

S1 Table

Number	Canonica pathway	S. mansoni control challenge	VR1020-Sm-p80	pcDNA3-Sm-p80 + rSm-p80 + ODN	rSm-p80 + alum	rSm-p80 + GLA	rSm-p80 + ODN
1	14-3-3-mediated Signaling	X	X	X			X
2	3-phosphoinositide Biosynthesis	X					X
3	3-phosphoinositide Degradation	X					X
4	4-1BB Signaling in T Lymphocytes	X	X				
5	4-aminobutyrate Degradation I					X	
6	Actin Cytoskeleton Signaling		X	X			X
7	Actin Nucleation by ARP-WASP Complex	X	X				X
8	Activation of IRF by Cytosolic Pattern Recognition Receptors	X	X				X
9	Acute Myeloid Leukemia Signaling	X	X				X
10	Acute Phase Response Signaling	X					
11	Acyl Carrier Protein Metabolism				X		
12	Adipogenesis pathway						X
13	Agrin Interactions at Neuromuscular Junction		X				X
14	Aldosterone Signaling in Epithelial Cells	X					X
15	Allograft Rejection Signaling		X				
16	Altered T Cell and B Cell Signaling in Rheumatoid Arthritis	X	X				
17	AMPK Signaling	X		X			X
18	Amyloid Processing		X				
19	Amyotrophic Lateral Sclerosis Signaling			X			X
20	Androgen Signaling	X	X				X
21	Angiotensin Signaling	X					X
22	Antigen Presentation Pathway	X	X				X
23	Antioxidant Action of Vitamin C	X					
24	Antiproliferative Role of Somatostatin Receptor 2						X
25	Antiproliferative Role of TOB in T Cell Signaling	X					
26	Apoptosis Signaling	X	X				X
27	April Mediated Signaling	X					X
28	Arginine Degradation VI (Arginase 2 Pathway)	X					
29	Arsenate Detoxification I (Glutaredoxin)		X				
30	Aryl Hydrocarbon Receptor Signaling	X	X				
31	Assembly of RNA Polymerase I Complex	X					X
32	Assembly of RNA Polymerase II Complex	X	X				
33	Assembly of RNA Polymerase III Complex	X		X			X
34	ATM Signaling	X					
35	Autoimmune Thyroid Disease Signaling	X	X				
36	autophagy		X				X
37	Axonal Guidance Signaling		X	X			X
38	B Cell Activating Factor Signaling	X					
39	B Cell Development	X	X				
40	B Cell Receptor Signaling	X	X	X			X
41	Basal Cell Carcinoma Signaling			X			
42	Biotin-carboxyl Carrier Protein Assembly			X			
43	Bladder Cancer Signaling		X				
44	BMP signaling pathway		X				
45	Breast Cancer Regulation by Stathmin1	X	X				X
46	Calcium Signaling			X		X	X
47	Calcium-induced T Lymphocyte Apoptosis	X	X				
48	cAMP-mediated signaling	X		X	X		X
49	Cardiac Hypertrophy Signaling	X	X				X
50	Cardiac β -adrenergic Signaling		X				X
51	Caveolar-mediated Endocytosis Signaling	X	X	X			X
52	CCR3 Signaling in Eosinophils	X	X				X
53	CCR5 Signaling in Macrophages		X				
54	CD27 Signaling in Lymphocytes	X					X
55	CD28 Signaling in T Helper Cells	X	X				X
56	CD40 Signaling	X	X				X
57	Cdc42 Signaling	X	X				X
58	CDK5 Signaling	X	X				X
59	CDP-diacylglycerol Biosynthesis I		X				
60	Cell Cycle Control of Chromosomal Replication	X	X				
61	Cell Cycle Regulation by BTG Family Proteins	X					
62	Cell Cycle: G1/S Checkpoint Regulation	X	X				X
63	Cell Cycle: G1/S Checkpoint Regulation	X					X
64	Ceramide Signaling	X	X				
65	Chemokine Signaling	X	X				X
66	Cholecystokinin/Gastrin-mediated Signaling	X	X				X
67	Cholesterol Biosynthesis I	X					
68	Cholesterol Biosynthesis II (via 24,25-dihydrolanosterol)	X					
69	Cholesterol Biosynthesis III (via Desmosterol)	X					
70	Chronic Myeloid Leukemia Signaling	X	X				X
71	Circadian Rhythm Signaling						X
72	Clathrin-mediated Endocytosis Signaling						X
73	CNTF Signaling	X	X				X
74	Coagulation System			X			
75	Coenzyme A Biosynthesis		X				
76	Colorectal Cancer Metastasis Signaling	X	X				X
