnosed 1998 and 2000 in Hiroshima city, Japan	Asian Pac J Cancer Prev	10	675-680	2009
Yasui W, Oue N, Sentani K, Sakamoto N and Motoshita J	Transcriptome dissection of gastric cancer: Identification of novel diagnostic and therapeutic targets from pathology specimens (review article)	Pathol Int	59	121-136	2009
Noguchi T, Oue N, Wada S, Sentani K, Sakamoto N, Kikuchi A and Yasui W	h-Prune is an independent prognostic marker for survival in esophageal squamous cell carcinoma	Ann Surg Oncol	16	1390-1396	2009
Yamamoto H, Kitada Y, Yamamoto H, Oue N, Ohdan H, Yasui W and Kikuchi A	Laminin gamma2 mediates Wnt5a-induced invasion of gastric cancer cells	Gastroenterol	137	242-252	2009
Oue N, Sentani K, Sakamoto N, Motoshita J, Nishisaka T, Fukuhara T, Matsuura H, Sasaki H, Kanachi K and Yasui W	Characteristic gene expression in stromal cells of gastric cancer among atomic-bomb survivors	Int J Cancer	124	1112-1121	2009
Hayashi T, Matsubara A, Ohara S, Mita K, Hasegawa Y, Usui T, Arihiro K, Norimura S, Sentani K, Oue N and Yasui W	Immunohistochemical analysis of Reg IV in cancer of the urogenital organs: Frequent expression of Reg IV in prostate cancer and potential utility of serum tumor marker	Oncol Rep	21	95-100	2009
Kuniyasu H, Oue N, Sasahira T, Yi L, Moriwaka Y, Shimomoto T, Fujii K, Ohmori H and Yasui W	Reg IV enhances peritoneal metastasis of gastric carcinomas	Cell Proliferat	42	110-121	2009

Iwase H, Kurebayashi J, Tsuda H, Ohta T, Kurosumi M, <u>Miyamoto K</u> , Yamamoto Y and Iwase T	Clinicopathological analyses of triple negative breast cancer using surveillance data from the Registration Committee of the Japanese Breast Cancer Society	Breast Cancer	in press		2010 2009 May 23. [Epub ahead of print]
Terada K, Okochi-Takada E, Akashi-Tanaka S, <u>Miyamoto K</u> , Taniyama K, Tsuda H, Asada K, Kaminishi M, Ushijima T	Association between frequent CpG island methylation and HER2 amplification in human breast cancers	Carcinogenesis	30	466-471	2009
Hamatani K, Eguchi H, Mukai M, Koyama K, Taga M, Ito R, Hayashi Y and Nakachi K	Improved method for analysis of RNA present in long-term preserved thyroid cancer tissue of Atomic bomb survivors	Thyroid	20	43-49	2010
Yoshida K, Nakachi K, Imai K, Cologne JB, Niwa Y, Kusunoki Y and <u>Hayashi T</u>	Lung cancer susceptibility among atomic bomb survivors in relation to CA repeat number polymorphism of <i>epidermal growth factor receptor</i> gene and radiation dose	Carcinogenesis	30	2037-2041	2009
Hattori N, <u>Hayashi T</u> , Nakachi K, Ichikawa H, Goto C, Tokudome Y, Kuriki K, Hoshino H, Shibata K, Yamada N, Tokudome M, Suzuki S, Nagaya T, Kobayashi M and Tokudome S	Changes of ROS during a Two-day Ultra-marathon Race.	Int J Sports Med	30	426-429	2009
Yoshida K, Kubo Y, <u>Kusunoki Y</u> , Morishita Y, Nagamura H, Hayashi I, Kyoizumi S, Seyama T, Nakachi K and <u>Hayashi T</u>	Caspase-independent cell death without generation of reactive oxygen species in irradiated MOLT-4 human leukemia cells	Cell Immunol	255	61-68	2009
Kawasaki A, <u>Hayashi T</u> , Nakachi K, Trosko JE, Sugihara K, Kotake Y, Ohta S	Modulation of connexin43 in rotenone induced model of Parkinson's disease	Neuroscience	160	61-68	2009
Kyoizumi S, Yamaoka M, Kubo Y, Hamasaki K, Hayashi T, Nakachi K, Kasagi F and <u>Kusunoki Y</u>	Memory CD4 T-cell subsets discriminated by CD43 expression level in A-bomb survivors	Int J Radiat Biol	86	56-62	2010

