

## Supplementary Appendix

This appendix has been provided by the authors to give readers additional information about their work.

Supplement to: Stevens AJ, Jensen JJ, Wyller K, Kilgore PC, Chatterjee S, Rohrbaugh ML. The role of public-sector research in the discovery of drugs and vaccines. N Engl J Med 2011;364:535-41.

Table 1 Drugs identified (generic and brand names), Originating Institutions, Current Marketer, Type(s) of Patent Protection and Type(s) of FDA Approval

Generic Name	Brand Name (Indication)	Assignee	Current Marketer	Type of Patent(s)	Type of Approval (See text for types of approval)
<b>Small Molecule Drugs (93)</b>					
abacavir sulfate	Ziagen	U. of Minnesota	GlaxoSmithKline	Sy, C	1P,3P
abacavir sulfate; lamivudine	Epzicom	Emory University/U. of Minnesota	GlaxoSmithKline	Sy, C, Tr	3S
abacavir sulfate; lamivudine; zidovudine	Trizivir	Emory University/U. of Minnesota	GlaxoSmithKline	Sy, C, Tr, F	3P
abarelix	Plenaxis	Indiana University	Specialty European Pharma	C, Tr	1P
adenocine	Adenocard	U. of Virginia	Astellas Pharma Inc.	Tr	1P
alitretionin topical	Panretin	Salk Institute/Baylor College of Medicine	Eisai	Tr	1P
amifostine	Ethylol	Southern Research Institute	AstraZeneca	C	1P
amphotericin B	Abelcet	U. of Texas	Enzon Pharmaceuticals	C, Tr	2P
arsenic trioxide	Trisenox	Sloan Kettering	Cephalon	Tr	1P
bexarotene	Targretin	SRI International/La Jolla Cancer Research Foundation/Salk Institute	Eisai	C	1P,3P
bortezomib	Velcade	National Institutes of Health	Takeda	Sy, C	1P
busulfan	Busulfex	U. of Texas/U. of Houston	Otsuka Pharmaceuticals	Sy, C, Tr	3P
butorphanol tartrate	Stadol	U. of Kentucky	Bristol-Myers Squibb	F	3S
calcefidol	Calderol	Wisconsin Alumni Research Foundation	Schering-Plough	C	1S
calcitriol	Calcijex	Wisconsin Alumni Research Foundation	Abbott	C	3S
calcitriol	Rocaltrol	Wisconsin Alumni Research Foundation	Fontus Pharmaceuticals	C	1P,3S
carboplatin	Paraplatin	Michigan State University	Bristol-Myers Squibb	C, Tr	1P,3S
carmustine	Gliadel	MIT	Eisai	Sy, C	3P
cinacalcet hydrochloride	Sensipar	Brigham & Women's	Amgen	S, C, Tr	1P
cisplatin	Platinol	Michigan State University	Bristol-Myers Squibb	Tr	1S
cladribine	Leustatin	Brigham Young/Scripps	J&J	Sy, C	1P
clofarabine	Clolar	Sloan-Kettering/Southern Research Institute	Genzyme	C, Tr	1P
colfosceril palmitate, cetyl alcohol, tyloxapol	Exosurf	U. of California	GlaxoSmithKline	C, Tr	1P
cyclosporine ophthalmic	Restasis	U. of Georgia	Allergan	Tr	3P,3P
