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Commercial Chiral Stationary Phases for the Separations of Clinical Racemic Drugs

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COMMERCIAL CHIRAL STATIONARY PHASES FOR THE SEPARATIONS OF CLINICAL RACEMIC DRUGS

Part I: From Alimentary Tract to Cardiovascular System Drugs

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Abstract: The enantioseparation of clinically used racemic drugs by liquid chromatography on commercial chiral stationary phases (CSPs) available in 2006 is reviewed. The CSPs are briefly described. The data was extracted and compiled from the ChirBase database (Marseille, France). All the drugs included are listed according to the Anatomical Therapeutic Chemical (ATC) classification that defined thirteen therapeutic classes. Only positive results are reported and, for a given CSP type, only the set of analytical conditions providing the best enantioselectivity is provided. The analyst can find at a glance the optimal CSP column and its supplier, as well the suitable mobile phase allowing for an efficient enantioresolution of a given racemic drug. Given the amount of data, Part I of this compilation includes the commercial CSP description and only the 6 opening ATC classes from Class 1: "Alimentary tract and metabolism" to Class 6: "Cardiovascular system." Part II includes the 7 remaining classes. Part III will include chiral separations done using supercritical fluid chromatography.

Keywords: Chiral drugs, therapeutic activity, chiral separations, enantioseparations, Chiral stationary phases

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INTRODUCTION

From the 2004 available data, it appears that about 62% of drugs approved worldwide are chiral (1). One chiral drug over three or 23% of all drugs are sold as racemates (1). Since the publication in 1992 of formal guidelines for the development of chiral drugs in the United States (2) and in 1994 in the European Union (3), the applicants must identify the presence of chirality in new drugs, attempt to separate the stereoisomers, evaluate the contribution of the various stereoisomers to the activity of interest and make a rational selection of the stereoisomeric form proposed for marketing (4). As a consequence, a significant decrease in the number of new drugs introduced as racemates can be noted along the turn of the century. One of over 5 new drugs was a racemate in 1991–1993 or 20%. These numbers dropped to 1 racemate over 17 new drugs or only 6% in 2000–2002 (1).

The stereochemical purity of single-enantiomer drugs is most often determined by HPLC on commercially available chiral stationary phases (CSPs). A great deal of work has been carried out on the enantioselective separation of chiral drugs, both on commercial and home made CSPs. The enormous amount of generated information is available in several volumes that contain reviews of advances in this field (4). These publications on the state-of-the-art are interesting from a scientific point of view, but are not useful for the analyst who has a need to verify the purity of a single-enantiomer substance under specific conditions (given chromatographic mode and commercial CSPs, enantiomer to quantify eluted first, etc.).

For the latter purpose, two main database strategies are suitable. The first is simple and rapid and consists of using ChirBase, the world's largest database on enantioselective separations (5). ChirBase contains actual experimental measurements, such as chromatographic data, experimental conditions, etc. The second strategy, more classical but time-consuming, involves the use a bibliographic database. This approach can often provide many answers to the problem, but the extraction of the relevant information in this way can be tedious.

The purpose of this article is to assist the analyst by providing the optimum results of the enantioseparation of drug racemates on commercial CSPs obtained via searching the ca. 60, 000 entries of ChirBase working in the ISIS Base environment.

RESULTS AND COMMENTS

ChirBase is a structural database that can be searched for chemical structures, chromatographic data, or bibliographic information; in addition, one can execute any combined search. ChirBase can be queried using exact-structure or substructure searching to obtain answers in a few seconds. However, this usual manner of using the database requires knowing the

structure of the compounds which is not always the case. Therefore, a different approach is needed if we are to extract the necessary information from ChirBase in time-efficient manner. In addition to the chiral molecular structure and name of the substance, ChirBase contains, in a variety of fields, further data, i.e., journal reference (authors, journal name, volume, pages, year), separation results (elution order, retention factors (k), enantioselectivity (alpha), resolution (R_s) and retention times (t_r)), analytical conditions (chiral stationary phase (CSP) name, mobile phase) and commercial information (CSP trade name, CSP suppliers). From these data, drug racemates separated on commercial CSPs were extracted.

First, all the entries where the authors used a home-made CSP were discarded, since in these entries, the field "CSP trade name" is empty. More than 30,000 entries were discarded this way. From the remaining entries, the relevant compounds must be selected. This task was achieved by running multiple substructure searches in cascade, and discarding the entries that have no pharmaceutical relevance. Such an approach is facilitated by the fact that the relevant compounds can be found in ChirBase by their nonproprietary (generic) names, i.e., United States Adopted Names, or International Nonproprietary Names, or, alternatively, by their trivial or simple chemical names, but not the systematic Chemical Abstract names. The verification of their use as therapeutic agents is accomplished by consulting the Web site: http://chem.sis.nlm.nih.gov/chemidplus/ and completing with the aid of the Merck Index (12th edition) for the older drugs. Applying this procedure, 490 racemic drugs could be found in ChirBase. Now armed with the exact chemical structures of the drugs, a new search was then made to assure that all the relevant entries have been retrieved (e.g., compounds having the same structure but registered under different names).

Proceeding in this manner provided all the separations for each drug in HPLC or SFC, on commercially available CSPs. Separation on homemade CSPs were discarded as well as separations performed by SFC. When the alpha value was equal to 1 (meaning no separation was achieved) the entries were also rejected, as were the entries in which there is no data (alpha value, resolution or retention times) or the mobile phase was not reported. Finally, entries where the field "journal name" did not refer to a well-referenced journal or a symposium and instead included only difficult-to-verify information (e.g., personal communication, manufacturer application brochure, etc.), were also excluded. Thus, only material having complete data was taken into account.

The results included several separations for a given compound performed by HPLC on different CSPs with different mobile phases. For example amlodipine, a calcium channel antagonist used as an antihypertensive agent, was separated on 5 different types of CSP using different mobile phases, for a total of nine published separations. Only the best HPLC separations on each CSP using different mobiles phases were selected, giving only 7 answers for the enantioseparation of amlodipine. When available in ChirBase, the

elution order was also reported, since the selection of the CSP column can be dictated by the elution order. For example, if the separation is to be used for quantification, the enantiomer of interest must be the first-eluted stereoisomer because the accuracy is always better on the first peak as compared with the second. All of the retrieved information on the resolution of each racemate (drug name, structure, CSP trade name, mobile phase composition, elution order, alpha, R_s, retention time, authors, journal, publication year, volume and pages was exported from ISIS/Base into Excel via ISIS SAR tool and then ranked by family and subfamily according to the Anatomical Therapeutic Chemical Classification System of drugs (ATC). In this framework, the drugs having multiple pharmacological activities are classified according to the dominant pharmacological/therapeutic properties in the ATC classification. In each family, drugs in clinical trials or old drugs no longer in use have been included. The different families composed the 13 tables (and the associated references) of this review, and a table containing information on the CSPs (CSP trade name, structure, chemical name, manufacturers and suppliers with the corresponding country) was also added.

In the tables, each field is presented as follows: The drug name is written using the ATC spelling. For example Amphetamine is written Amfetamine. CSPs are listed in the same order than those used in the CSP tables (Pirkle type, ligand exchange, organometallic, crown ether, cyclodextins, antibiotic, polysaccharide, polymer and protein). In the mobile phase composition, the compound (acid or amine) between brackets after the pH value means that the pH was adjusted with this compound. When alpha value and resolution are not available the retention time was indicated in the boxes reserved for the elution order of each enantiomer.

The published elution orders sometimes display problems (e.g., different elution order on the same CSP). In many publications, the authors do not indicate how they determined the sign of optical rotation of the eluted components. Several methods are available for this determination: (i) injection of a pure enantiomer or a mixture enriched in one enantiomer; (ii) using a chiral detector online; (iii) determining the rotation with a polarimeter on a sample collected after chromatographic elution. The magnitude and direction of optical rotation may depend on the solvent, and therefore a change in the direction of rotation of the eluted enantiomers obtained upon changing from one achiral mobile phase to another, while using the same CSP is possible without necessarily indicating an inversion of the elution order.

In conclusion, anyone investigating the separation of chiral clinical drugs can now easily find the best method to obtain the successful results. The authors must, however, point out that these published separations should be checked carefully, because some of them seem to contain inaccurate information, particularly in terms of elution order as well as composition and preparation of buffered mobile phase (mixture of salts or addition of base or acid to the salt solution) and pH measurement (in the buffer or in the mobile phase, etc.).

1. COMMERCIALLY AVAILABLE CHIRAL STATIONARY PHASES

All chiral selectors are more or less complex single enantiomers because an isotropic medium is required to differentiate the 2 enantiomeric forms of a chiral molecule. The CSPs are listed according their different group types gathered in 3 principal families: one molecular and two macromolecular families, the small macromolecules with m.w. between 1000 and 2000 and the large ones with m.w. larger than 2000. The molecular CSPs include Pirkle types (I-A), Ligand Exchanges (I-B) and Organometallics (I-C). The small macromolecular CSPs comprise Crown ethers (II-A), Cyclodextrins (II-B), Antibiotics (II-C). The large macromolecular CSPs include Polysaccharides (Cellulose and Amylose) (III-A), Polymers (III-B) and Proteins (III-C).

I-A. π-COMPLEX OR PIRKLE-TYPE CSPs

CSP class I-A is also called "Pirkle-type" from William Pirkle that developed and popularized the concept of π-donating and π-accepting exchanges for chiral recognition, concept introduced by Gil-AV in the 1970s (6) These CSPs contain a π-donator or π-acid molecular group, often a dinitrobenzyl group and a π-acceptor or π-basic group such as a phenyl or naphtyl group (7, 8). These two groups create 2 interactions with the enantiomer molecule. Steric hindrance allows for chiral discrimination between the 2 enantiomers (9). Class I-A CSP work preferentially in the normal-phase mode and SFC. The SFC chiral separations will be presented in Part III of this compilation. Then, 35 different CSPs are listed in this review.

I-B. Ligand Exchange CSPs

The concept of chiral separation by ligand exchange between a chiral selector, a metallic cation, most often the copper II ion, and an enantiomer was introduced by Davankov in the late 60s (10). The enantiomers must be able to form bidentate chelates to be separated on this class I-B. Then, 10 different CSPs were found and listed.

I-C. Organometallic CSPs

A single CSP was commercialized, a ruthenium-based CSP. This CSP could be viewed as an I-B CSP.

II-A. Crown Ether CSPs

A crown-6-ether has a cavity that exactly matches the size of a primary ammonium cation NH_3^+. Chiral crown ether will interact with primary amines in acidic media. Four CSPs are listed in this class (11).

II-B. Cyclodextrin CSPs

Cyclodextrins are cylindrical or somewhat conical association of glucose units (Table 1). They have a chiral cavity associated with numerous external chemical groups easy to derivatize (12). Then, 16 different cyclodextrin CSPs are listed in the corresponding table.

II-C. Macrocyclic Glycopeptide Antibiotic CSPs

This class of CSP was exclusively developed by Armstrong in the 1990s (13). It is based on the fact that macrocyclic glycopeptides inhibit the development of Gram+ bacteria by blocking the cell-wall synthesis by binding to the D-Ala-D-Ala terminal of an essential protein (9). This class II-C Antibiotic was found very useful because it has a broad spectrum of application and can work in all chromatographic modes. Six CSPs are commercialized under the Chirobiotic trade name by the Astec company, recently merged in the Supelco company, a member of the Sigma-Aldrich group.

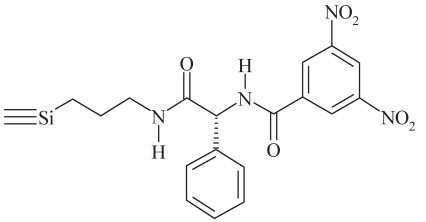
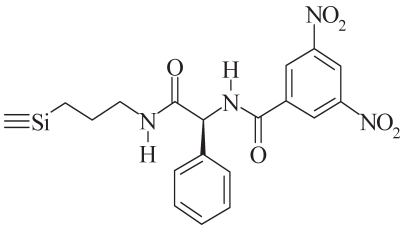
III-A. Cellulose and Amylose Polysaccharide CSPs

Polysaccharide CSPs were introduced in Japan by Okamoto (14). Cellulose-based CSPs are commercialized with the Chiralcel trade name and Amylose-based CSPs have the Chiralpak trade name. The 15 CSPs are commercialized by the Daicel Company. This class of CSP is the most useful with a broader spectrum than all other classes of CSPs. An analytical laboratory wanting to do chiral separations must have several polysaccharide CSP columns.

III-B. Polymer and Molecular Imprinted CSPs

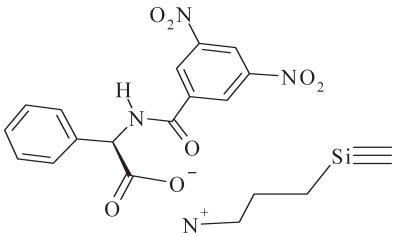
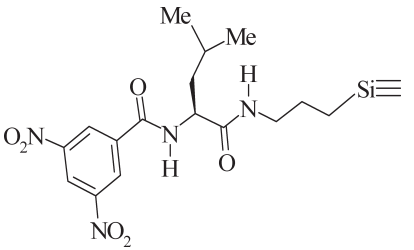
Six polymeric CSP are listed in the table. These CSPs are supposed to have a high density of chiral selectors so that they could separate larger amounts of enantiomers allowing for preparative separations. It is not yet routine work.

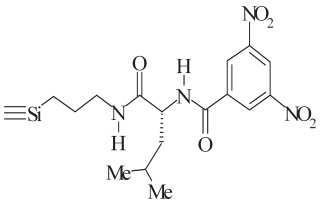
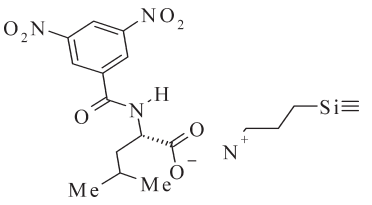
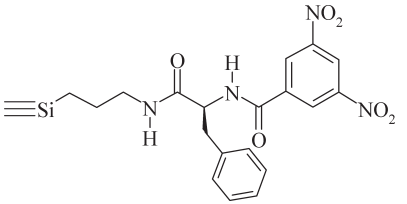
Table 1.

Group	Trade name	Structure	Selector chemical name	Supplier	Country
I-A	(R)-DNBPG covalent Pirkle 1A covalent Sumichiral OA-2000 Pirkle 1-A R-DNB Phenylglycine Pirkle Phase Chirex 3001 Hi-Chrom Pirkle		(R)-N-(3,5-Dinitrobenzoyl)phenylglycine bonded to aminopropyl silica	Regis Regis Sumika Technicol S.F.C.C. Phenomenex HiChrom Ltd	USA USA Japan UK France USA UK
I-A	DNBPG covalent Chirasep DNBPG		(S)-N-(3,5-Dinitrobenzoyl)phenylglycine bonded to aminopropyl silica	Regis Merck	USA Germany

(*continued*)

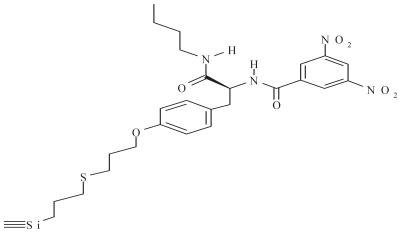
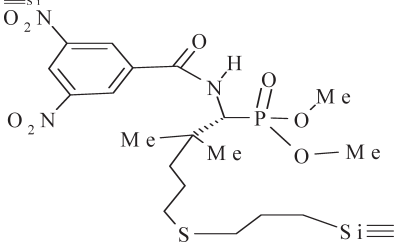
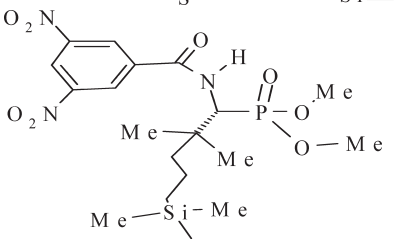
Table 1. Continued.

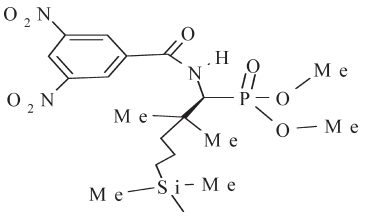
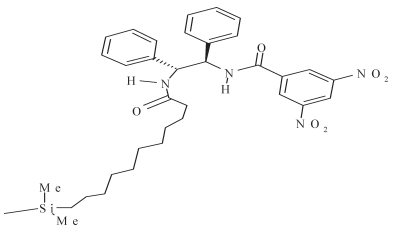
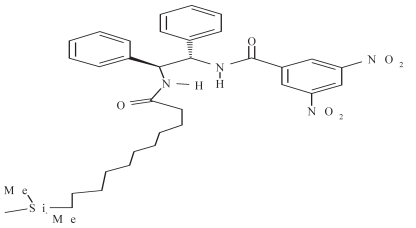
Group	Trade name	Structure	Selector chemical name	Supplier	Country
I-A	Pirkle 1A ionic		(R)-N-(3,5-Dinitrobenzoyl)phenylglycine ionically bonded to aminopropyl silica	Regis	USA
I-A	Pirkle-Leu covalent		(S)-N-(3,5-Dinitrobenzoyl)leucine bonded to aminopropyl silica	Regis	USA
	Rexchrom Pirkle covalent L-leucine			Regis	USA
	S-DNBL covalent			J.T. Baker	USA
	Hi-Chrom Reversible-Leucine covalent			HiChrom Ltd	UK
	L-Leucine covalent			Interchim	France

I-A	Hi-Chrom Pirkle Covalent Leucine		(R)-3,5-Dinitrobenzoyl-leucine bonded to amino-propyl silica	HiChrom Ltd	UK
I-A	S-DNBL ionic		(S)-N-(3,5-Dinitroben-zoyl)leucine ionically bonded to aminopropyl silica	Regis	USA
I-A	Chirachrom A1		(S)-N-(3,5-DNB)-phenyl-alanine bonded to amino-propyl silica	Interchim	France

(*continued*)

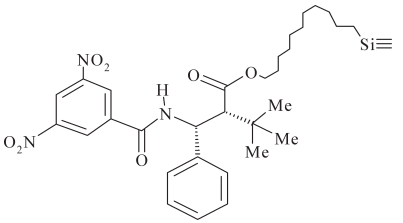
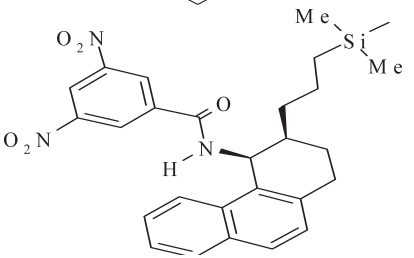
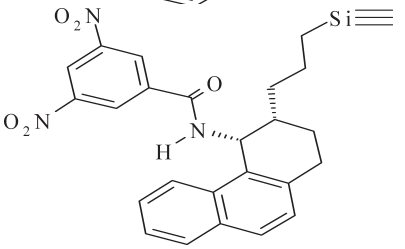
Table 1. Continued.