Hamasaki K, <u>Kusunoki Y</u> , Nakashima E, Takahashi N, Nakachi K, Nakamura N and Kodama Y	Clonally expanded T lymphocytes from atomic bomb survivors in vitro show no evidence of cytogenetic instability	Radiat Res	172	234-243	2009
Richardson D, Sugiyama H, Wing S, Sakata R, Grant EJ, Shimizu Y, <u>Nishi N</u> , Geyer S, Soda M, Suyama A, Kodama K, Kasagi F	Positive association between ionizing radiation and lymphoma mortality among men	Am J Epidemiol	169	969-976	2009
Richardson D, Sugiyama H, <u>Nishi N</u> , Sakata R, Shimizu Y, Grant E, Soda M, Hsu WL, Suyama A, Kodama K and Kasagi F	Ionizing radiation and leukemia mortality among Japanese atomic bomb survivors, 1950-2000	Radiat Res	172	368-382	2009
Shimizu Y, Kodama K, <u>Nishi N</u> , Kasagi F, Suyama A, Soda M, Grant E, Sugiyama H, Sakata R, Moriwaki H, Hayashi M, Konda M and Shore R	Radiation exposure and circulatory disease risk: Hiroshima and Nagasaki atomic bomb survivor data, 1950-2003	BMJ	340	b4326	2010
Masuda Y, Piao J and <u>Kamiya K</u>	DNA Replication-Coupled PCNA Mono-Ubiquitination and Polymerase Switching in a Human InVitro System.	J Mol Biol	396	487-500	2010
Piao J, Masuda Y and <u>Kamiya K</u>	Specific amino acid residues are involved in substrate discrimination and template binding of human REV1 protein	Biochem Biophys Res Commun	392	140-144	2010
Huang QM, Akashi T, Masuda Y, <u>Kamiya K</u> , Takahashi T and Suzuki M	Roles of POLD4, smallest subunit of DNA polymerase delta, in nuclear structures and genomic stability of human cells	Biochem Biophys Res Commun	391	542-546	2010
Fukuda H, Takamura-Enya T, Masuda Y, Nohmi T, Seki C, <u>Kamiya K</u> , Sugimura T, Masutani C, Hanaoka F and Nakagama H	Translesional DNA synthesis through a C8-guanyl adduct of 2-amino-1-methyl-6-phenylimidazo[4,5-b]pyridine (PhIP) in Vitro: Rev1 inserts dc opposite the lesion and DNA polymerase kappa potentially catalyzes extension reaction from the 3'-dc terminus	J Biol Chem	284	25585-25592	2009

Katsura M, Tsuruga T, Date O, Yoshihara T, Ishida M, Tomoda Y, Okajima M, Takaku M, Kurumizaka H, Kinomura A, Mishima HK and <u>Miyagawa K</u>	The ATR-Chk1 pathway plays a role in the generation of centrosome aberrations induced by Rad51C dysfunction	Nucleic Acids Res	37	3959-3968	2009
Takaku M, Machida S, Hosoya N, Nakayama S, Takizawa Y, Sakane I, Shibata T, <u>Miyagawa K</u> and Kurumizaka H	Recombination activation function of the novel RAD51- and RAD51B-binding protein, human EVL	J Biol Chem	284	14326-14336	2009
Sasano N, Enomoto A, Hosoi Y, Katsumura Y, Matsumoto Y, Morita A, Shiraishi K, <u>Miyagawa K</u> , Igaki H and Nakagawa K.	Edaravone, a known free radical scavenger, enhances X-ray-induced apoptosis at low concentrations	Cancer Lett	in press		2010 2010 Jan 19. [Epub ahead of print]

