


1 Supplementary Materials


2 Fig. S1. Test report of the Thyrokitty injection (I-131) used for the %cell uptake assay and the MTT
 3 assay.

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		시험지시 및 성적서		Document No. : KAERI-VPOL-203-F04	
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품명	싸이로키티 주사액(I-131)	제조번호	KAERI-Efficacy-2022-01	입고일자	2022. 10. 11.
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성상	무색의 맑은 액	무색의 맑은 액	2022. 10. 11.	남성수	적, 부
확인시험	주파수 0.364 MeV	0.363 ~ 0.366	2022. 10. 11.	남성수	적, 부
pH	7.5 ~ 9.0	8.0 ~ 9.0	2022. 10. 11.	남성수	적, 부
방사화학적 순도	95 % 이상	100	2022. 10. 11.	남성수	적, 부
무균	음성				적, 부
엔도톡신	175 EU/V 미만	5 EU/mL 미만	2022. 10. 11.	남성수	적, 부
불용성이물	무검출	무검출	2022. 10. 11.	남성수	적, 부
정량법(방사능량)	90 ~ 110 %	100.4	2022. 10. 11.	남성수	적, 부
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판정	판정일자	품질검사자	품질부서책임자		
적합	2022. 10. 11.	남성수	조은하		
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6 Fig. S2. Test report of the Thyrokitty injection (I-131) used for the tissue distribution and excretion
 7 test.

		시험지시 및 성적서		Document No. : KAERI-VPOL-203-F04	
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품명	싸이로키티 주사액(I-131)	제조번호		입고일자	2022.09.19
입고수량	1			시험일자	2022.09.19
시험의뢰번호		채취자/채취일자	남성수 / 2022.09.19		
접수일자	2022.09.19	채취량	1		
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시험항목	시험기준	시험결과	시험일자	시험자 (필수영사자)	적/부
성상	무색의 맑은 액	무색의 맑은 액	2022.09.19	남성수	적,부
확인시험	주피크 0.364 MeV	0.363 ~ 0.366	2022.09.19	남성수	적,부
pH	7.5 ~ 9.0	8.0	2022.09.19	남성수	적,부
방사화학적 순도	95 % 이상	100 %	2022.09.19	남성수	적,부
무균	음성				적,부
엔도톡신	175 EU/V 미만	175 EU/V 미만	2022.09.19	남성수	적,부
불용성이물	무검출	무검출	2022.09.19	남성수	적,부
정량법(방사능량)	90 ~ 110 %	102 %	2022.09.19	남성수	적,부
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판정	판정일자	품질검사자	품질부서책임자		
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이 문서는 KAERI의 소유이므로 대외비로 관리하여야 하며 허가 없이 복사할 수 없다. This document is the property of KAERI and is treated confidentially. It should not be copied without permission.					

9 **Table S1. Dosage for each individual**

	Animal no.	Weight (g)	Dosage (μCi)	Calculated dosage (μCi)	Actual dosage (μCi)	Dosing rate (%)
0.083 h	1	34.72	69.44	70	77.67	110.96
	2	33.53	67.06	70	76.39	109.13
	3	31.00	62.00	60	78.64	131.07
	4	32.38	64.76	60	61.82	103.03
1 h	1	34.65	69.30	70	78.49	112.13
	2	33.67	67.34	70	80.54	115.06
	3	33.38	66.76	70	75.32	107.60
	4	34.07	68.14	70	80.31	114.72
6 h	1	34.62	69.24	70	78.65	112.36
	2	34.07	68.14	70	79.39	113.41
	3	33.08	66.16	70	75.44	107.78
	4	32.41	64.82	60	55.87	93.11
24 h	1	34.62	69.24	70	78.51	112.16
	2	33.46	66.92	70	72.60	103.72
	3	33.05	66.10	70	74.60	106.56
	4	32.29	64.58	60	58.30	97.16
48 h	1	34.50	69.00	70	80.44	114.92
	2	33.88	67.76	70	81.23	116.04
	3	33.02	66.04	70	76.14	108.76
	4	32.34	64.68	60	58.21	97.02
72 h	1	34.29	68.58	70	76.44	109.20
	2	33.50	67.00	70	75.05	107.21
	3	32.86	65.72	70	75.46	107.80
	4	31.59	63.18	60	57.20	95.34
168 h	1	34.29	68.58	70	77.18	110.25
	2	34.88	69.76	70	82.47	117.81
	3	32.79	65.58	70	69.13	98.76
	4	31.31	62.62	60	59.90	99.83
Excretion	1	34.14	68.28	70	73.30	104.71
	2	34.81	69.62	70	79.69	113.85
	3	32.55	65.10	70	76.21	108.87
	4	32.48	64.96	60	58.28	97.13