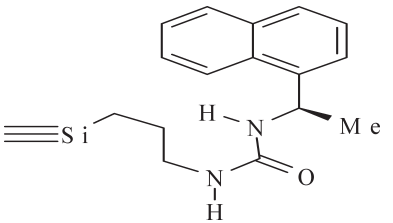
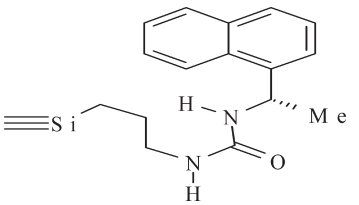
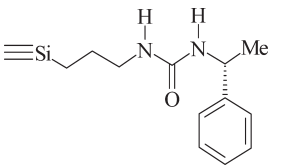
Group	Trade name	Structure	Selector chemical name	Supplier	Country
I-A	ChyRoSine-A		(S)-dinitrobenzoyltyrosine amide bonded to mercaptopropyl silica	Sedere	France
I-A	(R)-alpha-Burke 1		(R)-DNB-Aminophosphonate derivative bonded mercaptopropyl silica t	Regis, Interchim	USA, France
I-A	(R)-alpha-Burke 2		(R)-DNB-Aminophosphonate derivative bonded to silica	Regis	USA

I-A	(S)-alpha-Burke 2		(S)-DNB-Aminophosphonate derivative bonded to mercaptopropyl silica (endcapped)	Regis Phenomenex	USA USA
I-A	(R,R) ULMO		Mono-3,5-dinitrobenzoyl (R,R)-diphenylethanediamine bonded to undecyl amide silica	Regis	USA
I-A	(S,S) ULMO		Mono-3,5-dinitrobenzoyl (S,S)-diphenylethanediamine bonded to undecyl amide silica	Regis	USA

(*continued*)

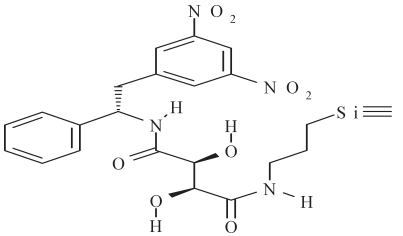
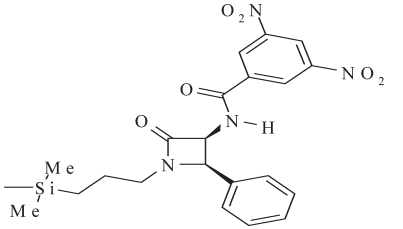
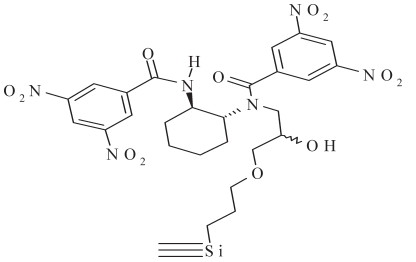
Table 1. Continued.

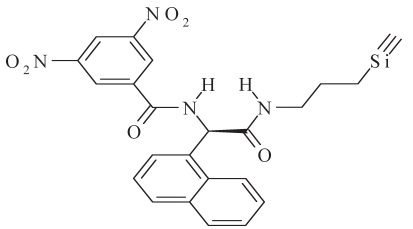
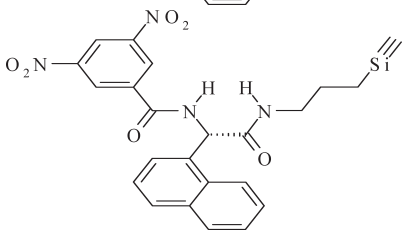
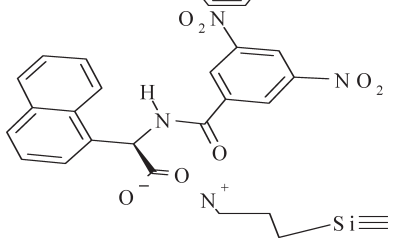
Group	Trade name	Structure	Selector chemical name	Supplier	Country
I-A	(R,R)-beta-GEM 1		3-(3′,5′-Dinitrobenzoyl)amino-(R)-3-phenyl-(R)-2-tBu- propanoic acid undecyl ester bonded to silica	Regis	USA
I-A	(S,S) Whelk-O1		(3R,4S)-4-(3,5-Dinitrobenzamido)-3-[3-(dimethylsilyloxy)propyl]-1,2,3,4-tetrahydrophenanthrene silica	Regis	USA
I-A	(R,R) Whelk-O2		(3S,4R)-4-(3,5-Dinitrobenzamido)-3-[3-(trioxysilyl)-propyl]-1,2,3,4-tetrahydrophenanthrene silica	Regis	USA

I-A	KK-Carnu		(R)-alpha-(1-Naphthyl)ethylamine urea bonded to silica	YMC	USA
I-A	SNU5 (S)-Naphthylurea		(S) Naphthylethylurea bonded to silica	Supelco Shandon	USA UK
I-A	Spherisorb Chiral 1 Supelcosil-LC-(R)-phenylUrea		(R)-N-Alpha-Phenethyl-N-propylurea bonded to silica	Phases Separations Supelco	UK USA

(*continued*)

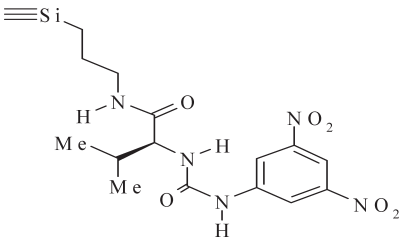
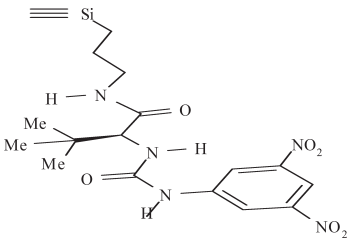
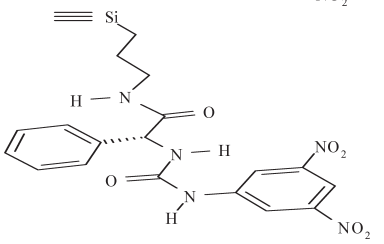
Table 1. Continued.

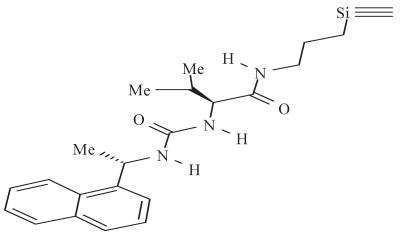
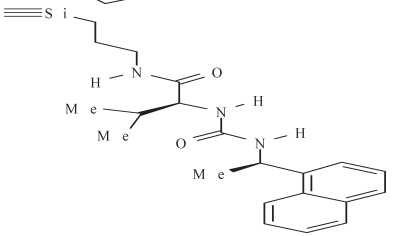
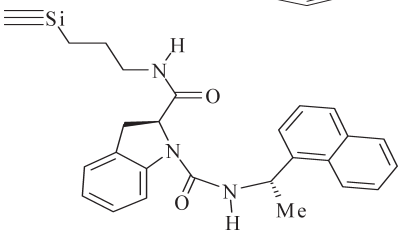
Group	Trade name	Structure	Selector chemical name	Supplier	Country
I-A	Nucleosil chiral 2		(l)-Tartaric acid-(l)-phenylethylamine bonded to silica	Macherey-Nagel	Germany
I-A	Pirkle 1-J		Cis-N-3-(3,5-Dinitrobenzoyl)-amino-4-phenyl-β-lactam bonded to silica	Regis	USA
I-A	(R,R)-DACH-DNB		(R,R)-N,N′-3,5-Dinitrobenzoyl-trans-1,2-diaminocyclohexane bonded to glycidoxypropyl silica	Regis	USA

I-A	Sumichiral OA-2500		N-Dinitrobenzoyl-(R)-1-Naphthylglycine bonded to aminopropyl silica	Sumika	Japan
	Chirex 3005			Phenomenex	USA
	Sumichiral OA-2500R			Sumika	Japan
I-A	Sumichiral OA-2500S		N-Dinitrobenzoyl-(S)-1-Naphthylglycine bonded to aminopropyl silica	Sumika	Japan
I-A	Sumichiral OA-2500I		(R)-N-(3,5-Dinitrobenzoyl)-1-naphthylglycine ionically bonded to aminopropyl silica	Sumika	Japan

(*continued*)

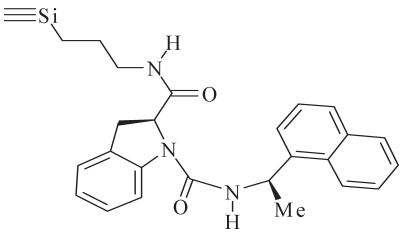
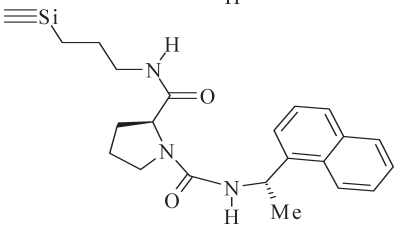
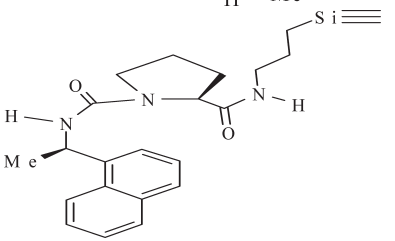
Table 1. Continued.

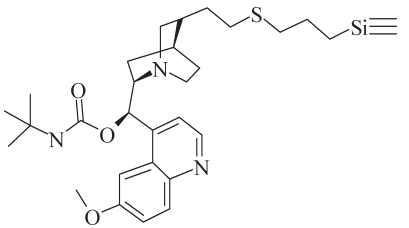
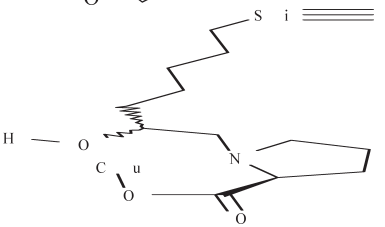
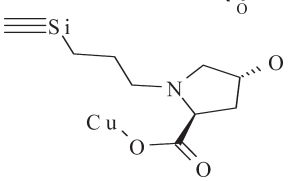
Group	Trade name	Structure	Selector chemical name	Supplier	Country
I-A	Sumichiral OA-3100		3,5-Dinitrophenylamino-carbonyl-(S)-valine bonded to aminopropyl silica	Sumika	Japan
	Sumichiral OA-3100			Regis	USA
	Chirex 3010			Phenomenex	USA
	Sumichiral OA-3100			YMC	USA
I-A	Sumichiral OA-3200		N-(3,5-Dinitrophenylcarba-moyl)-S-tertiobutylglycine bonded to aminopropyl silica	Sumika	Japan
I-A	Sumichiral OA-3300		N-(3,5-Dinitrophenylcarba-moyl)-(D)-phenylglycine bonded to aminopropyl silica	Sumika	Japan

I-A	Sumichiral OA-4000		N-(S)-1-(1-naphthyl)ethylaminocarbonyl-(L)-valine bonded to aminopropyl silica	Sumika	Japan
I-A	Sumichiral OA-4100		N-(R)-1-(alpha-Naphthyl)ethylaminocarbonyl-(S)-valine bonded to aminopropyl silica	Sumika	Japan
	Sumichiral OA-4100			Interchim	France
	Chirex 3014			Phenomenex	USA
I-A	Sumichiral OA-4800		(S)-Benzoproline-(S)-1-naphthylethylurea derivative bonded to aminopropyl silica	Sumika	Japan

(*continued*)

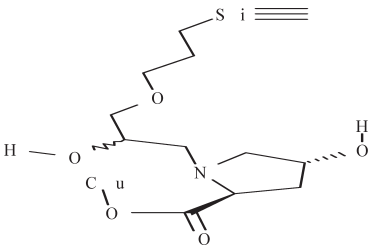
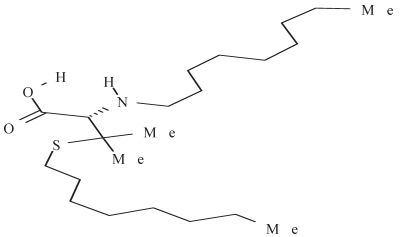
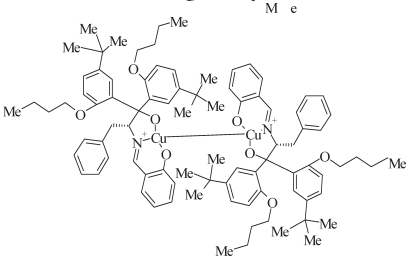
Table 1. Continued.

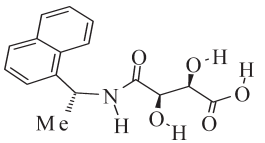
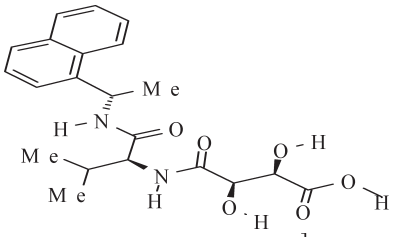
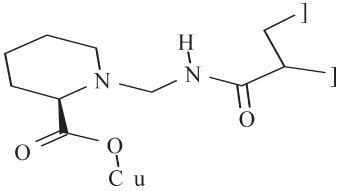
Group	Trade name	Structure	Selector chemical name	Supplier	Country
I-A	Sumichiral OA-4900		(S)-Benzoproline-(R)-1-naphthylethylurea derivative bonded to aminopropyl silica	Sumika	Japan
	Chirex 3022			Phenomenex	USA
	Sumichiral OA-4900			Rainin	USA
I-A	Sumichiral OA-4400		(S)-Proline-(S)-1-naphthylethylurea derivative bonded to aminopropyl silica	Sumika	Japan
	Chirex 3017			Phenomenex	USA
I-A	Sumichiral OA-4500		(R)-1-(1-Naphthyl)ethylaminocarbonyl-L-proline bonded to aminopropyl silica	Sumika	Japan
	Chirex 3018			Phenomenex	USA

I-A	Chiral AX QN-1		tert-butylcarbamoyl-Quinine bonded to mercaptopropylsilica	Bischoff	Germany
I-B	Chiralpak (WH)		(L)-Proline bonded to silica	Daicel J. T. Baker	Japan USA
I-B	Nucleosil Chiral-1		L-Hydroxyproline covalently bonded to silica	Macherey-Nagel	Germany

(*continued*)

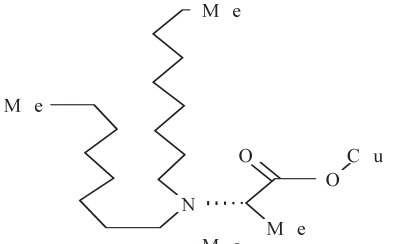
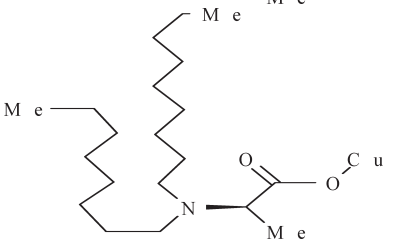
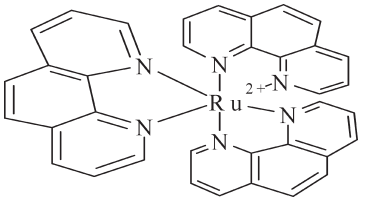
Table 1. Continued.

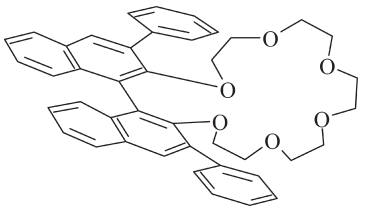
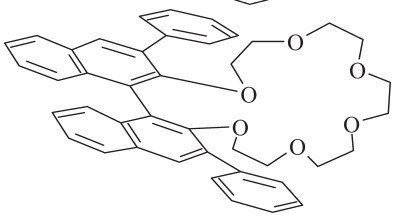
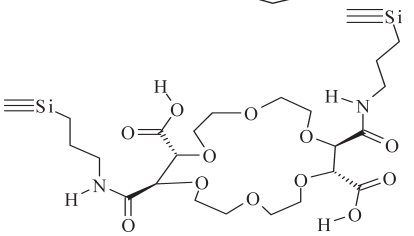
Group	Trade name	Structure	Selector chemical name	Supplier	Country
I-B	Chiral Hypro-Cu-100		(L)-Hydroxy-proline bonded to silica	Serva	Germany
I-B	Chirex 3126		N,S-Dioctyl-(D)-penicillamine coated on octadecyl silanized silica	Phenomenex	USA
	Sumichiral OA-5000			Sumika	Japan
	Chirex D-penicillamin			Phenomenex	USA
I-B	Sumichiral OA-5500		Binuclear Copper (II) of N-salicyliden-(R)-2-amino-1,1- bis(2-butoxy-5-tert-butylphenyl)-3-phenylpropanol coated on octadecyl silica	Sumika	Japan

I-B	Sumichiral OA-6000		(R,R)-tartaric acid-(R)-1-(alpha-naphthyl) ethylamide coated on octadecyl silanized silica	Sumika	Japan
I-B	Sumichiral OA-6100		(R,R)-tartaric acid-(S)-valine-(S)-1-(alpha-naphthyl) ethylamide coated on octadecyl silanized silica	Sumika	Japan
I-B	Chirosolve D-Pipec.		(D)-Pipecolinic bonded cross-linked polyacrylamide gel	JPS Chimie	Switzerland

(*continued*)

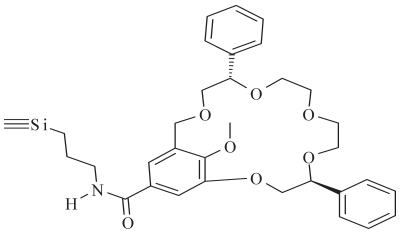
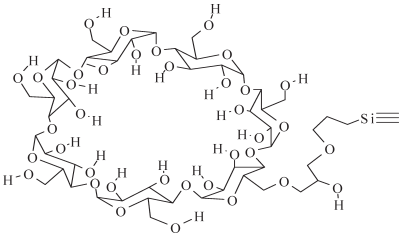
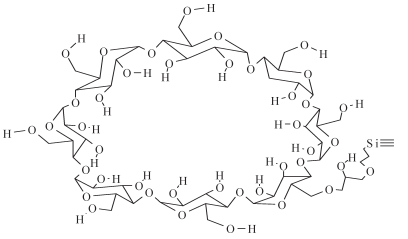
Table 1. Continued.

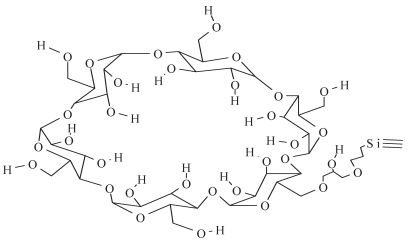
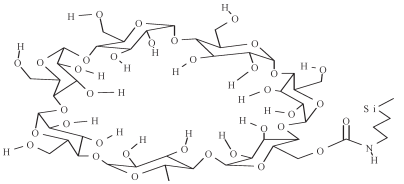
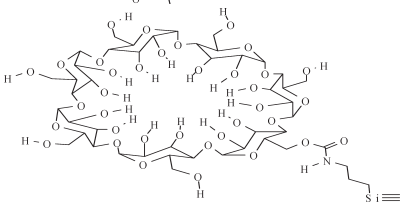
Group	Trade name	Structure	Selector chemical name	Supplier	Country
I-B	MCI CRS10W		N,N-Dioctyl-(L)-alanine coated on octadecyl silica	Mitsubishi Kasei	Japan
I-B	MCI CRS10WD		N,N-Dioctyl-(D)-alanine coated octadecyl silica	Mitsubishi Kasei	Japan
	Chiralpak MA(+)			Daicel	Japan
I-C	Ceramospher Chiral Ru-1		delta-tris(1,10-Phenanthroline)ruthenium II in spherical clay (sodium magnesium silicate)	Shiseido	Japan

II-A	Crownpak CR(−)		(R)-18-Crown-6-ether coated on octadecyl silica	Daicel	Japan
II-A	Crownpak CR(+)		(S)-18-crown-6 ether coated on octadecyl silica	Daicel J.T. Baker	Japan USA
II-A	Opticrown RCA(+)		(+)-(18-Crown-6)-2,3,11,12-tetracarboxylic acid bonded to aminopropyl silica	US Mac Corporation	USA

(*continued*)

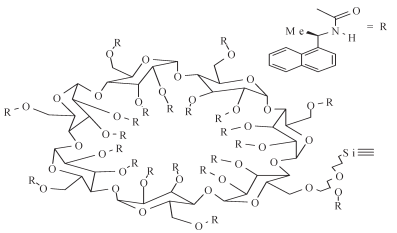
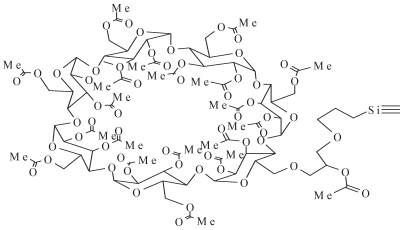
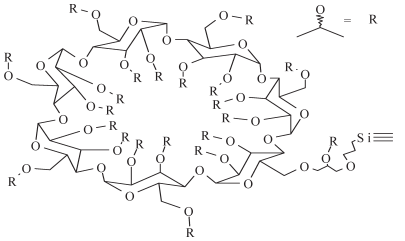
Table 1. Continued.

