CLINICAL EXPERIENCE ON T-1220 IN PEDIATRIC TREATMENT

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Abstract

T-1220, a new antibiotic, was applied to treatment of various rather severe infections in 16 children. Dosages were 80 mg/kg/day to acute non-complicating urinary tract infection, 300 mg/kg/day to purulent meningitis, and 100 to 200 mg/kg/day to most of all. The drug was dissolved in 5% solution of glucose and given intravenously with 10 to 60 ml of Solita T_3, divided 3 to 4 times daily. The effects of this drug were excellent for urinary tract infections with *Proteus mirabilis,* with *E. coli* resistant to carbenicillin, and with *Pseudomonas aeruginosa,* septicemia with *Corynebacterium* species in a low birth weight neonate, purulent meningitis with *Streptococcus* group B in a full-term neonate and a low birth weight infant, and with *Pneumococcus* in a child. It appears also to be effective to *Pseudomonas* infection of the lung or of the cephalohematoma, but to be much less effective to *Klebsiella* infection in our experience. Although it seems to be the valuable drug for treatment of sensitive bacterial infection in children including the premature neonate without any side effect, much more experience should be obtained in point of the dose, frequency and duration of administration in safety.

Introduction

Many antibiotics have been developed to general use from the group of wide spectrum penicillins and aminoglycosides. The former is less effective than the latter, but the latter is much more toxic than the former. T-1220, a new developed antibiotic belongs to the former group, has been introduced as a characteristic drug having stronger bactericidal effect to gram-negative bacilli, especially to *Pseudomonas aeruginosa* than that of carbenicillin[1]. Clinical trials have been done with desirable effect, even to infants or premature babies without any remarkable toxicity[2]. We tried to employ for treatment of severe infectious disease in cases to whom the expected effect was not obtained with ordinary antibiotics, during July, 1976 to January, 1977.

Material and method

The drug was supplied from Toyama Chemical Co. It in a vial was dissolved with 4 ml of 5% solution of glucose to 1 g/vial and with 8 ml to 2 g/vial respectively. It was administered, intravenously, diluted with 10 to 60 ml of Solita T_3 within 30 min. every time. A standard of daily dose was set up as 80 mg/kg to acute non-complicating urinary tract infection, 100 to 150 mg/kg to most of infections, 200 mg/kg to severe one, and 300 mg/kg to purulent meningitis. Skin test was done before administration and daily dose was given divided 3 to 4 times. Side effects were monitered clinically, and with examinations as a rule including peripheral blood examination, urinalysis, and serum chemistry for renal and hepatic functions.

Pathogenetic bacteria were isolated and confirmed in the central laboratory*1 of Kyushu university hospital. The sensitivity tests to ordinary drugs were also done there with the discs, and minimal inhibitory concentration (MIC) of T-1220 to the isolated bacteria was examined by courtesy of Dr. M. KOIKE*2.

Clinical result

Clinical results of T-1220 treatment were summarized in Table 1.

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Table 1 Cases, dosage and effects

No.	Name	Age	Sex	Weight	Diagnosis	Isolated bacteria	Sensitivity	Dosage(/day)	Duration	Effect	Side effect
1	U.A.	12y	M	35kg	Colon TB*[1] Sepsis?	*Klebsiella*/St**[1] *E. coli*/St *Enterobacter*/St	6.25μg/ml (MIC) 3.1 3.1	1.0×4 114mg/kg	5 days	none	none
2	Y.T.	14y	M	24kg	Colon TB Sepsis?	*Klebsiella*/St *E. coli*/St *Prot. morganii*/St	3.1 1.56 0.39	1.0×4 167mg/kg 1.3×4 217mg/kg	5 6	poor incomplete	none none
3	K.K.	10y	M	27kg	Typhoid fever	*S. typhosa*/Blood	0.78	1.0×3 111mg/kg	17	complete with chloramphenicol	none
4	T.M	17y	F	26kg	UTI*[2]	*Ps. aeruginosa*/U**[2]	6.25 −/CBPC, SBPC	1.0×3 115mg/kg	12	complete	Fungus alteration
5	M.T.	5y	M	15kg	Meningitis Sepsis	*Pneumococcus*/CSF Blood	##/PCG, ABPC, MCIPC, CER, EM, CLM, TC, CP	Initially 1.5g 1.2×4 320mg/kg	11	complete	none
6	K.S	4y	M	19kg	UTI	*Proteus mirabilis*	0.39	500mg×3 79mg/kg	10	complete	none
7	O.Y.	3y6m	M	13kg	Sepsis Neuroblastoma	Anerobic gram-posit. Bacilli/Blood	not done	650mg×4 200mg/kg	6	incomplete	none
8	F.S.	2y9m	M	13kg	Pneumonia Embryonal Ca.	neg/Throat		900mg×3 200mg/kg	3	good	none
9	T.F.	1y11m	F	12kg	Sepsis? AML*[3]	*Haemophilus*/Throat *Ps. aerug.*/St	not done 〃	500mg×4 167mg/kg	10	poor	none
10	U.K.	5m	F	11kg	UTI	*E. coli*/U	##/AKM, GM, DKB, CL +/CEX −/CBPC, SBPC, ABPC, TC, CP	400mg×4 140mg/kg	9	complete	none
11	K.K.	13d	M	3.5kg	Pneumonia Wilson-Mikity syndrome	*Ps. aerug.*/Sputum	3.1 +/CBPC, SBPC	240mg×3 206mg/kg	15	good	bacterial alteration