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12 **Table S2. After administration of the Thyrokitty injection (I-131), *in vivo* tissue distribution by**
 13 **individual (%ID/organ)**

0.083 h / animal no.	1	2	3	4	Mean (%ID/organ)	SD
Blood	28.513	8.357	5.533	9.193	12.899	10.526
Heart	0.140	0.365	0.150	0.254	0.227	0.105
Liver	1.870	2.542	1.829	2.475	2.179	0.382
Lung	0.440	0.633	0.517	0.685	0.569	0.111
Spleen	0.123	0.219	0.134	0.177	0.163	0.044
Kidney	2.075	2.180	1.794	2.434	2.121	0.265
Stomach	0.372	0.970	0.546	1.044	0.733	0.326
Small intestine	1.459	1.960	1.472	2.333	1.806	0.422
Large intestine	0.699	0.968	0.681	1.133	0.870	0.219
Muscle	2.192	4.088	2.174	3.747	3.050	1.011
Femur	8.670	11.576	8.306	10.846	9.850	1.607
Brain	0.098	0.080	0.052	0.102	0.083	0.023
Thyroid	0.064	0.201	0.160	0.154	0.145	0.058
Skin	23.354	17.639	10.134	19.370	17.624	5.537
Testis	0.089	0.124	0.093	0.149	0.114	0.028

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1 h / animal no.	1	2	3	4	Mean (%ID/organ)	SD
Blood	4.013	3.540	4.085	4.457	4.024	0.377
Heart	0.126	0.106	0.092	0.223	0.137	0.059
Liver	1.433	1.425	1.553	1.431	1.461	0.062
Lung	0.442	0.311	0.365	0.396	0.379	0.055
Spleen	0.126	0.097	0.113	0.137	0.118	0.017
Kidney	0.805	0.762	0.863	0.150	0.645	0.333
Stomach	1.825	3.099	2.454	0.974	2.088	0.907
Small intestine	2.585	1.355	2.878	1.674	2.123	0.725
Large intestine	1.064	1.038	0.961	2.719	1.446	0.850
Muscle	2.359	1.623	1.739	14.033	4.938	6.072
Femur	7.185	6.004	7.045	9.293	7.382	1.379
Brain	0.041	0.048	0.042	0.045	0.044	0.003
Thyroid	0.745	0.377	0.617	0.129	0.467	0.272
Skin	0.829	0.695	0.679	0.920	0.781	0.115
Testis	0.119	0.139	0.123	0.168	0.137	0.022

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6 h / animal no.	1	2	3	4	Mean (%ID/organ)	SD
Blood	1.654	1.241	1.425	1.391	1.428	0.171
Heart	0.052	0.042	0.060	0.054	0.052	0.007
Liver	0.687	0.406	0.557	0.447	0.524	0.126
Lung	0.188	0.110	0.157	0.124	0.145	0.035
Spleen	0.047	0.037	0.056	0.051	0.048	0.008
Kidney	0.373	0.177	0.310	0.250	0.277	0.084
Stomach	1.946	1.104	0.754	1.847	1.413	0.578
Small intestine	1.239	1.088	1.179	1.209	1.179	0.065
Large intestine	0.837	1.075	1.248	0.944	1.026	0.177
Muscle	0.773	0.713	0.964	0.593	0.761	0.155
Femur	2.304	2.263	2.806	2.184	2.389	0.282
Brain	0.016	0.013	0.022	0.015	0.016	0.004
Thyroid	1.446	1.138	1.224	1.584	1.348	0.204
Skin	0.184	0.202	0.324	0.202	0.228	0.065
Testis	0.085	0.067	0.066	0.088	0.077	0.012

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24 h / animal no.	1	2	3	4	Mean (%ID/organ)	SD
Blood	0.090	0.030	0.031	0.028	0.029	0.002
Heart	0.003	0.002	0.002	0.002	0.002	0.000
Liver	0.063	0.029	0.032	0.033	0.031	0.002
Lung	0.007	0.005	0.005	0.006	0.005	0.000
Spleen	0.003	0.001	0.002	0.001	0.002	0.000
Kidney	0.013	0.010	0.010	0.012	0.011	0.001
Stomach	0.055	0.012	0.010	0.023	0.015	0.007
Small intestine	0.090	0.035	0.025	0.046	0.036	0.010
Large intestine	0.039	0.021	0.023	0.030	0.025	0.005
Muscle	0.051	0.030	0.022	0.020	0.024	0.005
Femur	0.118	0.046	0.043	0.062	0.050	0.010
Brain	0.001	0.001	0.001	0.009	0.004	0.005
Thyroid	1.388	0.000	0.008	1.303	0.437	0.750
Skin	0.028	0.029	0.019	0.012	0.020	0.009
Testis	0.003	0.001	0.001	0.002	0.002	0.001

