



## Supporting Information

# **The Drug Discovery and Development Industry in India— Two Decades of Proprietary Small-Molecule R&D**

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**1. Table 5: Top-100 pharmaceutical and biotechnology companies in India by revenue**

#	Public Company <sup>(a, b)</sup>	Private Company <sup>(a, b)</sup>	Revenue (Cr INR)	Revenue (M\$ US) <sup>(c)</sup>	Fiscal Year	Reference
1	Sun Pharma		28.886,70	4.356,11	2015-16	Company Annual report 2016
2	Dr Reddy's Laboratories		15.967,10	2.407,84	2015-16	Company Annual report 2016
3	Lupin Ltd		14.396,17	2.170,94	2015-16	Company Annual report 2016
4	Aurobindo Pharma		14.062,35	2.120,60	2015-16	Company Annual report 2016
5	Cipla		13.887,16	2.094,18	2015-16	Company Annual report 2016
6	Cadila Healthcare		9.931,70	1.497,70	2015-16	Company Annual report 2016
7		Hetero Drugs Ltd	7.957,56	1.200,00	2014-15	<a href="http://www.prnewswire.com/news-releases/hetero-announces-the-launch-of-biosimilar-rituximab-maball-in-india-520727741.html">http://www.prnewswire.com/news-releases/hetero-announces-the-launch-of-biosimilar-rituximab-maball-in-india-520727741.html</a>
8	Glenmark Pharmaceuticals		7.580,00	1.143,06	2015-16	Company Annual report 2016
9	Torrent Pharma		6.892,00	1.039,31	2015-16	Company Annual report 2016
10		Intas Pharmaceuticals	6.569,20	990,64	2015-16	Company website acc Nov 22 2016 <a href="http://intaspharma.com/index.php?option=com_content&amp;view=article&amp;id=59&amp;Itemid=41">http://intaspharma.com/index.php?option=com_content&amp;view=article&amp;id=59&amp;Itemid=41</a>
11	Jubilant Lifesciences		5.816,00	877,05	2015-16	Company Annual report 2016
12	Alkem Laboratories Ltd		5.156,05	777,53	2015-16	Company Annual report 2016
13	Wockhardt		4.558,00	687,35	2015-16	Company Annual report 2016
14		Serum Institute of India	4.153,00	626,27	2015-16	Biospectrum survey <a href="http://www.biospectrumindia.com/category/top20/top-biotech-companies">http://www.biospectrumindia.com/category/top20/top-biotech-companies</a>
15		Mankind Pharma	4.000,00	603,20	2015-16	Mankind website Nov 22 2016 <a href="https://www.mankindpharma.com/mediakit/financial_highlights">https://www.mankindpharma.com/mediakit/financial_highlights</a>
16	Divis Laboratories		3.861,19	582,27	2015-16	Company Annual report 2016
17	Piramal Enterprises (Healthcare)		3.700,20	557,99	2015-16	Company Annual report 2016 (Piramal Healthcare = 54% of Piramal Enterprises revenue)
18	Biocon		3.569,90	538,34	2015-16	Company Annual report 2016
19	Strides Shasun		3.156,35	475,98	2015-16	Company Annual report 2016
20	Alembic Pharma		3.154,22	475,66	2015-16	Company Annual report 2016
21		Macleods Pharmaceuticals	2.981,00	449,53	2013-14	Business Standard 2016 - <a href="http://bsmedia.business-standard.com/media/bs/data/general-file-upload/2016-02/bs-1000-03.pdf">http://bsmedia.business-standard.com/media/bs/data/general-file-upload/2016-02/bs-1000-03.pdf</a>
22	Ipca Labs		2.901,95	437,61	2015-16	Company Annual report 2016
23		Micro Labs	2.700,00	407,16	2015-16	Company website Nov 22, 2016 - <a href="http://www.microlabsltd.com/about-us/our-history">http://www.microlabsltd.com/about-us/our-history</a>
24		USV Limited	2.544,50	383,71	2015-16	Company website Nov 22 2016 - <a href="http://www.usvindia.com/aboutus.php">http://www.usvindia.com/aboutus.php</a>
25		Arch Pharmalabs Ltd	2.285,98	344,73	2012-13	undergoing corporate debt restructuring - <a href="http://www.careratings.com/upload/CompanyFiles/PR/ARCH">http://www.careratings.com/upload/CompanyFiles/PR/ARCH</a>

						<a href="#">%20PHARMALABS%20LIMITED-04-02-2015.pdf</a>
26		Emcure Pharmaceuticals Ltd	2.059,88	310,63	2014-15	<a href="http://www.careratings.com/upload/CompanyFiles/PR/EMCURE%20PHARMACEUTICALS%20LIMITED-03-09-2016.pdf">http://www.careratings.com/upload/CompanyFiles/PR/EMCURE%20PHARMACEUTICALS%20LIMITED-03-09-2016.pdf</a>
27		Relax Pharmaceuticals	1.949,20	293,94	2013-14	Business Standard 2016 - <a href="http://bsmedia.business-standard.com/media/bs/data/general-file-upload/2016-02/bs-1000-03.pdf">http://bsmedia.business-standard.com/media/bs/data/general-file-upload/2016-02/bs-1000-03.pdf</a>
28		Aristo Pharmaceuticals	1.823,61	275,00	2013-14	IPHEX 2016 (company's own info) - <a href="http://www.iphex-india.com/exhibitor/view_approved">http://www.iphex-india.com/exhibitor/view_approved</a>
29	Laurus Labs		1.791,36	270,14	2015-16	Laurus AR 2016 from website acc Nov 22, 2016 - <a href="http://www.lauruslabs.com/sites/all/themes/lauruslab/pdf/AnnualReport-2015-16.pdf">http://www.lauruslabs.com/sites/all/themes/lauruslab/pdf/AnnualReport-2015-16.pdf</a>
30	Ajanta Pharma Ltd		1.744,16	263,02	2015-16	Company Annual report 2016
31		MSN Laboratories	1.657,82	250,00	2015-16	Company website accessed Nov 22 2016 - <a href="http://www.msnlabs.com/who_weare.html">http://www.msnlabs.com/who_weare.html</a>
32	Dishman Pharmaceuticals and Chemicals Ltd		1.622,59	244,69	2015-16	Company Annual report 2016
33	Granules India		1.437,21	216,73	2015-16	Company Annual report 2016
34		Cadila Pharmaceuticals	1.390,00	209,61	2014-15	<a href="http://www.careratings.com/upload/CompanyFiles/PR/CADILA%20PHARMACEUTICALS%20LIMITED-02-26-2016.pdf">http://www.careratings.com/upload/CompanyFiles/PR/CADILA%20PHARMACEUTICALS%20LIMITED-02-26-2016.pdf</a>
35	Vivimed Labs		1.356,44	204,55	2015-16	Company Annual report 2016
36	Unichem Laboratories Ltd		1.353,75	204,15	2015-16	Company Annual report 2016
37	JB Chemicals & Pharmaceuticals Ltd		1.309,30	197,44	2015-16	Company Annual report 2016
38	Natco Pharma		1.152,38	173,78	2015-16	Company Annual report 2016
39	Aarti Drugs		1.139,84	171,89	2015-16	Company Annual report 2016
40		Gland Pharma	1.120,70	169,00	2014-15	BusinessToday Aug 28, 2016 - <a href="http://www.businesstoday.in/magazine/corporate/chinese-pharma-company-buys-an-equally-less-known-indian-firm/story/235885.html">http://www.businesstoday.in/magazine/corporate/chinese-pharma-company-buys-an-equally-less-known-indian-firm/story/235885.html</a>
41	Syngene		1.113,10	167,86	2015-16	Company Annual report 2016
42	FDC Ltd		1.037,87	156,51	2015-16	Company Annual report 2016
43		Biological E	1.018,00	153,51	2015-16	Biospectrum survey <a href="http://www.biospectrumindia.com/category/top20/top-biotech-companies">http://www.biospectrumindia.com/category/top20/top-biotech-companies</a>
44	Elder Pharmaceuticals		1.008,91	152,14	2013-14	Company Annual report 2014 - facing bankruptcy
45	Indoco Remedies Ltd		1.004,87	151,53	2015-16	Company Annual report 2016
46	Hikal		927,50	139,87	2015-16	Company Annual report 2016
47	Orchid Pharma		898,35	135,47	2015-16	Company Annual report 2016
48	Dr Lal PathLabs Ltd		796,35	120,09	2015-16	Company Annual report 2016
49	Claris Lifesciences Ltd		794,68	119,84	2015-16	Company Annual report 2016
50	Shilpa medicare Ltd		724,01	109,18	2015-16	Company Annual report 2016
51	Panacea Biotec		673,43	101,55	2015-16	Company Annual report 2016

52	Ind-Swift Laboratories		667,43	100,65	2015-16	Company Annual report 2016
53		GVK Biosciences	663,13	100,00	2014-15	<a href="http://timesofindia.indiatimes.com/business/india-business/ChrysCap-buys-10-stake-in-research-firm-GVK-Bio/articleshow/50005374.cms">http://timesofindia.indiatimes.com/business/india-business/ChrysCap-buys-10-stake-in-research-firm-GVK-Bio/articleshow/50005374.cms</a>
54	Sequent Scientific		645,12	97,28	2015-16	Company Annual report 2016
55	SMS Pharmaceuticals		606,80	91,51	2015-16	Company Annual report 2016
56	Sterling Biotech		531,84	80,20	2015-16	Company Annual report 2016
57	TTK Healthcare		524,45	79,09	2015-16	Company Annual report 2016
58		Reliance Life Sciences	522,23	78,75	2013-14	<a href="http://www.careratings.com/upload/CompanyFiles/PR/RELIANCE%20LIFE%20SCIENCES%20PVT.%20LTD.-02-27-2015.pdf">http://www.careratings.com/upload/CompanyFiles/PR/RELIANCE%20LIFE%20SCIENCES%20PVT.%20LTD.-02-27-2015.pdf</a>
59	Suven Life Sciences		518,87	78,25	2015-16	Company Annual report 2016
60	Neuland Laboratories Ltd		517,49	78,04	2015-16	Company Annual report 2016
61	Morepen Laboratories Ltd		486,28	73,33	2015-16	Company Annual report 2016
62		Bharat Biotech International	450,00	67,86	2015-16	Biospectrum survey <a href="http://www.biospectrumindia.com/category/top20/top-biotech-companies">http://www.biospectrumindia.com/category/top20/top-biotech-companies</a>
63	Wanbury		424,67	64,04	2015-16	Company Annual report 2016
64	Venus Remedies		420,27	63,38	2015-16	Company Annual report 2016
65	Lincoln Pharmaceuticals		407,50	61,45	2015-16	Company Annual report 2016
66	Marksans Pharma		366,82	55,32	2015-16	Company Annual report 2016
67		Anthem Biosciences	350,00	52,78	2015-16	Biospectrum survey <a href="http://www.biospectrumindia.com/category/top20/top-biotech-companies">http://www.biospectrumindia.com/category/top20/top-biotech-companies</a>
68		Sai Life Sciences	340,47	51,34	2014-15	<a href="http://www.careratings.com/upload/CompanyFiles/PR/SAI%20LIFE%20SCIENCES%20LIMITED-02-18-2016.pdf">http://www.careratings.com/upload/CompanyFiles/PR/SAI%20LIFE%20SCIENCES%20LIMITED-02-18-2016.pdf</a>
69	Anuh Pharma		329,73	49,72	2015-16	Company Annual report 2016
70	Albert David Ltd		322,19	48,59	2015-16	Moneycontrol - Annual report 2016 not available
71	Ind-Swift Ltd		316,84	47,78	2015-16	Company Annual report 2016
72	Mangalam Drugs & Organics Ltd		295,18	44,51	2015-16	Company Annual report 2016
73	Advanced Enzyme Technologies Ltd		293,80	44,31	2015-16	Company Annual report 2016
74	RPG Life Sciences Ltd		280,10	42,24	2015-16	Company Annual report 2016
75		Concord Biotech	272,90	41,15	2015-16	Biospectrum survey - accessed Dec 5 2016 - <a href="http://www.biospectrumindia.com/category/top20/top-biotech-companies">http://www.biospectrumindia.com/category/top20/top-biotech-companies</a>
76		Tablets (India) Ltd	271,00	40,87	2015-16	<a href="http://www.icra.in/Files/Reports/Rationale/Tablets%20India-r-17102016.pdf">http://www.icra.in/Files/Reports/Rationale/Tablets%20India-r-17102016.pdf</a>
77	Parenteral Drugs India Ltd		262,32	39,56	2015-16	Company Annual report 2016
78	Sharon Bio-Medicine Ltd		255,40	38,51	2015-16	Company Annual report 2016
79		Blue Cross Laboratories	250,00	37,70	2012-13	India Leadership Conclave 2013 - <a href="http://www.indiaprwire.com/pressrelease/medical/20130607198041.htm">http://www.indiaprwire.com/pressrelease/medical/20130607198041.htm</a>