<平成20年度>

書籍

著者氏名	論文タイトル名	書籍全体の 編集者名	書 籍 名	出版社名	出版地	出版年	ページ

雑誌

発表者氏名	論文タイトル名	発表誌名	巻号	ページ	出版年
Kodama M, Kitadai Y, Tanaka M, Kuwai T, Tanaka S, Oue N, <u>Yasui W</u> and Chayama K	Vascular endothelial growth factor C stimulates progression of human gastric cancer via both autocrine and paracrine mechanisms	Clin Cancer Res	14	7205-7214	2008
Sentani K, Oue N, Sakamoto N, Arihiro K, Aoyagi K, Sasaki H and <u>Yasui W</u>	Gene expression profiling with microarray and SAGE identifies PLUNC as a marker for hepatoid adenocarcinoma of the stomach	Modern Pathol	21	464-475	2008
Sentani K, Oue N, Sakamoto N, Nishizaka T, Fukuhara T, Arihiro K, Ochiai A and <u>Yasui W</u>	Immunohistochemical staining for Reg IV and claudin-18 is useful in the diagnosis of gastrointestinal signet ring cell carcinoma	Am J Surg Pathol	32	1182-1189	2008

Miyagawa K, Sakakura C, Nakashima S, Yoshikawa T, Fukuda K, Kin S, Nakase Y, Shimomura K, Oue N, <u>Yasui W</u> , Hayashizaki H, Okazaki Y, Yamagishi H, Hagiwara A and Otsuji E	Overexpression of RegIV in peritoneal dissemination of gastric cancer and its potential as a novel marker for the detection of peritoneal micrometastasis	Anticancer Res	28	1169-1179	2008
Ossandon F, Villarroel C, Aguayo F, Santibanez E, Oue N, <u>Yasui W</u> and Corvalan AH	In silico analysis of gastric carcinoma serial analysis of gene expression libraries reveals different profiles associated with ethnicity	Mol Cancer	7	22	2008 Feb 27
Ohara S, Oue N, Matsubara A, Mita K, Hasegawa Y, Hayashi T, Usui T, Amatya VJ, Takeshima Y, Kuniyasu H and <u>Yasui W</u>	Reg IV is an independent prognostic factor for relapse in patients with clinically localized prostate cancer	Cancer Sci	99	1570-1577	2008
Fujii K, Sasahira T, Moriwaki Y, Oue N, <u>Yasui W</u> and Kuniyasu H	Protection of telomeres 1 protein levels are associated with telomere length in gastric cancer	Int J Mol Med	21	599-604	2008
The Study Group of Millennium Genome Project for Cancer (<u>Yasui W</u>)	Genetic variation of PSCA gene is associated with a susceptibility to diffuse-type gastric cancer	Nature Genet	40	730-740	2008
Sasahira T, Kirita T, Oue N, Bhawal UK, Tamamoto K, Fujii K, Ohmori H, Luo Y, <u>Yasui W</u> , Bosserhoff A and Kuniyasu H	High mobility group box-1-inducible melanoma inhibitory activity is associated with nodal metastasis and lymphangiogenesis in oral squamous cell carcinoma	Cancer Sci	99	1806-1812	2008
Sentani K, Oue N, Sakamoto N, Fukuhara T, Matsuura H and <u>Yasui W</u>	Positive immunohistochemical staining of gamma-H2AX is associated with tumor progression in gastric cancers from radiation-exposed patients	Oncol Rep	20	1131-1136	2008
<u>Hamatani K</u> , Eguchi H, Ito R, Mukai M, Takahashi K, Taga M, Imai K, Cologne JB, Soda M, Arihiro K, Fujihara M, Abe K, Hayashi T, Nakashima M, Sekine I, <u>Yasui W</u> , Hayashi Y and Nakachi K	<i>RET/PTC</i> rearrangements preferentially occurred in papillary thyroid cancer among atomic bomb survivors exposed to high radiation dose	Cancer Res	68	7176-7182	2008