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48 h / animal no.	1	2	3	4	Mean (%ID/organ)	SD
Blood	0.027	0.023	0.018	0.037	0.026	0.008
Heart	0.002	0.001	0.001	0.002	0.002	0.000
Liver	0.033	0.027	0.020	0.044	0.031	0.010
Lung	0.006	0.005	0.004	0.005	0.005	0.001
Spleen	0.001	0.001	0.001	0.001	0.001	0.000
Kidney	0.016	0.012	0.011	0.015	0.013	0.003
Stomach	0.011	0.007	0.006	0.013	0.009	0.003
Small intestine	0.041	0.026	0.015	0.043	0.031	0.013
Large intestine	0.019	0.013	0.017	0.024	0.018	0.005
Muscle	0.032	0.022	0.020	0.027	0.025	0.005
Femur	0.044	0.036	0.041	0.070	0.048	0.015
Brain	0.001	0.001	0.001	0.001	0.001	0.000
Thyroid	0.937	0.877	1.179	0.010	0.751	0.511
Skin	0.022	0.026	0.076	0.028	0.038	0.026
Testis	0.001	0.001	0.001	0.002	0.001	0.000

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72 h / animal no.	1	2	3	4	Mean (%ID/organ)	SD
Blood	0.018	0.027	0.030	0.016	0.023	0.007
Heart	0.001	0.001	0.001	0.001	0.001	0.000
Liver	0.019	0.032	0.029	0.021	0.025	0.006
Lung	0.005	0.005	0.005	0.003	0.004	0.001
Spleen	0.001	0.001	0.001	0.001	0.001	0.000
Kidney	0.014	0.017	0.018	0.011	0.015	0.003
Stomach	0.004	0.007	0.005	0.004	0.005	0.001
Small intestine	0.019	0.018	0.023	0.023	0.021	0.003
Large intestine	0.010	0.019	0.020	0.019	0.017	0.005
Muscle	0.018	0.028	0.024	0.016	0.022	0.006
Femur	0.038	0.053	0.053	0.044	0.047	0.007
Brain	0.001	0.001	0.001	0.001	0.001	0.000
Thyroid	1.435	1.033	1.841	1.027	1.334	0.388
Skin	0.013	0.008	0.136	0.018	0.044	0.062
Testis	0.001	0.001	0.001	0.006	0.003	0.003

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168 h / animal no.	1	2	3	4	Mean (%ID/organ)	SD
Blood	0.007	0.015	0.023	0.007	0.013	0.008
Heart	0.001	0.000	0.001	0.001	0.001	0.000
Liver	0.011	0.009	0.022	0.012	0.014	0.006
Lung	0.005	0.003	0.006	0.004	0.005	0.002
Spleen	0.001	0.000	0.001	0.000	0.001	0.000
Kidney	0.010	0.014	0.023	0.019	0.017	0.006
Stomach	0.003	0.002	0.004	0.004	0.003	0.001
Small intestine	0.008	0.006	0.015	0.014	0.011	0.004
Large intestine	0.008	0.006	0.023	0.011	0.012	0.008
Muscle	0.023	0.011	0.022	0.019	0.019	0.005
Femur	0.539	0.018	0.042	0.034	0.158	0.254
Brain	0.001	0.000	0.002	0.001	0.001	0.001
Thyroid	0.365	0.254	0.425	0.350	0.349	0.071
Skin	0.008	0.005	0.017	0.007	0.009	0.005
Testis	0.000	0.000	0.001	0.001	0.001	0.000

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27 **Table S3. After administration of the Thyrokitty injection (I-131), *in vivo* tissue distribution by**
 28 **individual (%ID/g)**

0.083 h / animal no.	1	2	3	4	Mean (%ID/g)	SD
Blood	14.038	4.260	3.051	4.853	6.551	5.048
Heart	1.053	1.995	1.122	1.790	1.490	0.473
Liver	0.964	1.376	0.988	1.504	1.208	0.273
Lung	2.054	3.074	2.164	3.603	2.724	0.743
Spleen	1.128	1.675	1.274	1.942	1.505	0.372
Kidney	2.923	3.694	2.985	4.645	3.562	0.802
Stomach	1.557	2.938	2.283	3.730	2.627	0.927
Small intestine	0.878	1.356	0.941	1.389	1.141	0.269
Large intestine	0.635	1.043	0.702	1.099	0.870	0.235
Muscle	0.451	0.871	0.501	0.827	0.662	0.217
Femur	1.135	1.569	1.218	1.523	1.361	0.217
Brain	0.206	0.183	0.123	0.318	0.208	0.082
Thyroid	1.828	2.370	3.566	2.413	2.544	0.731
Skin	38.475	12.591	17.936	31.963	25.241	12.024
Testis	0.486	0.672	0.469	0.725	0.588	0.130