80	Aarey Drugs and Pharmaceuticals		249,16	37,57	2015-16	Company Annual report 2016
81	Astec Lifesciences		245,80	37,07	2015-16	Company Annual report 2016
82	Themis Medicare		235,98	35,59	2015-16	Company Annual report 2016
83	Caplin Point Laboratories		234,76	35,40	2015-16	Company Annual report 2016
84	Gufic Biosciences		202,86	30,59	2015-16	Company Annual report 2016
85	Bal Pharma Ltd		199,60	30,10	2015-16	Company Annual report 2016
86	Amrutanjan Healthcare		192,42	29,02	2015-16	Company Annual report 2016
87		Aurigene Discovery Technologies	187,60	28,29	2015-16	Dr Reddys Laboratories annual report 2015-16
88	Kopran Ltd		187,31	28,25	2015-16	Moneycontrol - Annual report 2016 not available
89	Syncom Formulations India		186,57	28,13	2015-16	Company Annual report 2016
90		TCG Lifesciences	165,30	24,93	2014-15	<a href="http://www.careratings.com/upload/CompanyFiles/PR/TCG%20LIFESCIENCES%20LIMITED-04-12-2016.pdf">http://www.careratings.com/upload/CompanyFiles/PR/TCG%20LIFESCIENCES%20LIMITED-04-12-2016.pdf</a>
91	Sun Pharma Advanced Research Centre		164,22	24,76	2015-16	Company Annual report 2016
92		Advinus Therapeutics	160,30	24,17	2015-16	<a href="http://www.careratings.com/upload/CompanyFiles/PR/ADVINUS%20THERAPEUTICS%20LTD.-11-08-2016.pdf">http://www.careratings.com/upload/CompanyFiles/PR/ADVINUS%20THERAPEUTICS%20LTD.-11-08-2016.pdf</a>
93	Alembic Ltd		152,40	22,98	2015-16	Company Annual report 2016
94	Jagsonpal Pharmaceuticals		144,19	21,74	2015-16	Company Annual report 2016
95	Bharat Immunologicals & Biologicals		128,03	19,31	2015-16	Moneycontrol - Annual report 2016 not available
96	Sanjivani Parenteral Ltd		115,48	17,41	2015-16	Moneycontrol - Annual report 2016 not available
97	Denis Chem Lab Ltd		101,11	15,25	2015-16	Company Annual report 2016
98	Everest Organics Ltd		99,84	15,06	2015-16	Company Annual report 2016
99	Jenburkt Pharma		96,32	14,53	2015-16	Company Annual report 2016
100	NGL Fine-Chem Ltd		96,29	14,52	2015-16	Company Annual report 2016

(a) Former top-100 companies that have been acquired:

- Matrix Laboratories - acquired 2006 by Mylan Laboratories (ranked top-10 in 2006)
- Dabur Research Foundation – acquired 2008 by Fresenius Kabi (ranked 37 in 2008)
- Ranbaxy - acquired 2008 by Daiichi-Sankyo, and in 2015 by Sun Pharma (ranked 1 in 2008)

(b) Colour code: green = proprietary drug discovery; blue = discovery collaborations; yellow = no proprietary drug discovery

(b) Exchange rate March 31, 2016 (1 US\$ = 66,1428 INR)

## 2. Table 6: Development compounds at Indian pharmaceutical and biotechnology companies

**Table 6.a.: Proprietary development compounds from Indian companies**

Entry	Company	Compound	Therapeutic area	Mode of action	Target class	Year <sup>(a)</sup>	Status (mid-2016)	Refs.
1	Dr Reddy's Laboratories	DRF-2593 /Balaglitazone, <b>1</b>	Type 2 diabetes	Partial Peroxisome proliferator-activated receptor $\gamma$ (PPAR $\gamma$ ) agonism	Nuclear signalling	1996	Novo Nordisk (1997-2004); Rheosciences (2005-2010); DRL own development in 2010, Phase 3 – stop 2011	[55, 56]
2	Dr Reddy's Laboratories	DRF 2725 /Ragaglitazar, <b>2</b>	Type 2 diabetes	Dual PPAR $\alpha$ / $\gamma$ agonism	Nuclear signalling	1998	Novo Nordisk (1998-2002) ; Phase 3 - Stop 2002	[56, 57]
3	Dr Reddy's Laboratories	DRF 1042, <b>3</b>	Oncology, solid tumors	Topoisomerase-I inhibition	DNA structure	1998	ClinTec (2006) ; Phase 2 - stop 2011	[59, 60]
4	Dr Reddy's Laboratories	DRF 1644	Oncology	Topoisomerase-I inhibition	DNA structure	2000	Phase 1 – stop 2005	[65]
5	Dr Reddy's Laboratories	DRF-NPCC	Metabolic disorders	Insulin sensitization	NA	2000	Preclinical – stop 2003	[395]
6	Dr Reddy's Laboratories	DRF-PPI	Gastric ulcer	Proton pump inhibition	Transporter	2000	Preclinical - stop 2001	[54]
7	Dr Reddy's Laboratories	DRF 3188, <b>40</b>	Oncology	Cell cycle blockade	NA	2001	Preclinical – stop 2003	[396]
8	Dr Reddy's Laboratories	DRF 4158/LBL-752	Type 2 diabetes, dyslipidemia, hypertension, obesity	Dual PPAR $\alpha$ / $\gamma$ agonism and HMG-CoA Reductase inhibition	Nuclear signalling, oxidoreductase	2000	Novartis licence 2001 ; Preclinical - stop 2003	[58]
9	Dr Reddy's Laboratories	DRF 4367, <b>41</b>	Inflammation	COX-2 inhibition	Oxidoreductase	2000	Preclinical - stop 2001	[397]
10	Dr Reddy's Laboratories	DRF 4832	Metabolic disorders with cardiovascular complications	PPAR agonism	Nuclear signalling	2001	Preclinical – stop 2004	[398]
11	Dr Reddy's Laboratories	DRF 4848, <b>42</b>	Inflammation, pain	Selective COX-2 inhibition	Oxidoreductase	2001	Preclinical – stop 2003	[399]
12	Dr Reddy's Laboratories	NA	Cardiovascular disorders, restenosis	NA	NA	2002	Preclinical - stop 2003	[54]

13	Dr Reddy's Laboratories	DRF 5265	Oncology	NA	NA	2004	Preclinical - stop 2005	[54]
14	Dr Reddy's Laboratories	DRF 8417, <b>43</b>	Bacterial infections	Oxazolidinone class protein synthesis inhibition	Protein synthesis	2003	Preclinical - stop 2003	[400]
15	Dr Reddy's Laboratories	RUS 3108	Cardiovascular disorders, atherosclerosis	Perlecan induction	Multimodal	2003	Perlecan Pharma ; Phase 1 – stop 2008	[62]
16	Dr Reddy's Laboratories	DRF 10945	Metabolic disorders	Non-fibrate predominantly PPAR $\alpha$ agonism	Nuclear signalling	2003	Perlecan Pharma 2006-08 ; Phase 2 - stop 2008	[61]
17	Dr Reddy's Laboratories	DRF 11057	Bacterial infections	Oxazolidinone class protein synthesis inhibition	Protein synthesis	2003	Preclinical - stop 2004	[54]
18	Dr Reddy's Laboratories	DRL 11605	Metabolic disorders, obesity, dyslipidemia	Pan PPAR $\alpha/\delta/\gamma$ agonism	Nuclear signalling	2004	Perlecan Pharma ; Phase 1 - stop 2007	[61]
19	Dr Reddy's Laboratories	DRL 12424	Cardiovascular disorders	NA	NA	2006	Preclinical - stop 2008	[54]
20	Dr Reddy's Laboratories	DRF 13792	Bacterial infections (gram-positive bacteria)	NA	NA	2004	Preclinical – stop 2006	[54]
21	Dr Reddy's Laboratories	DRL 16536	Metabolic disorders	AMPK modulation	Kinase (activation)	2006	Perlecan Pharma ; Preclinical - stop 2008	[54]
22	Dr Reddy's Laboratories	DRL 16048	Bacterial infections (Gram positive resistant infections)	NA	NA	2007	Preclinical - stop 2008	[54]
23	Dr Reddy's Laboratories	NA	Respiratory disorders, COPD	PPAR $\gamma$ agonism	Nuclear signalling	2007	Collaboration Argenta Discovery; Phase 1 - stop 2008	[64]
24	Dr Reddy's Laboratories	DRL 17822	Dyslipidemia	Cholesterylester transfer protein (CETP) inhibition	Cholesterol transport	2008	Phase 2 – stop 2013	[66]
25	Dr Reddy's Laboratories	DRL 19440	Infections	NA	NA	2010	Preclinical – stop 2011	[54]
26	Dr Reddy's Laboratories	DRL 21994	Dyslipidemia	NA	NA	2009	Phase 1 – stop 2011	[54]
27	Dr Reddy's Laboratories	DRL 21995	Dyslipidemia	Lipid metabolism modulation	NA	2009	Phase 1 – stop 2011	[54]