darunavir ethalonate	Prezista	National Institutes of Health/U. of Illinois	J&J	Tr	1P
desloratadine	Clarinex	U. of Massachusetts	Schering-Plough	C, Tr	1S,5S
dexrazoxane hydrochloride	Zinecard	New York University	Pfizer	Tr	1P
didanosine	Videx	National Institutes of Health	Bristol-Myers Squibb	Tr	1P,3P,3P,3P
dorzolamide hydrochloride	Trusopt	U. of Florida	Merck	C, Tr	1P
dorzolamide hydrochloride; timolol maleate	Cosopt	U. of Florida	Merck	Tr, F	4S
doxercalciferol	Hectorol	Wisconsin Alumni Research Foundation	Genzyme	Sy, C	1S,3S
doxorubicin hydrochloride	Doxil	U. of California	J&J	Sy	3P
doxycycline hyclate	Periostat	State University of New York	Galderma SA	Tr, F	3S,3S
doxycycline time released	Oracea	State University of New York/New York University	Galderma SA	Tr, F	3S
edrophonium chloride	Enlon-Plus	U. of California	Bioniche Pharma	C, Tr	4S,5S
efavirenz; emtricitabine; tenofovir disoproxil fumarate	Atripla	Emory University/Yale University	Gilead Pharmaceuticals	Sy, C, Tr	4P
eltrombopag olamine	Promacta	Rockefeller University	GlaxoSmithKline	C	1P
emtricitabine	Emtriva	Emory University/Yale University	Gilead Pharmaceuticals	Sy, C, Tr, F	1S,3P
emtricitabine	Truvada	Emory University/Yale University	Gilead Pharmaceuticals	Sy, C, Tr	4P
estradiol	Menostar	U. of California/Kaiser Health Plan/Permanente Medical Group	Bayer Healthcare	Tr	6S
ethinyl estradiol; levonorgestrel	Seasonale	Eastern Virginia Medical School	DuraMed	Tr	3S
fentanyl citrate	Actiq	U. of Utah	Cephalon	Sy, C, Tr, F	3S
fexofenadine hydrochloride	Allegra	Georgetown University	Sanofi Aventis	Tr	1S,4S,3S,3S,3S
fludarabine phosphate, 2-F-araA	Fludara	National Institutes of Health	Bayer Healthcare	Sy, C, Tr	1P
fluoxetine hydrochloride	Sarafem	MIT	Eli Lilly	Tr	Label,3S
gallium nitrate	Ganite	Sloan Kettering	Genta	Tr	1P
ganciclovir	Vitrasert	U. of Kentucky	Bausch and Lomb	Tr, F	3P
histrelin acetate	Supprelin	Salk Institute	Shire	C, Tr	1P,3S,5S
hyaluronidase	Hylenex	U. of Connecticut	Baxter Healthcare	C	1P
hydralazine and isosorbide dinitrate	BiDil	U. of Minnesota	NitroMed	Tr	4S
imatinib mesylate	Gleevec (GIST)	Dana-Farber Cancer Institute/Oregon Health & Science University	Novartis	Tr	1P
itraconazole	Sporanox	National Institutes of Health	J&J	Sy, C, F	1P,3P,3S
ketoconazole	Nizoral	U. of Tennessee	J&J	Tr	3S,3S,3S
lamivudine	Epivir/Epivir-HBV	Emory University	GlaxoSmithKline	C	1P,3P,3P,3P
lamivudine; zidovudine	Combivir	Emory University	GlaxoSmithKline	C	19,4P
lanreotide	Somatuline Depot	Tulane University	Ipsen	C	1S