Yuasa Y, Nagasaki H, Akiyama Y, Takizawa T, Kojima, K, Kawano T, Sugihara K, Imai K and <u>Nakachi K</u>	DNA methylation status is inversely correlated with green tea intake and physical activity in gastric cancer patients	Int J Cancer	124	2677-2682	2009
<u>Nakachi K</u> , Hayashi T, <u>Hamatani K</u> , Eguchi H and <u>Kusunoki Y</u>	Sixty years of follow-up of Hiroshima and Nagasaki survivors: Current progress in molecular epidemiology studies	Mutat Res	659	109-117	2008
Ohara M, Hayashi T, <u>Kusunoki Y</u> , <u>Nakachi K</u> , Fujiwara T, Komatsuzawa H and Sugai M	Cytolethal distending toxin induces caspase-dependent and -independent cell death in MOLT-4 cells	Infect Immun	76	4783-4791	2008
Santen RJ, Song RX, Masamura S, Yue W, Fan P, Sogon T, Hayashi S, <u>Nakachi K</u> and Eguchi H	Adaptation to estradiol deprivation causes up-regulation of growth factor pathways and hypersensitivity to estradiol in breast cancer cells	Adv Exp Med Biol	630	19-34	2008
Tamakoshi A, <u>Nakachi K</u> , Ito Y, Lin Y, Yagyu K, Kikuchi S, Watanabe Y, Inaba Y and Tajima K	Soluble Fas (sFas) level and cancer mortality: findings from a nested case-control study within a large-scale prospective study	Int J Cancer	123	1913-1916	2008
Sueoka-Aragane N, Imai K, Komiya K, Sato A, Tomimasu R, Hisatomi T, Sakuragi T, Mitsuoka M, Hayashi S, <u>Nakachi K</u> and Sueoka E	Exon 19 of EGFR mutation in relation to the CA-repeat polymorphism in intron 1	Cancer Sci	99	1180-1187	2008
Members of Asia Pacific Cohort Studies Collaboration, <u>Nakachi K</u>	Cigarette smoking, systolic blood pressure, and cardiovascular diseases in the Asia-Pacific region	Stroke	39	1694-1702	2008
Kanzaki H, Ouchida M, Hanafusa H, Yamamoto H, Suzuki H, Yano M, Aoe M, Imai K, Date H, <u>Nakachi K</u> and Shimizu K	The association between RAD18 Arg302Gln polymorphism and the risk of human non-small-cell lung cancer.	J Cancer Res Clin Oncol	134	211-217	2008
<u>Kusunoki Y</u> and Hayashi T	Long-lasting alterations of the immune system by ionizing radiation exposure: Implications for disease development among atomic bomb survivors	Int J Radiat Biol	84	1-14	2008

Nishi N, Sugiyama H, Hsu WL, Soda M, Kasagi F, Mabuchi K and Kodama K	Differences in mortality and incidence for major sites of cancer by education level in a Japanese population	Ann Epidemiol	18	584-591	2008
Preston DL, Cullings HM, Suyama A, Funamoto S, Nishi N, Soda M, Mabuchi K, Kodama K, Kasagi F and Shore RE	Solid cancer incidence in atomic bomb survivors exposed in utero or as young children	J Natl Cancer Inst	100	428-436	2008
Ohishi W, Fujiwara S, Cologne JB, Suzuki G, Akahoshi M, Nishi N, Takahashi I and Chayama K	Risk factors for hepatocellular carcinoma in a Japanese population: A nested case-control study	Cancer Epidemiol Biomarkers Prev	17	846-854	2008
Gu Y, Masuda Y and Kamiya K	Biochemical analysis of human PIF1 helicase and functions of its N-terminal domain	Nucleic Acids Res	36	6295-6238	2008
Uehara Y, Ikehata H, Komura J, Ito A, Ogata M, Itoh T, Hirayama R, Furusawa Y, Ando K, Panuesku T, Woloschak EC, Komatsu K, Matsuura S, Ikura T, Kamiya K and Ono T	Absence of Ku70 gene obliterates X-Ray-induced lacZ mutagenesis of small deletions in mouse tissues	Radiat Res	170	216-223	2008
Tomida J, Masuda Y, Hiroaki H, Ishikawa T, Song I, Tsurimoto T, Tateishi S, Shiomi T, Kamei Y, Kim J, Kamiya K, Vaziri C, Ohmori H and Todo T	DNA damage induced ubiquitylation of RFC2 subunit of RFC complex	J Biol Chem	283	9071-9079	2008
Sarai N, Kagawa W, Fujikawa N, Saito K, Hikiba J, Tanaka K, Miyagawa K, Kurumizaka H and Yokoyama S	Biochemical analysis of the N-terminal domain of human RAD54B	Nucleic Acids Res	36	5441-5450	2008
Kobayashi J, Iwabuchi K, Miyagawa K, Sonoda E, Suzuki K, Takata M and Tauchi H	Current topics in DNA double-strand break repair	J Radiat Res	49	93-103	2008
Enomoto A and Miyagawa K	How to cope with DNA damage induced by ionizing radiation and anti-cancer drugs?	Prog Theor Phys (Supple)	173	109-123	2008