28	Ranbaxy	RBx 2258/SPM-969/Parvosin/Pamirosin, <b>4</b>	Benign prostatic hyperplasia	Alpha <sub>1α/δ</sub> -adrenoceptor antagonism	GPCR	1998	Licensed to Schwarz Pharma (2002), Phase 2 – stop 2004	[67, 68]
29	Ranbaxy	RBx-4638 /Clafrinast	Bronchial asthma	VLA-4 antagonism	Integrin	2000	Phase 1 - stop 2003	[76, 77]
30	Ranbaxy	RBx 7644 /Ranbezolid, <b>6</b>	Bacterial infections	Oxazolidinone class protein synthesis inhibition	Protein synthesis	2000	Phase 1 – stop 2004	[78]
31	Ranbaxy	RBx 7796, <b>7</b>	Allergic rhinitis, asthma	5-LO inhibition	Oxidoreductase	2001	Phase 2 - stop 2004	[79]
32	Ranbaxy	RBx 9001, <b>44</b>	Benign prostatic hyperplasia	α <sub>1</sub> adrenoceptor antagonism (Tamsulosine metabolite)	GPCR	2003	Preclinical - stop 2004	[401]
33	Ranbaxy	RBx 9841	Urinary incontinence	Selective muscarinic M <sub>3</sub> receptor antagonism	GPCR	2003	Phase 1 - stop 2006	[80]
34	Ranbaxy	RBx 10558, PPD-10558, <b>5</b>	Hypercholesterolemia	HMG-CoA synthase inhibition	Transferase	2004	Licensed to PPD/Furiex Pharma (2007); Phase 2 – stop 2011	[74, 75]
35	Ranbaxy	RBx 11082	Asthma, COPD	PDE4 inhibition	Phosphodiesterase	2004	Preclinical - stop 2007	[67]
36	Ranbaxy	RBx 11528	Benign prostatic hyperplasia	NA	NA	2006	Preclinical - stop 2007	[67]
37	Ranbaxy	RBx 14016	Asthma, COPD	PDE4 inhibition	Phosphodiesterase	2005	Preclinical - stop 2006	[67]
38	Ranbaxy	RBx 14255, <b>45</b>	Infections	Macrolide/ketolide class protein synthesis inhibition	Protein synthesis	2006	Preclinical - stop 2008	[402]
39	Ranbaxy	RBx 10014374	Type 2 diabetes	NA	NA	2006	Preclinical - stop 2007	[67]
40	Ranbaxy	RBx 10017609	Respiratory diseases, COPD	Dual MMP-9 and MMP-12 inhibition	Protease	2007	Partnered with GSK, Phase 2 - stop 2013	[73]
41	Ranbaxy	RBx 10017876	COPD, asthma	PDE IVB inhibition	Phosphodiesterase	2007	Preclinical - stop 2008	[67]
42	Ranbaxy	RBx 10019821	Diabetes	DPP IV inhibition	Protease	2007	Preclinical - stop 2008	[67]
43	Ranbaxy	RBx 10020025	COPD, asthma	Muscarinic M <sub>3</sub> receptor antagonism	GPCR	2007	Preclinical - stop 2008	[67]

44	Torrent	TRC-282	Angina, ischemic stroke, neurodegeneration	Nitric oxide release	Cyclase	2005	Preclinical - stop 2006	[82, 87]
45	Torrent	TRC-4186, <b>8</b>	Diabetes related CV complications	Cleavage of Advanced Glycation Endproducts (AGE) crosslinks	Chemical bond cleavage	2002	Novartis license option 2002-2005; Phase 2 completed 2015 – development ongoing	[16, 83, 84]
46	Torrent	TRC-8156	Diabetes	DPPIV inhibition	Protease	2005	Preclinical - stop 2006	[88]
47	Torrent	TRC-120038, <b>11</b>	Hypertension	Dual action Angiotensin AT <sub>1</sub> and Endothelin ET <sub>A</sub> receptor antagonism (DARA)	GPCR	2008	Joint Venture with AstraZeneca (2005); preclinical - stop 2009	[89]
48	Torrent	TRC150094, <b>9</b>	Cardiometabolic risks	Functional diiodothyronine (T <sub>2</sub> ) mimetism	Nuclear signalling	2008	Phase 2 - ongoing 2016	[16, 85]
49	Torrent	TRC160334, <b>10</b>	Kidney failure, intestinal bowel disease	HIF hydroxylase inhibition	Oxidoreductase	2012	Phase 1 - ongoing in EU, IND application in India 2016	[86]
50	Wockhardt	WCK 771/ Levonadifloxacin, <b>12</b>	Infections, sepsis	Fluoroquinolone class topoisomerase/DNA gyrase inhibition	DNA structure	2000	USFDA fast track approval; Phase 2 ongoing, India 2016	[91, 92]
51	Wockhardt	WCK 919, <b>14</b>	Respiratory tract infections	Fluoroquinolone class topoisomerase/DNA gyrase inhibition	DNA structure	2000	Preclinical - stop 2002	[403]
52	Wockhardt	WCK 993A	Infections, sepsis	NA	NA	2000	Preclinical - stop 2001	[32, 90]
53	Wockhardt	WCK 1152, <b>14a</b>	Respiratory tract infections	Fluoroquinolone class topoisomerase/DNA gyrase inhibition	DNA structure	2002	Phase 1 - stop 2012	[91]
54	Wockhardt	WCK 1153, <b>14b</b>	Respiratory tract infections	Fluoroquinolone class topoisomerase/DNA gyrase inhibition	DNA structure	2001	Preclinical - stop 2002	[91]
55	Wockhardt	WCK 1456	Infections	NA	NA	2002	Preclinical - stop 2003	[90]
56	Wockhardt	WCK 1457	Infections	NA	NA	2003	Preclinical - stop 2004	[90]

57	Wockhardt	WCK 1584	Respiratory and urinary tract infections	NA	NA	2001	Preclinical - stop 2002	[90]
58	Wockhardt	WCK 1734	Skin infections, topical	Fluoroquinolone class topoisomerase/DNA gyrase inhibition	DNA structure	2004	Preclinical - stop 2009	[404]
59	Wockhardt	WCK 2349/Alalevonad ifloxacin, <b>13</b>	Respiratory tract infections	Fluoroquinolone class topoisomerase/DNA gyrase inhibition (prodrug)	DNA structure	2006	USFDA fast track approval; Phase 2 - ongoing India 2016	[93]
60	Wockhardt	WCK 2370	MRSA resistant infections	Oxazolidinone class protein synthesis inhibition	Protein synthesis	2008	Preclinical - stop 2009	[90]
61	Wockhardt	WCK 2664	Gram-positive MRSA resistant infections	Oxazolidinone class protein synthesis inhibition	Protein synthesis	2008	Preclinical - stop 2009	[90]
62	Wockhardt	WCK 4086	Infections	Oxazolidinone class protein synthesis inhibition	Protein synthesis	2010	Preclinical - ongoing 2016	[90]
63	Wockhardt	WCK 4873/Nafitromycine	Infections	Ketolide class protein synthesis inhibition	Protein synthesis	2010	Phase 1 - ongoing US 2016	[90, 94]
64	Wockhardt	WCK 5107 /Zidebactam, <b>15</b>	Infections	Dual penicillin-binding protein-2 (PBP2) & betalactamase inhibitor	Transpeptidase, betalactamase	2014	Phase 1 – ongoing 2016	[96]
65	Piramal	P276/Riviciclib, <b>16</b>	Oncology - multiple myeloma, head and neck cancer, malignant melanoma	CDK4 inhibition	Kinase	2002	Phase 1 2005, Phase 2 2007 - stop 2013	[98]
66	Piramal	P664 (back-up compound)	Oncology	CDK4 inhibition	Kinase	2005	Preclinical 2005 – stop 2006	[97]
67	Piramal	P979	Inflammation, RA, psoriasis, ankylosing spondylarthritis	Blockade of TNF-alpha release, IL-6 inhibition	Cytokine	2004	Preclinical – stop 2013	[97]
68	Piramal	P1446 /Voruciclib, <b>17</b>	Oncology - multiple myeloma, head and neck cancer, malignant melanoma (b/u to P276)	CDK4 inhibition	Kinase	2007	Phase 1 - stop 2015	[98]
69	Piramal	P1539	Inflammation	Dual acting NSAID and NO	Oxidoreductase,	2002	Preclinical – stop 2003	[405]

				release (Aspirin-linker-NO)	cyclase			
70	Piramal	P1736, <b>18</b>	Diabetes	Non-PPAR insulin sensitization	Nuclear signalling	2002	Phase 2 – stop 2014	[105]
71	Piramal	P1961	Oncology	Dual CDK4/HIF1alpha inhibition	Kinase, nuclear signalling	2007	Phase 1 initiated - stop 2009	[97]
72	Piramal	P2026	Inflammation	Dual acting NSAID and NO release (Diclofenac-linker-NO)	Oxidoreductase, cyclase	2002	Preclinical - stop 2003	[406]
73	Piramal	PM181104	Infections	Cyclic peptide class protein synthesis inhibition	Protein synthesis	2008	Preclinical - stop 2014	[407]
74	Piramal	P2745	Hematological malignancies, Gleevec-resistant cancers	Transforming growth factor beta (TGFbeta) pathway inhibition	Kinase	2010	Phase 1 – Stop 2013	[106]
75	Piramal	P3914	Inflammation	Dual action Naproxen-linker-NO donor	Oxidoreductase	2009	Phase 1 India – Stop 2013	[107, 108]
76	Piramal	PL225B/Target X	Oncology	IGF-1R inhibition (oral)	Kinase	2011	MSD collaboration; Phase 1 2014 - stop 2014	[99-101]
77	Piramal	Target Y	Oncology	IGF-1R inhibition	Kinase	2012	MSD collaboration; preclinical (India) 2012 - stop 2013	[97]
78	Piramal	P7170/Panulisib, <b>19</b>	Oncology (solid tumors) and inflammation	Dual PI3K-mTOR and Alk-1 inhibition	Kinase	2011	Partnered with MSD 2013, got back 2014, Phase 1 - stop 2015	[109, 110]
79	Piramal	P7435	Diabetes	Diacylglycerol-acyltransferase-1 (DGAT1) inhibition	Transferase	2011	Phase 1 US completed 2015 – stop 2015	[97]
80	Piramal	P11187	Metabolic disorders	GPR40 agonism	GPCR	2012	Phase 1 completed 2015 – stop 2015	[97]
81	Sun Pharma	SUN 1334H, <b>20</b>	Allergies	Histamine H <sub>1</sub> receptor antagonism	GPCR	2003	Phase 2 - stop 2013	[116, 117]
82	Sun Pharma	SUN 09	Spasm related disorders	GABA <sub>B</sub> receptor agonism via Baclofen prodrug	GPCR	2007	Phase 1 India - stop 2013	[118]