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latanoprost	Xalatan	Columbia University	Pfizer	Tr	1P
lenalidomide	Revlimid	Children's Hospital, Boston	Celgene	Tr	1P
lovastatin	Altoprev	Children's Hospital, Boston	Shionogi	Tr	3S
memantine	Namenda	Children's Hospital, Boston	Forest Pharmaceutical	S, Sy, C	1S,3S
methylnaltrexone bromide	Relistor	U. of Chicago	Wyeth	Tr	1S
nicotine	Habitrol	U. of California	Novartis	Tr, F	3S
nitric oxide	INOMax	Massachusetts General Hospital	AGALinde	S, Tr, D	1P
omeprazole	Zegerid	U. of Missouri	Santarus	Tr, F	3S,6S,4S,3S
paclitaxel	Taxol	National Institutes of Health/Florida State University	Bristol-Myers Squibb	Sy, Tr	1P
palifermin	Kepivance	National Institutes of Health	BioVitrium	S, Sy, C, Tr	BLA
paricalcitol	Zemiplar	Wisconsin Alumni Research Foundation	Abbott	C, Tr	1S,3S
pegaptanib sodium	Macugen	U. of Colorado	Pfizer	C	1P
pemetrexed	Alimta	Princeton University	Eli Lilly	C	1P,6S
pentosan polysulfate sodium	Elmiron	U. of California	J&J	Tr	1S
phosphorothioate oligonucleotide/fomivirsen sodium	Vitravene	National Institutes of Health	Novartis	C, Tr	1P
potassium citrate	Urocit-K	U. of Texas	Mission Pharmacal	Tr	3P
pregabalin	Lyrica	Northwestern University	Pfizer	C, Tr	1P,6S,6S
silver sulfadiazine	Sildaflo	Columbia University	King Pharmaceuticals	Tr	3S
silver sulfadiazine	Silvadene	Columbia University	King Pharmaceuticals	Tr	2P
stavudine	Zerit	Yale University	Bristol-Myers Squibb	Tr	1P,3P,3S
sunitinib	Sutent	New York University	Pfizer	S, Sy, C	1P,6P
tadalafil	Cialis	Cold Spring Harbor	Eli Lilly	S	1S
technetium TC-99M red bloodcell kit	Ultratag	Associated Universities (Brookhaven)	Mallinckrodt	Sy	3S
thalidomid	Thalomid	Rockefeller University/Children's Hospital, Boston	Celgene	Tr	6S
thyrotropin alfa	Thyrogen	Sloan-Kettering/National Institutes of Health	Genzyme	Sy, C	1P
tiopronin	Thiola	U. of Texas/U. of Missouri	Mission Pharmacal	Tr	1P
topiramate	Topamax (Migraine)	Tufts New England Medical Center	J&J	Tr	Label
tretinoin	Avita	U. of California	Mylan Bertek Pharmaceuticals	F	5S,5S
tretinoin	Renova	U. of Pennsylvania	J&J	Tr	3S,3S
trimetrexate glucuronate	NeuTrexin	National Institutes of Health	AstraZeneca	Tr	1P
triptorelin pamoate	Trelstar	Tulane University	Watson Laboratories	C	1S,3S
valsartan	Diovan	Brigham & Women's	Novartis	Tr	3S
verteporfin	Visudyne	Massachusetts General Hospital/MIT/Mass Eye and Ear	Novartis	Tr	1P
voriconazole	Vfend	U. of Kansas	Pfizer	C	1S,3S,6S,6SS,3S
vorinostat	Zolinza	Columbia University/Sloan Kettering	Merck	C, Tr	1P
zalcitabin	Hivid	National Institutes of Health	Roche	Tr	1P
ziprasidone hydrochloride; ziprasidone mesylate	Geodon	U. of Kansas	Pfizer	C, F	1S,3S,3S
<b><u>Biologics (36)</u></b>					
abatacept	Orencia	U. of Michigan/Department of the Navy	Bristol-Myers Squibb	Tr	BLA
abciximab	ReoPro	State University of New York	Eli Lilly	C	BLA
adalimumab	Humira	Rockefeller University/Scripps	Abbott	Tr, F	BLA
agalsidase beta	Fabrazyme	Mt. Sinai School of Medicine	Genzyme	Sy, C	BLA
aldesleukin	Proleukin	Sloan-Kettering	Novartis	C	BLA
alefacept	Amevive	U. of Michigan/Dana-Farber Cancer Institute	Astellas Pharma Inc.	C, Tr	BLA
alglucosidase alfa	Myozyme	Duke University	Genzyme	Tr	BLA
anakinra	Kineret	U. of Colorado	BioVitrium	C	BLA
antihemophilic factor (human)	Monoclata-P	Scripps	CSL Behring	C	BLA
bivalirudin	AngioMax	Health Research, Inc. (Wadsworth Center)	The Medicines Company	C	1S
botulinum toxin type A	Botox (Hyperhydrosis)	Mt. Sinai School of Medicine	Allergan	Tr	BLA
cetorelix	Cetrotide	Tulane University	Merck Serono	C, Tr	1S
cetuximab	Erbix	U. of California	Bristol-Myers Squibb		BLA
coagulation factor IX	BeneFIX	U. of Washington	Wyeth	C, Tr	BLA
daclizumab	Zenapax	National Institutes of Health	Roche	Tr	BLA
denileukin diftitox	ONTAK	Harvard/Boston Medical Center/Boston University	Eisai	C	BLA
drotrecogin alfa	Xigris	Oklahoma Medical Research Foundation	Eli Lilly	C, Tr	BLA
eculizumab	Soliris	Oklahoma Medical Research Foundation/Yale University	Alexion	S, C, Tr	BLA
enfuvirtide	Fuzeon	Duke University	Roche	C	1P
etanercept	Enbrel	Massachusetts General Hospital	Amgen	C, Tr	BLA