77	Communication between Innate and Adaptive Immune Cells		X				
78	Corticotropin Releasing Hormone Signaling	X		X			X
79	CREB Signaling in Neurons	X	X	X			X
80	Crosstalk between Dendritic Cells and Natural Killer Cells	X	X				X
81	CTLA4 Signaling in Cytotoxic T Lymphocytes	X	X				X
82	CXCR4 Signaling	X	X				X
83	Cyclins and Cell Cycle Regulation	X	X				
84	Cysteine Biosynthesis III (mammalia)	X					
85	Cytotoxic T Lymphocyte-mediated Apoptosis of Target Cells	X	X			X	
86	Death Receptor Signaling	X	X				X
87	Dendritic Cell Maturation	X	X				X
88	Diphthamide Biosynthesis		X				
89	D-myo-inositol (1,3,4)-trisphosphate Biosynthesis			X			X
90	D-myo-inositol (1,4,5)-trisphosphate Degradation	X		X			X
91	D-myo-inositol (3,4,5,6)-tetrakisphosphate Biosynthesis	X					X
92	D-myo-inositol-5-phosphate Metabolism	X					X
93	DNA damage-induced 14-3-3 σ Signaling	X					

94	DNA Double-Strand Break Repair by Homologous Recombination	X						
95	DNA Double-Strand Break Repair by Non-Homologous End Joining	X						X
96	DNA Methylation and Transcriptional Repression Signaling	X						X
97	Docosahexaenoic Acid (DHA) Signaling							X
98	Dopamine Receptor Signaling		X					
99	Dopamine-DARPP32 Feedback in cAMP Signaling	X	X	X				X
100	EGF Signaling	X		X				X
101	EIF2 Signaling				X		X	X
102	Endometrial Cancer Signaling	X	X	X				X
103	Endoplasmic Reticulum Stress Pathway	X						X
104	Endothelin-1 Signaling	X	X	X				X
105	eNOS Signaling			X				
106	Ephrin A Signaling			X				X
107	Ephrin B Signaling	X	X					X
108	Ephrin Receptor Signaling	X	X					X
109	Epithelial Adherens Junction Signaling			X				X
110	ErbB Signaling	X	X					X
111	ErbB2-ErbB3 Signaling	X	X					
112	ErbB4 Signaling	X	X	X				X
113	ERK/MAPK Signaling	X	X					X
114	ERK5 Signaling	X						X
115	Erythropoietin Signaling	X	X	X				X
116	Estrogen Receptor Signaling	X	X	X				X
117	Estrogen-Dependent Breast Cancer Signaling	X						X
118	Estrogen-mediated S-phase Entry	X						
119	Factors Promoting Cardiogenesis in Vertebrates			X				X
120	FAK Signaling	X	X	X				X
121	Fatty Acid Activation			X				
122	Fatty Acid β -oxidation I		X					
123	Fc Epsilon RI Signaling	X	X					
124	Fcy Receptor-mediated Phagocytosis in Macrophages and Monocytes	X	X					X
125	FcyRIIB Signaling in B Lymphocytes	X	X					
126	FGF Signaling			X				
127	FLT3 Signaling in Hematopoietic Progenitor Cells	X	X	X				X
128	fMLP Signaling in Neutrophils	X	X					X
129	Folate Polyglutamylation	X						
130	Folate Transformations I	X						
131	G Beta Gamma Signaling	X	X					X
132	G Protein Signaling Mediated by Tubby		X					X
133	GABA Receptor Signaling							X
134	GADD45 Signaling	X	X					
135	Gap Junction Signaling	X	X	X				X
136	GDNF Family Ligand-Receptor Interactions	X	X					X
137	Geranylgeranyldiphosphate Biosynthesis			X				
138	Germ Cell-Sertoli Cell Junction Signaling	X	X	X				X
139	Glioblastoma Multiforme Signaling	X	X	X				X
140	Glioma Invasiveness Signaling	X	X	X				X
141	Glioma Signaling	X	X	X				X
142	Glucocorticoid Receptor Signaling	X	X					X
143	Gluconeogenesis I		X				X	
144	Glutamate Degradation III (via 4-aminobutyrate)						X	
145	Glutamate Receptor Signaling			X				X
146	Glutaryl-CoA Degradation	X	X					
147	Glycogen Degradation III		X					
148	Glycolysis I		X					
149	GM-CSF Signaling	X	X					X
150	GNRH Signaling	X	X	X				X
151	GPCR-Mediated Integration of Enteroendocrine Signaling Exemplified by an L Cell							X