83	Sun Pharma	SUN 44	Neuropathy, seizures	GABA receptor agonism via Gabapentin prodrug	Ion channel	2007	IND India - preclinical - stop 2013	[118]
84	Sun Pharma	SUN 461	Asthma, COPD	Glucocorticoid receptor agonism	Nuclear signalling	2007	Preclinical - stop 2010	[114]
85	Sun Pharma	SUN 597, 21	Inflammation, psoriasis	Glucocorticoid receptor agonism	Nuclear signalling	2010	Phase 1 EU - stop 2015 for inhalation; Phase 1 ongoing for dermatology 2016	[120-122, 126]
86	Sun Pharma	SUN K706	Chronic myeloid leukemia	Bcr-abl Tyrosine kinase inhibition	Kinase	2011	Phase 1 - ongoing 2016	[114, 124-126]
87	Sun Pharma	SUN L731	Asthma, allergic rhinitis	LTD4 receptor antagonism	GPCR	2013	Preclinical - stop 2015	[123, 126]
88	Sun Pharma	SUN K954	Chronic myeloid leukemia	Bcr-abl Tyrosine kinase inhibition	Kinase	2016	Preclinical – ongoing 2016	[124-126]
89	Zydus Cadila	ZYH1/ Saroglitazar (Lipaglyn™), 22	Dyslipidemia	PPAR $\alpha/\gamma$ agonism	Nuclear signalling	2004	Launched 2013, clinical development for further indications ongoing (2016)	[132]
90	Zydus Cadila	ZYH2	Type 2 diabetes	PPAR $\alpha/\gamma$ agonism	Nuclear signalling	2005	Phase 1 - stop 2012	[131]
91	Zydus Cadila	ZYO1	Obesity, diabetes	CB <sub>1</sub> receptor antagonism	GPCR	2005	Phase 1 - stop 2012	[136]
92	Zydus Cadila	ZYI1	Inflammatory disorders, pain	NA	NA	2005	Phase 2 - stop 2012	[142]
93	Zydus Cadila	ZYH7	Dyslipidemia	PPAR $\alpha$ agonism	Nuclear signalling	2007	Phase 2 completed 2015 – development ongoing	[131]
94	Zydus Cadila	ZYT1	Dyslipidemia	Thyroid hormone receptor beta (TR-beta) agonism	Nuclear signalling	2008	Phase 1 - stop 2012	[141]
95	Zydus Cadila	ZYD1	Diabetes, obesity	GLP-1 receptor agonism	GPCR	2009	Phase 1 - stop 2014	[137]
96	Zydus Cadila	ZYOG1	Diabetes, obesity	GLP-1 receptor agonism	GPCR	2009	Phase 1 - stop 2014	[138]
97	Zydus Cadila	ZYGK1	Diabetes	Glucokinase activation	Kinase	2011	Phase 1 - stop 2014	[139]
98	Zydus Cadila	ZYPH0907	Osteoporosis	Parathyroid hormone (PTH) receptor agonism (oral)	GPCR	2011	Phase 1 - stop 2014	[143]
99	Zydus Cadila	ZYG19	Diabetes	GPR-119 agonism	GPCR	2011	Phase 1 - stop 2015	[140]
100	Zydus Cadila	ZYGL241	Diabetes, obesity	GLP-1 agonism (oral)	GPCR	2011	Preclinical - stop 2012	[131]
101	Zydus Cadila	ZYDPLA1	Diabetes	DPPIV inhibition	Protease	2013	Phase 1 trials US completed – development ongoing	[133]

							2016	
102	Zydus Cadila	ZYAN1	Anemia (commonly observed in chronic kidney disorder)	Hypoxia-inducible factor prolyl hydroxylase (HIF-PH) inhibition	Oxidoreductase	2014	Phase 1 trials Australia completed – development ongoing 2016	[134]
103	Zydus Cadila	ZYTP1	Oncology	PARP inhibition (oral)	DNA structure	2014	Preclinical - ongoing 2016 (IND approved for Phase 1 in India)	[135]
104	FDC Limited	NCL-FDC-101	Fungal infections	Not available	Not available	2006	No information available on development status	[149]
105	JB Chemicals and Pharmaceuticals	JB-7/G	Inflammation, pain	COX-2 inhibition	Oxidoreductase	2004	Preclinical 2004 – abandoned 2005	[156]
106	Glenmark	GRC 1087	Obesity, diabetes	$\beta_3$ adrenergic receptor agonism	GPCR	2002	Preclinical - stop 2004	[408]
107	Glenmark	GRC 3015	Asthma, COPD	PDE4 inhibition	Phosphodiesterase	2002	Preclinical - stop 2004	[161, 162]
108	Glenmark	GRC 3566	Asthma, COPD	PDE4 inhibition	Phosphodiesterase	2003	Preclinical - stop 2005	[161, 162]
109	Glenmark	GRC 3590	Asthma, COPD	PDE4 inhibition	Phosphodiesterase	2003	Preclinical - stop 2004	[161, 162]
110	Glenmark	GRC 3785	Asthma, COPD	PDE4 inhibition	Phosphodiesterase	2003	Preclinical - stop 2004	[161, 162]
111	Glenmark	GRC 3886 /Oglemilast, <b>23</b>	Asthma, COPD	PDE4 inhibition	Phosphodiesterase	2004	Licensed to Forest (2004)/ Teijin (2005) - Phase 2 stop 2009	[163, 164]
112	Glenmark	GRC 4039 /Revamilast, <b>26</b>	Asthma, rheumatoid arthritis, other inflammatory disorders	PDE4 inhibition	Phosphodiesterase	2006	Phase 2 - stop 2012	[175, 176]
113	Glenmark	GRC 6211, <b>25</b>	Pain, migraine, incontinence, asthma	TRPV1 antagonism	Ion channel	2006	Licensed to Lilly (2007), Phase 2 - stop 2008	[167, 168]
114	Glenmark	GRC 8087	Diabetes	DPPIV inhibition	Protease	2004	Preclinical - stop 2004	[161]
115	Glenmark	GRC 8200 /Melogliptin, <b>24</b>	Diabetes	DPPIV inhibition	Protease	2004	Licensed to Merck KgaA, 2006, returned 2008 - Phase 2 stop 2011	[165, 166]

116	Glenmark	GRC 9332	Metabolic disorders	SCD1 inhibition	Oxidoreductase	2008	Preclinical - stop 2008	[409]
117	Glenmark	GRC 10389	Obesity	CB <sub>1</sub> receptor antagonism	GPCR	2006	Preclinical - stop 2007	[161, 410]
118	Glenmark	GRC 10622	Pain	CB <sub>2</sub> receptor agonism	GPCR	2006	Preclinical - stop 2007	[161]
119	Glenmark	GRC 10693/Tedalinab, <b>27</b>	Neuropathic pain, osteoarthritis, inflammatory pain	CB <sub>2</sub> receptor agonism	GPCR	2006	Phase 1 - stop 2011	[177, 178]
120	Glenmark	GRC 10801	Obesity	CB <sub>1</sub> receptor antagonism	GPCR	2006	Preclinical - stop 2008	[161]
121	Glenmark	GRC 15300 = SAR292833	Osteoarthritic pain	TRPV3 antagonism	Ion channel	2008	Licensed to Sanofi (2010) - Phase 2 PoC study failed - returned 2013, stop 2014	[169, 170]
122	Glenmark	GRC 17173	Osteoarthritis, neuropathic and dental pain	TRPV3 antagonism	Ion channel	2008	Preclinical - stop 2008	[161]
123	Glenmark	GRC 17536	Respiratory disorders, pain	TRPA1 inhibition	Ion channel	2010	Phase 2 - ongoing 2016	[179]
124	Glenmark	GRC 27864	Inflammation, pain	mPGES-1 inhibition	Synthase	2012	Option agreement with Forest Labs (2012), Phase 1 - ongoing 2016	[171-174]
125	Lupin	LL 3858 /Sudoterb, <b>28</b>	Tuberculosis	Undefined mechanism	NA	2004	Phase 2 India completed 2013 - stop 2015	[183, 184]
126	Lupin	LL 4218 /Desoside-P	Psoriasis	Undefined mechanism	NA	2004	Phase 2 India - stop 2010	[182]
127	Lupin	LL 6531	Metabolic diseases	PPAR modulation	Nuclear signalling	2008	Preclinical - stop 2009	[181]
128	Lupin	LND 101001	CNS, cognitive defects, AD	α <sub>7</sub> nACh receptor modulators	Ion channel	2011	Phase 2 in Europe - ongoing 2016	[185, 186]
129	Lupin	LNP 1892	Primary hyperparathyroidism (PHPT) and Chronic Kidney Disease (CKD)	CaSR receptor modulation	GPCR	2013	Phase 1 successfully completed - development ongoing 2016	[187]
130	Lupin	LNP 3794	Oncology	MEK inhibition	Kinase	2013	Phase 1 EU - ongoing 2016	[188]
131	Lupin	LNP 1955	Autoimmune diseases, (rheumatoid arthritis, psoriasis)	CRAC modulation	Ion channel	2014	Phase 2 PoC study - ongoing 2016	[189]
132	Reliance Life	RSCL-0409	Inflammatory	TLR signalling pathways	NA	2007	Preclinical – stop 2010	[194]

	Sciences		disorders	inhibition				
133	Reliance Life Sciences	RSCL-0520	Inflammatory disorders	TLR signalling pathways inhibition	NA	2007	Preclinical – stop 2010	[195]
134	Orchid	OCID 2987	Inflammation, COPD, asthma	PDE4 inhibition	Phosphodiesterase	2010	Phase 1 successfully completed 2013 in EU, – stop 2015	[197, 201]
135	Orchid	OCID 5005	Oncology	STAT-3/IL 6 inhibition	Nuclear signalling, cytokine	2006	Preclinical - stop 2006	[197]
136	Orchid	NA	Inflammation	Th1/Th2 cytokine synthase inhibition	Cytokine	2007	Preclinical - stop 2012	[197]
137	Orchid	OCID 4681, <b>29</b>	Oncology	HDAC inhibition	Deacetylase	2010	Phase 1 trial India solid tumors 2012 – stop 2014	[202, 203]
138	Orchid	OCID5090/AAI101, <b>30</b>	Infections	Betalactamase inhibition	Betalactamase	2012	Licensed to Allecra Therapeutics (2013) - Phase 1, France - ongoing 2016	[204-206]
139	Suven	SUVN-501	CNS diseases, mild cognitive impairment	5-HT <sub>6</sub> receptor antagonism	GPCR	2009	Preclinical - ongoing 2016	[212, 411]
140	Suven	SUVN-502	CNS diseases, mild cognitive impairment	5-HT <sub>6</sub> receptor antagonism	GPCR	2007	Phase 2a for PoC study – ongoing 2016	[212-214]
141	Suven	SUVN-504, <b>46</b>	CNS, Obesity, metabolic disorders	5-HT <sub>6</sub> receptor antagonism	GPCR	2008	Preclinical - stop 2010 for CNS, stop 2014 metabolic disorders	[412, 413]
142	Suven	SUVN-507, <b>47</b>	CNS diseases, mild cognitive impairment	5-HT <sub>6</sub> receptor antagonism	GPCR	2009	Preclinical - ongoing 2016	[212, 414]
143	Suven	SUVN-512	CNS diseases, mild cognitive impairment	5-HT <sub>6</sub> receptor antagonism	GPCR	2013	Preclinical - ongoing 2016	[212, 415]
144	Suven	SUVN-901	CNS diseases, mild cognitive impairment	5-HT <sub>6</sub> receptor antagonism	GPCR	2009	Preclinical - stop 2012	[414]
145	Suven	SUVN-911	Major depressive disorder (MDD)	α4 β2 nACh receptor antagonism	Ion channel	2010	Preclinical - ongoing 2016	[212, 217]
146	Suven	SUVN-976	CNS diseases, mild cognitive impairment	5-HT <sub>6</sub> receptor antagonism	GPCR	2010	Preclinical - stop 2015	[210]
147	Suven	SUVN-D4010	CNS diseases, mild	Partial 5-HT <sub>4</sub> receptor agonism	GPCR	2010	Phase 1 US - ongoing 2016	[212, 216]