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filgrastim	Neupogen	Sloan Kettering	Amgen	Sy, C, Tr	BLA
ibritumomab (Intravenous route)	Zevalin	National Institutes of Health	BiogenIdec	Sy, C	BLA
infliximab	Remicade	New York University	J&J	S, C, Tr	BLA
interferon beta-1A	Avonex	Stanford University	BiogenIdec	Sy, C	BLA
laronidase	Aldurazyme	Los Angeles Biomedical Research Institute	Genzyme	C, Tr	BLA
natalizumab	Tysabri	Fred Hutchinson Cancer Center	BiogenIdec	Tr	BLA
orelvekin	Neumega	Children's Hospital, Boston	Wyeth	C	BLA
palivisumab	Synagis	National Institutes of Health	AstraZeneca	C	BLA
pegfilgrastim	Neulasta	Sloan Kettering	Amgen	Sy, C, Tr	BLA
pegvisomant	Somavert	Ohio University	Pfizer	C, Tr	1P
protein C concentrate (Human)	Ceprotin	Oklahoma Medical Research Foundation	Baxter Healthcare	Sy, C	BLA
respiratory syncytial virus immune globulin	Respigam	U. of Massachusetts	AstraZeneca	Sy	BLA
sermorelin acetate	Geref	Salk Institute	Merck Serono	C, Tr	1S
somatropin	Nutropin/Protropin	U. of California	Genentech	C	1P,5S,5S,3S,3S
somatropin recombinant	Humatrope	U. of California	Eli Lilly	C	5P
tositumomab	Bexxar	U. of Michigan/Dana-Farber Cancer Institute	GlaxoSmithKline	C, Tr	BLA
<b><u>Vaccines (15)</u></b>					
BCG	TICE BCG Vaccine (BCG Live)	U. of Illinois Chicago	Schering-Plough	B	BLA
cytomegalovirus immune globulin	Cytogam	U. of Massachusetts	CSL Behring	B	BLA
diphtheria, tetanus, and pertussis (DTaP) vaccines	Certiva	National Institutes of Health	Baxter Healthcare	Sy, C, Tr	BLA
haemophilus b conjugate (HbOC) vaccine	HibTITER	U. of Rochester	Wyeth	C, Tr	BLA
hepatitis A adult vaccine	Havrix	National Institutes of Health	GlaxoSmithKline	Sy, C, Tr	BLA
hepatitis A inactivated/hepatitis B (recombinant) vaccine	Twinrix	National Institutes of Health	GlaxoSmithKline	Sy, C, Tr	BLA
hepatitis B vaccine	Heptavax-B	Fox Chase Cancer Center	Merck	Sy, C	BLA
hepatitis B vaccine (recombinant)	Recombivax	U. of California/U. of Washington/U. of Rochester	Merck	Sy, C, Tr	BLA
human papillomavirus (HPV) vaccine, quadrivalent	Gardasil	Georgetown University/U. of Rochester/National Institutes of Health	Merck	C, Tr	BLA
influenza virus vaccine (nasal)	FluMist	U. of Michigan	AstraZeneca	C	BLA
OspA lipoprotein	LYMERix	National Institutes of Health/Yale University	GlaxoSmithKline	C	BLA
rotavirus vaccine, live (oral)	Rotarix	Children's Hospital, Cincinnati/Gamble Research Institute	GlaxoSmithKline	C, Tr	BLA
rotavirus vaccine, live (oral)	RotaShield	National Institutes of Health	Wyeth	Sy, C, Tr	BLA
rotavirus vaccine, live (oral) pentavalent	Rotateq	Wistar Institute/Children's Hospital of Philadelphia	Merck	Sy, C, F	BLA
zoster vaccine live	Zostavax	U. of Colorado	Merck		BLA
<b><u>In Vivo Diagnostics (8)</u></b>					
corticotropin ovine trifluoride	Acthrel	Salk Institute	Ferring A/S	C, Tr	1P
technetium Tc 99m depreotide injection	NeoTect	National Institutes of Health	Bayer Healthcare	Sy, C	1P
technetium TC-99M apcitide	AcuTect	National Institutes of Health	Bayer Healthcare	Sy, C	1P
technetium TC-99M exametazime kit	Ceretec	U. of Missouri	General Electric	C	1P
technetium TC-99M sestamibi kit	Cardiolite	Harvard/MIT/U. of Cincinnati	Lantheus Medical Imaging	S, Sy, C, F	1S
technetium TC-99M sestamibi kit	Miraluma	Harvard/MIT/U. of Cincinnati	Lantheus Medical Imaging	S, Sy, C	1S
technetium TC-99M tetrofosmin kit	Myoview	U. of Cincinnati	General Electric	G	1S
urea, C-13	Breathtek/Meretek	Baylor College of Medicine	Otsuka Pharmaceuticals	D	1S,1S
<b><u>Over-the-Counter Drugs (1)</u></b>					
famotidine, calcium, and magnesium	Pepcid Complete	Brigham & Women's	J&J Merck Consumer Pharm.	Tr, F	4S

**Key:** S Screening  
Sy Method of Synthesis  
C Composition of Matter  
Tr Method of Treating  
F Formulation  
D Medical Device