Tomoda Y, Katsura M, Okajima M, Hosoya N, Kohno N and Miyagawa K	Functional evidence for Eme1 as a marker of cisplatin resistance	Int J Cancer	124	2997-3001	2009
--	--	--------------	-----	-----------	------

<平成19年度>

書籍

著者氏名	論文タイトル名	書籍全体の 編集者名	書 籍 名	出版社名	出版地	出版年	ページ
<u>Yasui W</u> and Oue N	Systematic collection of tissue specimens and molecular pathological analysis of newly diagnosed solid cancers among atomic bomb survivors	Shibata Y, NambaH, Suzuki K, Tomonaga M	Radiation Risk Perspectives	Elsevier	Amsterdam	2007	81-86

雑誌

発表者氏名	論文タイトル名	発表誌名	巻号	ページ	出版年
Oue N, Kuniyasu H, Noguchi T, Sentani K, Ito M, Tanaka S, Setoyama T, Sakakura C, Natsugoe S and <u>Yasui W</u>	Serum concentration of Reg IV in patients with colorectal cancer: Overexpression and high Reg IV serum level is associated with liver metastasis	Oncology	72	371-380	2008
Ishikawa N, Takano A, <u>Yasui W</u> , Inai K, Nishimura H, Ito H, Miyagi Y, Nakayama H, Figita M, Hosokawa M, Tsuchiya E, Kohno N, Nakamura Y and Daigo Y	Cancer-testis antigen, lymphocyte antigen 6 complex locus K is a serologic biomarker and a therapeutic target for lung and esophageal carcinomas	Cancer Res	67	11601-11611	2007
Suzuki T, Yoshida K, Wada Y, Hamai Y, Sentani K, Oue N and <u>Yasui W</u>	Melanoma-associated antigen-A1 expression predicts resistance to decetaxel and paclitaxel in advanced and recurrent gastric cancer	Oncol Rep	18	329-336	2007

Taniwaki M, Takano A, Ishikawa N, Yasui W, Inai K, Nishimura H, Tsuchiya E, Kohno N, Nakamura Y and Daigo Y	Activation of KIF4A as a prognostic biomarker and therapeutic target for lung cancer	Clin Cancer Res	13	6624-6631	2007
Mano Y, Takahashi K, Ishikawa N, Takano A, Yasui W, Inai K, Nishimura H, Tsuchiya E, Nakamura Y and Daigo Y	Fibroblast growth factor receptor 1 oncogene partner as a novel prognostic biomarker and therapeutic target for lung cancer	Cancer Sci	98	1902-1913	2007
Oue N, Yoshida K, Noguchi T, Sentani K, Kikuchi A and Yasui W	Increased expression of h-prune is associated with tumor progression and poor survival in gastric cancer	Cancer Sci	98	1198-1205	2007
Hasegawa Y, Matsubara A, Terashima J, Seki M, Mita K, Usui T, Oue N and Yasui W	DNA methylation of the RIZ1 gene is associated with nuclear accumulation of p53 in prostate cancer	Cancer Sci	98	32-36	2007
Matsumura S, Oue N, Mitani Y, Kitadai Y and Yasui W	DNA demethylation of vascular endothelial growth factor-C (VEGF-C) is correlated with gene expression and its possible involvement of lymphangiogenesis in gastric cancer	Int J Cancer	120	1689-1695	2007
Mitani Y, Oue N, Matsumura S, Yoshida K, Noguchi T, Ito M, Tanaka S, Kuniyasu H, Kamata N and Yasui W	Reg IV is a serum biomarker for gastric cancer patients and predicts response to 5-fluorouracil-based chemotherapy	Oncogene	26	4383-4393	2007
Members of the Prospective Studies Collaboration and Nakachi K	Blood cholesterol and vascular mortality by age, sex, and blood pressure: a meta-analysis of individual data from 61 prospective studies with 55000 vascular deaths	Lancet	370	1829-1839	2007