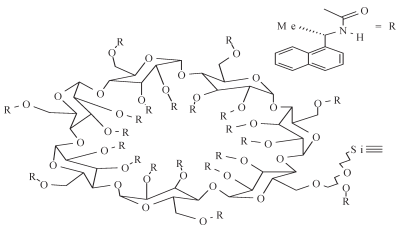
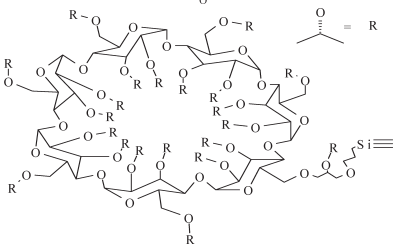
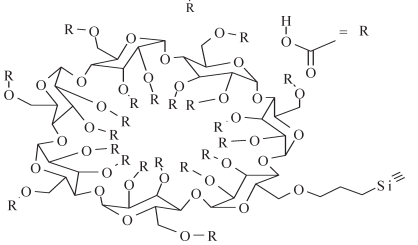
Group	Trade name	Structure	Selector chemical name	Supplier	Country
II-A	Sumichiral OA-8000		(S,S)-Pseudo-18-crown-6-ether bonded to aminopropyl silica	Sumika	Japan
II-B	Cyclobond I		β-Cyclodextrin covalently bonded to glycidoxypropyl silica	Astec	USA
	Cyclobond I			Serva	Germany
	Cyclobond I			Technicol	UK
	Cyclobond I			Rainin	USA
	Cyclobond I			ICT	Germany
	Cyclobond I 2000			Astec	USA
	Cyclobond I 2000			Technicol	UK
II-B	Cyclobond II		γ-Cyclodextrin bonded to silica	Astec	USA

II-B	Cyclobond III		α-Cyclodextrin bonded to silica	Astec	USA
II-B	ChiraDex		ß-Cyclodextrin bonded to silica	Merck	Germany
II-B	Ultron ES-CD		β-Cyclodextrin bonded to silica	Shinwakako	Japan

(*continued*)

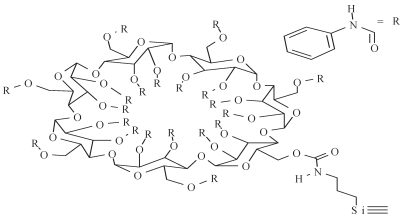
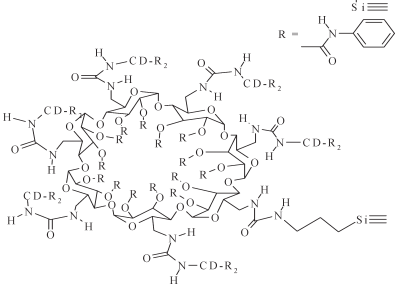
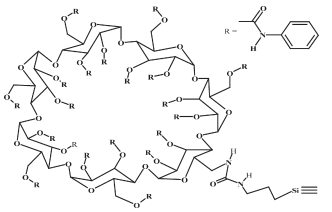
Table 1. Continued.

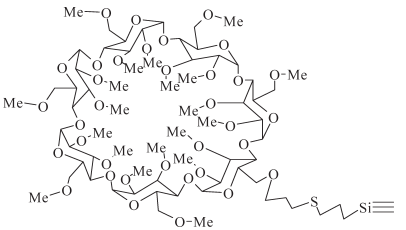
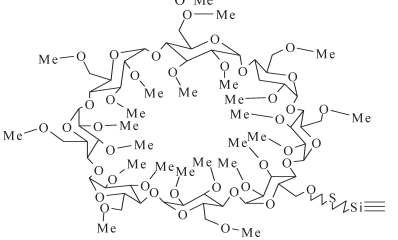
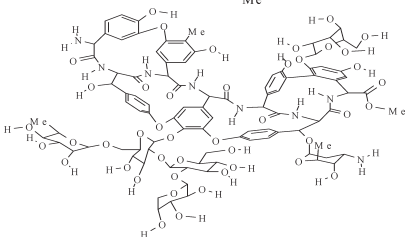
Group	Trade name	Structure	Selector chemical name	Supplier	Country
II-B	Cyclobond I 2000 RN		(R)-naphthylethylisocyanate derivatized β-cyclodextrin bonded to silica	Astec	USA
II-B	Cyclobond I Ac		Acetylated β-cyclodextrin bonded to glycidoxypropyl silica	Astec	USA
	Cyclobond I 2000 Ac			Astec	USA
	Cyclobond I 2000 Ac			Serva	Germany
II-B	Cyclobond I RSP		β-Cyclodextrin (S) and (R,S)-hydroxypropyl derivative bonded to silica	Astec	USA
	Beta-RSP-2000			Astec	USA
	Cyclobond I RSP			Rainin	USA

II-B	Cyclobond I SN		β-Cyclodextrin-(S)-Naphthylethyl carbamate derivative bonded to silica	Astec	USA
	Cyclobond I 2000 SN			Astec	USA
II-B	Cyclobond I SP		β-Cyclodextrin-(S)-hydroxypropylether derivative bonded to silica	Astec	USA
	Cyclobond I SP			Rainin	USA
II-B	OR-Pak CDBS-453		Carboxymethylated β-cyclodextrin bonded to silica	Showa Denko	Japan

(*continued*)

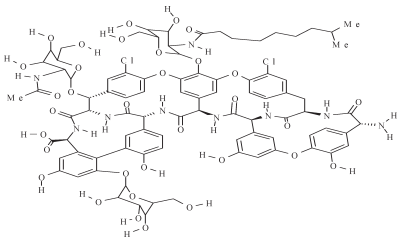
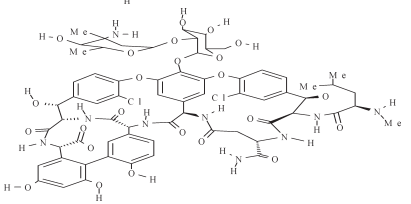
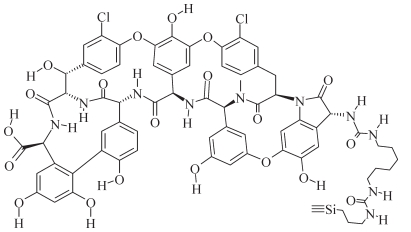
Table 1. Continued.

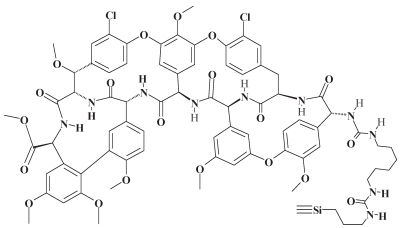
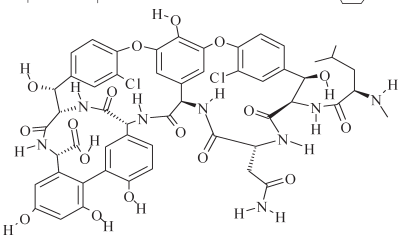
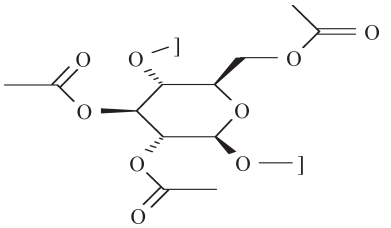
Group	Trade name	Structure	Selector chemical name	Supplier	Country
II-B	Ultron ES-PhCD		β-Cyclodextrin phenylcarbamate bonded to silica	Shinwakako	Japan
II-B	CHIDEX-MKP		Perphenylcarbamate-heptakis(6-azido-6-deoxy) beta-cyclodextrin cross-linkly immobilized to aminopropyl silicagel	Chiral Sciences & Technologies Pte. Ltd	Singapore
II-B	CHIDEX-SKP		Perphenylcarbamate-beta-cyclodextrin covalently bonded to aminopropyl silica gel via a mono-urea linkage	Chiral Sciences & Technologies Pte. Ltd	Singapore

II-B	Nucleodex β-PM		Permethylated-β-cyclodextrin bonded to silica	Macherey-Nagel	Germany
II-B	Nucleodex γ-PM		Permethylated-γ-cyclodextrin bonded to silica	Macherey Nagel	Germany
II-C	Chirobiotic R		Ristocetin A bonded to silica	Astec	USA

(*continued*)

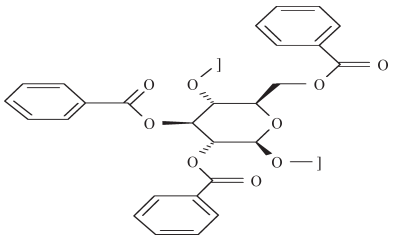
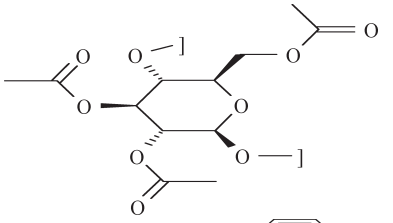
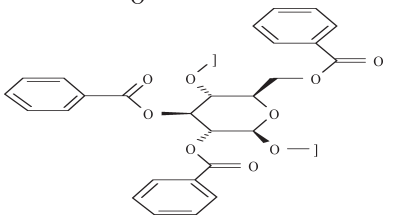
Table 1. Continued.

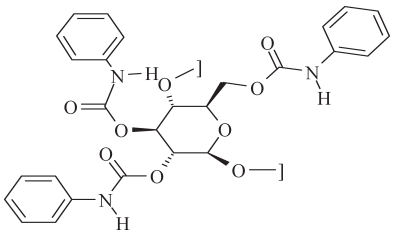
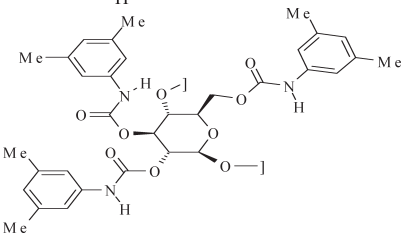
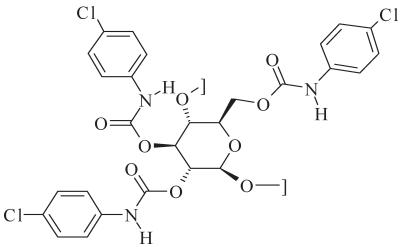
Group	Trade name	Structure	Selector chemical name	Supplier	Country
II-C	Chirobiotic T		Amphoteric Teicoplanin bonded to silica	Astec	USA
				Technicol	UK
II-C	Chirobiotic V		Vancomycin bonded to silica	Astec	USA
				Technicol	UK
II-C	Chirobiotic TAG		Teicoplanin aglycone covalently bonded to silica	Astec	USA

II-C	Chirobiotic MTAG		Methylated Teicoplanin aglycone covalently bonded to silica	Astec	USA
II-C	Chirobiotic VAG		Vancomycin aglycone bonded to silica	Astec	USA
III-A	CTA-I			Merck	Germany
	MCTA			Merck	Germany
	CEL-AC-40-XF			Macherey-Nagel	Germany
	Chiralcel CA-1		Microcrystalline cellulose triacetate	Daicel	Japan
	CTA-I			Fluka	Switzerland
	Conbrio-TAC			Perstop Biochem	Sweden

(*continued*)

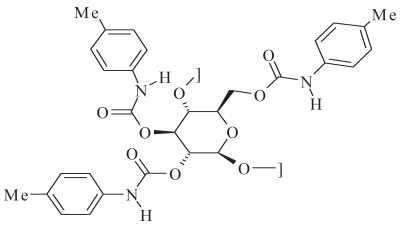
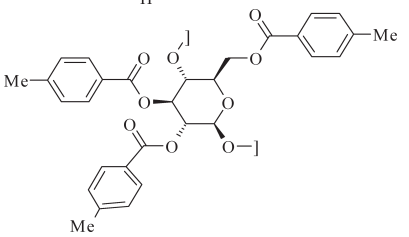
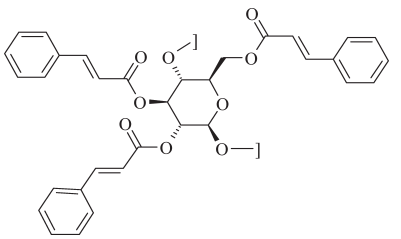
Table 1. Continued.

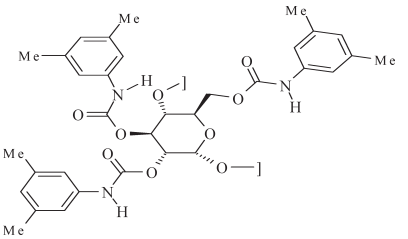
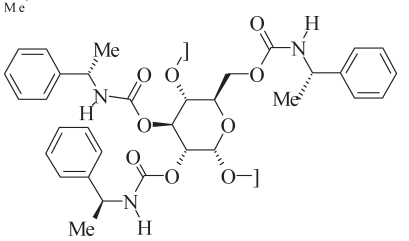
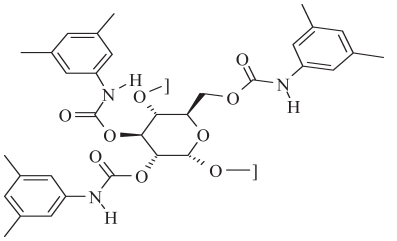
Group	Trade name	Structure	Selector chemical name	Supplier	Country
III-A	Chiral Tribencel		Microcrystalline Tribenzoylcellulose	Macherey-Nagel	Germany
III-A	Chiralcel OA		Cellulose triacetate coated on macroporous silica	Daicel	Japan
	Optipak-TA			Waters	USA
	Chiralcel OA			J. T. Baker	USA
III-A	Chiralcel OB		Cellulose tribenzoate coated on macroporous silica	Daicel	Japan
				J.T. Baker	USA
	Chiralcel OB-H			Daicel	Japan

III-A	Chiralcel OC		Cellulose triphenylcarbamate coated on macroporous silica	Daicel	Japan
				J.T. Baker	USA
III-A	Chiralcel OD		Cellulose tris(3,5-dimethylphenylcarbamate) coated on macroporous silica	Daicel	Japan
	Chiralcel OD			J.T. Baker	USA
	Chiralcel OD-H			Daicel	Japan
	Chiralcel OD-R			Daicel	Japan
	Chiralcel OD-RH			Daicel	Japan
III-A	Chiralcel OF		Cellulose tris(4-Chlorophenylcarbamate) coated on macroporous silica	Daicel	Japan
				J.T. Baker	USA

(*continued*)

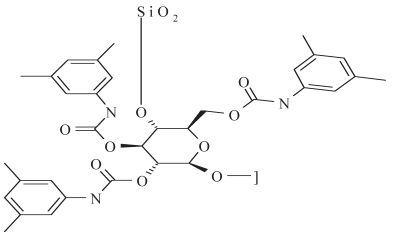
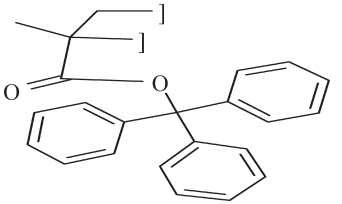
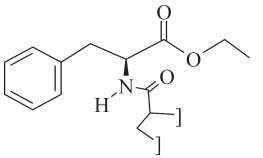
Table 1. Continued.

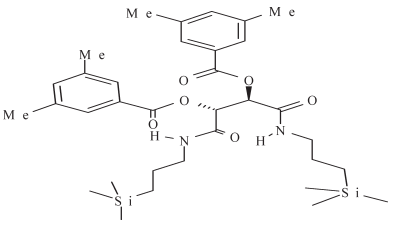
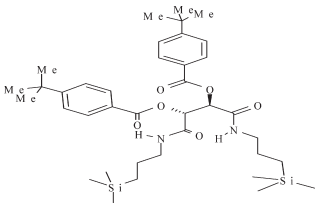
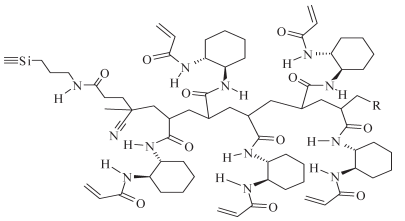
Group	Trade name	Structure	Selector chemical name	Supplier	Country
III-A	Chiralcel OG		Cellulose tris(4-Methyl-phenylcarbamate) coated on macroporous silica	Daicel	Japan
				J. T. Baker	USA
III-A	Chiralcel OJ		Cellulose tris(4-methyl-benzoate) coated on macroporous silica	Daicel	Japan
	Chiralcel OJ-R		Cellulose tris(4-methyl-benzoate) bonded on macroporous silica	J.T. Baker	USA
	Chiralcel OJ-RH			Daicel	Japan
	Exp B101			Daicel	Japan
				Bio-Rad RSL	Belgium
III-A	Chiralcel OK		Cellulose tricinnamate coated on macroporous silica	Daicel	Japan
				J. T. Baker	USA

III-A	Chiralpak AD		Amylose tris(3,5-dimethyl-phenylcarbamate) coated on macroporous silica	Daicel	Japan
	Chiralpak AD-RH			J.T. Baker	USA
	Chiralpak AD-R			Daicel	Japan
				Daicel	Japan
III-A	Chiralpak AS		Amylose tris[(S)alpha-phenethyl]carbamate coated on macroporous silica	Daicel	Japan
	Chiralpak AS			J.T. Baker	USA
	Chiralpak AS-H			Daicel	Japan
III-A	Chiralpak IA		Amylose tris(3,5-dimethyl-phenylcarbamate) photochemically cross-linked on silica	Daicel	Japan

(*continued*)

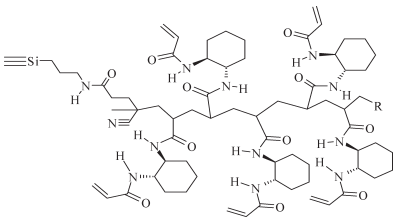
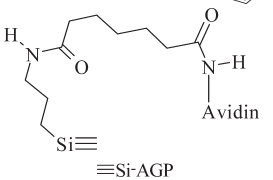
Table 1. Continued.