152	GPCR-Mediated Nutrient Sensing in Enteroendocrine Cells			X				X
153	G-Protein Coupled Receptor Signaling	X		X				X
154	Graft-versus-Host Disease Signaling	X	X					
155	Granzyme B Signaling	X						X
156	Growth Hormone Signaling	X		X				
157	G α 12/13 Signaling	X	X	X				X
158	G α i Signaling							
159	G α q Signaling	X	X					X
160	G α s Signaling			X				X
161	Heme Degradation		X					
162	Hepatic Fibrosis / Hepatic Stellate Cell Activation			X				X
163	HER-2 Signaling in Breast Cancer	X						X
164	Hereditary Breast Cancer Signaling	X	X					
165	HGF Signaling	X		X				X
166	HIF1 α Signaling		X					
167	HIPPO signaling	X						X
168	HMGB1 Signaling	X	X					
169	Human Embryonic Stem Cell Pluripotency			X				
170	Huntington's Disease Signaling	X						X
171	Hypoxia Signaling in the Cardiovascular System	X						X
172	iCOS-iCOSL Signaling in T Helper Cells	X	X					X
173	IGF-1 Signaling	X		X				X
174	IL-1 Signaling	X						X
175	IL-10 Signaling	X						
176	IL-12 Signaling and Production in Macrophages	X						
177	IL-15 Production	X						
178	IL-15 Signaling	X	X					X
179	IL-17 Signaling	X						
180	IL-17A Signaling in Airway Cells	X						X
181	IL-17A Signaling in Fibroblasts		X					X
182	IL-17A Signaling in Gastric Cells		X					
183	IL-2 Signaling	X	X					X
184	IL-22 Signaling	X						
185	IL-3 Signaling	X	X					X
186	IL-4 Signaling	X	X	X				X
187	IL-6 Signaling	X	X					
188	IL-8 Signaling	X	X					X
189	IL-9 Signaling	X						
190	ILK Signaling	X	X				X	X
191	Induction of Apoptosis by HIV1	X	X					

192	Inhibition of Angiogenesis by TSP1	X	X					
193	iNOS Signaling	X						X
194	Inosine-5'-phosphate Biosynthesis II	X						
195	Inositol Pyrophosphates Biosynthesis				X			
196	Insulin Receptor Signaling	X	X	X				X
197	Integrin Signaling	X	X					X
198	Interferon Signaling	X	X					X
199	Intrinsic Prothrombin Activation Pathway				X			
200	Isoleucine Degradation I		X					
201	JAK/Stat Signaling	X	X					X
202	Ketogenesis	X	X					
203	Ketolysis	X	X					
204	L-DOPA Degradation		X					
205	Leptin Signaling in Obesity	X		X				X
206	Leucine Degradation I	X	X					
207	Leukocyte Extravasation Signaling	X		X				X
208	Lipid Antigen Presentation by CD1							
209	LPS-stimulated MAPK Signaling	X	X					X
210	Lymphotoxin β Receptor Signaling	X	X					X
211	Macropinocytosis Signaling	X	X					
212	Mechanisms of Viral Exit from Host Cells	X						
213	Melanocyte Development and Pigmentation Signaling	X		X				X
214	Melanoma Signaling	X	X					
215	Melanin Degradation III				X			
216	Melanin Signaling							X
217	Methionine Degradation I (to Homocysteine)	X		X				
218	Mevlonate Pathway I	X						
219	MIF Regulation of Innate Immunity	X	X					
220	MIF-mediated Glucocorticoid Regulation	X						
221	Mismatch Repair in Eukaryotes	X						X
222	Mitochondrial Dysfunction				X			X
223	Mitochondrial L-carnitine Shuttle Pathway			X				
224	Mitotic Roles of Polo-Like Kinase	X	X					
225	Molecular Mechanisms of Cancer	X	X	X				X
226	Molybdenum Cofactor Biosynthesis	X						
227	Mouse Embryonic Stem Cell Pluripotency	X	X	X				X
228	MSP-RON Signaling Pathway			X				X
229	mTOR Signaling							X
230	Myc Mediated Apoptosis Signaling	X	X					X
231	NADH Repair		X					
232	Natural Killer Cell Signaling	X	X					X
233	Netrin Signaling							X
234	Neuregulin Signaling	X						X
235	Neuropathic Pain Signaling In Dorsal Horn Neurons			X				X
236	Neuroprotective Role of THOP1 in Alzheimer's Disease		X					