Takahashi K, <u>Eguchi H</u> , Arihiro K, Ito R, Koyama K, Soda M, Cologne JB, Hayashi Y, Nakata Y, <u>Nakachi K</u> and <u>Hamatani K</u>	The presence of <i>BRAF</i> point mutation in adult papillary thyroid carcinomas from atomic bomb survivors correlates with radiation dose	Mol Carcinogenesis	46	242-248	2007
Yano M, <u>Hamatani K</u> , <u>Eguchi H</u> , Hirai Y, MacPhee DG, Sugino K, Dohi K, Itamoto T, Asahara T	Prognosis in patients with hepatocellular carcinoma correlates to mutations of p53 and/or hMSH2 genes	Eur J Cancer	43	1092-1100	2007
Kanzaki H, Ouchida M, Hanafusa H, Sakai A, Yamamoto H, Suzuki H, Yano M, Aoe M, Imai K, Date H, <u>Nakachi K</u> and Shimizu K	Single nucleotide polymorphism in the RAD18 gene and risk of colorectal cancer in the Japanese population	Oncol Rep	18	1171-1175	2007
Hayashi I, Morishita Y, Imai K, Nakamura M, <u>Nakachi K</u> and Hayashi T	High- throughput spectrophotometric assay of reactive oxygen species in serum	Mutat Res	631	55-61	2007
Sogon T, Masamura S, Hayashi S-I, Santen RJ, <u>Nakachi K</u> and Eguchi H	Demethylation of promoter C region of estrogen receptor α gene is correlated with its enhanced expression in estrogen-ablation resistant MCF-7 cells	J Steroid Biochem Mol Biol	105	106-114	2007
Sueoka N, Sato A, <u>Eguchi H</u> , Komiya K, Sakuragi T, Mitsuoka M, Satoh T, Hayashi S, <u>Nakachi K</u> and Sueoka E	Mutation profile of EGFR gene detected by denaturing high-performance liquid chromatography in Japanese lung cancer patients	J Cancer Res Clin Oncol	133	93-102	2007
Hamasaki K, Imai K, <u>Nakachi K</u> , Takahashi K, Kodama Y and <u>Kusunoki Y</u>	Short-term culture and γ H2AX flow cytometry determine the difference of individual radiosensitivities in human peripheral T lymphocytes	Environ Mol Mutagen	48	38-47	2007

Hamasaki K, Imai K, Hayashi T, <u>Nakachi K</u> and <u>Kusunoki Y</u>	Radiation sensitivity and genomic instability in the hematopoietic system: Frequencies of micronucleated reticulocytes in whole-body X-irradiated BALB/c and C57BL/6 mice	Cancer Sci	98	1840-1844	2007
Preston D, Ron E, Tokuoka S, Funamoto S, <u>Nishi N</u> , Soda M, Mabuchi K and Kodama K	Solid cancer incidence in atomic bomb survivors: 1958-1998	Radiat Res	168	1-64	2007
Watanabe H, Kashimoto N, Kajimura J, Ishikawa M and <u>Kamiya K</u>	Tumor induction by monoenergetic neutrons in B6C3F1 mice	J Radiat Res	48	205-210	2007
Igaki H, Nakagawa K, Uozaki H, Akahane M, Hosoi Y, Fukayama M, <u>Miyagawa K</u> , Akashi M, Ohtomo K and Maekawa K	Pathological changes in the gastrointestinal tract of a heavily radiation-exposed worker at the Tokai-mura criticality accident	J Radiat Res	49	55-62	2008
Shimura T, Torres MJ, Martin MM, Rao AV, Pommier Y, Katsura M, <u>Miyagawa K</u> and Aladjem MI.	Bloom's syndrome helicase and Mus81 are required to induce transient double-strand DNA breaks in response to DNA replication stress	J Mol Biol	375	1152-1164	2008
<u>Miyagawa K</u>	Clinical relevance of the homologous recombination machinery in cancer therapy	Cancer Sci	99	187-194	2008
Enomoto A, Kido N, Ito M, Morita A, Matsumoto Y, Takamatsu N, Hosoi Y and <u>Miyagawa K</u>	Negative regulation of MEKK1/2 signaling by Serine-Threonine Kinase 38 (STK38)	Oncogene	27	1930-1938	2008
Sasano N, Enomoto A, Hosoi Y, Katsumura Y, Matsumoto Y, Shiraishi K, <u>Miyagawa K</u> , Igaki H and Nakagawa K	Free radical scavenger edaravone suppresses X-ray-induced apoptosis through p53 inhibition in MOLT-4 cells	J Radiat Res	48	495-503	2007

