B5 132

(B5-A) (B5-B) (B5-C)
(B5-D)

B6

137

(B6-A) (B6-B)
(B6-C)

141

C1 143

(C1-A) (C1-B)
(C1-C) (C1-D)
(C1-E)

151

C1 X 153

(C1-A) (C1-B)
(C1-C) (C1-D) (C1-E)

159

C1 161

(C1-A) (C1-B) (C1-C)
(C1-D)

169

C1 171

(C1-A) (C1-B), (C1-C),
(C1-E), (C1-F), (C1-G)

183

185

187

189

3000

19 5

2

3

4

22 6

23

23 5

PD PO

7

PD PO

—

,

(Nat. Struct. Mol. Biol. 2011)

Nature 2010, Nature Immunol. 2010

Nature 2011

Sec
Nature 2008, 2011
(Science
2011)
Nature 2011, PNAS 2011
— Nature Struct. Mol. Biol. 2008

Nature
2009, Nature 2009, Nature Structural and Molecular Biology 2009, Mol. Cell
2010, NAR 2010, Nature 2010 —
(NF – κ B Essential modulator)

NF – κ B -
RNA
Gfh1 RNA —
Nature 2010)
Nature
2008, 2009
Science

—

3

P0 PD

4

5

26S

26S

10

100 26S

4 5

1 26S

26S

26S

NMR

NMR NMR X
NMR

senior author
NMR

Atg

Atg X

Atg

PAS

NMR SAIL Atg

Atg

Atg

Atg

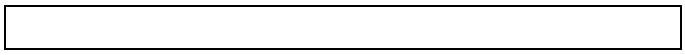
PDB

Nature Science
EMBO J

Agt

NMR SAIL

Atg



Atg

Atg

SAIL NMR

SAIL NMR

SAIL NMR

21 D SAIL

SAIL

SAIL

NMR

20

PD

PAD4

TFIIE

TFIEa

Voltage-Sensitive Phosphatase (VSP)　Voltage Sensor Only Protein (VSOP)

PDB

PTEN

VSP　VSOP

PTEN

PDB

PDB

PDB

COPII

X

NMR

X NMR

- -

-ZO

NMR PDZ

X NMR

X

X NMR

X PDB

FAT-Dachsous

X

FAT Dachsous

NF-κB

NF-κB

LUBAC NF-κB

LUBAC HOIP Zink Finger (ZF, NZF1, NZF2) NEMO NZF1 NEMO HOIP LUBAC SHARPIN LUBAC

LUBAC

SHARPIN

LUBAC NF-κB

SHARPIN

Keap1 Nrf2 Keap1-DC Nrf2 DLG
Keap1 Keap1
p62 Keap1-DC MafG
DNA Maf DNA
Keap1 Nfr2
Nrf2-Maf
p62 Nfr2

Nrf

Keap1-Nfr2 Nfr2-Maf
DNA
Nrf2

Keap1-Nfr2 Keap1 Nrf2

Keap1 Nrf2 Keap1-DC Nrf2 DLG
Keap1 p62 Keap1-DC
MafG DNA
Maf DNA
Keap1 Nfr2
Nrf2-Maf
p62
Nfr2

