Data in brief 23 (2019) 103814

Contents lists available at ScienceDirect

Data in brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Screening dataset of food components that enhance transcriptional activity of PGC1-beta

Shiho Nakai [1], Ran Uchitomi [1], Rintaro Matsuda, Takumi Onishi, Yukino Hatazawa, Yasutomi Kamei*

Graduate School of Life and Environmental Sciences, Kyoto Prefectural University, Kyoto, Japan

ARTICLE INFO

Article history:
Received 29 November 2018
Received in revised form 25 February 2019
Accepted 27 February 2019
Available online 6 March 2019

Keywords:
Screening
Reporter assay
Transcriptional activity

ABSTRACT

PGC-1β is a transcriptional co-activator of nuclear receptors, which acts to increase energy expenditure. PGC-1β fused to GAL4 DNA-binding domain transfected in HEK293T cells showed a reporter luciferase activity. We screened food-derived and natural compounds using a reporter assay system to measure the transcriptional activity of PGC-1β.

We found that soy-derived isoflavones, genistein and daidzein, and several resveratrols activated PGC-1β, see "Genistein, daidzein, and resveratrols stimulate PGC-1β-mediated gene expression" [1]. The list of 166 compounds and their reporter activity is shown here.

DOI of original article: https://doi.org/10.1016/j.bbrep.2018.11.009.
* Corresponding author.
E-mail address: kamei@kpu.ac.jp (Y. Kamei).
[1] These authors contributed equally to this study.

https://doi.org/10.1016/j.dib.2019.103814

Specifications table

Subject area	*Biology*
More specific subject area	*Food science*
Type of data	*Table*
How data was acquired	*Luciferase reporter assay, using Promega, GloMax Navigator System GM2010*
Data format	*Analyzed*
Experimental factors	*Cells, treated with food compounds, were lysed for luciferase assay.*
Experimental features	*We used PGC-1β fused with a GAL4 DNA-binding domain, which allows the measurement of transcriptional activation of PGC-1β in the presence of various compounds in the culture medium.*
Data source location	*Kyoto, Japan*
Data accessibility	*Contained within this article*
Related research article	[1] *R. Uchitomi, S. Nakai, R. Matsuda, T. Onishi, S. Miura, Y. Hatazawa, Y. Kamei. Genistein, daidzein, and resveratrols stimulate PGC-1β-mediated gene expression.* ***Biochemistry and Biophysics Reports*** *17:51-55, 2019* [1]

Value of the data

- The data could be used by researches, for example, in the food sciences, to evaluate food-derived and natural compounds as activators of PGC-1β, a transcriptional regulator that can enhance energy expenditure-related gene.
- We made a fusion protein of PGC-1β with GAL4 DNA-binding domain, and established a system for screening PGC-1β-transcriptional activators. The system will be a practical example of screening system.
- As in vivo activation of PGC-1β increases energy expenditure, PGC-1β-transcriptional activators could form the basis for anti-obesity dietary supplements.

1. Data

Food components and their reporter activity values as PGC-1β-transcriptional activators are listed. Chemical Names and Relative luc values are shown. The data from luciferase values in the presence of vehicle alone were set at 100. Data are expressed as mean ± SE (N = 3). P value < 0.05 was considered significant. ***P < 0.001, **P < 0.01, *P < 0.05 compared with the samples from in the presence of vehicle alone. Compounds that significantly increased luc activity were Baicalin, Caffeic Acid, Chrysin, Daidzein, 5, 7-Dimethoxyflavone, (-)-Epicatechin, Genistein, Homogentisic acid, (+/−)-Lavandulol, Lupeol, Luteolin, Quercetin, Resveratrol, trans-Oxyresveratrol, trans-Piceatannol, and trans-Pterostilbene. Compounds that significantly decreased luc activity were Daunorubicin hydrochloride, Magnolol, and trans-Ferulic acid (see Table 1).