Group	Trade name	Structure	Selector chemical name	Supplier	Country
III-A	Chiralpak IB		Cellulose tris(3,5-dimethylphenylcarbamate) immobilized on silica	Daicel	Japan
III-B	Chiralpak OT(+)		(+)-Poly(triphenylmethyl-methacrylate) coated on macroporous silica	Daicel	Japan
				J.T. Baker	USA
III-B	Chiraspher		Poly-[(S)-N-Acryloyl-phenylalanine-ethylester] bonded to diol silica	Merck	Germany
				Bodman Chemical	USA
				Curtin-Matheson Scientific	USA

III-B	Kromasil CHI-I		O,O'-di(3,5-dimethyl-benzoyl)-(2R,3R)-diallyl-tartardiamide-crosslinked in network and immobilized by hydrosilylation on vinyl silica	EKA Chemical	Sweden
III-B	Kromasil CHI-DMB			EKA Chemical	Sweden
	Kromasil CHI-II		O,O'-di(4-tBu-phenyl)-(2R,3R)-diallyl-tartardiamide-crosslinked in network and immobilized by hydrosilylation on vinyl silica	EKA Chemical	Sweden
	Kromasil CHI-TBB			EKA Chemical	Sweden
III-B	(R,R)-P-CAP		N-(2-acryloylamine-(1R,2R)-cyclohexyl)-acrylamide radical-polymerised with 4,4'-azo-bis-(4-cyano)-valeric acid immobilized on 3-amino-propyl silica	Astec	USA

(*continued*)

Table 1. Continued.

Group	Trade name	Structure	Selector chemical name	Supplier	Country
III-B	(S,S)-P-CAP		N-(2-acryloylamine-(1S,2S)-cyclohexyl)-acrylamide radical-polymerised with 4,4'-azo-bis-(4-cyano)-valeric acid immobilized on 3-aminopropyl silica	Astec	USA
III-C	Bioptic AV-1		Avidin-conjugated aminopropyl silica	Meta Chem	USA
III-C	Chiral-AGP		α-Acid Glycoprotein immobilized on silica	ChromTech AB	Sweden
				J.T. Baker	USA
				Interchim	France
				Regis	USA
				Grom	Germany
				Technicol	UK
				Stagroma	Switzerland

III-C	Chiral-Protein 2	≡Si—HSA	Human Serum Albumin bonded to silica	S.F.C.C.	France
	HSA-CSP			Shandon	France
	Chiral protein HSA			Shandon	UK
	Chiral-HSA			ChromTech AB	Sweden
III-C	Chiral-CBH	≡Si—CBH	Cellobiohydrolase (CBH I) immobilized on silica	ChromTech AB	Sweden
	TrichSep-100			Skandinaviska GeneTec AB	Sweden
III-C	EnantioPac	≡Si-AGP	α-Acid Glycoprotein bonded to silica	LKB-Pharmacia	Sweden
III-C	Progel-TSK Heparin-5PW	Heparine—Resine	Affinity column of heparin immobilized on a copolymer styrene-divinylbenzene	Supelco	USA
III-C	Resolvosil	≡Si-BSA	Bovine Serum Albumin bonded to silica	Macherey-Nagel	Germany
	Resolvosil BSA-7			Alltech Associate	USA
	Resolvosil-BSA-7			LKB-Pharmacia	Sweden
	Resolvosil BSA-10			Macherey-Nagel	Germany
	Resolvosil BSA-10			Rainin Instrument	USA
	BSA-300-15sp			Amicon	USA

(*continued*)

Table 1. Continued.

Group	Trade name	Structure	Selector chemical name	Supplier	Country
III-C	Ultron-ES-OVM		Ovomucoid-conjugated aminopropyl silica	Sinwakako	Japan
				Mac-Mod	USA
				Grom	Germany
				Hichrom ltd	UK

III-C. Protein based CSPs

Eight protein based CSPs are listed. These were the first introduced CSPs and were very popular. They are less and less used in the 21st century because they have a very limited capacity and are fragile (15).

For the different cited CSPs the name of suppliers is given. However several CSPs are no longer available today since the providing companies disappeared, were merged into other companies, or they stopped their CSP production.

2. DRUGS ACTING ON THE ALIMENTARY TRACT AND METABOLISM

This class of clinical drugs include 30 drugs members of several families (anabolic steroid, antidiarrheal, anti-emetic, antiobesity, bile therapy, diet, digestive, gastrointestinal disorder, gastro-esophageal reflux disease (G.O.R.D), liver therapy, propulsive, vitamins and antihyperlipo-proteinemic) in function of their medical applications. The two most important groups in terms of number of chiral drugs are the 13 drugs for acid related disorders and for functional gastrointestinal disorders followed by the 5 antiobesity preparations.

Figure 1 is a chart showing that the polysaccharide-based CSPs separated more than half of the enantiomeric pairs listed in Table 2. This class of CSP includes the Chiralcel and ChiralPak brand names of Daicel (Daicel Chemical Ltd., Tokyo, Japan). The highest enantioresolution factors were also obtained

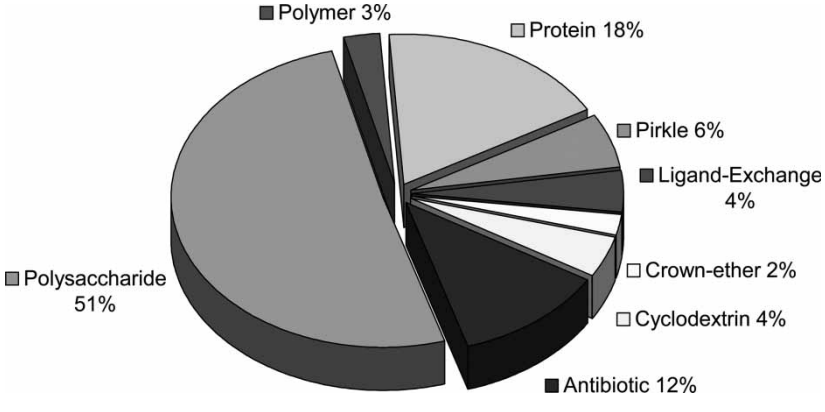
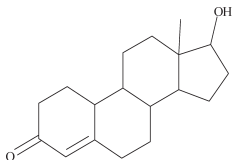
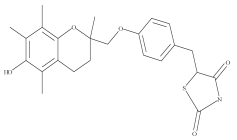
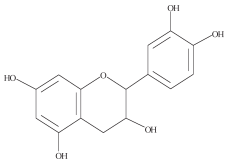
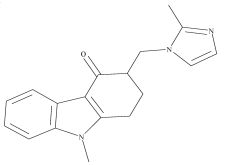
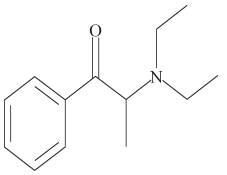
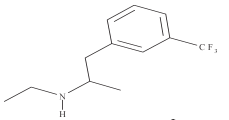
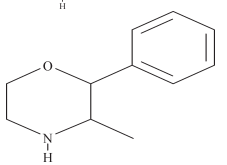


Figure 1. Chiral stationary phases used to resolve the enantiomers of drugs acting on the alimentary tract and metabolism. The percentages indicate the number of enantiomers successfully separated by the CSP.

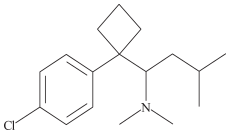
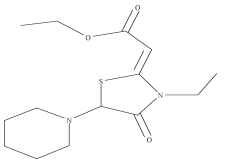
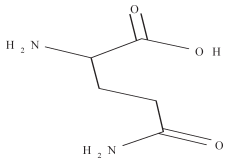
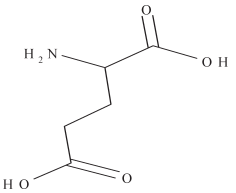
Table 2.

Drug name	Structure	Medical class	CSP trade name	Mobile phase	First	Second	α	Rs	Ref.
Nandrolone		Anabolic steroid	Nucleodex beta-PM	70/30-H_2O/MeCN/	ent	Natural	1.07	0.9	(16)
			Nucleodex gamma-PM	70/30-H_2O/MeCN/	ent	Natural	1.09	0.8	(16)
			Chiralpak AD	90/10-Hexane/i-PrOH	Natural	ent	1.41	4.1	(17)
			Chiralpak AD	5/95-H_2O/MeOH	Natural	ent	1.45	2.9	(17)
			Chiralpak AD	5/95-H_2O/MeCN	Natural	ent	2.63	6.5	(17)
R,S-S,R		Antidiabetic		1000/1-MeOH/ $MeCO_2H$, $LiClO_4$ 50 mM	13	15.5			(18)
Troglitazone			Chiralcel OJ-RH	1000/1-MeOH/ $MeCO_2H$, $LiClO_4$ 50 mM	R,R 11	S,S 19			(18)
S,S-R,R			Chiralcel OJ-RH						(18)
Cianidanol		Antidiarrheal	Chiralcel OC	64.5/35/0.5-Hexane/ EtOH/AcOH				2.04	(18)
Ondansetron		Anti-emetic	Chiralcel OD	65/25/10/1-Hexane/ EtOH (95%)/i-PrOH/ MeCN	R(−)	S(+)	1.25	1.98	(20)
			Chiralcel OD-R	65/35-H_2O, $NaClO_4$ 0.7M/MeCN	R(−)	S(+)	1.23	2.1	(21)

Amfepramone		Anti-obesity	Chiralcel OD	98/2/0.1-Hexane/MeCN/Et_2NH	(+)	(−)	1.16	(22)
			Chiralcel OD	98/2/0.1-Hexane/$C_8H_{17}OH$/Et_2NH	(+)	(−)	1.52 2.11	(22)
			Chiralcel OD	98/2/0.1-Hexane/THF/Et_2NH	(+)	(−)	1.79 4.83	(22)
			Chiralcel OD	98/2/0.1-Hexane/$MeCO_2C_4H_9$/Et_2NH	(+)	(−)	1.93 5.16	(22)
			Chiralcel OD	98/2/0.1-Hexane/$C_4H_9OC_4H_9$/Et_2NH	(+)	(−)	2.22 6.72	(22)
			Chiralcel OD	98/2/0.1-Hexane/CH_2ClCH_2Cl/Et_2NH	(+)	(−)	2 6.78	(22)
			Chiralpak AD	98/2/0.1-Hexane/tert-BuOH/Et_2NH	(+)	(−)	1.54 4.29	(22)
			Chiralpak AD	98/2/0.1-Hexane/THF/Et_2NH	(+)	(−)	1.46 4.06	(22)
			Chiralpak AD	98/2/0.1-Hexane/$MeCO_2C_4H_9$/Et_2NH	(+)	(−)	1.5 3.15	(22)
			Chiralpak AD	98/2/0.1-Hexane/CH_2ClCH_2Cl/Et_2NH	(+)	(−)	1.88 5.31	(22)
			Chiralpak AD	98/2/0.1-Hexane/MTBE/Et_2NH	(+)	(−)	1.83 4.25	(22)
Fenfluramine		Antiobesity	Chiralcel OF	99.9/0.1-Hexane/Et_2NH	R	S	1.17 2.03	(23)
			Chiralcel OG	99.95/0.05-Hexane/Et_2NH	R	S	1.08 0.95	(23)
Phenmetrazine		Anti-obesity	EnantioPac	Phosphate buffer 0.02M, pH = 7/$C_7H_9CO_2H$ 0.01M			1.57	(24)
			EnantioPac	Phosphate buffer 0.02M, pH = 6.0/TPAB 0.001M			1.44	(25)

(*continued*)

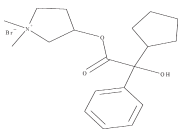
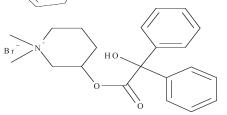
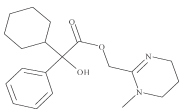
Table 2. Continued.

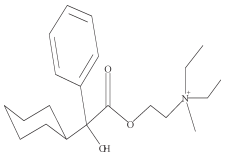
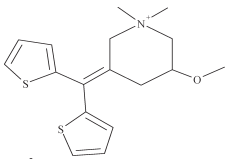
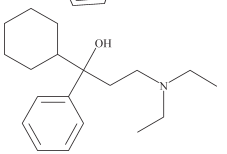
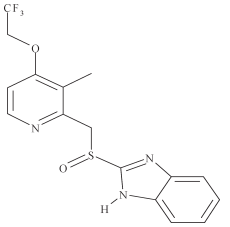
Drug name	Structure	Medical class	CSP trade name	Mobile phase	First	Second	α	Rs	Ref.
Sibutramine		Anti-obesity	Ultron ES-OVM	70/30-NaH_2PO_4 0.01M, pH = 7/MeCN	R 4.6	S 5.4			(26)
Piprozolin		Bile therapy	Cel Ac-40 XF	MeOH	(−)	(+)		1.7	(27)
			Cel Ac-40 XF	5/95-H_2O/EtOH				0.76	(27)
			Chiralcel OD	85/15-Hexane/EtOH			1.31	2	(28)
			Chiralcel OD	MeOH			2.14	3.5	(29)
			Chiralcel OJ	MeOH			7.14	4	(29)
			Chiralpak AD	MeOH			2.37	5	(29)
			Chiralpak AD	MeCN			1.57	0.3	(29)
Glutamine		Diet	Sumichiral OA-5000	$H_2O/CuSO_4$ 1 mM	L	D	1.67		(30)
			Sumichiral OA-6000	H_2O $CuSO_4$ 1 mM			2.81		(31)
			Sumichiral OA-8000	85/15/0.5/0.2-Hexane/EtOH/TFA/H_2O			1.31	3.42	(32)
			Opticrown RCA(+)	50/50-MeOH/H_2O-H_2SO_4 10 mM	L	D	1.32	1.72	(33)
			Chirobiotic T	60/40-MeOH/H_2O	L	D	1.9	1.5	(34)
			Chiralpak AD	18/1/1-Hexane/EtOH/MeOH-CamphorSO_3H (0.2%)			1.06	0.66	(35)
Glutamic acid		Digestive	Sumichiral OA-5000	85/15-H_2O-$CuSO_4$ 2 mM/MeOH	L	D	1.1		(30)
			Sumichiral OA-6000	95/5-H_2O-$CuSO_4$ 2 mM/MeCN	D	L	1.53		(31)
			Sumichiral OA-8000	85/15/0.5/0.2-Hexane/EtOH/TFA/H_2O			1.38	6.38	(32)

MCI CRS10WD	$H_2O/CuSO_4$ 2 mM	L	D	1.55	4.6	(33)
MCI CRS10W	$H_2O/CuSO_4$ 2 mM pH = 5.15	D	L	1.54	2.3	(34)
Crownpak CR(+)	$HClO_4$ pH = 2	R	S	6.3	2.93	(35)
Opticrown RCA(+)	50/50-MeOH/H_2O-H_2SO_4 10 mM	L	D	1.44	1.78	(36)
Chirobiotic T	40/60-H_2O, TEAA buffer 18 mM, pH = 4.1/MeOH, $(MeCO_2)_2Cu$ 0.5 mM			1.6	1.2	(37)
Chirobiotic T	40/60-H_2O, TEAA buffer 18 mM, pH = 4.1/MeOH			1.7	2	(37)
Chirobiotic T	40/60-H_2O, pH = 3.8 $(MeCO_2H)$/MeOH	L	D	1.9	1.5	(38)
	Chirobiotic T	10/50/40-H_2O, TEAA (0.1%)/EtOH/MeOH	11	17.7		(39)
Chiralpak AD	90/10-Hexane/EtOH, TFA (0.2%)			1.42	2.69	(40)
Chiralpak AD	90/10-Hexane/EtOH, $EtSO_3H$ (0.2%) Cyclo-pentylamine (0.1%)			1.19	2.42	()
Chiralpak AD	90/10-Hexane/n-Pro-panol, $EtSO_3H$ (0.2%)			1.14	1.65	(40)

(*continued*)

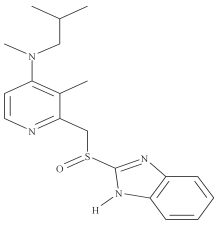
Table 2. Continued.

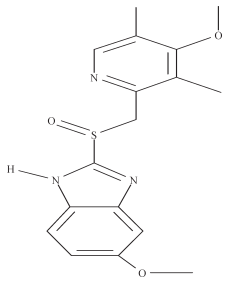
Drug name	Structure	Medical class	CSP trade name	Mobile phase	First	Second	α	Rs	Ref.
(R,R),(S,S)-Glycopyrronium		Gastrointestinal disorder	Cyclobond I	85/15-H_2O, $MeCO_2H$ 0.0072M, pH = 4.15 (Et_3N)/MeCN			1.18		(41)
Mepenzolate		Gastrointestinal disorder	Chiral-AGP	Phosphate buffer 0.01M, pH = 7/i-PrOH (2%)			1.24	1	(42)
			EnantioPac	Phosphate buffer 0.02M, pH = 7/NaCl 0.1M/EtOH 1.74M			1.32		(42)
			EnantioPac	Phosphate buffer pH = 7.2/i-PrOH (4%)			1.4		(42)
			EnantioPac	Phosphate buffer pH = 7.01			1.1		(43)
Oxyphenecyclimine		Gastrointestinal disorder	Chirex 3017	40/35/25-Hexane/CH_2ClCH_2Cl/EtOH-TFA (20/1)			1.5		(44)
			Chirobiotic V	99/1-TEAA buffer/MeCN/MeOH,			1.1	1.1	(45)
			Chiralpak AD	90/10-Hexane/i-PrOH			1.85	2.83	(46)
			Chiral-AGP	90/10-Phosphate buffer 0.01M, pH = 7/i-PrOH			1.4	1	(43)
			EnantioPac	Phosphate buffer 0.02M, pH = 7/NaCl 0.1M/i-PrOH 1.33M			1.42		(24)
			EnantioPac	Phosphate buffer pH = 7.5			1.5		(42)

Oxyphenonium		Gastrointestinal disorder	Chiral-AGP	Phosphate buffer 0.02M, pH = 6.9/DAS 0.00005M/i-PrOH (5%)	R	S	2.85		(47)
			EnantioPac	Phosphate buffer 0.02M, pH = 6.9/ NaCl 0.1M/i-PrOH (5%)	R	S	2.05		(47)
Timepidium		Gastrointestinal disorder	Ultron ES-CD	85/15-Phosphate buffer 50 mM, pH = 4.6/ MeCN	15.58	17.89			(48)
Tridihexethyl		Gastrointestinal disorder	EnantioPac	Phosphate buffer 0.02M, pH 7/DMAO 0.002M/i-PrOH 0.33M			1.64		(24)
Lansoprazole		gastro-oesophageal reflux disease (G.O.R.D).	Ultron ES-PhCD	60/30/10-$NaClO_4$ 50 mM/MeCN/MeOH	R 31.6	S 36.6			(49)
			Chirobiotic R	25/75-MeOH/TEAA (0.1%) pH = 6			1.13	0.69	(50)
			Chiralcel OD	80/20-Hexane/EtOH	R(+)	S(−)		0.44	(50)
			Chiralcel OD	85/15/0.1-Isohexane/ EtOH/TFA			1.41	0.94	(50)
			Chiralcel OD-H	90/10-Hexane/i-PrOH	R 18.4	S 21.3			(52)
			Chiralcel OD-R	35/65-$NaClO_4$ 50 mM/MeOH			1.16		(53)

(*continued*)

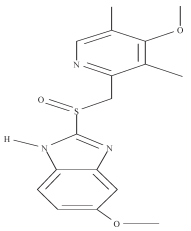
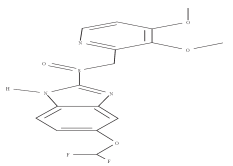
Table 2. Continued.