Nrf

Keap1-Nfr2 Nfr2-Maf
DNA
Nrf2
p62
Nfr2

Keap1 Keap1

Keap1 DC
Nrf2DLG/ETGE X

X

Keap1-Cul3-Roc1

Keap1 Keap1 2
2
X

1 5

ATP

PDB

NMR

ATP

ATP

NMR

22

ATP

H+-ATP Fo NMR

PDB

ATP

NMR

NMR

ATP

22 19 21

2

F0F1ATPase 2

22

V-ATPase X
ATP 1

V-ATPase X V-
ATPase
ATP

PDB

in silico

V-ATPase

V-ATPase
V-ATPase
V-ATPase

V-ATPase

V-ATPase

V-ATPase V-ATPase

ATP

V-

ATPase

V-ATPase

V-ATPase

PDB

V-ATPase

V-ATPase

palmerolide

V-ATPase

ATP

ABC

PDB

ATP ABC

19 21

19 21
GFP

V-ATPase

T. thermophilus V-ATPase

V-ATPase A_3B

ATPase ATPase
X

V-ATPase

RNA

PDB

RNA

RNA

RNA

PDB

RNA

Argonaute

RNA

RNA RNA

RNA

PDB

RNA

RNA

RNA

tRNA

RNA

RNA

PDB

PDB

TLR9

DNA

DOCK2

DOCK2 Rac
DOCK2
DOCK2

DOCK N SH ELMO DOCK
DHR− Rac
DOCK DOCK2 DHR-2 Rac DOCK2 SH3 ELMO

3
DOCK2 2
Science
DOCK2

1

DOCK2

DOCK2

Science

1

DOCK2

3

DOCK2

DOCK2

DOCK2 N SH ELMO
DOCK2 DHR−2 Rac

DOCK2

DOCK2

DOCK2

DOCK2

DOCK2

2

Nox2 C NADPH Ca++
Nox2
11 Nox2

Nox2

NMR

Nox2 NADPH Nox

Nox2 NADPH

Nox C Nox

Nox2 NADPH
Nox

p PX p
Nanodisc PI
PI

γ

γ

γ

A5226A

γ 4

N

16 13

γ

PDB

1 A5226A

γ

PDB

2

In silico

γ

γ

A5226A

γ

PDB

γ

γ

X

A5226A

γ

Fab X

DHOD QFR TAO

in silico

in silico *T. cruzi* DHOD

TAO

in silico

PDB

in silico

TLO

4

T cruzi DHOD *in silico*

X

9 5

ATC, DHOD, GK, OFR, TAO

DHOD

3

In silico

DHOD
II

TcDHOD 200

In silico

in silico DHOD, ATC,GK

DHOD

AdipoR/AMPK /ACC

Nature

(AdipoR)

(Ad) AdipoR

AdipoR
ACC1,AMPK
AdipoR

—

AdipoR

AdipoR/AMPK /ACC

AdipoR/AMPK /ACC

AdipoR

AMPKKs,AMPK,ACC

AdioR1 Nature
2

AdipoR/AMPK /ACC

AdiopoR,ACC,AMPK,AMPKKs

AdpoR

AdipoR/AMPK /ACC

AMPKK/AMPK/ACC

AMPK CAMKKβ

AMPK

AMPK ACC

AMPK

CCR2 C

CCR2 C

NMR

CCR2

CCR2 C

NMR

CCR2 C

NMR

VDR TGF-β

Smad

VDR

PPARγ VDR TGF-β

PPARγ VDR

PPARγ VDR

Smad

in vivo

48

3

non-genomic action

PPARγ VDR non-genomic TGF-β

Smad Smad/Nuclear receptor

TGF-β

POC

Smad

PPARγ VDR

Smad

TGF-β

TGF-β

PPARγ VDR TGF-β

Smad

Smad

Smad Smurf

PPARγ

VDR

Smad

non-genomic

X

Smad

Smad

TGF-β

PPARγ VDR

PPARγ VDR

PPARγ VDR

Smad

NPP

NPP

NPP2 MPP6

NPP

NPP2

NPP

22 GlcNac Tn-1

HEK293 NPP2

NPP6 NPP1

NPP2

NPP2 NPP2

B

5 LPA

LPA NPP2

NPP2

NPP2

NPP

NPP

NPP2 MPP6

NPP

NPP2

NPP

22 GlcNac Tn-1

HEK293 NPP2

NPP6 NPP1

NPP

NPP

NPP2 MPP6

NPP

NPP2

NPP

22 GlcNac Tn-1

HEK293 NPP2

NPP6 NPP1

3

NPP

NPP

NPP2 MPP6

NPP

NPP2

NPP

22 GlcNac Tn-1

HEK293 NPP2

NPP6 NPP1

HEK293

2

6

Sema6A Plexin-A2

Nature Immunol

Sema6A-Plexin-A2

Sema3A

3A

Sema3A

(PBAN) (PBANR)

PBAN NMR

PBAN C

C

C

PBANR

PBAN PBANR

(PBAN) (PBANR) 2

PBAN

NMR PBAN C

C

C

PBANR

PBAN PBANR

PBAN PBANR

(PBAN) (PBANR)