2. Experimental design, materials and methods

2.1. Screening compounds that increase GAL4-PGC-1β activity

HEK293T cells (Riken Cell Bank, Tsukuba, Japan) were maintained in Dulbecco's Modified Eagle's Medium (DMEM) supplemented with 10% fetal bovine serum (FBS). We used amino acids 1–147 of GAL4 that were fused to the full length of PGC-1β cDNA [2]. Namely, full-length PGC-1β cDNA was cloned into the pM vector (Clontech/Takara Bio, Shiga, Japan) to produce a fusion protein with the GAL4 DNA-binding domain. HEK293T cells were co-transfected with a reporter gene containing four copies of a GAL4 binding site ((UAS)4-Luc), and pM- PGC-1β (GAL4- PGC-1β). The luciferase reporter plasmid (25 ng), expression plasmid (pM- PGC-1β: 25 ng), and the phRL-TK vector (2 ng: Promega Co., Madison, WI, USA) as an internal control of transfection efficiency were transfected into HEK293T cells using Lipofectamine 2000 (Invitrogen, Carlsbad, CA, USA). Five hours after transfection, the cells were plated at a density of 1×10^5 cells per well in a 96-well plate in Dulbecco's modified Eagle's medium (DMEM) supplemented with 10% fetal bovine serum (FBS). Twenty-nine hours after transfection, the cells were treated with various commercially available compounds (Sigma-Aldrich Japan, Tokyo, Japan; final concentration, 10 μM). After twenty hours, cells were lysed and assayed for luciferase activity using the

Table 1
List of food-derived and natural compounds and their values of reporter activity as PGC-1β-transcriptional activators. Vehicle alone serves as the reference value (set as 100).

No.	Chemical Name	Relative Luc activity (%)		P value
1	Abietate	113 ± 9	0.312	
2	Acacetin	106 ± 28	0.850	
3	Aconitine	120 ± 10	0.454	
4	Allicin	98 ± 9	0.862	
5	Allyl Disulfide < Diallyl Disulfide>	117 ± 15	0.416	
6	alpha-Mangostin	98 ± 31	0.960	
7	alpha-Santonin	93 ± 25	0.834	
8	alpha-Terpineol	99 ± 7	0.899	
9	Apigenin	205 ± 64	0.194	
10	Arbutin	99 ± 4	0.805	
11	(-)-Arctigenin	104 ± 9	0.884	
12	Arctiin	95 ± 8	0.619	
13	Astragaloside	138 ± 9	0.182	
14	Aucubin	111 ± 14	0.495	
15	Baicalin	135 ± 9	0.023	*
16	Barbaloin	125 ± 20	0.440	
17	Benzoic acid	108 ± 6	0.326	
18	Berberine Chloride	76 ± 8	0.057	
19	(-)-Bilobalide from Ginkgo biloba leaves	104 ± 33	0.921	
20	Borneol	119 ± 21	0.436	
21	Bornyl isovalerate	127 ± 14	0.242	
22	Caffeic Acid	136 ± 9	0.032	*
23	Capsaicin	168 ± 27	0.118	
24	(+/−)-Catechin hydrate	105 ± 14	0.850	
25	Chrysin	168 ± 18	0.020	*
26	Chrysophanol	107 ± 14	0.789	
27	cis-4-Hydroxycinnamic acid	87 ± 22	0.633	
28	Citrinin	98 ± 9	0.933	
29	Colchicine	200 ± 34	0.066	
30	Corosolic acid	105 ± 7	0.612	
31	4-Coumaric Acid	114 ± 11	0.313	
32	Cucurbitacin B	144 ± 55	0.494	
33	Curcumin 1 (Curcumin)	162 ± 16	0.084	
34	Curcumin 2	152 ± 26	0.197	
35	Curcumin 3	95 ± 18	0.878	
36	Daidzein	204 ± 17	0.007	**
37	Daunorubicin hydrochloride	53 ± 7	0.025	*
38	Dihydrocapsaicin	108 ± 12	0.565	
39	Dihydromyricetin	126 ± 17	0.388	
40	5,7-Dihydroxy-3-(4-hydroxy-phenyl)-chromen-4-one	136 ± 35	0.418	
41	3,3′-Diindolylmethane	84 ± 6	0.287	
42	5, 7-Dimethoxyflavone	160 ± 10	0.006	**
43	Diosgenin	118 ± 15	0.435	
44	Diosmetin	157 ± 9	0.065	
45	Diosmin	125 ± 20	0.433	
46	dl-Tetrahydroberberine (dl-Canadine)	113 ± 10	0.499	
47	Echinacoside	113 ± 7	0.588	
48	(-)-Epicatechin	174 ± 13	0.042	*
49	(-)-Epicatechin gallate	86 ± 21	0.591	
50	(-)-Epigallocatechin	123 ± 20	0.392	
51	(-)-Epigallocatechin gallate	154 ± 32	0.229	
52	Esculetin <Cichorigenin>	115 ± 11	0.312	
53	Evodiamine	121 ± 23	0.521	
54	Fucoxanthin	101 ± 13	0.966	
55	Fustin	102 ± 7	0.865	
56	Galangin	101 ± 3	0.937	
57	Gallic acid monohydrate	115 ± 15	0.583	
58	(-)-Gallocatechin gallate	79 ± 9	0.219	
59	Genistein	169 ± 21	0.034	*