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1 h / animal no.	1	2	3	4	Mean (%ID/g)	SD
Blood	1.980	1.797	2.092	2.236	2.026	0.185
Heart	0.909	0.754	0.720	1.162	0.886	0.202
Liver	0.729	0.768	0.831	0.756	0.771	0.043
Lung	1.638	1.408	1.835	1.858	1.685	0.209
Spleen	1.163	1.074	1.165	1.190	1.148	0.051
Kidney	1.464	1.301	1.568	0.283	1.154	0.591
Stomach	7.389	10.913	10.266	3.477	8.011	3.389
Small intestine	1.322	0.879	1.722	0.941	1.216	0.390
Large intestine	0.749	0.724	5.686	2.187	2.336	2.335
Muscle	0.486	0.344	0.372	2.942	1.036	1.272
Femur	0.943	0.811	0.959	1.240	0.988	0.181
Brain	0.098	0.096	0.097	0.103	0.099	0.003
Thyroid	9.431	12.562	20.571	1.192	10.939	8.014
Skin	1.109	1.112	1.579	1.679	1.370	0.302
Testis	0.780	0.741	0.727	0.893	0.785	0.075

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6 h / animal no.	1	2	3	4	Mean (%ID/g)	SD
Blood	0.817	0.622	0.737	0.733	0.727	0.080
Heart	0.317	0.266	0.375	0.356	0.329	0.048
Liver	0.379	0.230	0.309	0.274	0.298	0.063
Lung	0.690	0.477	0.659	0.636	0.616	0.095
Spleen	0.444	0.327	0.435	0.493	0.425	0.070
Kidney	0.530	0.349	0.560	0.492	0.483	0.094
Stomach	6.299	3.861	2.946	5.700	4.701	1.564
Small intestine	0.835	0.551	0.652	0.602	0.660	0.124
Large intestine	0.858	0.893	0.964	0.917	0.908	0.045
Muscle	0.159	0.150	0.208	0.131	0.162	0.033
Femur	0.303	0.302	0.386	0.306	0.324	0.041
Brain	0.038	0.034	0.044	0.035	0.038	0.005
Thyroid	17.012	11.267	11.543	25.556	16.345	6.687
Skin	0.481	0.504	0.474	0.319	0.445	0.085
Testis	0.398	0.330	0.431	0.385	0.386	0.042

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24 h / animal no.	1	2	3	4	Mean (%ID/g)	SD
Blood	0.044	0.016	0.016	0.015	0.015	0.000
Heart	0.018	0.011	0.010	0.012	0.011	0.001
Liver	0.030	0.014	0.016	0.018	0.016	0.002
Lung	0.044	0.024	0.023	0.027	0.025	0.002
Spleen	0.023	0.014	0.013	0.014	0.014	0.001
Kidney	0.033	0.016	0.018	0.024	0.020	0.004
Stomach	0.115	0.038	0.035	0.073	0.049	0.021
Small intestine	0.039	0.018	0.017	0.023	0.019	0.003
Large intestine	0.037	0.020	0.016	0.036	0.024	0.011
Muscle	0.010	0.007	0.005	0.005	0.005	0.001
Femur	0.015	0.006	0.006	0.009	0.007	0.002
Brain	0.002	0.001	0.001	0.020	0.007	0.010
Thyroid	30.173	0.014	0.088	16.283	5.462	9.372
Skin	0.032	0.053	0.035	0.035	0.041	0.010
Testis	0.016	0.006	0.007	0.009	0.007	0.002

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48 h / animal no.	1	2	3	4	Mean (%ID/g)	SD
Blood	0.013	0.012	0.009	0.019	0.013	0.004
Heart	0.009	0.007	0.006	0.013	0.009	0.003
Liver	0.017	0.013	0.012	0.020	0.016	0.004
Lung	0.023	0.021	0.017	0.025	0.022	0.004
Spleen	0.011	0.010	0.008	0.012	0.010	0.002
Kidney	0.026	0.020	0.021	0.030	0.024	0.004
Stomach	0.026	0.029	0.019	0.041	0.029	0.009
Small intestine	0.017	0.012	0.011	0.020	0.015	0.005
Large intestine	0.018	0.012	0.011	0.023	0.016	0.006
Muscle	0.006	0.005	0.004	0.006	0.005	0.001
Femur	0.006	0.005	0.006	0.010	0.006	0.002
Brain	0.002	0.001	0.002	0.003	0.002	0.001
Thyroid	14.643	27.404	34.668	0.149	19.216	15.169
Skin	0.020	0.055	0.108	0.050	0.058	0.037
Testis	0.007	0.006	0.005	0.006	0.006	0.001