PBANR

10

PBANR

A-

A-

AREB1

ABA X

ABA

AREB1

ABA X

ABA

GID1 DELLA
GID2

GID1
SIR1 GID2

3 GID1, DELLA, GID2
GID1
DELLA, GID2

GID1-GA

1 1

GID1

GA-GID1

GID1-GA

DELLA GID2

GID1 DELLA GID2

X

GA-GID1
SIR1 GID2

GA-GID1

2

(MexB)

AcrB

PDB

MexB ArcB

PDB

AcrB

PDB

MexB

MexB MexA
OprM MexA
X

PDB

SIRT3

SIRT3

SIRT3

SIRT3 SIRT3
SIRT3

SIRT3 shRNA

SIRT3

in vitro
SIRT3

SIRT3

SIRT3

SIRT3

2

SIRT3

SIRT3
SIRT3- SIRT3

SIRT3

SIRT3

SIRT3 *in vivo*

SIRT3 SIRT3
SIRT3 SIRT3

SIRT3

ESP

ESP1

ESP

ESP

ESP

ESP-

ESP

(Nature)

ESP ESP-

ESP (Nature
)

Sphingomonas A1

ABC

X

ABC

AMP phosphorylase
Tk-Rubisco

X

Rubisco

PDB
Thermococcus kodakaraensis Tk) AMP phosphorylase, ribose-1,5-bisphosphate (R15P) isomerase

T Rubisco Rubisco
AMP phosphorylase R15P isomerase

Tk-Rubisco

Thermococcus kodakaraensis Tk) AMP phosphorylase, ribose-1,5-bisphosphate (R15P) isomerase

T Rubisco Rubisco
AMP phosphorylase R15P isomerase

Tk-Rubisco

Tk-Rubisco

Rubisco

Tk-Rubisco Rubisco

Rubisco Rhodopseudomonas palustrisΔ3 in vitro 71% kcat/Km 57% SP5-V330T) Rhodopseudomonas palustrisΔ3 55%

Tk-Rubisco

PDB

2

OsRbohB OsRac1 OsRac1
Defensome
pCold-GST

Rac
NADPH Rac

H19-H21

OsRbohB OsRac1 OsRac1
Defensome

14-3-3 GF14b bZIP
OsFD1
Defensome

H19-H21

X

(B6-B)
NADPH (RbohB) Rac

Rac
Rboh N C

NADPH Rac
Rac

NADPH

NMR

OsRbohB

pCold-GST

14-3-3 GF14b bZIP
OsFD1
Defensome

19 21
NMR
C1

Systematic approach

3000

1/10

111 27

6

2

40

–

PURE system

PURE system *in vitro*

native source authentic reference misfold

NMR

PURE system

PURE

in vivo

S-S

S-S

FACS

19 21

GPCR

hT1R2 hT1R3

1

1

μm SAD/MAD

S/N

SPring-8

SAD
S

S

BL-1A

6000 21

in vivo nM

5

6000 21

in vivo nM

in vivo

perspective

21

nM

9600

400

21

nM

9600

21

nM

21

15

HPLC

6480

SIRT3

HPLC

6480

SIRT3

G GPCR

CXCR7 μM

Eg5 nM

in vivo

GPCR

GPCR

Hydrophilic tag

G GPCR

CXCR7 μM

Eg5 nM

in vivo

8

in vivo

ALK

IC50 nM

Focused

Library

X

ALK

IC50 nM

3000

14 18

DB

DB CASAdb

FUJIdb PCIdb

DB

DB

DB CASAdb

FUJIdb PCIdb

web

PREIMS

LIMS Spring-8 Photon Factory X

LIMS

DB

3

DB
DB CASAdb
FUJIdb PCIdb

DB

DB
DB CASAdb
FUJIdb PCIdb

YouTube TargetTanpaku

DB

DB

261

Spring-8 Photon Factory X
1420

(TPPE)

261

Spring-8 Photon Factory
X

1420

PREIMS

C1

website

2

— CASP

— CASP9

ToSY

web

Nox

60

Nox

1

.

.

MRC EMBL Max Planck Scripps