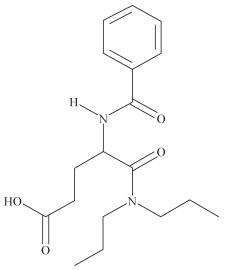
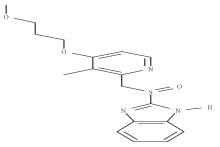
Drug name	Structure	Medical class	CSP trade name	Mobile phase	First	Second	α	Rs	Ref.
			Chiralcel OD-R	25/75-H_2O/MeOH	(+) 15.7	(−) 18.1			(54)
		Chiralpak AD	80/20-Isohexane/i-PrOH	S(−)	R(+)	1.35			(55)
		Chiralpak AS	80/20-Hexane/EtOH	R(+)	S(−)		2.07		(56)
		Kromasil CHI-TBB	75/20/5-Isohexane/$MeCO_2Et$/i-PrOH	S(−)	R(+)	1.5			(56)
		Chiral-AGP	90/10-NaH_2PO_4 pH = 7/i-PrOH	(−)	(+)	1.21	1.13		(57)
		Chiral-AGP	500/70-Sodium phosphate buffer pH = 7/MeCN	(+) 6.2	(−) 7.2				(53)
Leminoprazole		G.O.R.D.	Chiralpak AD	20/1-isoHexane/EtOH	(−) 9.0	(+) 9.8			(58)

Omeprazole		G.O.R.D.	(S,S) ULMO	90/10-Heptane/i-PrOH			1.65	0.96	(59)
			Chirobiotic R	25/75-MeOH/TEAA (0.1%) pH = 6			1.37	1.83	(60)
			Chiralcel OB-H	93/7-Hexane/EtOH			1.36		(60)
			Chiralcel OC	80/20/0.1-Hexane/i-PrOH/Et_2NH	(−)	(+)	1.3	0.69	(61)
			Chiralcel OD	88/12-Hexane/EtOH	(−)	(+)	1.12		(62)
			Chiralcel OD-H	91/6/3-Hexane/EtOH/i-PrOH	S(−)	R(+)	1.5	1.8	(63)
			Chiralcel OJ-R	80/20-$NaClO_4$ 50 mM/MeCN			1.13		(53)
			Chiralpak AD	MeOH			3	5	(20)
			Chiralpak AD	MeCN			1.57	1.2	(29)
			Chiralpak AD	50/50-MeOH/EtOH			2.29	3.12	(50)
			Chiralpak AD	50/50/0.005-Isohexane/EtOH/$MeCO_2H$	(−) 4	(+) 5.8			(58)
			Chiralpak AD	80/20-Hexane/EtOH	(−)	(+)	2.91		(62)
			Chiralpak AD	40/55/5-Hexane/EtOH/MeOH	(+) 8.5	(−) 13.34			(64)
			Chiralpak AD	70/1/30/0.04-Isohexane/MeCN/EtOH/$MeCO_2H$	S 3	R 4.5			(65)
			Chiralpak AD	100/0.05/0.05-MeOH/Et_3N/TFA			2.71	2.24	(66)
			Chiralpak AD	100/0.05-MeOH/Et_3N			3.02	3.44	(66)
			Chiralpak AD-RH	50/50- H_2O/MeCN	S(−)	R(+)	1.34	1.18	(63)

(*continued*)

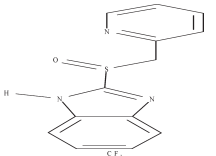
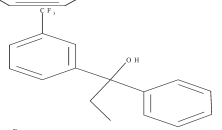
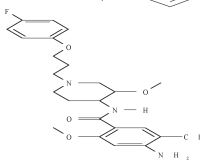
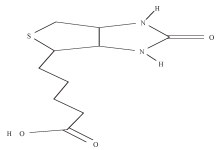
Table 2. Continued.

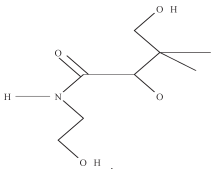
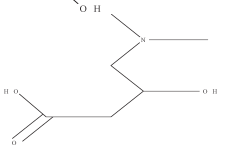
Drug name	Structure	Medical class	CSP trade name	Mobile phase	First	Second	α	Rs	Ref.
Omeprazole		G.O.R.D.	Chiralpak AS	80/20-Hexane/EtOH			2.2		(60)
			Kromasil CHI-TBB	75/20/5-Isohexane/$MeCO_2Et$/i-PrOH	S(−)	R(+)	1.41		(55)
			Chiral-AGP	90/10 Phosphate buffer 0.01M, pH = 7.2/MeCN	R	S	3.22		(67)
			Chiral-AGP	95/5-Phosphate buffer 0.02M, pH = 4.6/i-PrOH			1.27		(68)
			Resolvosil	Phosphate buffer 80 mM, pH = 5.80			1.89		(69)
			Resolvosil BSA-7	98/2-Phosphate buffer 50 mM, pH = 5.8/1-PrOH			1.5	1.4	(70)
			Resolvosil BSA-7	99.25/0.75-Ammonium phosphate buffer 50 mM, pH = 7/EtOH	(+) 13.88	(−) 18.27			(71)
			Ultron ES-OVM	90/10-Phosphate buffer pH = 7/i-PrOH	(−)	(+)	1.22		(62)
Pantoprazole		G.O.R.D.	Chiralcel OJ-R	75/25-$NaClO_4$ 50 mM/MeCN	(−)	(+)	1.26		(58)
			Chiralpak AD	80/20-Isohexane/i-PrOH	R(+)	S(−)	1.38		(55)
			Chiralpak AD	150/50/0.01-Isohexane/EtOH/$MeCO_2H$	(−) 9.5	(+) 13.3			(72)
			Kromasil CHI-TBB	75/20/5-Isohexane/$MeCO_2Et$/i-PrOH	S(−)	R(+)	1.2		(55)

Proglumide		G.O.R.D.	(S,S) Whelk-O1	75/25/0.1-Hexane/i-PrOH/$MeCO_2H$			1.49		(73)
			Chirex 3001	55/35/10-Hexane/CH_2ClCH_2Cl/EtOH-TFA (20/1)			1.27		(45)
			Chirex 3005	MeOH/$MeCO_2NH_4$ 0.02 mM			1.45		(45)
			Chirex 3014	62/35/3-Hexane/CH_2ClCH_2Cl/EtOH-TFA (20/1)			1.17		(45)
			ChiraDex	90/10/0.4/0.3-MeCN/MeOH/$MeCO_2H$/Et_3N			1.13	1.14	(74)
			Cyclobond I 2000 RN	95/5/0.8/0.6-MeCN/MeOH/$MeCO_2H$/Et_3N			1.19	1.8	(75)
			Chirobiotic T	80/20-TEAA buffer (0.01%) pH = 4.1/MeOH			1.4	1.6	(76)
			Chirobiotic V	90/10-TEAA buffer (1%) pH = 4/MeCN			2.02	4.6	(45)
			Chirobiotic V	90/10-H_2O, TEAA buffer (1%) pH = 4.1/MeCN			2.27	3.6	(77)
Rabeprazole		G.O.R.D.	Chiralpak AD	80/20-Isohexane/i-PrOH	R(+)	S(−)	1.08		(55)
			Kromasil CHI-TBB	75/20/5-Isohexane/$MeCO_2Et$/i-PrOH	S(−)	R(+)	1.43		(55)
			Chiral-AGP	30/70-Sodium phosphate buffer pH = 7/MeCN	(+) 4.1	(−) 6.8			(58)
			Resolvosil BSA-7	20/1-Phosphate buffer 0.1M, pH = 8.5/1-PrOH	R 6.0	S 13			(78)

(*continued*)

Table 2. Continued.

Drug name	Structure	Medical class	CSP trade name	Mobile phase	First	Second	α	Rs	Ref.
Timoprazole		G.O.R.D.	Chiralpak AD	80/20-Hexane/EtOH	(−)	(+)	3.63		(62)
Flumecinol		Liver therapy	Chiralcel OD	98/2-Hexane/i-PrOH	(+)	(−)	1.3	1	(79)
			Chiral-AGP	90/10-Phosphate buffer 0.010M, pH = 7/i-PrOH			1.34	1.3	(80)
Cisapride		Propulsive	Chiralcel OJ	64.5/35/0.5-Hexane/EtOH/Et_2NH	(−) 6.7	(+) 11.1			(81)
			Chiralcel OJ	60/40-Hexane/EtOH	8.36	11.3			(82)
			Chiralcel OJ-R	60/40-$MeCO_2K$ 0.1M/MeCN				3.63	(82)
			Chiralcel OJ-R	60/40-NaF 0.1M/MeCN				2.08	(82)
Biotin		Vitamin	Chiralcel OD-R	90/10-KH_2PO_4 0.05M, pH = 2.5/MeCN	(−)	(+)	1.17		(83)
			ChiraDex	98/2-KH_2PO_4 buffer 0.01M, pH = 4/i-PrOH	L(−)	D(+)		0.73	(84)
			Chirobiotic T	60/40-$MeCO_2NH_4$ 0.02M, pH = 4.1/MeOH	D(+)	L(−)		3.8	(84)

Dexpanthenol		Vitamin	Chiralpak AS	MeCN	4.5	5.5		(85)
Levocarnitine		Antihyperlipo proteinemic	Chirobiotic T	40/60- H_2O, TEAA buffer 18 mM, pH = 7.1/MeOH		1.1	0.6	(37)
			Chirobiotic T	40/60-H_2O, TEAA buffer 18 mM, $(MeCO_2)_2Cu$ 5 mM/ MeOH		1.6	0.7	(37)
			Chirobiotic T	15/85-H_2O, $MeCO_2$-NH_4 0.025M/MeOH		1.19	0.9	(86)
			Chirobiotic T	10/0.1/0.1-MeOH/ $MeCO_2H/Et_3N$		1.1	0.5	(86)

on these CSPs (Rs = 6.8 with amphepranone and Rs = 6.5 with nandrolone, Table 2). The protein CSPs were the second most successful phases separating 18% of the Table 2 drugs.

3. ANTI-INFECTIVES FOR SYSTEMIC USE

This chapter includes essentially the antibacterial and antiviral drugs including the urinary antiseptics and antimycotic drugs (Table 3).

Figure 2 shows that most commercial CSPs were used to separate the enantiomers of antiinfective drugs. The polysaccharide based CSPs were again the most successful followed by the macrocyclic glycopeptide CSPs and the Pirkle-type CSPs.

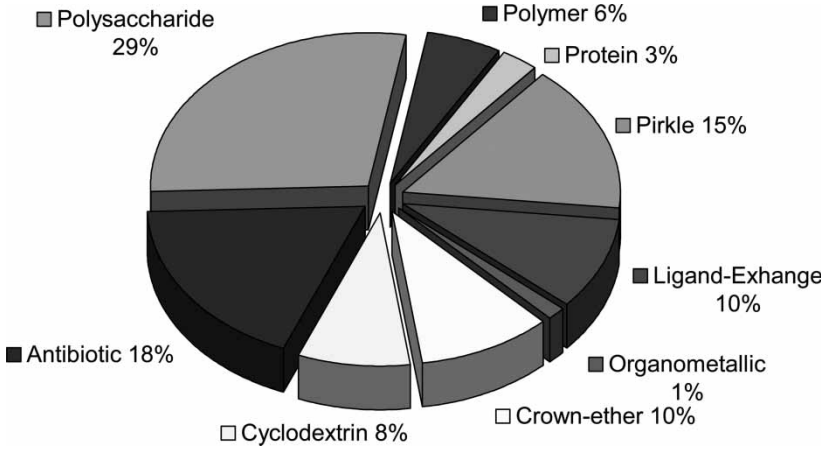
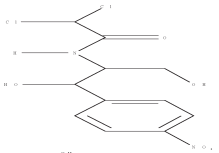
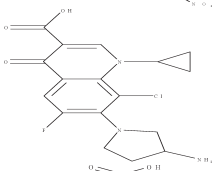
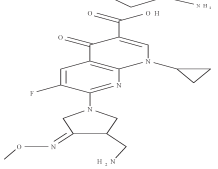
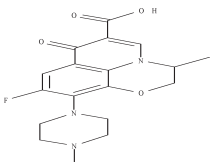


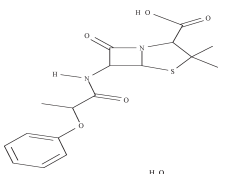
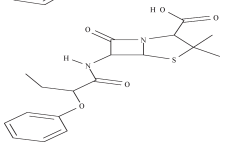
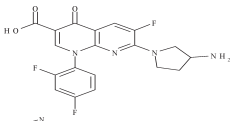
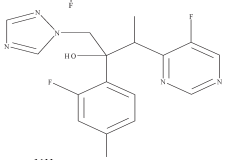
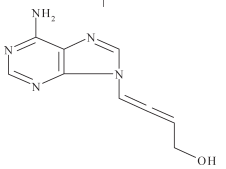
Figure 2. Chiral stationary phases used to resolve the enantiomers of antiinfectives drugs for systemic use. The percentages indicate the number of enantiomers successfully separated by the CSP.

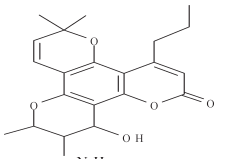
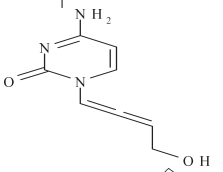
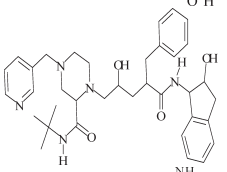
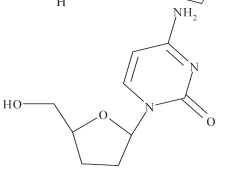
Table 3.

DRUG NAME	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Erithro-Chloramphenicol		Antibacterial	Cyclobond I	1/1/8-MeOH/H_2O/TEAA (0.1%)	(−)	(+)	1.07	1.4	(87)
Threo-Chloramphenicol			Cyclobond I	1/1/8-MeOH/H_2O/TEAA (0.1%)	(−)	(+)	1.09	1.2	(87)
Clinafloxacin		Antibacterial	Crownpak CR(+)	88/12-H_2O, HClO4 pH = 2/ MeOH $C_{10}H_{21}NH_2$ 0.1 mM	R	S	1.2		(88)
(Z)-Gemifloxacin		Antibacterial	Crownpak CR(+)	85/15-H_2O, $HClO_4$ 114 mM, pH = 1/MeOH			2.14	3.72	(89)
(Z)-Gemifloxacin			Crownpak CR(+)	85/15-H_2O, HCl 10 mM/ MeOH			1.61	1.87	(89)
(Z)-Gemifloxacin			Crownpak CR(+)	85/15-H_2O, TFA 10 mM/ MeOH			1.6	3.63	(80)
(Z)-Gemifloxacin			Crownpak CR(+)	85/15-H_2O, $MeSO_3H$ 10 mM/MeOH			1.59	1.85	(89)
(E)-Gemifloxacin			Crownpak CR(+)	85/15-H_2O, TFA 10 mM/ MeOH			1.03	0.13	(89)
Ofloxacin		Antibacterial	Chiralpak AS-RH	80/20-Borate buffer 20 mM, pH = 9/MeCN			1.2		(90)
			Resolvosil BSA-7	KH_2PO_4 0.2M, pH=8 (KOH)/DMOA 5 mM	S(−)	R(+)	1.33	0.992	(91)
			Resolvosil BSA-7	97/3-Phosphate buffer 50 mM, pH = 7.5/i-PrOH	S(−)	R(+)		0.9	(92)

(*continued*)

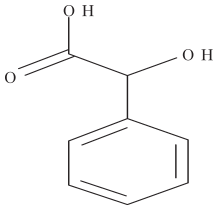
Table 3. Continued.

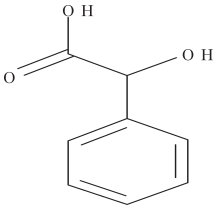
DRUG NAME	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Phenethicillin		Antibacterial	Chiralpak AS-RH	100/2-H_2O, KPF_6 0.1M/ MeCN			1.37		(90)
Propicillin		Antibacterial	Chiralpak AS-RH	100/2-H_2O, KPF_6 0.1M, pH=2 (H_3PO_4)/MeCN			1.11		(90)
Tosufloxacin		Antibacterial	Chiralpak AS	85/15/0.6/0.1-Hexane/ EtOH/TFA/Et_3N	(−)	(+)	1.32		(93)
Voriconazole		Antimycotic	Chiralcel OD	80/20/0.5-Hexane/EtOH/ Et_2NH	2R,3S	2S,3R	1.59	3.78	(94)
			Chiralcel OD-R	70/30-$NaClO_4$ 0.5M, pH = 2/MeCN	2R,3S	2S,3R	1.23	1.51	(94)
			Chiralpak AS	90/10-Hexane/EtOH	2S,3R	2R,3S	1.52	4.75	(94)
Adenallene		Antiviral	Chiralcel CA-1	EtOH	S(+) 9.7	R(−) 11.1			(95)

Calanolide		Antiviral	(S,S) Whelk-O1	90/10-Hexane/i-PrOH			1.4		(96)
Cytallene		Antiviral	Chiralcel OB	80/20-Hexane/i-PrOH, Et_2NH (0.3%)	R(−) 10.6	S(+) 15.7			(97)
Indinavir		Antiviral	Chiralpak AD	85/15-Hexane/i-PrOH			1.12	1.31	(98)
Cis-Zalcitabine		Antiviral	Cyclobond I	Potassium phosphate 0.01M, pH = 7				1.2	(99)
Cis-Zalcitabine			Cyclobond I RSP	75/25-H_2O/Et_3N (pH = 6.5 glacial $MeCO_2H$)	2S	2R	1.13	2.2	(99)
Trans-Zalcitabine			Cyclobond I RSP	75/25-H_2O/Et_3N pH = 6.5 ($MeCO_2H$)	2S	2R	1.13	2.3	(99)

(*continued*)

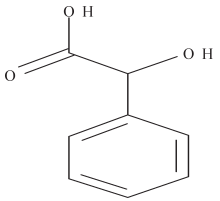
Table 3. Continued.