			cognitive impairment					
148	Suven	NA	CNS diseases	$\alpha_7$ nACh receptor agonism or partial antagonism	Ion channel	2009	Preclinical - stop 2010 for CNS	[210]
149	Suven	SUVN-G3031	CNS diseases, mild cognitive impairment	Histamine H <sub>3</sub> receptor antagonism	GPCR	2012	Phase 1 US completed 2015 – development ongoing	[212, 215]
150	Suven	NA	Pain	CB <sub>2</sub> receptor agonism	GPCR	2013	Preclinical - ongoing 2016	[212]
151	Suven	NA	Pain	$\alpha_4 \beta_2$ nACh receptor antagonism	Ion channel	2016	Preclinical – ongoing 2016	[212]
152	Suven	NA	CNS diseases, mild cognitive impairment	Positive allosteric modulation of muscarinic M <sub>1</sub> Ach receptor	GPCR	2016	Preclinical – ongoing 2016	[212]
153	Suven	NA	Psychiatric disorders	Multimodal	NA	2016	Preclinical – ongoing 2016	[212]
154	Natco	NRC/AN/015	Oncology	Bcr-abl Tyrosine kinase inhibition	Kinase	2006	Preclinical - stop 2007	[218]
155	Natco	NRC-AN-019, <b>31</b>	Oncology, imatinib resistant chronic myeloid leukemia	Bcr-abl Tyrosine kinase inhibition	Kinase	2006	Phase 2 India solid tumors - ongoing 2016	[219]
156	Natco	NRC 2694, <b>32</b>	Oncology, solid tumors	EGFR kinase inhibition	Kinase	2009	Phase 1 India - ongoing 2016	[220]
157	Panacea	PBL 1427	Diabetes, metabolic diseases	DPPIV inhibition	Protease	2010	Phase 1 India - ongoing 2016, looking to partner	[222, 223]
158	Panacea	PBL 1920	CNS disorders, depression	Unknown mechanism	NA	2013	Preclinical - on hold 2014, looking to partner <sup>(b)</sup>	[221]
159	Panacea	PBL 2270	Gram positive bacterial infections	Oxazolidinone class protein synthesis inhibition	Protein synthesis	2010	Preclinical - on hold 2014, looking to partner <sup>(b)</sup>	[221]
160	Panacea	PBL 2958	Diabetes, metabolic syndrome and related diseases	SGLT2 inhibition	Transporter	2013	Preclinical - on hold 2014, looking to partner <sup>(b)</sup>	[221]
161	Matrix Laboratories (now Mylan)	MX 4007	Diabetes	DPPIV inhibition	Protease	NA	No information available on development status	[228]
162	Matrix Laboratories (now Mylan)	MX 6001	Inflammation, allergic diseases	PDE4 inhibition	Phosphodiesterase	NA	No information available on development status	[228]

163	Hetero Drugs	NA	HIV	Not disclosed	NA	2012	No information available on development status	[233]
164	Hetero Drugs	NA	HIV	Not disclosed	NA	2012	No information available on development status	[233]
165	Jubilant	JIEM-0186	Oncology	EGFR kinase inhibition	Kinase	2015	Preclinical – ongoing 2016	[237]
166	Jubilant	JBI-097	Oncology	Dual LSD1/HDAC inhibition	Demethylase, deacetylase	2015	Preclinical – ongoing 2016	[238, 239]
167	Jubilant	CK-103/JBET-050)	Oncology	BET BRD4 bromodomain inhibition	Bromodomain	2015	Licensed to Checkpoint Therapeutics (2016) preclinical – ongoing 2016	[240, 241]
168	Alkem	Alkem-43	Osteoporosis	Cathepsin K inhibition	Protease	2014	Early preclinical stage - drug discovery terminated end 2015	[252]
169	Advinus	GKM-001 /ADV1002401	Type 2 diabetes	Glucokinase activation	Kinase (activation)	2008	Phase 2 - ongoing 2016	[275, 276]
170	Advinus	GKM-002	Type 2 diabetes	Glucokinase activation	Kinase (activation)	2012	Backup to GKM-001 - preclinical ongoing 2016	[278, 279]
171	Advinus	PNQ-103	Immuno-oncology, previously COPD & Sickle Cell Disease	Adenosine A <sub>2B</sub> receptor antagonism	GPCR	2011	Preclinical - ongoing 2016	[278, 279]
172	Advinus	PNQ-201	Immuno-oncology, previously IBD	Adenosine A <sub>2B</sub> receptor antagonism	GPCR	2011	Preclinical ongoing - 2016	[278, 279]
173	Advinus	PNQ-370	Immuno-oncology, previously Oncology (solid tumors, PD)	Adenosine A <sub>2B</sub> receptor antagonism	GPCR	2014	Preclinical - ongoing 2016	[278, 279]
174	Advinus	PNQ-401	Immuno-oncology, previously Autoimmune diseases	Dual JAK3/1 inhibition	Kinase	2013	Early preclinical - ongoing 2016	[278, 279]
175	Advinus	PNQ-701	Immuno-oncology, previously Autoimmune diseases	JAK1 selective inhibition	Kinase	2015	Early preclinical - ongoing 2016	[278, 279]
176	Advinus	PNQ-849	Immuno-oncology, previously Autoimmune diseases	BTK inhibition	Kinase	2015	Preclinical – ongoing 2016	[278, 279]

177	Advinus	PNQ-154	Immuno-oncology	BTK inhibition	Kinase	2015	Preclinical – ongoing 2016	[278, 279]
178	Anthem Biosciences	PAT-1118	Oncology	HDAC inhibition	Deacetylase	2014	Preclinical – ongoing 2016	[291, 292]
179	Anthem Biosciences	PAT-1102, <b>33</b>	Oncology	HDAC inhibition	Deacetylase	2014	Preclinical – ongoing 2016	[291, 292]
180	Aurigene	Debio 1142	Oncology	Kinase inhibition (undisclosed pathway)	Kinase	2011	Licensed to Debiopharm - preclinical stop 2014	[295]
181	Aurigene	AUNP-012/W014A	Oncology	PD-1 inhibition (peptide)	Immune check-point	2012	Licensed to Pierre Fabre 2014 - preclinical stop 2015	[296, 297]
182	Aurigene	ODM-207	Oncology	BET bromodomain inhibition	Bromodomain	2014	Option agreement with Orion Pharma, preclinical - ongoing 2016	[301-303]
183	Aurigene	AU-4869	Oncology	NAMPT inhibition	Transferase	2014	Preclinical - ongoing 2016	[304]
184	Aurigene	CA-170/AUPM-170	Oncology	Dual PD-L1/Vista inhibition (small molecules)	Immune check-points	2015	Licensed to Curis – Phase 1 ongoing 2016	[298, 299]
185	Aurigene	CA-327/AUMP-327	Oncology	Dual PD-L1/Tim-3	Immune check-points	2015	Licensed to Curis – preclinical ongoing 2016	[298, 299]
186	Aurigene	CA-4948/AU-4948	Oncology	IRAK-4 inhibition	Kinase	2015	Licensed to Curis - preclinical ongoing 2016	[298, 299]
187	Aurigene	NA	Oncology	Covalent KRAS inhibition	Hydrolase (GTPase)	2015	Preclinical – ongoing 2016	[305]
188	Aurigene	NA	Oncology	Covalent cdk7 inhibition	Kinase	2015	Preclinical – ongoing 2016	[306]
189	Aurigene	NA	Inflammation	ROR $\gamma$ antagonism or inverse agonism	Nuclear signalling	2014	Preclinical - ongoing 2016	[307]
190	Aurigene	AEA16, <b>34</b>	Bacterial infections - MRSA	Enoyl-acyl carrier protein reductase (FabI) inhibition	Oxidoreductase	2013	Preclinical - stop 2015	[308]
191	Aurigene	NA	Bacterial infections	PD-1 inhibition	Immune check-point	2013	Preclinical - ongoing 2016	[293]
192	GVK Bio	GVK-Trkl	Oncology	TrkA inhibition	Kinase	2016	Preclinical – ongoing 2016	[310, 311]
193	Kareus Therapeutics	KU-046	Alzheimer's disease, multiple sclerosis, Fragile X Syndrom	Agents against oxidative stress, energy deficiency	NA	2013	Phase 1 completed 2014 (US) – development ongoing US	[314]
194	Kareus Therapeutics	KU-5039	Diabetes	AMPK activation	Kinase (activation)	2013	Phase 1 - ongoing US 2016	[315]
195	Connexios Life Sciences	CNX-010-49	Metabolic disorders, type 2 diabetes	11 $\beta$ HSD 1 inhibition	Oxidoreductase	2011	Preclinical - ongoing 2016	[321]