Suzuki T, Nishi T, Nagino T, Sasaki K, Aizawa K, Kada N, Sawaki D, Munemasa Y, Matsumura T, Muto S, Sata N, <u>Miyagawa K</u> , Horikoshi M and Nagai R	Functional interaction between the transcription factor Kruppel-like factor 5 and poly(ADP-ribose) polymerase-1 in cardiovascular apoptosis	J Biol Chem	282	9895-9901	2007
--	--	-------------	-----	-----------	------

Chapter VI

Histological and Serological Tumor Markers of Gastric Cancer

*Wataru Yasui*¹, Kazuhiro Sentani, Naoya Sakamoto,
Junichi Motoshita and Naohide Oue*

Department of Molecular Pathology Hiroshima
University Graduate School of Biomedical Sciences, Japan

Abstract

Gastric cancer is one of the most common cancers worldwide. The prognosis of early gastric cancer patients is prolonged drastically by recent progress of diagnosis and treatment; however, the prognosis of patients with advanced disease remains poor. Therefore, the most important to conquer gastric cancer is the early detection and the effective treatment for advanced cancer. This chapter reviews classical and possible serological tumor markers and their usefulness in gastric cancer detection and histological tumor markers in relation with patient prognosis. Known tumor markers such as CEA and CA 72-4 are not satisfactory in their sensitivity for early detection although they may have prognostic impact. Several of possible tumor markers such as interleukins, matrix metalloproteinases, cell adhesion molecules, cell cycle regulators and methylated DNA are reported to be useful in clinical or histological diagnosis that must be confirmed by prospective study. Novel tumor markers and possible therapeutic targets such as Reg IV and GW112 identified by our global analysis of gene expression are also described. Further investigations are needed to identify new diagnostic targets, which are directory corrected to molecular target therapy.

Keywords: Serological tumor marker – Histological prognostic factor – Gastric cancer – CEA – CA 72-4 – Growth factor – Matrix metalloproteinase – Cell adhesion molecule – DNA methylation – Cell cycle regulator - Serial analysis of gene expression.

* Corresponding author: Wataru Yasui; Department of Molecular Pathology Hiroshima University Graduate School of Biomedical Sciences, 1-2-3 Kasumi, Minami-ku, Hiroshima 734-8551, Japan; E-mail: wyasui@hiroshima-u.ac.jp

Introduction

Gastric cancer is the fourth most common cancer and the second leading cause of cancer death only to lung cancer in the world [1]. Incidence of gastric cancer is declining worldwide, which is mainly due to changes in life style especially eating habits (decreased consumption of high-salt diet and availability of fresh fruit and vegetables throughout the year). Another point for decreasing incidence of gastric cancer is a rate of *Helicobacter pylori* (Hp) infection. It is known that worldwide gastric cancer has geographical variations in incidence, patient's outcome and molecular bases between the West and the East [2, 3]. The prognosis of early gastric cancer is prolonged drastically by recent progress of diagnosis and treatment. However, if patients are diagnosed with gastric cancer as advanced disease, the prognosis is extremely poor with survival rates rarely exceeding 15%. According to the world cancer report by World Health Organization, five-year survival rate of gastric cancer patients of all stages after diagnosis is around 50% in Japan and is 30% or less in other countries [4]. Therefore, the point, which should be conquered in gastric cancer, is the discovery in an early stage and the effective medical treatment for advanced cancer. Integrated research in molecular pathology has uncovered the genetic and epigenetic alterations in the course of development and progression of gastric cancer [5-8]. These include telomerase activation, genetic instability, and abnormalities in oncogenes, tumor suppressor genes, growth factors, matrix degradation enzymes, cell cycle regulators, cell adhesion molecules and DNA repair genes. Most of these can be used as tumor markers of gastric cancer, and if secreted, those serve as serological tumor markers. A better knowledge of the molecular bases of stomach carcinogenesis leads to new paradigms in diagnostics. Novel molecules participating in biological behavior of cancer must be useful targets for cancer therapy. This chapter describes classical, possible and novel tumor markers of gastric cancer and their clinical usefulness in diagnosis using serum samples and histology sections.