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72 h / animal no.	1	2	3	4	Mean (%ID/g)	SD
Blood	0.009	0.013	0.015	0.009	0.011	0.003
Heart	0.010	0.008	0.009	0.006	0.008	0.002
Liver	0.010	0.016	0.015	0.011	0.013	0.003
Lung	0.022	0.025	0.022	0.015	0.021	0.004
Spleen	0.009	0.011	0.007	0.006	0.008	0.002
Kidney	0.025	0.033	0.032	0.025	0.029	0.004
Stomach	0.017	0.026	0.018	0.014	0.019	0.005
Small intestine	0.009	0.011	0.014	0.012	0.011	0.002
Large intestine	0.012	0.013	0.015	0.018	0.015	0.002
Muscle	0.004	0.006	0.005	0.004	0.005	0.001
Femur	0.005	0.007	0.007	0.006	0.006	0.001
Brain	0.002	0.002	0.003	0.002	0.002	0.001
Thyroid	35.000	51.658	73.649	73.377	58.421	18.707
Skin	0.019	0.011	0.168	0.033	0.058	0.074
Testis	0.005	0.006	0.006	0.035	0.013	0.014

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40

168 h / Animal no.	1	2	3	4	Mean (%ID/g)	SD
Blood	0.003	0.007	0.011	0.003	0.006	0.004
Heart	0.005	0.002	0.007	0.004	0.004	0.002
Liver	0.005	0.004	0.010	0.006	0.006	0.002
Lung	0.021	0.012	0.026	0.016	0.019	0.006
Spleen	0.007	0.003	0.007	0.004	0.005	0.002
Kidney	0.018	0.025	0.041	0.035	0.030	0.010
Stomach	0.008	0.005	0.014	0.011	0.010	0.004
Small intestine	0.004	0.003	0.013	0.007	0.007	0.004
Large intestine	0.006	0.004	0.014	0.010	0.009	0.004
Muscle	0.004	0.002	0.005	0.004	0.004	0.001
Femur	0.067	0.002	0.005	0.004	0.020	0.031
Brain	0.001	0.001	0.004	0.002	0.002	0.001
Thyroid	13.531	11.524	19.335	14.006	14.599	3.336
Skin	0.013	0.011	0.021	0.009	0.013	0.005
Testis	0.001	0.002	0.005	0.003	0.003	0.002

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43 **Table S4. Excretion amount of each individual in urine and feces over time (%ID)**

44

6 h / animal no.	1	2	3	4	Mean (%ID)	SD
Urine	12.463	0.007	11.951	13.780	9.550	6.409
Feces	0.111	0.312	0.023	0.038	0.121	0.133
Swab	2.105	2.567	0.341	0.702	1.429	1.075

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24 h / animal no.	1	2	3	4	Mean (%ID)	SD
Urine	4.046	29.868	12.942	19.303	16.540	10.867
Feces	4.274	4.618	6.247	3.509	4.662	1.154
Swab	12.429	1.866	5.207	3.877	5.845	4.599

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48 h / animal no.	1	2	3	4	Mean (%ID)	SD
Urine	0.242	0.996	5.120	1.247	1.901	2.188
Feces	0.839	0.528	1.389	0.339	0.774	0.459
Swab	6.005	1.106	3.685	0.613	2.852	2.496

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72 h / animal no.	1	2	3	4	Mean (%ID)	SD
Urine	0.279	0.161	0.219	0.521	0.295	0.158
Feces	0.937	0.741	0.260	0.414	0.588	0.307
Swab	3.546	1.282	0.493	2.536	1.964	1.349

48

120 h / animal no.	1	2	3	4	Mean (%ID)	SD
Urine	0.392	0.069	0.624	0.149	0.309	0.251
Feces	0.100	0.280	0.649	0.216	0.311	0.237
Swab	0.159	0.288	1.045	0.406	0.474	0.394

49

168 h / animal no.	1	2	3	4	Mean (%ID)	SD
Urine	0.122	0.039	0.393	0.164	0.180	0.151
Feces	0.452	0.141	0.324	0.122	0.260	0.157
Swab	1.093	0.195	0.740	0.117	0.536	0.463

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