DRUG NAME	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Mandelic acid		Urinary antiseptic	(S,S) Whelk-O1	99.9/0.1-H_2O/$MeCO_2H$			1.13		(100)
			Sumichiral OA-4000	400/90/10/1-Hexane/CH_2-$ClCH_2Cl$/EtOH/TFA			1.03		(101)
			Sumichiral OA-4100	400/90/10/1-Hexane/CH_2-$ClCH_2Cl$/EtOH/TFA			1.03		(101)
			Sumichiral OA-4400	400/90/10/1-Hexane/CH_2-$ClCH_2Cl$/EtOH/TFA			1.05		(101)
			Sumichiral OA-4500	400/90/10/1-Hexane/CH_2-$ClCH_2Cl$/EtOH/TFA			1.06		(101)
			Sumichiral OA-4600	400/90/10/1-Hexane/CH_2-$ClCH_2Cl$/EtOH/TFA			1.04		(101)
			Sumichiral OA-4700	400/90/10/1-Hexane/CH_2-$ClCH_2Cl$/EtOH/TFA			1.04		(101)
			Sumichiral OA-4800	400/90/10/1-Hexane/CH_2-$ClCH_2Cl$/EtOH/TFA			1.03		(101)
			Sumichiral OA-4900	400/90/10/1-Hexane/CH_2-$ClCH_2Cl$/EtOH/TFA			1.04		(101)
			Chirex 3126	85/15-H_2O, CuSO4 2 mM/2-PrOH	19	40			(102)
			Sumichiral OA-5000	70/30-$CuSO_4$ 2 mM/MeOH			1.28		(103)
			Sumichiral OA-6000	85/15-H_2O, $CuSO_4$ 2 mM/MeCN			2.12		(104)
			Sumichiral OA-6100	90/10-H_2O, $CuSO_4$ 2 mM/MeCN	R	S	3.1	3.88	(105)
			Chiralpak WH	$CuSO_4$ 0.25 mM	S	R	1.34	2	(106)
			Chiral Hypro-Cu-100	H_2O, $CuSO_4$ 0.001M	S(+)	R(−)	1.42	2.95	(107)
			MCI CRS10WD	90/10-$CuSO_4$ 2 mM/MeCN	D	L	1.38	3.98	(108)
			MCI CRS10W	85/15-H2O, $CuSO_4$ 2.0 mM, pH = 5.1/MeOH	D	L	1.54	0.94	(109)
			Ceramospher Chiral Ru-1	90/10/1-Hexane/EtOH/TFA			1.18		(110)

Mandelic acid		Urinary antiseptic	Cyclobond I	96/4-TEAA pH = 7.1/ MeOH			1.07	1.4	(111)
			Chirobiotic R	75/25-TEAA (0.1%) pH= 6/ MeOH			4.46	3.1	(112)
			Chirobiotic R	100/0.02/0.01-MeOH/ $MeCO_2H/Et_3N$			3.83	5.2	(112)
			Chirobiotic T	75/25-TEAA (0.1%) pH= 6/ MeOH			15.33	1.4	(112)
			Chirobiotic T	90/10-TEAA buffer (0.01%) pH= 4.1/THF			2.9	2.3	(113)
			Chirobiotic T	90/10-TEAA buffer (0.01%) pH= 4.1/MeCN			2.3	2.3	(113)
			Chirobiotic T	100/0.05/0.15- MeOH/ $MeCO_2H/Et_3N$			7.59	8	(114)
			Chirobiotic V	75/25-TEAA buffer (0.1%) pH 6 /MeOH			2	0.6	(114)
			Chirobiotic V	4/96-H_2O/EtOH	L	D	4.34		(114)
			Chirobiotic V	47.5/47.5/5-H_2O/MeOH/ Et_3N pH = 6.6 ($MeCO_2H$)	L	D	2.6		(116)
			Chirobiotic V	54.5/45.1/0.2/0.2-MeOH/ $MeCN/MeCO_2H/Et_3N$	L	D	1.82		(115)
			Chirobiotic TAG	45/55/0.3/0.2-MeOH/ $MeCN/MeCO_2H/Et_3N$			6.03	9.45	(116)
			Chirobiotic MTAG	60/40-H2O, TEAA buffer (1%) pH = 4.1 (Et_3N, $MeCO_2H$)/MeOH			5.62	7.87	(116)
			Chirobiotic MTAG	45/55/0.3/0.2-MeOH/ $MeCN/MeCO_2H/Et_3N$			2.7	3.61	(116)
			Chiralcel OD	80/20/1-Hexane/i-PrOH/ CCl_3CO_2H	L(+)	D(−)	1.66	1.74	(117)

(*continued*)

Table 3. Continued.

DRUG NAME	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Mandelic acid		Urinary antiseptic	Chiralcel OD-H	93/7/0.05-Hexane/i-PrOH/TFA	S(+)	R(−)	1.3	2.4	(118)
			Chiralcel OD-R	95/5-$NaClO_4$-$HClO_4$ 0.5M, pH = 2.3/MeCN	S 39	R 42			(119)
			Chiralcel OJ	90/10/0.2-Heptane/EtOH/TFA	23.6	27.2			(120)
			Chiralcel OJ-H	90/10-Heptane/i-PrOH/TFA (0.1%)			1.2		(121)
			Chiralcel OJ-H	90/10-Heptane/i-PrOH/$CF_3CO_2NH_4$ 0.1 mM			1.2		(121)
			Chiralpak AD-H	90/10-Heptane/i-PrOH/$CF_3CO_2NH_4$ 1 mM			1.31		(121)
			Chiralpak AD-H	90/10-Heptane/i-PrOH/TFA (0.1%)			1.29		(121)
			Chiralpak AD	95/5/1-Hexane/i-PrOH/TFA	S	R	1.21	3.5	(122)
			Chiralpak AS	95/5/1-Hexane/i-PrOH/TFA	S	R	1.04		(123)
			Chiraspher	H_2O, $Et_3NH_4PO_4$ 50 mM, $C_{16}H_{17}Et_3NH_4PO_4$ 5 mM pH = 6.5			4.63		(124)
			Kromasil CHI-TBB	80/20/0.5-IsoHexane/$MeCO_2Et$/$MeCO_2H$			1.05		(125)
			(R,R)-P-CAP	90/10-Heptane/EtOH			1.07	1	(126)
			(S,S)-P-CAP	1/99/0.1-MeOH/MeCN/TFA			1.11	1.29	(126)
			Resolvosil	$H_2PO_4NH_4$ buffer 50 mM, pH = 4.94	S(+)	R(−)	1.47	1.91	(127)

4. ANTINEOPLASTIC AND IMMUNOMODULATING AGENTS

Antineoplastic agents are a family of clinical drugs used for the treatment of cancer and considered as one of the most important class of drugs. Antineoplastic agents are constituted by five classes of compounds: the alkylating agents, the antimetabolites, the hormone antagonists, the immuno suppressive agents and the phytogenics. One compound cannot be classified, Irinotecan. Thalidomide is listed in this class of compounds. The thalidomide disaster was responsible for the drastic changes induced regarding asymmetric compounds in the pharmaceutical industry. Thalidomide was never again used as a sedative or hypnotic. It is now used as an immuno modulator and able to inhibit tumor necrosis factor α. It found important use in struggling against leprosy, tuberculosis and HIV.

Two racemic drugs out of 3 of this class of compounds were separated by a polysaccharide based CSP (Fig. 3). The remaining racemic drug was separated either by a macrocyclic glycopeptide-based CSP or by a protein CSP. Only 5% of all drugs in this class were separated by other CSPs (Table 4).

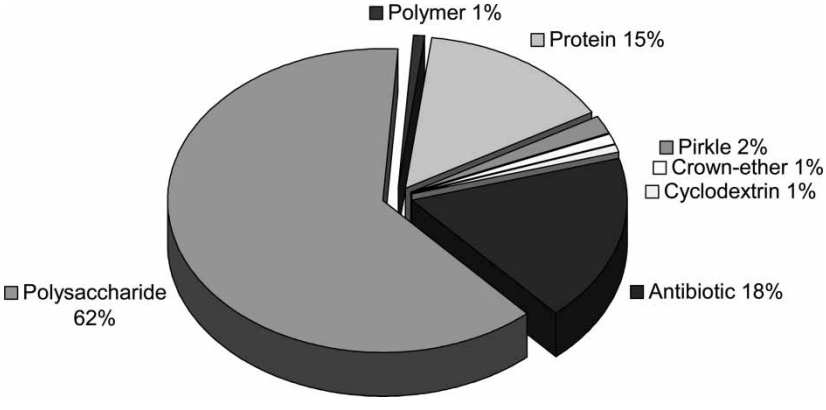
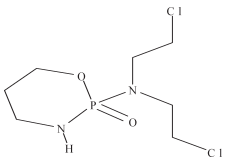
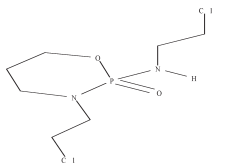
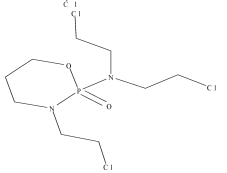
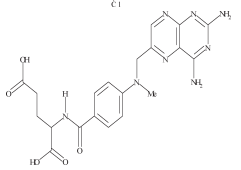
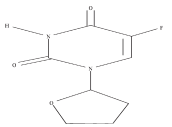
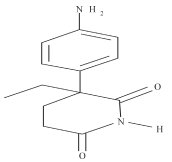
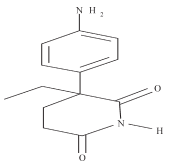


Figure 3. Chiral stationary phases able to separate the enantiomers of antineoplastic and immunomodulating drugs.

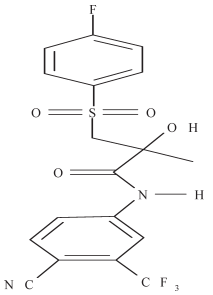
Table 4.

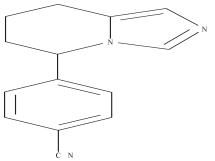
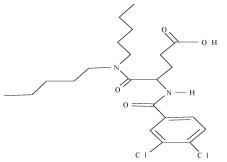
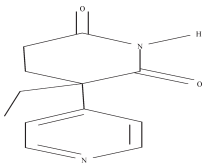
Drug Name	Structure	Medical CLASS	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Cyclophosphamide		Alkylating agent	Chiralcel OD	94/5/1-Hexane/1-PrOH/MeCN	R	S	1.21		(128)
			Chiral-AGP	99/1-Phosphate buffer 15 mM, pH = 4/MeCN	R	S	2.29		(129)
Ifosfamide		Alkylating agent	Chiralcel OD	80:20 Hexane/i-PrOH	R(+)	S(−)	1.49		(130)
			Chiralcel OD-H	70/30-Hexane/i-PrOH	R(+)	S(−)	1.57		(131)
			Chiral-AGP	99/1-Phosphate buffer 0.015M, pH = 4/MeCN	S	R	1.3	1.53	(132)
Trofosfamide		Alkylating agent	Chiralcel OD	90/10-Hexane/i-PrOH	R	S	1.1		(128)
Methotrexate		Antimetabolite	Chirobiotic T	100/0.2/0.1-MeOH/$MeCO_2H/Et_3N$	L	D	1.64		(133)
			Chirobiotic T	80/20-H_2O/MeOH			1.61	2.6	(133)
			Chirobiotic T	90/10-H_2O/MeCN			1.7		(133)
			Chiral-HSA	99/1-Phosphate buffer 50 mM, pH = 7.4/1-PrOH	L	D	1.31		(133)

Tegafur		Antimetabolite	Chirobiotic V	50/50-Hexane/i-PrOH			1.11		(134)
Aminoglutethimide		Hormone antagonist	Crownpak CR(+)	85/15-TEAA (0.1%) pH = 4/MeCN			2	0.8	(135)
			Cyclobond I	90/10 to 80/20-H_2O, TEAA (1%) pH = 4.1/MeCN			1.03	0.91	(136)
			Chirobiotic V	90/10-H_2O, TEAA buffer (1%) pH = 7/MeCN			1.15		(134)
			Chirobiotic V	90/10-H_2O, NH_4NO_3 18 mM, pH = 7/MeCN		1.19	0.68		(137)
			Chirobiotic V	95/5-TEAA (1%) pH = 7/MeCN			1.29	1.1	(138)
			Chiralcel OC	4/96-H_2O/EtOH	(−)	(+)	1.58		(139)
			Chiralcel OD	65/17.5/17.5-Hexane/i-PrOH/MeOH	R	S	1.46		(140)
			Chiralcel OD	60/40-Hexane/i-PrOH	S(−)	R(+)	1.51	8.87	(141)
			Chiralcel OD-R	MeOH	S(−)	R(+)	1.15		(142)
			Chiralcel OD-R	35/65-H_2O/MeOH	S(−)	R(+)	1.33	2.28	(142)
			Chiralcel OD-R	35/65-$NaClO_4$ buffer 0.1 N, pH = 3/MeOH	S(−)	R(+)	1.34	0.9	(142)
Aminoglutethimide		Hormone antagonist	Chiralcel OJ	50/50-Hexane/i-PrOH	S(−)	R(+)	3.74	10.34	(141)
			Chiralcel OJ	20/80-Hexane/EtOH	R(+)	S(−)	2.57	5.45	(143)
			Chiralcel OJ	50/50-MeOH/EtOH			2.67	9.5	(144)
			Exp B101	55/45-Hexane/i-PrOH			1.45	2.06	(145)
			Exp B101	50/50-H_2O/MeOH			2.2	3.22	(145)
			Exp B101	70/15/15-H_2O/MeOH/MeCN			1.56	1.3	(145)
			Exp B101	70/30-H_2O/MeCN			1.24	0.64	(145)
			Chiralcel OJ-R	70/30-H_2O/MeCN	R(+)	S(−)	1.9	4.3	(146)
			Chiralpak AD	50/50-MeOH/EtOH			2.98	6.7	(144)

(*continued*)

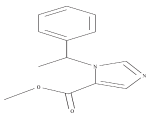
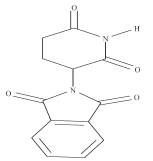
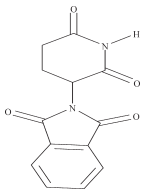
Table 4. Continued.

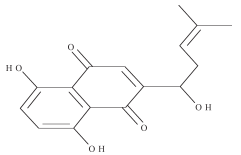
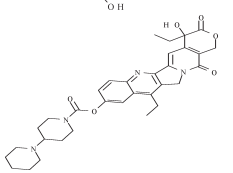
Drug Name	Structure	Medical CLASS	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			Chiralpak AD	MeOH	13	27			(144)
			Chiralpak AD	20/80-Hexane/MeOH	16	40			(144)
			Chiralpak AS	50/50-MeOH/EtOH			1.77	1.9	(144)
			Chiralpak AS	90/10-MeCN/i-PrOH			5.43	5.48	(144)
			Chiralpak AS	MeCN			3.14	6.34	(144)
			Chiralpak IA	MTBE				10.4	(147)
			Chiralpak IA	CH_2Cl_2	R(+)	S(−)	2.32	2.27	(148)
			Chiralpak IA	MeCN	R(+)	S(−)	2.21	1.88	(148)
			Chiralpak IB	MeCN	S(−)	R(+)	1.73	0.33	(148)
			Bioptic AV-1	Phosphate buffer 0.1M, pH = 6			1.3	1.86	(149)
			Chiral-AGP	$MeCO_2NH_4$ buffer 0.009M, pH = 5			1.5	1	(150)
			EnantioPac	Phosphate buffer pH = 7.5	R(+)	S(−)	1.38	1.08	(151)
			EnantioPac	99/1-Phosphate buffer pH = 7.5/i-PrOH	R(+)	S(−)	1.55	1.37	(151)
Bicalutamide		Hormone antagonist	Chirobiotic T	10/90-Hexane/i-PrOH	(+)	(−)	1.4	2.25	(152)
			Chirobiotic V	40/60-Hexane/i-PrOH	(−)	(+)	1.17	1.01	(152)
			Chirobiotic TAG	10/90-Hexane/i-PrOH	(+)	(−)	1.28	0.8	(152)
			Chirobiotic TAG	30/70-H_2O, TEAA (0.1%) TEAA/MeOH	(+)	(−)	1.68	1.2	(152)
			Chirobiotic TAG	10/90-Hexane/i-PrOH	(+)	(−)	1.28	0.8	(152)
			Chirobiotic VAG	10/90-Hexane/i-PrOH	(−)	(+)	1.13	1	(152)
			Chiralcel OD	90/10/1-Hexane/EtOH/ $C_3H_7NH_2$			1.24		(153)
			Chiralcel OD-H	90/10-Hexane/EtOH	S(+)	R(−)		1.56	(154)
			Chiralpak AD-H	75/25-Hexane/EtOH			3.15	17.11	(154)
			Chiralcel OD-H	95/5/0.1-Hexane/i-PrOH/ Et_2NH	(−)	(+)	1.04	0.85	(152)
			Chiralcel OD-H	90/10-Hexane/EtOH	(−)	(+)	1.11	1.2	(152)
			Chiral-AGP	92/8-Phosphate buffer 20 mM, pH = 7/EtOH	S 6	R 9.5			(155)

			Ultron ES-OVM	85/15-KH_2PO_4 buffer 20 mM, pH = 7/MeCN	S 6	R 9.2			(156)
Fadrozole		Hormone antagonist	Chiralcel OD	70/30-Hexane/i-PrOH	R(+)	S(−)	1.4		(157)
Lorglumide		Hormone antagonist	Ultron-ES-OVM	74/26-Phosphate buffer 0.01M, pH = 6.5/MeCN			2.6	5.2	(158)
Rogletimide		Hormone antagonist	Chirobiotic V	90/10-H_2O, TEAA buffer (1%) pH = 7/MeCN			1.2		(134)
			Chirobiotic V	90/10-H_2O, NH_4NO_3 18 mM, pH = 7/MeCN	S(−)	R(+)	1.26	1.1	(137)
			Chiralcel OD	65/35-Hexane/i-PrOH	S(−)	R(+)	1.34	0.96	(159)
			Chiralcel OD-R	75/25-H2O, NaClO4 0.3M, pH = 6.2/MeCN	R(+)	S(−)	1.6	3.9	(160)
			Chiralcel OJ-R	80/20-H_2O/MeCN	R(+)	S(−)	1.73	3.9	(146)
			Chiralcel OJ	65/35-Hexane/EtOH	R	S	1.85	5.33	(161)
			Chiralcel OJ-R	80/20-H_2O, $NaClO_4$ 0.25M, pH = 5.8/MeCN	R(+)	S(−)	1.62		(162)
			Bioptic AV-1	Phosphate buffer 0.1M, pH = 7.5			1.2	1.55	(149)

(*continued*)

Table 4. Continued.

Drug Name	Structure	Medical CLASS	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Metomidate		Immunosuppressive agent	Chiralcel OD	85/15-Hexane/i-PrOH			1.16	0.7	(163)
			Chiralpak AD	MeOH			1.56	3	(164)
Thalidomide		Immunosuppressive agent	(R,R) ULMO	70/30-Heptane/i-PrOH			1.1		(165)
			(S,S) Whelk-O1	63/7/0.1-H_2O/MeOH/$MeCO_2H$			1.1		(166)
			Chirobiotic V	65/35-H_2O, NH_4NO_3 18 mM, pH = 5.5/MeCN	R(+)	S(−)	1.78	1.29	(137)
			Chirobiotic V	50/50-MeOH/Dioxane			2.5		(167)
			Chirobiotic V	86/14-HCO_2NH_4 buffer 20 mM, pH = 5.4/MeCN	S 8.6	R 15			(168)
			Chiral Tribencel	MeOH	R(+)	S(−)	1.29		(169)
			Chiral Tribencel	75/25-MeOH/EtOH (99.5%)	R(+)	S(−)	1.28		(169)
			Chiralcel OB	MeOH	(−)	(+)	1.3		(170)
			Chiralcel OD	MeOH			1.13	0.4	(164)
			Chiralcel OJ	EtOH	R	S	1.57	3.5	(171)
			Chiralcel OJ	50/50-Hexane/EtOH	R(+)	S(−)	1.54	15.05	(172)
Thalidomide		Immunosuppressive agent	Exp B101	50/50-Hexane/i-PrOH			1.24	1.48	(144)
			Exp B101	50/50-H_2O/MeOH			1.2	0.85	(145)
			Exp B101	70/15/15/70-H_2O/MeOH/MeCN			1.13	0.51	(145)
			Chiralcel OJ-R	70/30-H_2O/MeCN	R(+)	S(−)	1.22	1.04	(146)
			Chiralcel OK	MeOH	(−)	(+)	1.5		(170)
			Chiralpak AD	MeCN			1.1		(164)
			Chiralpak AD	MeOH	S(−)	R(+)	3		(170)
			Chiralpak AD	85/15-EtOH/MeOH	S(−) 20	R(+) 26			(173)

			Chiralpak AD	80/4/-MeOH/EtOH/MeCN	S(−) 18	R(+) 28			(173)
			Chiralpak IA	CH_2Cl_2	R(+)	S(−)	1.81	2	(147)
			Chiralpak IA	MeCN	R(+)	S(−)	2	1	(147)
			Chiralpak IA	90/10-MTBE/Dioxane			1.65	8.83	(174)
			Chiralpak IA	90/10-Hexane/THF			1.28	4.55	(174)
			Chiralpak IA	95/5-MTBE/MeCN			1.37	4.16	(174)
			Bioptic AV-1	98/2-Phosphate buffer 0.1M, pH = 4/i-PrOH	S(−)	R(+)	1.4		(137)
			Chiral-AGP	99.7/0.3-$MeCO_2NH_4$ 50 mM, pH = 7/THF	R(+)	S(−)	1.63	2.41	(175)
			Chiral-AGP	95/5-Phosphate buffer 0.02M, pH = 4.6)/i-PrOH			1.12		(176)
			Ultron ES-OVM	95/5-Phosphate buffer 0.02M, pH = 4.6/EtOH			1.18		(166)
Shikonin		Phytogenic	Chiralcel OD	90/10-Hexane/i-PrOH	R	S	1.45	2	(177)
			Chiralpak AD	95/5-Hexane/i-PrOH	R 21.2	S 22.35			(178)
			Kromasil CHI-TBB	90/10-Hexane/i-PrOH	S 14.1	R 14.5			(179)
Irinotecan		Antineoplatic	Chiralpak AD	50/50-Hexane/i-PrOH	R 11.8	S 16.7			(180)

5. ANTIPARASITIC, INSECTICIDE DRUGS AND REPELLENTS

In this class of compounds, some racemic drugs possess veterinary and agrochemical applications (Figure 4). They are also used as ectoparasiticide and insecticide. The other properties include anticestodal, antinematodal, antitremotodal, antimalarial activity which constitute the anthelmintic and the antiprotozoal drug class (Table 5).