196	Connexios Life Sciences	CNX-011-67	Metabolic disorders, type 2 diabetes	GPR 40 agonism	GPCR	2011	Preclinical - ongoing 2016	[319]
197	Connexios Life Sciences	CNX-012-570	Metabolic disorders, type 2 diabetes	AMPK activation	Kinase (activation)	2013	Licensed to Boehringer Ingelheim (2014), preclinical - ongoing 2016	[317, 318]
198	Connexios Life Sciences	CNX-013-B2	Metabolic disorders, type 2 diabetes	RXR $\alpha$ / $\beta$ / $\gamma$ activation	Nuclear signalling	2014	Preclinical - ongoing 2016	[320]
199	Rhizen Pharmaceuticals	RP1400	Oncology, solid tumors	c-Met kinase inhibition	Kinase	2014	Preclinical - stop 2015	[330]
200	Rhizen Pharmaceuticals	RP-3128	Inflammation, RA, asthma, allergy	CRAC channel inhibition	Ion channel	2014	Preclinical - ongoing 2016	[331]
201	Rhizen Pharmaceuticals	TGR-1202/RP5264, <b>35</b>	Oncology, B-cell lymphomas	Selective PI3K $\delta$ kinase inhibition	Kinase	2011	Licensed to TG Therapeutics 2014, Phase 2/3 - ongoing 2016	[324-326]
202	Rhizen Pharmaceuticals	RP-6503	Asthma, COPD, pulmonary fibrosis	Dual PI3K $\gamma$ / $\delta$ kinase inhibition	Kinase	2013	Licensed to Novartis (2015), preclinical – ongoing 2016	[332]
203	Rhizen Pharmaceuticals	RP-6530, Tenalisib, <b>36</b>	Oncology, hematological malignancies	Dual PI3K $\gamma$ / $\delta$ kinase inhibition	Kinase	2012	Phase 1 - ongoing 2016	[324, 327]
204	Rhizen Pharmaceuticals	RP10107	Oncology - hematological malignancies, and solid tumors	Glutaminase inhibition	Hydrolase	2016	Preclinical – ongoing 2016	[329]
205	Sphaera Pharma	SPR965	Oncology	Pan PI3K/mTOR inhibition	Kinase	2014	Preclinical - ongoing 2016	[335]
206	Sphaera Pharma	SPR113	Infectious diseases – multidrug resistant tuberculosis	GPR109A (NIACR1) inhibition	GPCR	2015	ICGEB collaboration, preclinical - ongoing 2016	[338-340]
207	Curadev	RG70099/CRD1152	Oncology	Dual IDO/TDO inhibition	Oxidoreductase	2014	Licensed to Hoffmann La Roche (2015), preclinical - ongoing 2016	[342-345]
208	Shantani Proteome Analytics	H1T1007, <b>37</b>	Type 2 diabetes	Not disclosed novel mode of action	NA	2015	Preclinical - ongoing 2016	[349, 350]
209	Vyome Biosciences	VB-1953	Bacterial infections	Not disclosed dual mode of action	NA	2015	Preclinical - ongoing 2016 (approved for Phase 1 US	[352, 354]

							FDA)	
210	Vyome Biosciences	NA	Bacterial infections	Not disclosed dual mode of action	NA	2015	Preclinical – ongoing 2016	[355]
211	Vitas Pharma	VT-02-00068, <b>38</b>	Gram positive infections	Enoyl-acyl carrier protein reductase (FabI) inhibition	Oxidoreductase	2014	Preclinical - ongoing 2016	[358, 359]
212	Invictus Oncology	IO-125, <b>39</b>	Oncology	Cisplatinium-cholesterol conjugation	DNA structure	2015	Preclinical – ongoing 2016	[362, 363]
213	Krish Biotech	KBR1001/ KBRPL1001	Autoimmune and inflammatory diseases	RORγt antagonism	Nuclear signalling	2015	Preclinical – ongoing 2016	[365]
214	Krish Biotech	KBR2001/ KBR2001	Diabetes and metabolic disorders	GPR120 agonism	GPCR	2015	Preclinical – ongoing 2016	[366]
Notes :								
(a): Year preclinical development initiated								
(b): Development status not disclosed – one single compound currently in preclinical development at Panacea Biotec								

**Table 6.b.: Development compounds in-licensed by Indian companies**

Entry	Company	Compound	Therapeutic area	Mode of action	Target class	Year	Status (mid-2016)	Refs.
1	Ranbaxy	RBx 11160/OZ 277 - Arterolane,	Malaria	Antimalarial ozonide	Heme iron Fe(II)	2003 <sup>(a)</sup>	Launched – MMV collaboration, then license	[69-71]
2	Piramal	P1201	Diabetes	NA	NA	2007 <sup>(b)</sup>	In-licensed from Lilly – Phase 1 stop 2013	[97]
3	Piramal	P2202	Diabetes	11 $\beta$ hydroxysteroid dehydrogenase type-1 inhibition	Oxidoreductase	2007 <sup>(b)</sup>	In-licensed from Lilly – Phase 2 stop 2014	[97]
4	Glenmark	Crofelemer	Diarrhea	Dual CFTR and CACC channel antagonism	Ion channels	2005 <sup>(b)</sup>	In-licensed from Napo Pharmaceuticals (2005)	[23]
5	Orchid	BLX-1002	Diabetes	Non-PPAR AMPK activation	Kinase (activation)	2002 <sup>(a)</sup>	Partnered, from Bexel Biotechnologies, Phase 2 - stop 2015	[197, 198]
6	Orchid	DPOC-4088 (or DP-4088)	Blood coagulation disorders (deep vein thrombosis)	Direct thrombin inhibition	Protease	2008 <sup>(a)</sup>	Partnered, from Diakron Pharmaceuticals 2008 – Phase 1 ongoing 2016	[199, 200]
7	Jubilant Life Sciences	JL-101 (CGI-1842)	Oncology	VEGFR2, EphB4 and PDGFR $\beta$ kinase inhibition	Kinase	2008 <sup>(b)</sup>	Partnered, from CGI Pharmaceuticals, Phase 1 completed – stop 2012	[236]
8	IPCA	CDRI97/78	Malaria	Antimalarial ozonide	Heme iron Fe(II)	2007 <sup>(b)</sup>	In-licensed from CDRI, Phase 1 – ongoing 2016	[246]
9	IPCA	CDRI99/411	Malaria	Antimalarial ozonide	Heme iron Fe(II)	2008 <sup>(b)</sup>	In-licensed from CDRI, preclinical – abandoned	[246]
<p>Notes:                      (a) year development initiated                      (b) year in-licensed or partnered</p>								

**3. Table 7: Development timelines of proprietary development compounds at Indian companies (status mid-2016)**

Entry	Compound	Preclinical start	Preclinical STOP	Phase 1 start	Phase 1 STOP	Phase 2 start	Phase 2 STOP	Phase 3 start	Phase 3 STOP	Launch
1	DRF-2593/Balaglitazone	1996		1997		2000		2008	2011	
2	DRF 2725/Ragaglitazar	1998		1999		2000		2001	2003	
3	DRF 1042	1998		2000		2004	2011			
4	DRF 1644	2000		2004	2005					
5	DRF-NPCC	2000	2003							
6	DRF-PPI	2000	2001							
7	DRF 3188	2001	2003							
8	DRF 4158/LBL-752	2000	2003							
9	DRF 4367	2000	2001							
10	DRF 4832	2001	2004							
11	DRF 4848	2001	2003							
12	NA	2002	2003							
13	DRF 5265	2004	2005							
14	DRF 8417	2003	2003							
15	RUS 3108	2003		2005	2008					
16	DRF 10945	2003		2004		2006	2008			
17	DRF 11057	2003	2004							
18	DRL 11605	2004		2006	2007					
19	DRL 12424	2006	2008							
20	DRF 13792	2004	2006							
21	DRL 16536	2006	2008							
22	DRL 16048	2007	2008							
23	NA	2007		2008	2008					
24	DRL 17822	2008		2009		2011	2013			
25	DRL 19440	2010	2011							
26	DRL 21994	2009		2010	2011					

27	DRL 21995	2009		2010	2011					
28	RBx 2258/SPM-969/Parvosin, Pamirosin	1998		1999		2001	2004			
29	RBx-4638/Clafrinast	2000		2003	2003					
30	RBx 7644/Ranbezolid	2000		2002	2004					
31	RBx 7796	2001		2002		2003	2004			
32	RBx 9001	2003	2004							
33	RBx 9841	2003		2004	2006					
34	RBx 10558/PPD-10558	2004		2006		2011	2011			
35	RBx 11082	2004	2007							
36	RBx 11528	2006	2007							
37	RBx 14016	2005	2006							
38	RBx 14255	2006	2008							
39	RBx 10014374	2006	2007							
40	RBx 10017609	2007		2008		2011	2013			
41	RBx 10017876	2007	2008							
42	RBx 10019821	2007	2008							
43	RBx 10020025	2007	2008							
44	TRC-282	2005	2006							
45	TRC-4186	2002		2007		2009	ongoing			
46	TRC-8156	2005	2006							
47	TRC-120038	2008	2009							
48	TRC150094	2008		2010		2014	ongoing			
49	TRC160334	2012		2013	ongoing					
50	WCK 771/Levonadifloxacin	2000		2001		2004	ongoing			
51	WCK 919	2000	2002							
52	WCK 993A	2000	2001							
53	WCK 1152	2002		2005	2012					
54	WCK 1153	2001	2002							
55	WCK 1456	2002	2003							
56	WCK 1457	2003	2004							
57	WCK 1584	2001	2002							
58	WCK 1734	2004	2009							
59	WCK 2349/Alalevonadifloxacin	2006		2008		2011	ongoing			
60	WCK 2370	2008	2009							



61	WCK 2664	2008	2009							
62	WCK 4086	2010	ongoing							
63	WCK 4873/Nafitromycin	2010		2015	ongoing					
64	WCK 5107/Zidebactam	2014		2015	ongoing					
65	P276/Rivaciclib	2002		2005		2007	2013			
66	P664 (back-up compound)	2005	2006							
67	P979	2004	2013							
68	P1446/Voruciclib	2007		2009	2015					
69	P1539	2002	2003							
70	P1736	2002		2008		2010	2014			
71	P1961A-06	2007		2008	2009					
72	P2026	2002	2003							
73	PM181104	2008	2014							
74	P2745	2010		2011	2013					
75	P3914	2009		2012	2013					
76	PL225B/Target X	2011		2013	2014					
77	Target Y	2012	2013							
78	P7170/Panulisib	2011		2013	2015					
79	P7435	2011		2013	2015					
80	P11187	2012		2013	2015					
81	SUN 1334H	2003		2004		2007	2013			
82	SUN 09	2007		2011	2013					
83	SUN 44	2007	2013							
84	SUN 461	2007	2010							
85	SUN 597	2010		2011	ongoing					
86	SUN K706	2011		2016	ongoing					
87	SUN L731	2013	2015							
88	SUN K954	2016	ongoing							
89	ZYH1/Saroglitazar (Lipaglyn™)	2004		2005		2006		2009		2013
90	ZYH2	2005		2007	2012					
91	ZYO1	2005		2007	2012					
92	ZYI1	2005		2006		2007	2012			
93	ZYH7	2007		2009		2012	ongoing			
94	ZYT1	2008		2009	2012					
95	ZYD1	2009		2010	2014					

96	ZYOG1	2009		2010	212					
97	ZYGK1	2011		2012	2014					
98	ZYPH0907	2011		2012	2014					
99	ZYG19	2011		2012	2015					
100	ZYGL241	2011	2012							
101	ZYDPLA1	2013		2014	ongoing					
102	ZYAN1	2014		2015	ongoing					
103	ZYTP1	2014	ongoing							
104	NCL-FDC-101	2006	NA							
105	JB-7/G	2004	2005							
106	GRC 1087	2002	2004							
107	GRC 3015	2002	2004							
108	GRC 3566	2003	2005							
109	GRC 3590	2003	2004							
110	GRC 3785	2003	2004							
111	GRC 3886/Oglemilast	2004		2005		2006	2009			
112	GRC 4039/Revamilast	2006		2008		2011	2012			
113	GRC 6211	2006		2006		2007	2008			
114	GRC 8087	2004	2004							
115	GRC 8200/Melogliptin	2004		2005		2006	2011			
116	GRC 9332	2008	2008							
117	GRC 10389	2006	2007							
118	GRC 10622	2006	2007							
119	GRC 10693/Tedalinab	2006		2008	2011					
120	GRC 10801	2006	2008							
121	GRC 15300/SAR292833	2008		2009		2012	2014			
122	GRC 17173	2008	2008							
123	GRC 17536	2010		2011		2013	ongoing			
124	GRC 27864	2012		2014	ongoing					
125	LL 3858/Sudoterb	2004		2005		2010	2015			
126	LL 4218/Desoside-P	2004		2005		2007	2010			
127	LL 6531	2008	2009							
128	LND 101001	2011		2012		2014	ongoing			
129	LNP 1892	2013		2014	ongoing					
130	LNP 3794	2013		2014	ongoing					