237	Neurotrophin/TRK Signaling	X		X				X
238	NF- κ B Activation by Viruses	X	X	X				X
239	NF- κ B Signaling	X		X				X
240	NGF Signaling	X	X	X				X
241	Nitric Oxide Signaling in the Cardiovascular System			X				
242	nNOS Signaling in Skeletal Muscle Cells			X				
243	Non-Small Cell Lung Cancer Signaling	X	X					X
244	Notch Signaling	X		X				X
245	NRF2-mediated Oxidative Stress Response	X	X					X
246	Nucleotide Excision Repair Pathway	X						
247	Nur77 Signaling in T Lymphocytes	X	X					
248	Oncostatin M Signaling	X	X					
249	Ovarian Cancer Signaling	X		X				
250	OX40 Signaling Pathway		X					
251	Oxidative Phosphorylation				X			X
252	P2Y Purigenic Receptor Signaling Pathway	X	X					X
253	p38 MAPK Signaling	X	X					
254	p53 Signaling	X						X
255	p70S6K Signaling	X	X	X				X
256	PAK Signaling	X	X					X
257	Pancreatic Adenocarcinoma Signaling	X	X					X
258	Paxillin Signaling	X	X	X				X
259	PDGF Signaling	X	X	X				X
260	PDF Signaling	X	X					
261	phagosome formation			X				X
262	phagosome maturation		X					X
263	Phosphatidylglycerol Biosynthesis II (Non-plastidic)		X					
264	Phospholipase C Signaling	X	X					X
265	PI3K Signaling in B Lymphocytes	X	X	X				X
266	PI3K/AKT Signaling	X						X
267	PKC θ Signaling in T Lymphocytes	X	X					X
268	PPAR Signaling							X
269	PPAR α /RXR α Activation	X		X				X
270	Primary Immunodeficiency Signaling	X	X					
271	Production of Nitric Oxide and Reactive Oxygen Species in Macrophages	X	X					X
272	Prolactin Signaling	X	X	X				X
273	Proline Biosynthesis I	X						
274	Proline Biosynthesis II (from Arginine)	X						
275	Prostate Cancer Signaling	X				X		X
276	Protein Kinase A Signaling	X	X	X				X
277	Protein Ubiquitination Pathway	X			X			X
278	PRPP Biosynthesis I							
279	PTEN Signaling			X				X
280	Pyridoxal 5'-phosphate Salvage Pathway	X						
281	Pyrimidine Ribonucleotides De Novo Biosynthesis		X					
282	Rac Signaling	X	X					X
283	RAN Signaling							X
284	RANK Signaling in Osteoclasts	X		X				X
285	RAR Activation	X		X				X
286	Reelin Signaling in Neurons	X						X
287	Regulation of Actin-based Motility by Rho		X					X
288	Regulation of Cellular Mechanics by Calpain Protease	X	X					X
289	Regulation of eIF4 and p70S6K Signaling	X						X

290	Regulation of IL-2 Expression in Activated and Anergic T Lymphocytes	X	X				X
291	Regulation of the Epithelial-Mesenchymal Transition Pathway	X		X			X
292	Relaxin Signaling	X					X
293	Remodeling of Epithelial Adherens Junctions	X	X	X	X		X
294	Renal Cell Carcinoma Signaling	X	X				X
295	Renin-Angiotensin Signaling	X	X	X			X
296	Retinoic acid Mediated Apoptosis Signaling	X					X
297	RhoA Signaling		X				X
298	RhoGDI Signaling		X				X
299	Role of BRCA1 in DNA Damage Response	X	X				X
300	Role of CHK Proteins in Cell Cycle Checkpoint Control	X					X
301	Role of IL-17A in Arthritis	X					X
302	Role of JAK family kinases in IL-6-type Cytokine Signaling	X					X
303	Role of JAK1 and JAK3 in yc Cytokine Signaling	X	X				X
304	Role of JAK2 in Hormone-like Cytokine Signaling	X					X
305	Role of Macrophages, Fibroblasts and Endothelial Cells in Rheumatoid Arthri	X					X
306	Role of MAPK Signaling in the Pathogenesis of Influenza	X	X				X
307	Role of NANOG in Mammalian Embryonic Stem Cell Pluripotency	X		X			X
308	Role of NFAT in Cardiac Hypertrophy	X	X				X
309	Role of NFAT in Regulation of the Immune Response	X	X				X