12	H.T.	26d	F	2,465g	Pneumonia CHD & CHF*4	*Ps. aerug.*/Nose Throat St	3.1 ＋/CBPC 〃 SBPC 6.25	150mg×3 183mg/kg	2	not evaluated	died with CHF
13	D.T.	48d	F	2,060g	Meningitis	*Streptococcus* Group B/CSF	＋/PCG, ABPC, CBPC, CEX, CER, EM, TC, CP	150mg×4 300mg/kg	13	complete	none
14	M.C.	18d	F	2,035g	Meningitis Diarrhea	*Streptococcus* Group B/CSF	0.1	230mg×3 329mg/kg	21	complete bacteriologically	none
15	N.T.	11d	F	1,550g	Bacteremia	*Corynebacterium*/ Blood	＋/GM, CER, PCG	50mg×3 97mg/kg	4	good not effective for diarrhea	none
16	T.M.	4d	F	3.5kg	Abscess on the head	*Ps. aerug.*/Pus	＋/GM, CL	120mg×3 103mg/kg	13	incomplete	none

*1: Tuberculosis *2: Urinary tract infection *3: Acute myeloblastic leukemia
*4: Congenital heart disease & congestive heart failure
**1: Stool **2: Urine

Case report

Case 1. U.A. 12 years of age, male. He had been suffered from colon tuberculosis for one year with recurrent bloody diarrhea and emaciation. At the end of June, high fever with chill got up and it was supposed due to septicemic reaction, although no bacteria was isolated from the blood. 120 mg/kg/day of T-1220 was given for 5 days. Clinically any change was not seen and then massive hemorrhage from ulcer happened on the 5th day. This drug was replaced with cefazolin with good effect. *Klebsiella* in the stool was suspected as a pathogenetic organism.

Case 2. Y.T. 14 years of age, male. He had had bloody diarrhea, recurrent abdominal pain and emaciation for 2 years. The X-ray examination revealed remarkable irregular ulcers on the colon and indicated possibility having tuberculosis. Remittent fever of 38.5 to 39.2°C with chill began in the 3rd week of October, and it was suspected to be septicemic reaction as same as in the above case. The drug was given with 160 mg/kg/day, divided 4 times for 5 days. Fever was down to 37.4°C on the 2nd day, and then up to 38.7°C again. When the dose was increased to 210 mg/kg/day on the 6th day, the fever decreased once to 36.8°C, but rose again to 38.2°C, though the maximum temperature was kept in lower degree than that on days without the drug. Diarrhea was decreased in frequency from 6 to 3 times daily. *Klebsiella* isolated from stool before use, which had sensitivities negative to carbenicillin or sulbenicillin and positive to T-1220 at MIC of 3.1 μg/ml, was increased after treatment. After 12 days administration of it, cefazolin was given with good clinical response.

Case 3. K.K. 10 years of age, male. He had been treated with cephalexin or parenteral ampicillin for 3 weeks high fever and one week diarrhea with etiology undetermined. In our hospital *Salmonella typhosa* was isolated from blood. 110 mg/kg/day of T-1220 was given divided 3 times with oral chloramphenicol (50 mg/kg/day). 5 days later rising of temperature was completely ceased and stool became normal within 6 days. They were used for 17 days. No *Salmonella* was cultured again from any specimens of blood, urine, stool and duodenal fluid or bile.