(*continued on next page*)

Table 1 (*continued*)

No.	Chemical Name	Relative Luc activity (%)	P value	
60	Geraniol	121 ± 9	0.415	
61	Geranyl Acetate	123 ± 8	0.223	
62	Ginkgolic acid 15:0	124 ± 13	0.167	
63	Ginkgolide A	125 ± 4	0.171	
64	Ginkgolide B	172 ± 44	0.212	
65	Ginkgolide B	102 ± 13	0.935	
66	Ginkgolide C	141 ± 16	0.127	
67	Ginkgolide J	128 ± 11	0.204	
68	18β-Glycyrrhetinic acid	113 ± 16	0.489	
69	Glycyrrhizin (Glycyrrhizic acid)	139 ± 22	0.278	
70	Gomisin N	115 ± 6	0.157	
71	Gossypetin	120 ± 6	0.084	
72	Hesperetin	161 ± 20	0.105	
73	Hesperidin	119 ± 5	0.422	
74	(2S)-Hesperidin	117 ± 9	0.169	
75	Homogentisic acid	153 ± 8	0.031	*
76	Honokiol	109 ± 5	0.238	
77	3-(4-Hydroxy-3-methoxy-phenyl)-acrylic acid	128 ± 18	0.358	
78	3-Hydroxytyrosol	83 ± 10	0.307	
79	Icariin	113 ± 18	0.523	
80	Imperatorin	73 ± 7	0.024	*
81	Indole-3-carbino	122 ± 11	0.392	
82	Kaempferol	114 ± 21	0.658	
83	L-(+)-Ascorbic Acid	108 ± 4	0.333	
84	(+/−)-Lavandulol	120 ± 2	0.012	*
85	L-Deoxyalliin < S-Allyl-L-Cysteine>	131 ± 12	0.085	
86	Ligustilide	135 ± 19	0.222	
87	Limonene	132 ± 23	0.254	
88	Lupeol	137 ± 12	0.049	*
89	Luteolin	246 ± 40	0.032	*
90	Luteolin-7-O-Glucoside	121 ± 9	0.130	
91	Magnolol	40 ± 5	0.009	**
92	Mangiferin	104 ± 13	0.886	
93	Maslinic acid	105 ± 7	0.591	
94	Matrine	156 ± 31	0.211	
95	Melatonin	63 ± 9	0.063	
96	(-)-Menthone	90 ± 4	0.147	
97	(+)-Menthol	106 ± 21	0.820	
98	(+)-Menthone	135 ± 6	0.084	
99	Myricetin	159 ± 21	0.081	
100	Naringenin	131 ± 31	0.443	
101	Naringin	139 ± 12	0.176	
102	(2S)-Naringin	135 ± 17	0.238	
103	Naringin Hydrate	116 ± 8	0.385	
104	Neochlorogenic Acid	100 ± 5	0.988	
105	Neohesperidin	112 ± 13	0.430	
106	Nerolidol	108 ± 27	0.795	
107	Nordihydroguaiaretic acid	111 ± 27	0.728	
108	(+/−)-Octopamine hydrochloride	83 ± 10	0.328	
109	Oleanolic acid	118 ± 10	0.484	
110	Oroxylin A	134 ± 13	0.123	
111	Osthol	99 ± 10	0.902	
112	Osthole	104 ± 10	0.861	
113	Paclitaxel	98 ± 22	0.948	
114	Paeonol	118 ± 16	0.342	
115	Parthenolide	102 ± 3	0.922	
116	Pelargonidin	122 ± 12	0.298	
117	Pelargonidin chloride	130 ± 19	0.253	
118	3-Phenylpropyl isothiocyanate	111 ± 14	0.499	
119	Physcion	132 ± 16	0.180	
120	(1R)-(+)-a-Pinene	88 ± 12	0.567	
121	(1S)-(-)-a-Pinene	111 ± 9	0.537	

Table 1 (*continued*)