310	Role of Oct4 in Mammalian Embryonic Stem Cell Pluripotency	X					X
311	Role of Osteoblasts, Osteoclasts and Chondrocytes in Rheumatoid Arthritis	X		X			X
312	Role of p14/p19ARF in Tumor Suppression	X					X
313	Role of PI3K/AKT Signaling in the Pathogenesis of Influenza	X					X
314	Role of PKR in Interferon Induction and Antiviral Response	X					X
315	Role of RIG1-like Receptors in Antiviral Innate Immunity	X					X
316	Role of Tissue Factor in Cancer	X	X				X
317	Role of Wnt/GSK-3 β Signaling in the Pathogenesis of Influenza	X		X			X
318	Salvage Pathways of Pyrimidine Ribonucleotides	X	X				X
319	SAPK/JNK Signaling	X	X				X
320	Selenocysteine Biosynthesis II (Archaea and Eukaryotes)	X	X				X
321	Semaphorin Signaling in Neurons	X					X
322	Serine Biosynthesis	X					X
323	Sertoli Cell-Sertoli Cell Junction Signaling	X	X	X			X
324	Signaling by Rho Family GTPases	X	X				X
325	Small Cell Lung Cancer Signaling	X					X
326	Sonic Hedgehog Signaling	X				X	X
327	Sperm Motility	X		X			X
328	Spermidine Biosynthesis I	X					X
329	Spermine Biosynthesis	X					X
330	Sphingosine-1-phosphate Signaling	X	X				X
331	STAT3 Pathway	X		X			X
332	Sucrose Degradation V (Mammalian)	X	X				X
333	Superpathway of Cholesterol Biosynthesis	X					X
334	Superpathway of D-myo-inositol (1,4,5)-trisphosphate Metabolism	X		X			X
335	Superpathway of Inositol Phosphate Compounds	X		X			X
336	Superpathway of Methionine Degradation	X					X
337	Superpathway of Serine and Glycine Biosynthesis I	X					X
338	Synaptic Long Term Depression	X		X			X
339	Synaptic Long Term Potentiation	X	X	X			X
340	Systemic Lupus Erythematosus Signaling	X	X				X
341	T Cell Receptor Signaling	X	X				X
342	T Helper Cell Differentiation	X	X				X
343	TCA Cycle II (Eukaryotic)	X	X				X
344	Tec Kinase Signaling	X	X				X
345	Telomerase Signaling	X	X				X
346	Tetrahydrobiopterin Biosynthesis I	X	X				X
347	Tetrahydrobiopterin Biosynthesis II	X	X				X
348	TGF- β Signaling	X	X				X
349	Thio-molybdenum Cofactor Biosynthesis	X			X		X
350	Thiosulfate Disproportionation III (Rhodanese)	X	X				X
351	Thrombin Signaling	X	X	X			X
352	Thrombopoietin Signaling	X	X	X			X
353	Thymine Degradation	X		X			X
354	Thyroid Cancer Signaling	X					X
355	Tight Junction Signaling	X					X
356	TNFR1 Signaling	X					X
357	TNFR2 Signaling	X					X
358	Toll-like Receptor Signaling	X					X
359	TR/RXR Activation	X		X			X
360	TREM1 Signaling	X					X
361	Triacylglycerol Degradation	X	X				X
362	tRNA Charging	X					X
363	Tryptophan Degradation III (Eukaryotic)	X	X				X
364	Tumoricidal Function of Hepatic Natural Killer Cells	X					X
365	TWEAK Signaling	X					X
366	Type I Diabetes Mellitus Signaling	X	X				X
367	Type II Diabetes Mellitus Signaling	X		X			X
368	UDP-N-acetyl-D-galactosamine Biosynthesis II	X	X				X
369	Unfolded protein response	X					X
370	Uracil Degradation II (Reductive)	X		X			X
371	Uridine-5'-phosphate Biosynthesis	X	X				X
372	UVA-Induced MAPK Signaling	X	X	X			X
373	UVB-Induced MAPK Signaling	X	X				X
374	UVG-Induced MAPK Signaling	X	X				X
375	Valine Degradation I	X	X				X
376	VDR/RXR Activation	X					X
377	VEGF Family Ligand-Receptor Interactions	X	X	X			X
378	VEGF Signaling	X				X	X
379	Virus Entry via Endocytic Pathways	X	X				X
380	Wnt/Ca+ pathway	X		X			X
381	Wnt/ β -catenin Signaling	X					X
382	Xenobiotic Metabolism Signaling	X					X
383	Zymosterol Biosynthesis	X					X
384	α -Adrenergic Signaling	X	X				X
385	γ -glutamyl Cycle	X	X				X