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The Possible Reagents for a Cancer Diagnosis by a Urine Color Reaction

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=Abstract=

Urine NMR analyses made by use of an 80 MHz proton NMR spectrometer show that aromatic proton NMR signals appear in most cencer patients' urine. On the assumption that the signals may be caused by the phenolic compound of tyrosine excreted in the urine, a jellied reagent is used for identifying them by observing the urine color reaction. It is observed that the reagent reacted to the cancer urine becomes red. Such a change of the urine color seems to indicate the substance of tyrosine.

Recently an attempt to determine the reagent sensitivity an specificity of the urine of 69 persons including cancer and noncancer patients has been made. The results of the attempt are respectively 85.3% for sensitivity and 91.4% for specificity. This seems to show a possibility that the reagent can be used for the diagnosis.

1. Introduction

The urine NMR analyses[1-4] previously made by use of a 60 MHz NMR spectrometer showed that the proton NMR signals of 3.00 ppm to 3.09 ppm and 7.00 ppm to 8.00 ppm seemed to more often occur in the cancer patients' urine then the non-cancer patients'.

Recently a further attempt for the analyses by use of an 80 MHz proton NMR spectrometer was made. For the analyses each urine collected was completely evaported and then mixed with D_2O before measuring. DSS was used as an internal reference standard for all chemical shift measurements. The results of the attempt showed that the aromatic proton NMR signals between 7.00 ppm and 8.00 ppm appeared much more clearly than the signals measured by the 60 MHz NMR spectrometer.

The introduced two figures are the exemplary proton NMR signal distributions of cancer and non-cancer urine. Figs. 1 and 2 show the distributions of a stomach cancer patient's urine and a normal healthy person's urine, respectively. In particular, it is noticed that the aromatic proton resonance signals appear between 7.00 ppm and 8.00 ppm on the left-hand side of Fig. 1 as stated above. However it must here be mentioned that such signals are occasionally found even in normal urine.

In this study an attempt has been made to find a differental diagnosis between cancer and non-cancer patients by use of a reagent which can be used for identifying the NMR signals.

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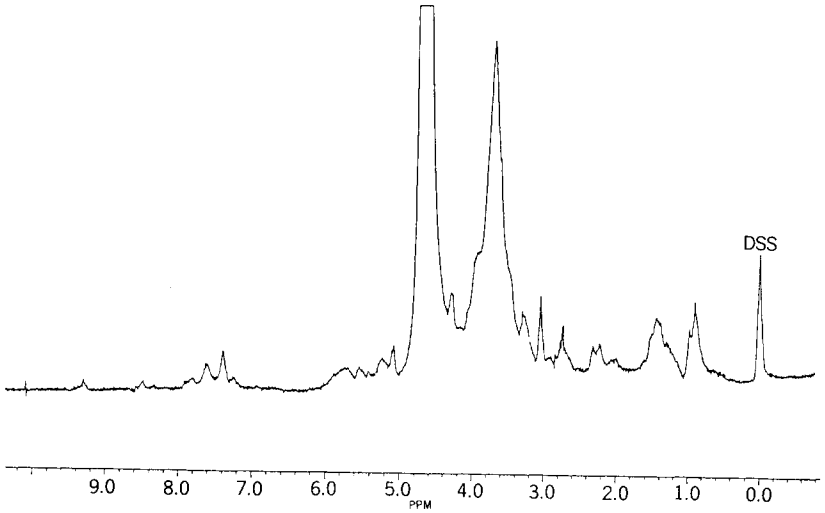

Fig. 1. Observed proton NMR signal distribution of stomach cancer with billrubin-urina at room temperature