Case 4. T.M. 17 years of age, female. She had developmental retardation complicating with Down syndrome. Urinary tract infection had been occurred occasionally and pyuria continued for a month in this episode. *Pseudomonas aeruginosa* was the pathogenetic bacterium with sensitivities negative to carbenicillin or sulbenicillin. The drug was applied with 110 mg/kg/day of dose, divided 3 times. Pyuria was improved within three days. After 12 days it was discontinued because of increase of mycotic fungus in urine which was needed of local application of amphotericin B for treatment.

Case 5. M.T. 5 years of age, male. The slender boy, whose left kidney had been removed with neuroblastoma 3 years ago, was well in these months. He had moderate fever for a week, which was thought as a cold at first. When he was admitted in our hospital, he was slightly drowsy. The neckstiffness, and KERNIG's and BRUDZINSKI's signs were positive. Immediately after blood culture in midnight, single dose of T-1220, 1.5 g, was given once intravenously. Fever rather rose from 39°C to 40.5°C for 4 hours after injection. 8 hours later, spinal tap was done. The cerebrospinal fluid (CSF) was turbid and contained polymorphonuclear cells, 1,230/cumm, 146 mg/dl of protein, 5 mg/dl of sugar and 111 mEq/L of chlor. Administration of T-1220 was succeeded for 11 days.

The fever was wearing off within four days, and the meningeal signs were improved for a week. The findings of the CSF were also better a week later. *Pneumococcus* was cultured from the blood before the use. A number of various shaped *Diplococcus* was stained with gram positive out of cells in smear of the CSF, which was obtained at 8 hours after the use. Culture of the CSF, however, was negative.

Case 6. K.S. 4 years of age, male. The boy had urinary tract infection with *Proteus mirabilis* associated with erythema exsudativum multiforme syndrome due to phenobarbital. 80 mg/kg/day of the drug was given, divided 3 doses with corticosteroid. Pyuria was improved rapidly.

Case 7. O.Y. 3 years and 6 months of age, male. He had suspected septicemia associated with neuroblastoma with metastasis on cranial area and in the abdomen. Continuous high fever between 39 to 40°C in daily maximum for 5 days was changed to remittent fever up to 38.4°C with 200 mg/kg/day of this drug. After 6 days administration of it, cephaloridine replaced and gave good effect. One week later, anerobic gram positive bacilli were cultured from the blood on the day the drug was begun to use.

Case 8. F.S. 2 years and 9 months of age, male. He began to cough with mild fever. He was seen and diagnosed having acute pneumonia and tumors in the abdomen and left supraclavicular area, which was due to metastasis of embryonal carcinoma of testis operated. Against the pneumonia T-1220 was given with daily dose of 200 mg/kg. After 3 days administration, it was discontinued because of improving of fever and C-reactive protein (CRP), and uncomfortableness of intravenous route for the patient.

Case 9. T.F. 1 year and 11 months of age, female. She had suspected septicemia associated with acute myeloblastic leukemia under treatment with cytosine arabinoside, cyclophosphamide, vincristine and corticosteroid. High fever between 39.0 to 39.6°C was not modified with 3 g of carbenicillin a day for 12 days. When 2 g of T-1220 a day was substituted for it, the fever descended between 38.2 to 38.4°C for 6 days but tended to ascend again. Blood culture was negative. Abundant *Haemophilus* in throat before the use were disappeared but *Pseudomonas aeruginosa* in stool was not eradicated.

Case 10. U.K. 5 months of age, female. The infant, who was obese with 11 kg of weight because of ACTH treatment for infantile spasm, otherwise with ordinary body weight 8 kg, had suddenly high fever of 39.5°C. Urinalysis showed positive Donné reaction, increased WBC in sediment and presence of motile bacilli. Initially cephalexin (100 mg/kg/day) was given orally, but any clinical or laboratory improvement was not obtained. On the 3rd day, when T-1220 was used instead of cephalexin, very rapid defervescence was seen within 2 days, and urinalysis became normal within 4 days. A pathogenetic organism in urine was *E. coli* which was resistant to CBPC, SBPC, ABPC, CP and TC, and + sensitive to cephalexin.