Known Serological Tumor Markers

Serological tumor markers have clinical value in screening high risk group, differentiating between normal and cancer patients, characterizing tumor behavior, and monitoring cancer growth and response to therapy [9]. While most of tumor markers are derived from cancer cells, some are produced by host cells in response to tumor growth and invasion. Known and possible serological tumor markers are listed in table 1.

Table 1. Serological tumor markers of gastric cancer

Known markers	Pepsinogen, CEA, CA19-9, CA 72-4
Possible markers	Interleukins
	IL-1beta, IL-6, IL-8, IL-18, IL-2 receptor
	Growth factor and angiogenic factor
	VEGF-A, VEGF-C, TGF-beta1, HGF
	Matrix metalloproteinase
	MMP-9, MMP-10, MMP-11, TIMP-1

Known markers	Pepsinogen, CEA, CA19-9, CA 72-4
	Cell adhesion molecule
	E-cadherin, ICAM-1
	Oncogene / tumor suppressor gene
	HER-2/c-erbB2, p53, p53 autoantibody
	DNA methylation
	p16, p15, E-cadherin, DAP-kinase, RARbeta
	Novel markers identified by us
	Reg IV, GW112, MIA

Pepsinogen

Serum pepsinogen (PG) has been used as biomarkers of gastric inflammation and atrophic change. Serum pepsinogen I (PG I) and pepsinogen II (PG II) levels are known to increase in the presence of *Helicobacter pylori* (*H. pylori*)-related chronic gastritis which may be predisposed condition for developing gastric cancer [10]. Decreased ration of PG I to PG II is associated with atrophic gastritis. The serum PG test has been the first screening step for gastric cancer in Japan, although this test is used to screen high risk subjects with atrophic gastritis rather than as a test for cancer its self. Miki et al. reported that the percentage of cases screened by PG test, who need further examination was 24% and who required endoscopic examination was 52% [11]. Most gastric cancer cases detected by PG test are asymptomatic and at early stage which are well suited for endoscopic treatment. As *H. pylori* infection and gastric atrophy are both risk factors for gastric cancer, detection of *H. pylori* antibodies (IgA and IgG) is also useful for screening [12]. A case-control study demonstrated that the odds ratio of gastric cancer between infected and non-infected persons was 3.12 for elevated IgA and 2.88 for elevated IgG antibodies [13]. The highest gastric cancer risk was found among individuals with simultaneously elevated IgA and IgG antibodies and low PG I with an odds ratio of over 10 in comparison with those who were negative for both antibodies and had normal PG I.

CEA and CA19-9

Carcinoembryonic antigen (CEA), an oncodevelopmental tumor antigen, is a glycoprotein that was discovered in extracts of colorectal cancer in 1965 and is still the most useful and widely investigated tumor marker for colorectal cancer [9]. CA19-9 is a carbohydrate marker recognized by the monoclonal antibody which reacts with a sialylated derivative of the Le^a blood group antigen donated as Le^{xa} (sialylated lacto-N-fucopenteose II). CA19-9 represents the reference marker of pancreatic cancer and is elevated in about 80% of patients affected by this disease [9]. Elevated serum CEA and CA19-9 levels are observed in 15-25% of gastric cancer patients [14-17]. Elevated serum CEA and CA19-9 correlates well with depth of tumor invasion, various forms of metastases and stage grouping. Patients with elevated CEA and CA19-9 levels are at high risk of having metastases or recurrence. CEA or CA19-9 monitoring after surgery is useful to predict the recurrence of gastric cancer. The patients of gastric cancer with elevated CEA or CA19-9 level show