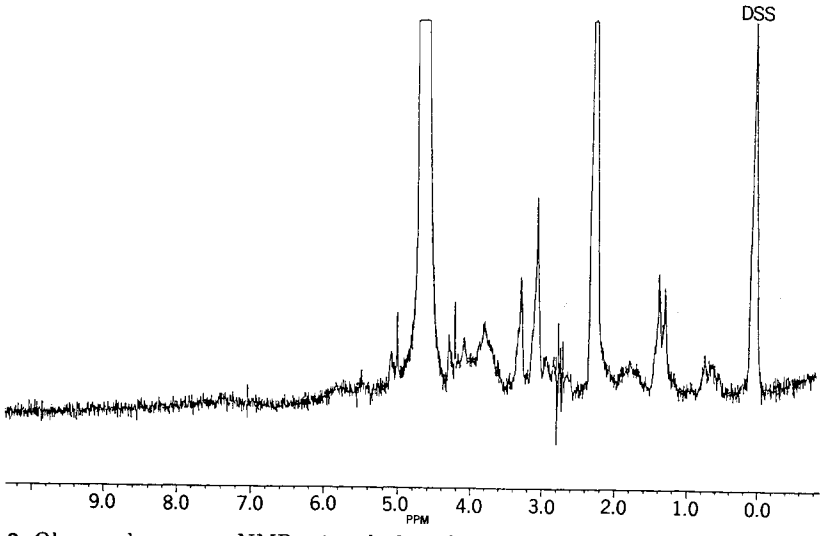

Fig. 2. Observed proton NMR signal distribution of a non-cancer patient's urine at room temperature

2. Assumption

On the assumption that the aromatic proton NMR signals might correspond to those of the phenolic compound of tyrosine excreted in the cancer urine, a reagent* made by use of Hg, HNO_3, distilled water and gelatin or by use of H_2SO_4, $HgSo_4$, distilled water and gelatin

* The patent number of the reagent approved by the Korea Patent Bureau is No 21558.

Table 1. The results diagnosed by the reagent and a medical examination

No	ID	AGE	SEX	DEPT	ORGAN	DX	TYPE	REAGENT
1	324789	43	F	GS	BREAST	BREAST CA	M	P
2	303122	49	M	EN	LARYNX	LARYNGEAL CA	M	P
3	325751	35	F	GS	BREAST	INV. DUCTAL CA	N	N
4	128313	72	M	GS	RECTUM	LEIOMYOSAROCOMA	N	N
5	326247	50	M	GS	STOMACH	STOMACH CA	M	P
6	326395	61	M	CH	LUNG	PNEUMONIA	N	N
7	326176	48	F	GS	GB	GB STONE	N	N
8		63	F	RT	LUNG	LUNG SQUAM. CA	M	P
9	303657	47	M	GS	RECTUM	RECTAL CA	M	P
10	152168	57	M	GU	BUADDER	TRANSI, CELL CA	M	P
11	326212	63	M	GI	LIVER	HEPATOCELL CA	M	P
12	324831	39	M	GS	STOMACH	STOMACH CA	M	P
13	304439	69	F	GI	ESOPHAGUS	ESOPHAGEAL CA	M	P
14	204110	51	M	GS	STOMACH	STOMACH CA	M	P
15	324085	53	F	GS	RECTUM	RECTAL CA	M	P
16	326182	46	M	CH	LUNG	LUNG CA	M	P
17	072654	45	M	EN	SARYNX	LARYNGEAL CA	M	P
18	324095	60	M	GS	GB	GB CA	M	P
19	316839	64	M	GS	STOMACH	STOMACH CA	M	P
20	296721	17	F	GI	BM	ALL	M	P
21	326046	64	F	CH	BRONCHUS	BRONCHOGENIC CA	M	N
22	238450	59	M	GI	LIVER	HEPATOCELL CA	M	P
23	324926	48	M	GS	STOMACH	STOMACH CA	M	P
24	326262	49	M	GS	DUOBENUM	PERIAMPUL, CA	M	P
25	157705	36	M	NS	PANCREAS	DM	N	N
26	160070	36	F	GY	CERVIX	CERVICAL CA	M	P
27	276398	62	M	SG	STOMACH	STINACG CA	M	P
28	321933	44	M	SG	RECTUM	RECTAL CA	N	N
29	225133	30	M	GI	LUNG	TB, RA, SJOGREN	N	P
30	325971	18	M	OS	FINGER	ENCHONDROMA	B	N
31	326521	21	M	CH	LUNG	PLEURISY TB	N	N
32	324083	29	F	OB	UTERUS	PREGNANCY	N	N
33	325900	53	F	GS	THYROID	HASHIMOTO	N	N
34	327020	63	M	CS	BRONCHUS	BRONCHIGENIC CA	M	P
35		39	F	GY	UTERUS	UEIOMYOMA	B	P
36	326792	13	M	PD	BM	ALL	M	P
37	326227	67	M	GI	COLON	COLON CA	M	P
38	326952	79	M	CS	BRONCHUS	BRONCHOGENIC CA	M	P
39	326239	52	M	GI	RERITONEUM	METASTATIC CA	M	N
40		54	F	CH	LUNG	UNKNOWN, CYTO(-)	N	N