Case 11. K.K. 139 days of age, male. The baby, born at 1,200 g of weight, was suffered from respiratory difficulty with Wilson-Mikity syndrome. On the 139th day after birth, he had fever and chest X-ray examination showed abnormal shadow of infiltration. *Pseudomonas aeruginosa* was isolated from sputum. The organism was sensitive to T-1220 at MIC of 3.1 μg/ml, and less sensitive, 1+ with discs, to carbenicillin or sulbenicillin. 200 mg/kg/day of the drug was given divided 3 times for 15 days. The fever was subsided, and physical sign on the chest and abnormal values of blood gas were improved in a few days. CRP was also modified from 6+ to 4+. Low grade fever, however, appeared again around the 10th day of administration. Culture was negative in sputum, but resistant *Klebsiella* increased in the stool.

Case 12. H.T. 26 days of age, female. The birth weight was 2,440 g after 43 weeks gestation and the weight was also 2,465 g on the day of treatment, because she had severe congenital heart disease. She had been given cephalothin for 3 days against pneumonia with high fever. When *Pseudomonas* was cultured from nose, throat and stool, T-1220 was choiced preferring to low concentration of sodium and low nephrotoxicity comparing with carbenicillin or gentamicin, because she had severe congestive cardiac failure. She was died of cardiac failure on the 3rd day of the treatment.

Case 13. D.T. 48 days of age, female. The infant, born with 1,190 g of weight at the 31st gestational week, had been grown without any trouble. On the 47th day, body temperature elevated up to 38°C. On the next day, spinal tap was done, because of hypoactivity and fever, although any definite neurological abnormality, increased tension of fontanel or abnormal findings of blood picture were not found. The CSF was turbid with polymorphonuclear cells 930/cumm. Concentrations of protein and glucose were 457 mg/dl and 6 mg/dl respectively. *Streptococcus* group B was cultured from the CSF, but not from blood, throat nor stool. T-1220 was given intravenously, 300 mg/kg/day for 13 days. Improving of general findings was so rapid as that the fever was not seen on the next day. Improving of the abnormal findings of the CSF was so slow as follows, increased cell count 300/cumm, elevated protein 435 mg/dl and decreased sugar 22 mg/dl at 2 weeks later, but the organism was not isolated from the CSF on the 2nd day and thereafter.

Case 14. M.C. 18 days of age, female. The low birth weight infant, born at 2,190 g in the 33rd gestational week by cesarean section, had appeared to be healthy until the 15th day. On the day she showed difficulty of feeding, and developed to have fever and convulsive seizures on the next day. Findings of the cerebrospinal fluid indicated the purulent meningitis. Both cephalothin and gentamicin were given for initial 3 days, and when the pathogenetic agent was confirmed to be *Streptococcus* group B, T-1220 alone was used with the dose of 300 mg/kg/day, divided 3 times for 21 days. The bacterium was completely eradicated and the baby is alive with severe sequelae.

Case 15. N.T. 11 days of age, female. The baby, born at 1,720 g of weight in the 33rd gestational week, had low grade fever and sequential diarrhea which was dark green in color with blood and had not been controlled with cephalothin. On the 11th day, blood culture produced *Corynebacterium* species bacterium. Instead of cephalothin, T-1220 was applied for 4 days. The fever was down 2 days later and diarrhea was improved in nature and in frequency from 11 times to 5 daily. The following blood culture were negative.

Case 16. T.M. 4 days of age, female. The infant, born at 3,700 g of weight, had hemorrhagic tendency and subaponeurotic hemorrhage. In spite of no fever, apneic attacks happened and CRP rose to 4+, and which were not improved with cephalothin. When a cephalohematoma on the right parietal area was found to be infected with *Pseudomonas aeruginosa,* T-1220 was given with the dose of 100 mg/kg/day for 13 days. It merely modified CRP 4+ to 3+. Any progressive sign was not observed clinically. So soon as gentamicin, sensitive to the bacillus, was used instead of T-1220, CRP elevated rapidly beyond expectation and infected hematoma became in need of surgical treatment.

The definite side effect was not seen locally nor generally in every case. Laboratory data before and after administration of T-1220 were summarized in Table 2.