No.	Chemical Name	Relative Luc activity (%)	P value	
122	(1S)-(-)-β-Pinene	109 ± 5	0.202	
123	Plumbagin from Plumbago indica	132 ± 5	0.210	
124	Protocatechuic Acid	152 ± 13	0.106	
125	Quassin	116 ± 15	0.484	
126	Quercetin, Dihydrate	166 ± 15	0.033	*
127	Rebaudioside A	105 ± 4	0.525	
128	Resveratrol	273 ± 60	0.048	*
129	Retinoic acid	109 ± 9	0.708	
130	Rhein	133 ± 37	0.481	
131	Rosmarinic acid	105 ± 17	0.857	
132	Rutin	111 ± 10	0.355	
133	Rutin trihydrate	104 ± 13	0.871	
134	Salicylic Acid Methylester	119 ± 29	0.560	
135	Sarsasapogenin	125 ± 20	0.447	
136	Schaftoside	93 ± 11	0.558	
137	Scopoletin	111 ± 17	0.722	
138	Scutellarein	131 ± 15	0.185	
139	Sennoside	118 ± 14	0.418	
140	Sesamol	117 ± 16	0.432	
141	Shikalkin	99 ± 6	0.865	
142	Shikonin	118 ± 8	0.149	
143	Silibinin	125 ± 11	0.341	
144	Sinomenine	136 ± 11	0.116	
145	Sophocarpine	129 ± 21	0.310	
146	β-Carotene	104 ± 6	0.653	
147	β-Sitosterol	122 ± 1	0.478	
148	Stevioside	112 ± 18	0.591	
149	Swertiamarin	103 ± 5	0.634	
150	Tannin < Tannic Acid>	145 ± 12	0.072	
151	Tanshinone I	82 ± 9	0.469	
152	Tanshinone IIA	130 ± 7	0.240	
153	(±)-Taxifolin	136 ± 37	0.440	
154	(+/−)-Taxifolin hydrate	110 ± 7	0.680	
155	Terpinyl acetate	103 ± 8	0.844	
156	trans-Ferulic acid	50 ± 5	0.001	**
157	trans-Oxyresveratrol	155 ± 13	0.019	*
158	trans-Piceatannol	205 ± 5	0.0002	***
159	trans-Polydatin (trans-Piceid)	109 ± 12	0.538	
160	trans-Pterostilbene	148 ± 14	0.031	*
161	(+)-trans Taxifolin	128 ± 2	0.271	
162	Trimethylapigenin	154 ± 25	0.106	
163	Ursolic acid	100 ± 5	0.994	
164	Vanillic Acid	105 ± 5	0.516	
165	Xanthophyll <Lutein>	110 ± 5	0.281	
166	Yohimbine hydrochloride	110 ± 14	0.723	

***P < 0.001, **P < 0.01, *P < 0.05: vs vehicle.

Dual-Glo Luciferase Assay kit (Promega). The activity was calculated as the ratio of firefly luciferase activity to Renilla luciferase activity (internal control) and expressed as an average of triplicate experiments. Namely, the firefly luciferase value was divided by the corresponding Renilla luciferase value. The luciferase values in the presence of vehicle alone were set at 100. The relative values in the presence of indicated compounds are shown.

2.2. Statistical analyses

Statistical analyses were performed using the Student's two-tailed unpaired t-test. P value < 0.05 was considered significant.

Acknowledgements

This study is supported by grants-in-aid for scientific research (KAKENHI) from the Japanese Ministry of Education, Culture, Sports, Science, and Technology (MEXT, Tokyo). This study is also supported by the Council for Science, Technology, and Innovation (CSTI), Cross-ministerial Strategic Innovation Promotion Program (SIP), and "Technologies for creating next-generation agriculture, forestry and fisheries" (funding agency: Bio-oriented Technology Research Advancement Institution, NARO). This study is also supported by The Public Foundation of Elizabeth Arnold-Fuji, and Japan Dairy Association (J-milk). The funders had no role in study design, data collection and analysis, decision to publish, and preparation of the manuscript.

Transparency document

Transparency document associated with this article can be found in the online version at https://doi.org/10.1016/j.dib.2019.103814.

References

[1] R. Uchitomi, S. Nakai, R. Matsuda, T. Onishi, S. Miura, Y. Hatazawa, Y. Kamei, Genistein, daidzein, and resveratrols stimulate PGC-1β-mediated gene expression, Biochem. Biophys. Rep. 17 (2019) 51–55.

[2] Y. Kamei, H. Ohizumi, Y. Fujitani, T. Nemoto, T. Tanaka, N. Takahashi, T. Kawada, M. Miyoshi, O. Ezaki, A. Kakizuka, PPARgamma coactivator 1beta/ERR ligand 1 is an ERR protein ligand, whose expression induces a high-energy expenditure and antagonizes obesity, Proc. Natl. Acad. Sci. U.S.A. 100 (2003) 12378–12383.