No	ID	AGE	SEX	DEPT	ORGAN	DX	TYPE	HEAGENT
41	327737	42	M	CH	LUNG	PLEURISY, TB	N	N
42	319626	70	F	CH	LING	LUNG CA	M	P
43	327009	64	M	GI	STOMACH	STOMACH CA	N	N
44		80	F	GI	STOMACH	STOMACH CA	M	N
45	325555	32	M	GS	STOMACH	STOMACH CA	M	P
46	326807	57	M	GS	STOMACH	STOMACH CA	M	P
47	324085	53	F	GI	INTESTINE	INIEST. OBSTRUCT	N	N
48	311747	16	F	GS	NECK	BRANCHIAL CLEFT	B	N
49	326110	6	F	GS		LIPOMATOSIS	B	N
50	326782	50	F	GY	UTERUS	MULLERIAN CA	M	N
51		65	M	GI	STOMACH	CHR GASTRITIS	N	N
52		64	M	GM	STOMACH	STOMACH CA	M	P
53	327003	61	F	CH	BRONCHIS	CHR BRONCHITIS	N	N
54	326899	64	F	GM	KIDNEY	RENAL CYST	B	P
55		26	F	GI	COLON	NONSP COLITIS	N	N
56	327775	37	F	GY	UTERUS	PLACENTA PREVIA	N	N
57	327390	36	F	GY	UTERUS	LEIMYOMA	N	N
58	327776	55	M	CH	LUNG	PLEURAL TB	N	N
59	195870	70	M	GU	KIDNEY	CHR PN	N	N
60	309035	43	F	GY	UTERUS	ADENOMYOSIS	N	N
61	026690	37	M	IC	LUNG	BRONCHIECTASIS	N	N
62	328103	26	M	GS	ANUS	ANAL FISTULA	N	N
63	328407	74	M	CH	LUNG	HEMOPTYSIS	N	N
64	327271		F	GU	KIDNEY	HYDROURETER	N	N
65	327009		M	GS	STOMACH	STOMACH CA	N	N
66	114326	67	F	GS	GB	CHRCHOLECYSTITI	N	N
67	327331	24	M	CH	PLEURA	PLEURAL TB	N	N
68	326826	70	M	GS	STOMACH	STOMACH CA	M	N
69	328396	28	F	GI	NECK	L/N TB	N	N

was used to identify the signals by observing the urine color reaction. It was abserved that the reagent reacted to the urine became red, which seemed to be the substance of tyrosine or at least to be the phenolic compound excreted.

3. Results and discussion

The following table shows that the results of sensitivity and specificity of the urine of 69 persons including the cancer and non-cancer patients(See Table 1 in Appendix). The table shows the comparison of the results diagnosed by the reagent with the results confirmed by the clinical pathology department of Korea University in Seoul. N and P in the table stand for negative reaction(non-cancer) and positive reaction(cancer), respectively. From the results in the table the sensitivity and specificity are calculated and given by 29/34=85.3% and 32/35=91.4%, respectively.

In conclusion, although the above two re-

sults are nothing but such as obtained by one trial, it seems to suggest that the reagent can be used for the diagnosis.

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■ 국 문 초 록 ■

뇨의 정색 반응에 의한 암진단이 가능한 시약

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80MHz 양성자 핵자기공영 분광기에 의한 뇨의 핵자기공명 분석으로 부터 방향족 양성자 공명신호들이 대부분의 암환자 뇨에 나타나고 있음을 알게 되었다. 이 신호들은 뇨에 배출된 타이로신의 페놀 성분에 기인된 것이라는 가정하에서 뇨의 정색반응을 관찰함으로써 그것들을 판명할 목적으로 한 젤리상시약을 이용하였다. 그 시약에 의하여 반응한 암환자 뇨는 적색을 나타내면서 반응하였다. 이와 같은 뇨의 적색 변화는 타이로신의 페놀 성분에 기인된 것임을 암시해 주는 것 같았다. 근래에 와서 암환자와 비암환자를 포함한 69명의 뇨에 대한 그 시약의 sensitivity와 specificity를 결정하기를 시도하였다. 그 결과, 85.3%의 sensitivity와 91.4%의 specificity를 얻게 되었다. 이와 같은 결과는 그 시약에 의해서 암진단이 가능함을 시사해 주었다.

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