Table 2 Laboratory data before and

No.	*1 Day examined	RBC 10^6/cumm	Hb g/dl	Ht %	WBC /cumm	Urinalysis				BUN ** mg%	Creatinine** mg%	Uric acid** mg%
						Prot.	Glucose	Urobilng.	Sediment			
1	−4	4.30	9.9	32	8,100	−	−	N	0	4.5	0.6	nd
	7	3.64	8.9	28	5,200	−	−	N	0	4.6	0.6	4.2
2	−1	4.76	10.3	34	10,600	±	−	N	W15	6	0.8	5.3
	11	4.68	10.7	34	9,000	−	−	N	0	8	0.5	4.2
3	−1	3.88	11.2	33	8,500	−	−	N	0	6	1.1	5.6
	18	3.58	10.2	30	4,800	−	−	N	0	10	0.4	4.2
4	−2	4.24	12.0	36	6,000	+	−	N	W##	15	0.4	7.5
	14	4.11	11.9	35	3,800	−	−	N	W70	8	0.4	6.6
5	0	3.66	9.4	30	13.200	±	−	N	0	21	1.2	5.5
	8	3.68	9.4	29	6.400	−	−	N	0	14	0.4	2.0
6	0	2.44	6.1	20	8,200	+	−	N	R6, W26, C5	11	0.4	4.6
	13	4.17	12.1	37	3,700	−	−	N	R1	7	0.4	6.0
7	−1	3.22	8.8	26	5,300	##	−	N	R##, W18	6	0.3	4.4
	10	3.23	8.6	26	7,000	+	−	N	R+	9	0.4	2.8
8	0	4.42	11.0	34	11,600	−	−	+	0	12	0.5	5.3
	5	4.04	9.8	30	4,200	±	−	N	0	9	0.3	4.3
9	0	3.17	9.3	26	3,100	+	−	N	R##	10	0.7	2.2
	11	3.48	10.3	29	900	+	−	N	R##, C5	15	0.3	1.7
10	−2	4.32	12.3	38	15,000	##	−	N	R5, W306	12	0.6	4.0
	10	4.41	12.8	38	15,600	−	−	N	0, 0	10	0.4	4.4
11	0	3.06	8.5	28	6,000	−	−	N	W6, C1	/	/	/
	11	/	9.3	/		−	−	N	0	5	0.4	1.6
12	−3	/	/	/	/	/	/	/	/	18.6	/	/
	3	4.38	18.5	nd	233,500	−	−	N	0	61	1.7	12
13	0	/	/	/	5,000	−	−	/	0	13.6	/	/
	12	/	/	/	5,700	−	−	/	0	4.0	/	/
14	0	4.13	13.0	43	4,300	±	−	N	0	23.3	/	/
	21	3.39	10.0	26	3,100	±	−	N	0	15	0.6	3.6
15	−8	3.88	18.0	50	8,400	±	−	N	0	24	/	/
	10	3.88	14.0	39	7,200	−	−	N	0	14	/	/
16	−1	3.65	14.0	38	36,100	##	−	N	0	86	2.5	20.8
	13	/	/	/	15,100	−	−	N	0	7	0.4	3.3

*1 : 0 means the day the administration was begun.
/ : not available

Discussion and conclusion

The new drug is stronger in antibacterial effect and more bactericidal against gram negative bacilli in general, comparing with carbenicillin or sulbenicillin by examination *in vitro*.[1] It is most important point whether the same effect is expected in clinical use. By our observation it appears to be excellent against *Pseudomonas* infections and it is clear in cases 4 and 11. T-1220 shows clinical effectiveness to *Pseudomonas* or *E. coli* infections which are resistant or poor sensitive to carbenicillin and sulbenicillin. In the case 16, it seems