131	LNP 1955	2014		2015		2016	ongoing			
132	RSCL-0409	2007	2010							
133	RSCL-0520	2007	2010							
134	OCID 2987	2010		2011	2015					
135	OCID 5005	2006	2006							
136	NA	2007	2012							
137	OCID 4681	2010		2012	2014					
138	OCID5090/AAI101	2012		2014	ongoing					
139	SUVN-501	2009	ongoing							
140	SUVN-502	2007		2008		2015	ongoing			
141	SUVN-504	2008	2014							
142	SUVN-507	2009	ongoing							
143	SUVN-512	2013	ongoing							
144	SUVN-901	2009	2012							
145	SUVN-911	2010	ongoing							
146	SUVN-976	2010	2015							
147	SUVN-D4010	2010		2015	ongoing					
148	NA	2009	2010							
149	SUVN-G3031	2012		2014	ongoing					
150	NA	2013	ongoing							
151	NA	2016	ongoing							
152	NA	2016	ongoing							
153	NA	2016	ongoing							
154	NRC/AN/015	2006	2007							
155	NRC-AN-019	2006		2009		2012	ongoing			
156	NRC 2694	2009		2014	ongoing					
157	PBL 1427	2010		2012	ongoing					
158	PBL 1920	2013	NA <sup>(a)</sup>							
159	PBL 2270	2010	NA <sup>(a)</sup>							
160	PBL 2958	2013	NA <sup>(a)</sup>							
161	MX 4007	NA								
162	MX 6001	NA								
163	NA – Hetero compound 1	NA								
164	NA – Hetero compound 2	NA								
165	JIEM-0186	2015	ongoing							

166	JB1-097	2015	ongoing							
167	CK-103/JBET-050	2015	ongoing							
168	Alkem-43	2014	2015							
169	GKM-001/ADV1002401	2008		2009		2011	ongoing			
170	GKM-002	2012	ongoing							
171	PNQ-103	2011	ongoing							
172	PNQ-201	2011	ongoing							
173	PNQ-370	2014	ongoing							
174	PNQ-401	2013	ongoing							
175	PNQ-701	2015	ongoing							
176	PNQ-849	2015	ongoing							
177	PNQ-154	2015	ongoing							
178	PAT-1118	2014	ongoing							
179	PAT-1102	2014	ongoing							
180	Debio 1142	2011	2014							
181	AUNP-012/W014A	2012	2015							
182	ODM-207	2014	ongoing							
183	AU-4869	2014	ongoing							
184	CA-170/AUPM-170	2015		2016	ongoing					
185	CA-327/AUMP-327	2015	ongoing							
186	CA-4948/AU-4948	2015	ongoing							
187	NA	2015	ongoing							
188	NA	2015	ongoing							
189	NA	2014	ongoing							
190	AEA16	2013	2015							
191	NA	2013	ongoing							
192	GVK-Trkl	2016	ongoing							
193	KU-046	2013		2014	ongoing					
194	KU-5039	2013		2014	ongoing					
195	CNX-010-49	2011	ongoing							
196	CNX-011-67	2011	ongoing							
197	CNX-012-570	2013	ongoing							
198	CNX-013-B2	2014	ongoing							
199	RP1400	2014	2015							
200	RP-3128	2014	ongoing							

201	TGR-1202/RP5264	2011		2013		2015	ongoing <sup>(b)</sup>	2016	ongoing <sup>(c)</sup>	
202	RP-6503	2013	ongoing							
203	RP-6530/Tenalisib	2012		2013	ongoing					
204	RP10107	2016	ongoing							
205	SPR965	2014	ongoing							
206	SPR113	2015	ongoing							
207	RG70099/CRD1152	2014	ongoing							
208	H1T1007	2015	ongoing							
209	VB-1953	2015	ongoing							
210	NA	2015	ongoing							
211	VT-02-00068	2014	ongoing							
212	IO-125	2015	ongoing							
213	KBR1001/KBRPL1001	2015	ongoing							
214	KBR2001/KBRPL2001	2015	ongoing							

(a) : Development status not disclosed – one single compound currently in preclinical development at Panacea Biotec

(b) : TGR-1202 as stand-alone treatment

(c) : TGR-1202 in combination with anti-CD20 mAb

#### 4. Table 8: Figures used for analysis and calculations

##### a. All development compounds by company and by year

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1. Major Pharmaceutical companies :																							
Dr Reddy's	0	0	1	1	3	3	8	9	10	7	8	6	7	8	4	5	6	1	1	0	0	0	0
Ranbaxy	0	0	0	0	1	1	3	4	4	6	3	4	5	6	2	2	2	2	1	0	0	0	0
Torrent	0	0	0	0	0	0	0	0	1	1	1	3	1	1	3	2	2	2	3	3	3	3	3
Wockhardt	0	0	0	0	0	0	3	4	3	3	3	3	4	4	6	3	5	5	4	4	5	5	5
Piramal	0	0	0	0	0	0	0	0	4	2	3	4	3	5	6	6	7	10	12	8	4	2	0
Sun Pharma	0	0	0	0	0	0	0	0	0	1	1	1	1	4	4	4	4	5	5	3	3	3	3
Zydus Cadila	0	0	0	0	0	0	0	0	0	0	1	4	4	5	6	9	9	13	7	8	6	5	5
JBCPL	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Glenmark	0	0	0	0	0	0	0	0	2	5	4	2	8	7	7	4	5	3	4	3	2	2	2
Lupin	0	0	0	0	0	0	0	0	0	0	2	2	2	2	3	2	1	2	2	4	5	4	4
Reliance	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0
Orchid	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	3	3	3	3	2	1	1
Suven	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	6	8	8	8	10	9	8	11
Natco	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	2	2	2	2	2	2	2	2
Panacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	4	4	4	2
Hetero	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Jubilant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
Alkem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Total pharma :	0	0	1	1	4	4	14	17	24	25	27	30	38	47	47	48	56	58	56	52	46	43	41
2. Biotech and start-up companies :																							
Advinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	3	4	5	6	9	9
Anthem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2
Aurigene	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	5	6	9	9
GVK Bio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Kareus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2
Connexios	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	4	4	4
Rhizen	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	5	4	5
Sphaera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2
Curadev	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Shantani	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Vyome	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
Vitas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Invictus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Krish Biotech	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Total biotech :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	7	10	18	28	39	42
Grand Total :	0	0	1	1	4	4	14	17	24	25	27	30	38	47	48	49	57	65	66	70	74	82	83

**b. Development compounds by phase and by year**

Phase	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Preclinical	0	0	1	0	3	1	10	12	17	18	20	16	21	28	24	21	25	34	34	38	42	50	51
Phase 1	0	0	0	1	1	3	2	2	4	4	4	11	11	8	15	19	22	17	16	19	21	20	19
Phase 2	0	0	0	0	0	0	2	2	2	3	3	3	6	11	8	7	8	13	15	12	10	11	11
Phase 3	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	2	2	1	1	0	0	0	1
Launched	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Total :	0	0	1	1	4	4	14	17	24	25	27	30	38	47	48	49	57	65	66	70	74	82	83

**b.1. Preclinical compounds by company and by year**

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Dr Reddy's			1		2	1	5	6	7	5	4	2	2	4	1	2	1						
Ranbaxy					1		2	3	1	2	2	3	4	5									
Torrent									1	1	1	3	1		2	1			1				

Wockhardt							3	3	2	2	2	1	2	2	3		2	2	2	2	3	1	1
Piramal									4	2	3	3	2	4	3	3	4	6	7	1			
Sun Pharma										1				3	3	3	3	2	2	2	2	2	1
Zydus Cadila											1	3	2	1	2	3	1	5	0	1	2	1	1
JBCPL											1	1											
Glenmark									2	5	4	0	5	4	3		1		1	1			
Lupin											2				1			1		2	1		
Reliance														2	2	2							
Orchid													1	1	1	1	3	2	1	1			
Suven														1	1	5	7	7	7	9	7	5	8
Natco													2	1	1	1	1	1	1	1			
Panacea																	2	2	1	3	3	3	1
Hetero																			2				
Jubilant																						3	3
Alkem																					1	1	0
Advinus															1			2	3	4	5	8	8
Anthem																					2	2	2
Aurigene																		1	2	5	6	9	8
GVK Bio																							1
Kareus																				2			
Connexios																		2	2	3	4	4	4
Rhizen																		1	2	1	3	2	3
Sphaera																					1	2	2
Curadev																					1	1	1
Shantani																						1	1
Vyome																						1	2
Vitas																					1	1	1
Invictus																						1	1
Krish Biotech																						2	2
Preclinical total	0	0	1	0	3	1	10	12	17	18	20	16	21	28	24	21	25	34	34	38	42	50	51



**b.2. Phase 1 compounds by company and by year**

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Dr Reddy's				1	1	2	1	1	1	1	2	2	3	2	2	2	4						
Ranbaxy						1	1		2	2	1	1	1	1	2	2	2						
Torrent														1	1		1	1	1	2	1	1	1
Wockhardt								1	1	1		1	1	1	2	2	2	1				2	2
Piramal												1	1		2	2	1	2	3	5	4	2	
Sun Pharma											1	1	1					2	2	1	1	1	2
Zydus Cadila												1	1	2	2	4	6	6	4	4	2	2	2
Glenmark												2	1		2	3	3	2	1		1	1	1
Lupin												2	2	1	1	1			1	1	2	3	2
Orchid																		1	2	2	2	1	1
Suven															1	1	1	1	1	1	2	2	2
Natco																1	1	1			1	1	1
Panacea																			1	1	1	1	1
Advinus																1	1						
Aurigene																							1
Kareus																					2	2	2
Rhizen																				2	2	1	1
Phase 1 total	0	0	0	1	1	3	2	2	4	4	4	11	11	8	15	19	22	17	16	19	21	20	19

**b.3. Phase 2 compounds by company and by year**

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Dr Reddy's							2	1	1	1	2	2	2	2				1	1				
Ranbaxy								1	1	2								2	1				
Torrent																1	1	1	1	1	2	2	2
Wockhardt											1	1	1	1	1	1	1	2	2	2	2	2	2
Piramal														1	1	1	2	2	2	2			