after administration of T-1220

GOT # mu/ml	GPT # mu/ml	Chol. ** mg%	LDH # mu/ml	T. Bil. ** mg%	ALP # mu/ml	Gluc. ** mg%	T. Prot. *** g%	Na ##	K ##	Cl ##	Ca ** mg%	CRP
39	15	150	135	nd	nd	96	6.6	140	3.8	101	9.0	3+
18	10	170	120	0.2	90	100	6.7	139	4.2	102	8.8	3+
18	7	100	125	0.3	95	90	5.8	139	3.8	103	8.5	4+
22	12	120	115	0.3	103	95	6.8	139	4.7	98	8.7	4+
70	38	150	450	0.6	136	125	6.2	126	3.3	93	8.2	4+
40	40	170	190	0.4	170	100	8.1	142	4.2	102	9.2	—
75	70	110	125	2.0	135	/	5.7	123	4.3	92	8.7	5+
60	80	180	120	0.3	160	80	7.4	141	4.7	99	8.6	—
186	45	153	1,200<	1.1	140	85	6.4	130	4.4	95	8.0	4+
30	20	250	255	0.2	90	150	7.0	134	5.2	95	9.3	2+
200	130	190	600	1.1	165	90	5.0	134	4.1	97	8.5	1+
30	22	225	600	0.6	160	85	6.7	142	3.8	104	9.8	—
80	75	110	700	0.4	150	/	5.9	132	4.4	102	3.5	5+
40	20	170	650	0.2	180	90	7.4					6+
56	20	280	600	0.4	150	85	7.8	137	6.2	99	8.5	3+
36	17	225	1 040	0.2	105	105	6.2	135	4.1	102	9.0	—
30	16	190	590	0.8	100	140	7.2	134	3.7	96	10.0	7+
20	14	260	270	1.1	85	115	6.8	144	3.3	102	10.3	5+
52	100	190	280	0.3	95	140	7.7	141	4.9	104	9.2	6+
70	56	210	360	0.2	236	110	7.6	142	4.4	109	9.2	—
/	/	/	/	/	/	/	/	139	3.8	102	nd	6+
53	35	100	625	0.8	240	60	5.1	131	4.8	93	8.0	4+
/	/	/	/	/	/	/	5.4	143	6.7	97	10.2	—
233	160	120	600	3.4	325	120	4.8	144	4.4	77	7.7	3+
/	/	/	/	/	/	/	5.4	133	5.7	95	nd	4+
/	/	/	/	/	/	/	4.8	142	5.9	109	nd	—
/	/	/	/	6.7	/	/	5.7	133	6.5	/	/	6+
40	30	210	260	0.6	250	97	5.3	160	4.3	123	10.0	1+
/	/	/	/	9.0	/	49	5.3	148	6.5	105	10.0	—
/	/	/	/	5.0	/	/	5.4	145	4.2	108	/	—
560	330	225	600	6.0	230	140	6.0	140	3.0	109	4.2	4+
25	13	210	360	0.4	120	80	6.8	140	4.0	/	10.0	3+
												(8+)*

*: when discontinued **, ***, #: Serum examined by autoanalyser SMA12-60.
##: mEq/L

to be more effective clinically to *Pseudomonas aeruginosa* infection than gentamicin ## sensitive to it. It must be considered, however, that the effect may depend on another factor such as penetrative force of the drug in the abscess, besides antibacterial strength. Against *Klebsiella* infections in our ward, clinical effect is incomplete with the dose of 100 to 200 mg/kg/day, in spite of excellent data *in vitro*,[1] although it is better than with carbenicillin clinically. Against gram positive cocci except resistant *Staphylococcus*, PCG or ABPC are more effective than T-1220.

The late onset streptococcal meningitis, which is usually fatal, is really responsive to T-1220 in both full-term newborn and low birth weight infant. T-1220 is effective to the meningitis with *Pneumococcus*, which in one of three principal pathogenetic bacteria in child meningitis after newborn period. It impresses strikingly of bactericidal activity *in vivo*, that one shot dose of it inhibits *Pneumococcus* to grow in the CSF, in which smear many cocci are seen. We want to know whether T-1220 is suitable for meningococcemia and *Haemophilus influenzae* meningitis. By impression under the above observations, T-1220 seems worth to use for initial treatment of severe bacterial infections in children, when pathogenetic agent is not determined, because of wider and stronger antibacterial effect than that of ordinary penicillins. Another merit is lower sodium concentration which is desirable for treatment of patients with renal or cardiac failure, or of premature baby.

We are interested, in the point of view of relapse, whether the drug is able to destruct any bacteria as completely *in vivo* as seen of *Pneumococcus*. *In vitro* the prolongation of bacteria is seen, but the rupture is not in same concentration of the drug and same cultured time as it is seen with carbenicillin.[1] This is related to the period when the drug should be discontinued. There was no uncomfortable effect locally or generally in our small trial fortunately. More precise observation is needed to obtain the optimal dose, interval and duration of administration in children safely.

Reference

1) The 23rd East Section Congress of Chemotherapy (Japan Society of Chemotherapy), New Drug Symposium I, Abstract of T-1220, Tokyo, 1976
2) NAKAZAWA, S. : Preliminary clinical study on T-1220 in pediatric area. The 2nd meeting of study on T-1220, Tokyo, 1976