Sun Pharma															1	1	1	1	1	1					
Zydus Cadila															1	2	2	1	1	1	2	2	1	1	1
Glenmark															2	3	2	1	1	1	2	2	1	1	1
Lupin																1	1	1	1	1	1	1	2	1	2
Suven																								1	1
Natco																				1	1	1	1	1	1
Advinus																			1	1	1	1	1	1	1
Rhizen																								1	
Phase 2	0	0	0	0	0	0	2	2	2	3	3	3	6	11	8	7	8	13	15	12	10	11	11	11	

**b.4. Phase 3 compounds by company and by year**

Phase	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Dr Reddy's								1	1						1	1	1						
Zydus Cadila																1	1	1	1				
Rhizen																							1
Phase 3	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	2	2	1	1	0	0	0	1

**b.5. Launched compounds**

Phase	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Zydus Cadila																				1	1	1	1
Launched total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1

**c. Development compounds by indication**

	Endocrinology/ metabolics	Oncology	Infections	Immunology/ Rheumatology	Neurology	Pulmonary/ Respiratory disorders	Cardiovascular disorders	Urology	Musculoskeletal	Nephrology	Psychiatry/ Psychology	Otolaryngology	Dermatology	Gastrointestinal
Dr Reddy's	11	4	5	2	0	1	3	0	0	0	0	0	0	1
Ranbaxy	3	0	2	0	0	7	0	4	0	0	0	0	0	0
Torrent	2	0	0	1	0	0	3	0	0	1	0	0	0	0
Wockhardt	0	0	15	0	0	0	0	0	0	0	0	0	0	0
Piramal	3	8	1	5	0	0	0	0	0	0	0	0	0	0
Sun	0	2	0	1	1	1	0	0	1	0	0	2	1	0
Zydus Cadila	11	1	0	1	0	0	0	0	1	1	0	0	0	0
FDC Limited	0	0	1	0	0	0	0	0	0	0	0	0	0	0
JB Chemicals & Pharmaceuticals	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Glenmark	6	0	0	2	5	8	0	1	0	0	0	0	0	0
Lupin	2	1	1	2	1	0	0	0	0	1	0	0	0	0
Reliance Life Sciences	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Orchid	0	2	1	1	0	1	0	0	0	0	0	0	0	0
Suven	0	0	0	0	13	0	0	0	0	0	2	0	0	0
Natco	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Panacea	2	0	1	0	0	0	0	0	0	0	1	0	0	0
Matrix Laboratories	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Hetero Drugs	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Jubilant	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Alkem	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Advinus	2	7	0	4	0	1	0	0	0	0	0	0	0	0
Anthem	0	2	0	0	0	0	0	0	0	0	0	0	0	0

Aurigene	0	9	2	1	0	0	0	0	0	0	0	0	0	0
GVK Bio	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Kareus	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Connexios	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhizen	0	4	0	1	0	2	0	0	0	0	0	0	0	0
Sphaera	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Curadev	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Shantani	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Vyome	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Vitas	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Invictus	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Krish Bio	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Total :	50	50	35	26	21	21	6	5	3	3	3	2	1	1

**d. Therapeutic indications by company**

	Endocrinology / metabolics	Oncology	Infections	Immunology/ Rheumatology	Neurology	Pulmonary/ Respiratory disorders	Cardiovascular disorders	Urology	Musculoskeletal	Nephrology	Psychiatry/ Psychology	Otolaryngology	Dermatology	Gastrointestinal
Dr Reddy's	11	4	5	2	0	1	3	0	0	0	0	0	0	1
Glenmark	6	0	0	2	5	8	0	1	0	0	0	0	0	0
Piramal	3	8	1	5	0	0	0	0	0	0	0	0	0	0
Ranbaxy	3	0	2	0	0	7	0	4	0	0	0	0	0	0
Wockhardt	0	0	15	0	0	0	0	0	0	0	0	0	0	0
Zydus Cadila	11	1	0	1	0	0	0	0	1	1	0	0	0	0
Suven	0	0	0	0	13	0	0	0	0	0	2	0	0	0

Advinus	2	7	0	4	0	1	0	0	0	0	0	0	0	0
Aurigen	0	9	2	1	0	0	0	0	0	0	0	0	0	0
Sun	0	2	0	1	1	1	0	0	1	0	0	2	1	0
Lupin	2	1	1	2	1	0	0	0	0	1	0	0	0	0
Torrent	2	0	0	1	0	0	3	0	0	1	0	0	0	0
Rhizen	0	4	0	1	0	2	0	0	0	0	0	0	0	0
Orchid	0	2	1	1	0	1	0	0	0	0	0	0	0	0
Panacea	2	0	1	0	0	0	0	0	0	0	1	0	0	0
Connexios	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Natco	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Jubilant	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Reliance Life Sciences	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Matrix Laboratories	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Hetero Drugs	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Anthem	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Kareus	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Sphaera	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Vyome	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Krish Biotech	1	0	0	1	0	0	0	0	0	0	0	0	0	0
FDC Limited	0	0	1	0	0	0	0	0	0	0	0	0	0	0
JB Chemicals & Pharmaceuticals	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Alkem	0	0	0	0	0	0	0	0	1	0	0	0	0	0
GVK Bio	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Curadev	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Shantani	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Vitas	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Invictus	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Total :	50	50	35	26	21	21	6	5	3	3	3	2	1	1

**e. Compounds by target class**

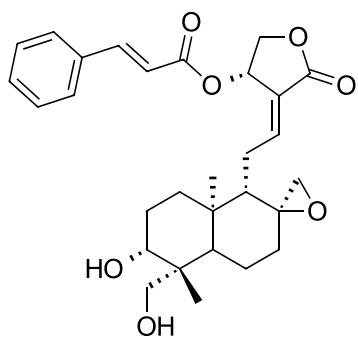
	GPCR	Kinase (inhibition)	Nuclear signalling	Oxidoreductase	Phosphodiesterase	Ion channel	DNA Structure	Protease	Protein synt hesis	Immune check-point	Kinase (activation)	Deacetylase/demethylase	Cyclase	Cytokine	Transferase	Betalactamase	Bromodomain	Hydrolase	Transporter	Integrin	Chemical bond cleavage	Cholesterol transport	Synthase	Not available
Dr Reddy's	0	0	7	3	0	0	2	0	2	0	1	0	0	0	0	0	0	0	1	0	0	1	0	11
Ranbaxy	4	0	0	1	3	0	0	2	2	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2
Torrent	2	0	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
Wockhardt	0	0	0	0	0	0	6	1	4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	4
Piramal	1	9	2	3	0	0	0	0	1	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0
Sun	3	2	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zydus Cadila	6	0	4	1	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
FDC Limited	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
JB Chem. & Pharmaceuticals	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glenmark	5	0	0	1	6	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Lupin	1	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Reliance Life Sciences	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Orchid	0	0	1	0	1	0	0	0	0	0	0	1	0	2	0	1	0	0	0	0	0	0	0	0
Suven	11	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Natco	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panacea	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Matrix Laboratories	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hetero Drugs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Jubilant	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0
Alkem	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Advinus	3	5	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Aurigene	0	3	1	1	0	0	0	0	0	6	0	0	0	0	1	0	1	1	0	0	0	0	0	0
Anthem	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
GVK Bio	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kareus	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Connexios	1	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhizen	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Sphaera	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Curadev	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shantani	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Vyome	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Vitas	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Invictus	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Krish Biotech	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total :	39	31	21	15	11	11	10	10	10	6	6	5	3	3	3	2	2	2	2	1	1	1	1	31

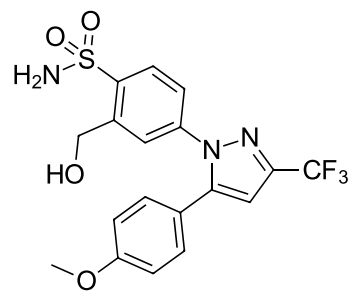
**f. Attrition and timelines**

All compounds	Preclin max	Ph 1 max	Ph2 max	Ph3 max	Launched	PC-Ph1 OK	PC-Ph1 STOP	PC-Ph1 ongoing	Ph1-Ph2 OK	Ph1-Ph2 STOP	Ph1-Ph2 ongoing	Ph2-Ph3 OK	Ph2-Ph3 STOP	Ph2-Ph3 ongoing	Ph3-Launch OK	Ph3-Launch STOP	Ph3-Launch ongoing	Time preclinical to decision point	Time Ph1 to decision point	Time Ph2 to decision point	Time Ph3 to decision point
214	132	48	30	3	1	82	81	51	34	29	19	4	19	11	1	2	1	1,9	2,5	3,4	3

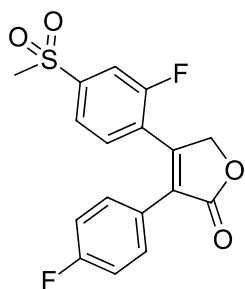
**5. Figure 7: Additional chemical structures from supporting information tables**



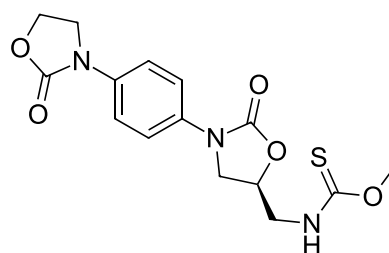
**40 – DRF 3188**



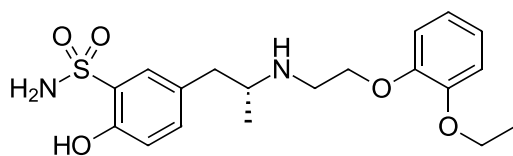
**41 – DRF 4367**



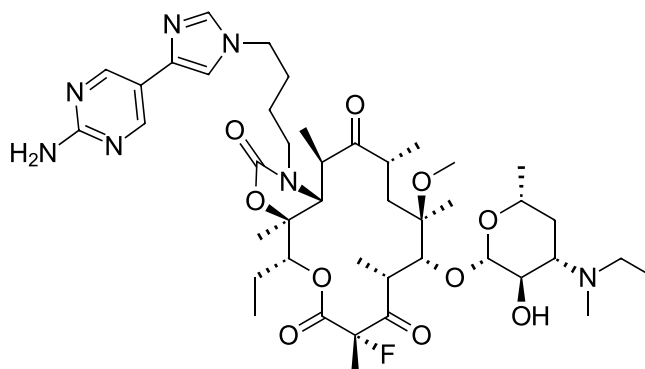
**42 – DRF 4848**



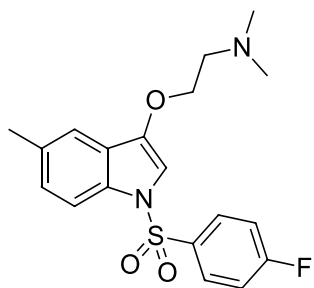
**43 – DRF 8417**



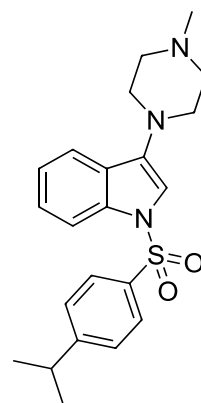
**44 – RBx 9001**



**45 – RBx 14255**



**46 – SUVN-504**



**47 – SUVN-507**



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