The Pirkle-type CSPs were successful in 1 separations of every 2. The polysaccharide and protein based CSPs are next. Pirkle CSPs were first because the molecular structure of many racemic drugs in this class contains a high number of sp^2 hybridized carbons forming aromatic combinations prone to π-π interaction, an important interaction in the Pirkle-type recognition mechanism.

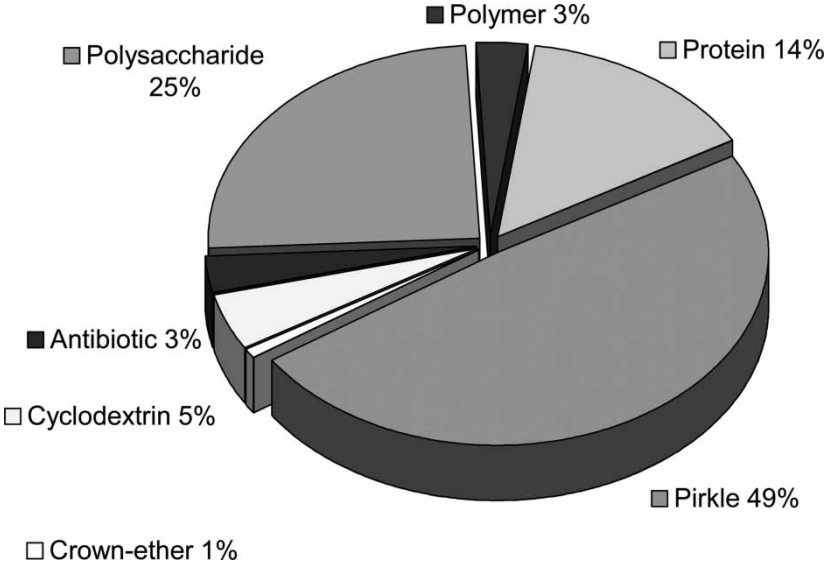
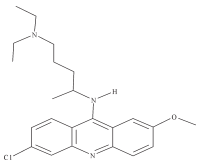
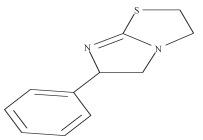
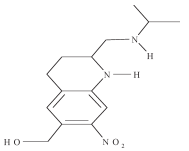


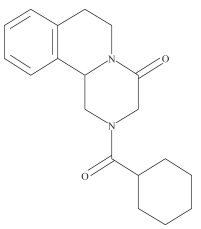
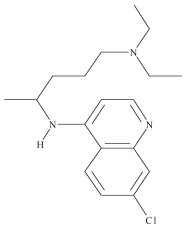
Figure 4. Chiral stationary phases able to separate the enantiomers of antiparasitic, insecticides and repellent and anthelmintic drugs.

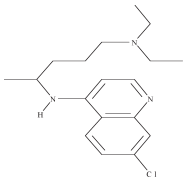
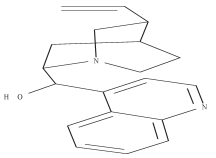
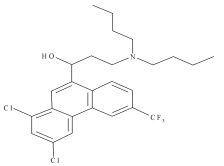
Table 5.

Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Quinacrine		Anticestodal	Chirex 3017	40/35/25-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.38		(181)
			Chirex 3020	55/35/10-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.1		(182)
			Chirex 3022	40/35/25-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.33		(182)
Levamisole		Antinematodal	Cyclobond I SN	70/30-TEAA buffer (1%) pH = 4.5/MeCN			1.2		(183)
			Chiral-CBH	95/5-NaH_2PO_4 buffer 10 mM, pH = 6-di-NaEDTA 50μM/i-PrOH			1.78	3.29	(184)
Oxamniquine		Antitrematodal	Chiral-AGP	99.2/0.86-Sodium phosphate 10 mM, pH = 5.8/MeCN	(−)	(+)	1.8	3.45	(185)
				97/3-Sodium phosphate 10 mM, pH = 7/MeOH			1.38		(185)
			EnantioPac	99.5/0.5-Phosphate buffer 10 mM, pH = 5.85, NaCl (1%)/i-PrOH	(−)	(+)	2	2	(186)

(*continued*)

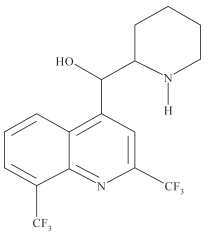
Table 5. Continued.

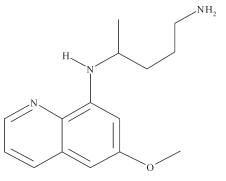
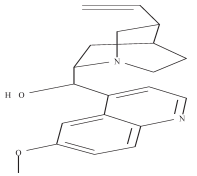
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Praziquantel		Antitrematodal	(R,R) Whelk-O2	80/20-Hexane/i-PrOH			1.48		(194)
			CTA-1	EtOH			5.58		(187)
			MCTA	MeOH	(−)	(+)	2.92		(188)
			Chiralcel OD	72/28-Hexane/i-PrOH	R(−)	S(+)	1.33	1.57	(191)
			Chiralcel OD	65/25/10/0.5-Hexane/EtOH/ i-PrOH/MeCN				1.5	(192)
			Chiralcel OD-R	60/40-$NaClO_4$ 0.25M, pH=4 ($HClO_4$)/MeCN	24.5	26			(193)
			Chiralcel OD-H	85/15-Hexane/EtOH			1.35		(194)
			Chiralcel OJ	90/10-Hexane/EtOH	R(−) 14.9	S(+) 16			(189)
			Chiralcel OJ-R	66/34-$NaClO_4$ 0.1M/MeCN	R(−)	S(+)	1.29	2.7	(190)
			Chiralpak AD	90/10-Hexane/i-PrOH	S(+)	R(−)	1.18		(188)
			Chiralpak AD-H	80/20-Hexane/i-PrOH			1.13		(194)
Chloroquine		Antimalarial	Chirex 3014	55/35/10-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.22		(182)
			Chirex 3018	40/35/25-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA			1.2		(182)
			Chirex 3020	55/35/10-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.21		(182)
			Chirex 3022	40/35/25-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA			1.13		(182)
			Chirobiotic T	100/0.05/0.15-MeOH/ $MeCO_2H/Et_3N$			1.06	0.75	(199)
			Chirobiotic V	100/0.05/0.15-MeOH/ $MeCO_2H/Et_3N$			1.13	1.3	(199)
			Chirobiotic V	80/20-TEAA (0.1%) pH = 4.1/MeCN			1.05	0.6	(199)
			Chirobiotic V	10/90-MeOH, $CF_3CO_2NH_4$ (0.1%)/H_2O, HCO_2H (0.1%)			2.53	1.92	(200)

			Chiral-AGP	85/15-Phosphate buffer 0.04 M, pH = 7/MeCN, DMAO, 1 mM	(−)	(+)	1.08		(197)
			Chiral-AGP	85/15-Phosphate buffer 0.04M, pH = 7/MeCN	(−)	(+)	1.01		(197)
			EnantioPac	100/1,6/5,5/0.1-H_2O/NaH_2PO_4 1M, pH=7 (NaOH 1M)/ i-PrOH/DMAO	(−)	(+)	1.43		(195)
Chloroquine		Antimalarial	EnantioPac	96/4-Phosphate buffer 10 mM, NaCl 0.1M, pH = 6.75/i-PrOH				1.15	(196)
			Progel-TSK Heparin-5PW	Phosphate buffer 20 mM, pH = 6	(+)	(−)	1.18	0.87	(198)
			Progel-TSK Heparin-5PW	Ammonium acetate buffer 10 mM, pH = 6	(+)	(−)	1.14	0.75	(198)
			Progel-TSK Heparin-5PW	99/1-Phosphate buffer 10 mM, pH = 6/i-PrOH	(+)	(−)	1.15	0.7	(198)
Cinchonine		Antimalarial	Cyclobond I	10/90-MeCN/H_2O-TEAA (1%) pH = 4.1	Cincho nidine	Cinch onine	1.31	1.86	(201)
Halofantrine		Antimalarial	l-Leucine covalent	90/5/5-Hexane/$CHCl_3$/i-PrOH-Et_3N (1%)	(+)	(−)	1.3		(202)
			Chiralcel OD	90/10/0.1-Hexane/i-PrOH/Et_2NH	(+)	(−)	1.27	1.33	(204)
			Chiralpak AD	93/4.5/2.5/0.1-Hexane/EtOH/2-Butanol/Et_2NH	(+)	(−)	1.22	1.6	(204)
			Ultron-ES-OVM	55/45-Phosphate buffer 13 mM, pH = 7/MeCN			3	9	(203)

(*continued*)

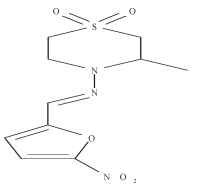
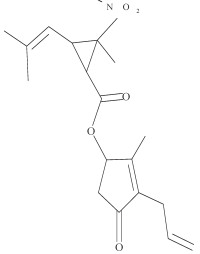
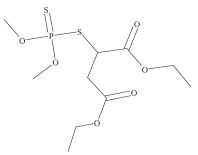
Table 5. Continued.

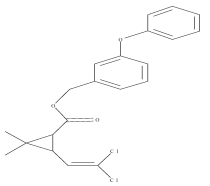
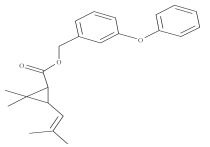
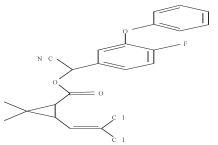
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Mefloquine		Antimalarial	SNU5	82/4/14/0.005-Hexane/i-PrOH/MeOH/Et_3N	(+)	(−)	1.45	1.45	(205)
			SNU5	80/20/10-Hexane/i-PrOH/MeCN	(+)	(−)	1.35	1.05	(205)
			SNU5	80/20/10-Hexane/i-PrOH/MeOH	(+)	(−)	1.37	1.2	(205)
			SNU5	80/20-Hexane/i-PrOH	(+)	(−)	1.25	0.65	(205)
			(S)-Naphthylurea	80/4/14-Hexane/i-PrOH/MeOH	(+)	(−)	1.29	1	(206)
			Chiralcel OD-H	95/5/0.05-Hexane/i-PrOH/TFA			1.98		(208)
			Chiralpak AS	95/5/0.1-Hexane/i-PrOH/TFA			2.57		(208)
			Chiralpak AD	95/5/0.1-Isohexane/1-PrOH/Et_2NH			5.51		(209)
			Kromasil CHI-DMB	95/5/0.1/0.05-Hexane/i-PrOH/TFA/Et_3N			1.71		(210)
			Kromasil CHI-DMB	95/5/0.1-Hexane/i-PrOH/TFA			1.38		(210)
			Kromasil CHI-I	90/10/0.2/0.1-Heptane/i-PrOH/HCO_2H/Et_3N			1.32		(211)
			Chiral-AGP	85/15-Phosphate buffer 0.04M, pH = 5/MeCN, DMAO 2 mM	(−)	(+)	1.5		(197)
			Chiral-AGP	90/10-Sodium phosphate buffer 0.05M, pH = 4.85/1-PrOH	11S,2'R	11R,2'S	1.5		(207)
			Chiral-AGP	93/7-Phosphate buffer 10 mM, pH = 4/MeCN			2.16	2.37	(208)

Primaquine		Antimalarial	Chirex 3014	55/35/10-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.18		(182)
			Chirex 3020	58/35/7-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.16		(182)
			Crownpak CR(+)	85/15-H_2O, $HClO_4$ 10 mM/MeOH			1.14	0.9	(212)
			Chiralpak AD	95/5/0.3-Hexane/i-PrOH/TFA			1.35	1.91	(208)
			Chiralcel OD-H	90/10/0.1-Hexane/EtOH/TFA			1.78	2.86	(208)
			Chiralcel OD-R	70/30-$NaClO_4$ 0.1M, pH = 3/MeCN			1.41	1.16	(208)
			Chiral-AGP	95/5-Phosphate buffer 50 mM, pH = 7/1-PrOH			1.12		(208)
			Ultron ES-OVM	92/8-Phosphate buffer 50 mM, pH = 6/MeCN			1.68	5.18	(208)
			Ultron ES-OVM	92/8-Phosphate buffer 50 mM, pH = 6/EtOH			1.62	4.57	(208)
Quinine		Antimalarial	Cyclobond I	90/10-H_2O, TEAA (1%) pH = 4.1/MeCN	Quinine	Quinidine	1.21	1.76	(201)

(*continued*)

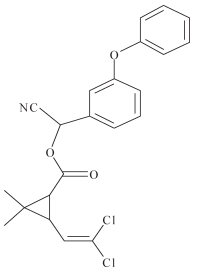
Table 5. Continued.

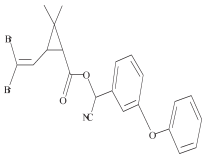
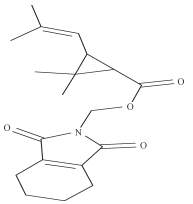
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Nifurtimox		Antiprotozoal	Chiralcel OD	MeOH			1.08		(213)
			Chiralcel OJ	MeOH			1.47	1	(213)
			Chiralpak AD	MeOH			1.22	1.5	(213)
			Chiralpak AD	MeCN			2.2	1.2	(213)
Trans-Allethrin		Ectoparasiticide	Pirkle 1A	Hexane/i-PrOH (0.1%)	S,1-R	R,1-R		1	(214)
Cis-Allethrin			Sumichiral OA-4600	500/30/0.15-Hexane/CH_2Cl-CH_2Cl/EtOH	α-S,R	α-R,S	1.29	1	(215)
Cis-Allethrin			Sumichiral OA-4600	500/30/0.15-Hexane/CH_2Cl-CH_2Cl/EtOH	α-S,S	α-R,R	1.13	1	(215)
Trans-Allethrin			Sumichiral OA-4600	500/30/0.15-Hexane/CH_2Cl-CH_2Cl/EtOH	α-S,R	α-R,S	1.28	1	(215)
Trans-Allethrin			Sumichiral OA-4600	500/30/0.15-Hexane/CH_2Cl-CH_2Cl/EtOH	α-S,S	α-R,R	1.16	1	(215)
Trans-Allethrin			Cyclobond I	72:28-H_2O/MeCN	1-R,R	1-S,S	1.19	1.58	(216)
Trans-Allethrin			Cyclobond I	72:28-H_2O/MeCN	1-R,S	1-S,R	1.14	0.86	(216)
Cis-Allethrin			Chiralcel OJ	99.3/0.7-Hexane/i-PrOH	1S,3R-αS(+)	1R,3S-αR(−)	1.44		(217)
Cis-Allethrin			Chiralcel OJ	99.3/0.7-Hexane/2-PrOH	1R,3S-αS(+)	1S,3R-αR(−)	2.02		(217)
Trans-Allethrin			Chiralcel OJ	90/10-Hexane/MTBE	1S,3S-αS(+)	1R,3R-αR(−)	1.52		(217)
Trans-Allethrin			Chiralcel OJ	90/10-Hexane/MTBE	1S,3S-αR(−)	1R,3R-αS(+)	2.97		(217)
Malathion		Ectoparasiticide	Chirex 3010	98/2-Hexane/i-PrOH	2.73	3			(218)
			Chiralcel OJ	90/9.05/0.47/0.48-Hexane/EtOH/MeOH/i-PrOH	(+)	(−)	1.34	4.11	(219)
			Chiralcel OD-H	250/1-Hexane/i-PrOH	R	S	1.26	2.63	(220)

Cis-Permethrin		Ectoparasiticide	Pirkle 1A	90/10-Pentane/CH_2Cl_2			0.5	(221)
Trans-Permethrin			Pirkle 1A	90/10-Pentane/CH_2Cl_2			0.2	(221)
Cis-Permethrin			(S,S)-Whelk-O1	99.8/0.2-Hexane/i-PrOH		1.11		(222)
Trans-Permethrin			(S,S)-Whelk-O1	99.8/0.2-Hexane/i-PrOH		1.24		(222)
Cis-Permethrin			Chirex 3005	99.75/0.25-Hexane/i-PrOH	9.02	9.52		(218)
Cis-Permethrin			Sumichiral OA-2500I	500/1-Hexane/CH_2Cl-CH_2Cl	1-R	1-S	1.13	(215)
Trans-Permethrin			Sumichiral OA-2500I	500/1-Hexane/CH_2Cl-CH_2Cl	1-R	1-S	1.04	(215)
Permethrin (cis, trans)			Chiralcel OD-R	90/10-H_2O/MeOH			1.06	0.55	(223)
Permethrin (cis, trans)			Chiralcel OJ	95/5-Hexane/i-PrOH			1.58	1.94	(223)
Cis-Phenothrin			Sumichiral OA-2000	500/1-Hexane/CH_2Cl-CH_2Cl	D	L	1.1	1	(224)
Trans-Phenothrin		Ectoparasiticide	Sumichiral OA-2000	500/1-Hexane/CH_2Cl-CH_2Cl	D	L	1.07	1	(224)
Cis-Phenothrin			Sumichiral OA-2500I	500/1-Hexane/CH_2Cl-CH_2Cl	1-R	1-S	1.09	1	(215)
Trans-Phenothrin			Sumichiral OA-2500I	500/1-Hexane/CH_2Cl-CH_2Cl	1-R	1-S	1.06	0.8	(215)
Cis-Cyfluthrin		Insecticide	Pirkle 1A ionic	Hexane/i-PrOH (0.1%)	R,R,R	S,S,S	1.12	1	(225)
Trans-Cyfluthrin			Pirkle 1A ionic	Hexane/i-PrOH (0.1%)	1-R,3-S,α-R	1-S,3-R,α-S	1.11	1	(225)
Cis-Cyfluthrin			Nucleosil chiral 2	Hexane/i-PrOH (0.05%)/TFA (0.05%)	α-R,R	α-S,S	1.06	0.65	(217)
Cis-Cyfluthrin			Nucleosil chiral 2	Hexane/i-PrOH (0.05%)/TFA (0.05%)	α-R,S	α-S,R	1.02	0.17	(217)
Trans-Cyfluthrin			Nucleosil chiral 2	Hexane/i-PrOH (0.05%)/TFA (0.05%)	α-R,R	α-S,S	1.03	0.25	(217)

(*continued*)

Table 5. Continued.

Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Cis-Cypermethrin		Insecticide	Pirkle 1A	Hexane/i-PrOH (0.2%)	RRR	SSS		1	(226)
Trans-Cypermethrin		Insecticide	Pirkle 1A	Hexane/i-PrOH (0.2%)	α-R,1R	α-S,1S		1	(226)
Cis-Cypermethrin			Pirkle 1A ionic	Hexane/i-PrOH (0.1%)	R,R,R	S,S,S	1.09	1	(225)
Cis-Cypermethrin			Pirkle 1A ionic	Hexane/i-PrOH (0.1%)	1-S,3-S,α-R	1-R,3-R, α-S	1.03		(225)
Trans-Cypermethrin			Pirkle 1A ionic	Hexane/i-PrOH (0.1%)	1-R,3-S,α-R	1-S,3-R, α-S	1.09	1	(225)
Cis-Cypermethrin			Sumichiral OA-4600	500/10/0.05-Hexane/CH_2Cl-CH_2Cl/EtOH	α-R,R	α-S,S	1.25	1	(215)
Cis-Cypermethrin			Sumichiral OA-4600	500/10/0.05-Hexane/CH_2Cl-CH_2Cl/EtOH	α-R,S	α-S,S	1.06	0.7	(215)
Trans-Cypermethrin			Sumichiral OA-4600	500/10/0.05-Hexane/CH_2Cl-CH_2Cl/EtOH	α-R,R	α-S,S	1.22	1	(215)
Trans-Cypermethrin			Sumichiral OA-4600	500/10/0.05-Hexane/CH_2Cl-CH_2Cl/EtOH	α-R,S	α-S,R	1.09	1	(215)
Cis-Cypermethrin			Sumichiral OA-4700	500/10/0.05-Hexane/CH_2Cl-CH_2Cl/EtOH	α-R,R	α-S,S	1.06		(215)
Cis-Cypermethrin			Sumichiral OA-4700	500/10/0.05-Hexane/CH_2Cl-CH_2Cl/EtOH	α-R,S	α-S,S	1.04		(215)
Trans-Cypermethrin			Sumichiral OA-4700	500/10/0.05-Hexane/CH_2Cl-CH_2Cl/EtOH	α-R,R	α-S,S	1.05		(215)
Trans-Cypermethrin			Sumichiral OA-4700	500/10/0.05-Hexane/CH_2Cl-CH_2Cl/EtOH	α-R,S	α-S,R	1.03		(215)
Cis-Cypermethrin			Nucleosil chiral 2	Hexane/i-PrOH (0.05%)/TFA (0.05%)	α-R,R	α-S,S	1.05	0.59	(217)
Cis-Cypermethrin			Nucleosil chiral 2	Hexane/i-PrOH (0.05%)/TFA (0.05%)	α-R,S	α-S,R	1.03	0.36	(217)
Trans-Cypermethrin			Nucleosil chiral 2	Hexane/i-PrOH (0.05%)/TFA (0.05%)	α-R,R	α-S,S	1.02	0.23	(217)
Cypermethrin			ChiraDex	45/55-H_2O, $Et_3NH_4SO_4$ 150 mM, pH = 3.5/MeOH	13.5	18			(227)

Decamethrin		Insecticide	Pirkle 1Ac	Hexane/i-PrOH (0.1%)	α-R,1-R	α-S,1-R		1	(226)
			Pirkle 1A ionic	Hexane/i-PrOH (0.1%)	R,R,R	RRS	1.04		(225)
			Chiralcel OD-R	85/15-H_2O/EtOH			1.13	1.39	(223)
			Chiralpak OT(+)	99/1-MeOH/$MeCO_2H$				1	(228)
Tetramethrin		Insecticide	(S,S)-Whelk-O1	98/2-Hexane/i-PrOH			1.12		(222)
Cis-Tetramethrin			Sumichiral OA-2000	200/200/1-Hexane/CH_2Cl-CH_2Cl/EtOH	D	L	1.08	1	(224)
Trans-Tetramethrin			Sumichiral OA-2000	200/200/1-Hexane/CH_2Cl-CH_2Cl/EtOH	D	L	1.06	1	(224)
Cis-Tetramethrin			Sumichiral OA-2500I	500/30/0.15-Hexane/CH_2Cl-CH_2Cl/EtOH	1-R	1-S	1.08		(215)
Trans-Tetramethrin			Sumichiral OA-2500I	500/30/0.15-Hexane/CH_2Cl-CH_2Cl/EtOH	1-R	1-S	1.03		(215)

6. BLOOD AND BLOOD-FORMING ORGANS

The anticoagulant drug acenocoumarol and warfarin are two of the easiest enantiomeric pairs to separate. Warfarin and coumachlor, another similar coumarin derivative, are used as test molecules with most new CSPs. Coumachlor is a powerful anticoagulant with strongly delayed action. It is never used in human treatment but only as a rodenticide. Polysaccharide CSPs produced the highest enantioresolution factors so they are the CSP listed in the table. However almost any CSP is able to resolve fully these anticoagulant coumarins (Figure 5). This is because the 4 substituents on the asymmetric central carbon are very different: they are (1) the smallest hydrogen atom, (2) a dipolar acetyl group, (3) a benzene ring either nitro (acenocoumarol) or chloro (coumachlor) substituted or non substituted (warfarin) and (4) a π-electron rich hydroxycoumaryl group. (Table 6).

It is important to realize that most often a successful separation is considered as satisfying. It means that if a particular CSP is successful in separating a given enantiomeric pair, all other CSPs may not be tried when they could be successful as well. This observation is true for all classes of compounds.

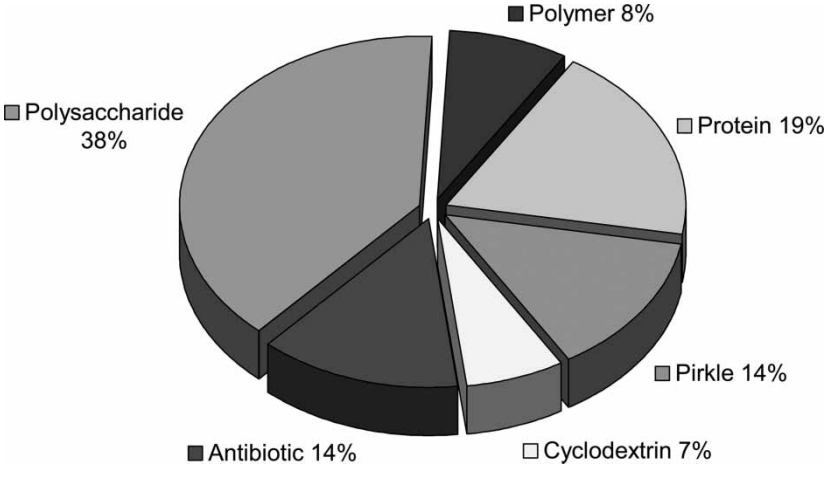
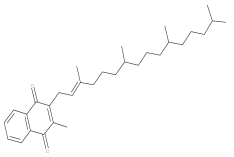
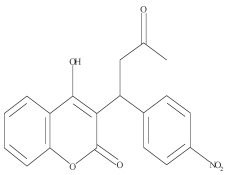


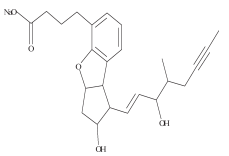
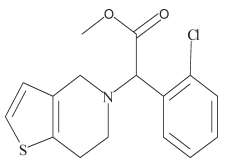
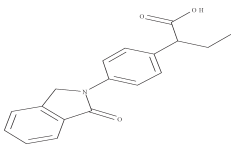
Figure 5. Chiral stationary phases able to separate the enantiomers of blood and blood-forming organ drugs.

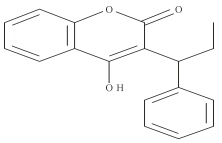
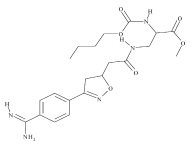
Table 6.

Drug NAME	Structure	Medical CLASS	CSP Trade NAME	Mobile Phase	First	Second	α	Rs	Ref
Phylloquinone K1		Antihemorrhagic	Chiralpak OT(+)	1/9-H_2O/MeCN	7-S,11-S	7-R,11-R		1	(229)
			Chiralpak OT(+)	1/9-H_2O/MeCN	7-R,11-S	7-S,11-R		1	(229)
			Chiralpak OT(+)	1/9-H_2O/MeCN	7-S,11-S	7-R,11-R		1	(229)
			Chiralpak OT(+)	1/9-H_2O/MeCN	7-R,11-S	7-S,11-R		1	(229)
Acenocoumarol		Antithrombotic	Chiralcel OJ-R	Gradient: 95/5–90/10/0.5 and 60/40/0.5-Hexane/EtOH/ $MeCO_2H$ to 50/50 (20 min). then 0/100 (5 min)	R 24.5	S 30			(230)
			Chiralcel OD-RH	60/40-Phosphate buffer 50 mM, pH = 2/MeCN				3.94	(231)
			Chiralcel OD-RH	60/40-Phosphate buffer 50 mM, pH = 2, $NaClO_4$ 250 mM/MeCN				3.91	(231)
			Chiralcel OJ-R	60/40-Phosphate buffer 50 mM, pH = 2/MeCN				1.37	(231)
				60/40-Phosphate buffer 50 mM, pH = 2, $NaClO_4$ 250 mM/MeCN				1.41	(231)
			Chiralpak AD	70/30/0.1-Hexane/i-PrOH/ TFA	6.3	16.5			(232)
			Chiralpak AD-RH	60/40-Phosphate buffer 50 mM, pH = 5.5/MeCN				1.4	(231)
			Chiral-AGP	90/10-Phosphate buffer 0.01M, pH = 7/i-PrOH	R	S	1.28		(233)

(*continued*)

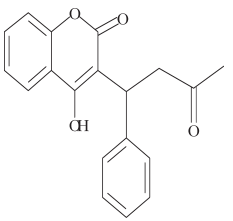
Table 6. Continued.

Drug NAME	Structure	Medical CLASS	CSP Trade NAME	Mobile Phase	First	Second	α	Rs	Ref
			Chiral-AGP	90/10-Phosphate buffer 0.01M, pH = 7/MeCN	R	S	1.23		(233)
			Chiral-AGP	95/5-Phosphate buffer 0.01M, pH = 6.6, DMAO (0.1%)/i-PrOH	R(+)	S(−)	1.15	1.56	(234)
Beraprost		Antithrombotic	Chiral-AGP	98.5/0.5/1.0-Na_2HPO_4 buffer 20 mM, pH = 7/MeCN/i-PrOH	1	d	2.99	6.5	(235)
Clopidogrel		Antithrombotic	Nucleodex beta-PM	35/65-TEAA buffer (0.1%) pH = 4/MeOH	S(+) 19.1	R(−) 22.1			(236)
Indobufen		Antithrombotic	Chiralcel OD	60/40/1-Hexane/i-PrOH/HCO_2H	R(−)	S(+)	1.33	1	(237)
			EnantioPac	Phosphate buffer 0.02M pH = 7/Propylene glycol 0.25M, NaCl 0.1M	R(−) 28.9	S(+) 32.9			(237)

Phenprocoumon			(S,S)-Whelk-O1	Gradient: 95/5–90/10/0.5 and 60/40/0.5-Hexane/EtOH/$MeCO_2H$ to 50/50 (20 min). then 0/100 (5 min)	S 9.5	R 12			(230)
		Antithrombotic	Nucleosil chiral 2	100/25/0.1-Heptane/Dioxane/TFA	S	R	1.06		(238)
			Cyclobond I	82/8/10-TEAA buffer (0.1%) pH = 7.05/MeOH/MeCN	S(−)	R(+)	1.09	0.72	(239)
Phenprocoumon		Antithrombotic	Chiral-AGP	90/10-Phosphate buffer 0.01M, pH = 7.0/i-PrOH	S	R	1.95		(233)
Roxifiban		Antithrombotic	Chiral-AGP	95/5-Sodium phosphate 10 mM, pH = 7/i-PrOH	SR 12	RS 21			(240)
			Chiral-AGP	97/3-Sodium phosphate 20 mM, pH = 6/MeCN	RR 19.2	SS 26			(240)
Warfarin, sodium salt			(R,R) ULMO	70/30-Heptane/i-PrOH/TFA (0.05%)			1.35		(241)

(*continued*)

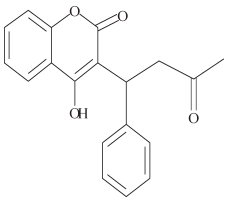
Table 6. Continued.

Drug NAME	Structure	Medical CLASS	CSP Trade NAME	Mobile Phase	First	Second	α	Rs	Ref
Warfarin		Antithrombotic	(R,R) Whelk-O1	60/40/0.5/-H_2O/MeCN/$MeCO_2H$	S 13.6	R 15.8			(242)
			(R,R) Whelk-O1	30/70/0.5-H_2O/EtOH/$MeCO_2H$			1.66		(243)
			(S,S) Whelk-O1	80/20/0.5-Hexane/i-PrOH/$MeCO_2H$			2		(244)
			(R,R) Whelk-O2	80/20-Hexane/i-PrOH			1.97		(245)
			Chirex 3022	85/10/5-Hexane/CH_2Cl-CH_2Cl/EtOH-TFA (20:1)			1.09	0.78	(246)
		Nucleosil chiral 2		100/30/0.1-Heptane/Dioxane/TFA	S	R	1.06		(238)
		Cyclobond I	100/3/2.5-MeCN/$MeCO_2H$/Et_3N	S 8.4	R 9.8			(247)	
			Cyclobond I 2000	MeCN/$MeCO_2H$ (0.3%)/Et_3N (0.2%)			1.14	0.59	(246)
			Cyclobond RSP	70/30-$MeCO_2Na$, $MeCO_2H$ 0.1M, pH = 4/MeOH			1.07	0.7	(248)
			Chirobiotic T	40/60-H_2O/MeOH			1.33	1.5	(249)
			Chirobiotic T	40/60-H_2O, TEAA buffer pH = 4.1/MeOH			1.2	1.3	(249)
			Chirobiotic T	40/60-H_2O, $MeCO_2H$ buffer pH = 3.8/MeOH			1.28	1.9	(249)
			Chirobiotic T	40/60-H_2O, $MeCO_2H$ pH = 3.8/MeOH			1.3	1.3	(250)
			Chirobiotic T	40/60-H_2O, TEAA buffer 18 mM, pH = 4.1 $Cu(MeCO2)_2$ 5 mM/MeOH			1.1	0.6	(251)
			Chirobiotic V	80/20-TEAA buffer (1%) pH = 7/MeCN			1.93	4.7	(252)

Chirobiotic V	25.2/44.8/30 (mol%)-H_2O/MeOH/CHF_3				0.87	(253)
Chirobiotic V	36/64 (mol%)-H_2O/MeOH				0.63	(253)
Chirobiotic TAG	60/40-H_2O, TEAA buffer (1%) pH = 4.1 ($MeCO_2H$)/MeOH			1.32	2.51	(254)
Chirobiotic MTAG	60/40-H_2O, TEAA buffer (1%) pH = 4.1 ($MeCO_2H$)/MeOH			1.36	1.9	(254)
Chiralcel OC	9/1-Hexane/i-PrOH			1.69		(255)
Chiralcel OC	86/11/3-Hexane/1-PrOH/MeCN	R (+)	S (−)	1.4	1	(256)
Chiralcel OD	80/20/1-Hexane/i-PrOH/HCO_2H	(−)	(+)	2.65		(257)
Chiralcel OD	60/40-$NaClO_4$ 0.25M/MeCN			1.6	1.91	(258)
Chiralcel OD	85/15-Hexane/i-PrOH			2.49		(245)
Chiralcel OD-H	50/50-Heptane/EtOH, CF_3-CO_2NH_4 0.1 mM			3.36		(259)
Chiralcel OD-H	50/50-Heptane/EtOH			1.67		(259)
Chiralcel OD-R	60/40-$NaClO_4$ 0.25M, pH = 4.0 ($HClO_4$)	22.9	27.5			(260)
Chiralcel OD-RH	60/40-Phosphate buffer 50 mM, pH = 2/MeCN				8.64	(231)
Chiralcel OD-RH	60/40-Phosphate Buffer 50 mM, pH = 2, $NaClO_4$ 250 mM/MeCN				8.49	(231)
Chiralcel OD-RH	60/40-Borate buffer 20 mM, pH = 9/MeCN				0.91	(231)
Chiralcel OJ-R	60/40-Phosphate buffer 50 mM, pH = 2, $NaClO_4$ 250 mM/MeCN				3.55	(231)
Chiralcel OJ-R	60/40-Phosphate buffer 50 mM, pH = 2/MeCN				3.51	(231)
Chiralcel OJ-R	60/40-Borate buffer 20 mM, pH = 9/MeCN				1.16	(231)

(*continued*)

Table 6. Continued.

Drug NAME	Structure	Medical CLASS	CSP Trade NAME	Mobile Phase	First	Second	α	Rs	Ref
			Chiralpak AD	70/30/0.1-Hexane/i-PrOH/TFA	4.3	8			(232)
			Chiralpak AD	80/20-Hexane/i-PrOH			3.94		(245)
			Chiralpak AD	100/0.1-EtOH/TFA	(+) 3.6	(−) 4.8			(261)
Warfarin		Antithrombotic	Chiralpak AD-H	90/10-Heptane/i-PrOH, $CF_3CO_2NH_4$ 0.1 mM			4.61		(259)
			Chiralpak AD-H	90/10-Heptane/i-PrOH			4.56		(259)
			Chiralpak AD-RH	60/40-Phosphate buffer 50 mM, pH = 2, $NaClO_4$ 250 mM/MeCN				2.51	(231)
			Chiralpak AD-RH	60/40-Phosphate buffer 50 mM, pH = 2/MeCN				2.67	(231)
			Chiralpak AD-RH	60/40-Borate buffer 20 mM, pH = 9/MeCN				0.95	(231)
			Chiralpak OT(+)	MeOH			2.47	1.47	(262)
			(R,R)-P-CAP	90/10:0.1-Heptane/i-PrOH/TFA			1.13	1.58	(263)
			Chiral-AGP	90/10-Phosphate buffer 0.01M, pH = 7/MeCN	R (+)	S (−)	1.51	1	(233)
			Chiral-AGP	85/15-Phosphate buffer 0.035 mM, pH = 7/i-PrOH	S (−)	R (+)	1.69	1	(264)
			BSA-300-15sp	92/8-Phosphate buffer 50 mM, pH = 6.8/i-PrOH			1.63	1.13	(265)
			Resolvosil BSA-7	Phosphate buffer 50 mM, pH = 6.8/1-PrOH (3%)				1	(266)
			Resolvosil BSA-10	97/3-Na_2HPO_4 0.2M, pH = 7.5/1-PrOH, CCl_3CO_2H 3 mM	S	R	1.19	1.05	(267)
			Ultron-ES-OVM	Phosphate buffer 1.25–25 mM, pH = 5–7/MeCN or EtOH			1.3	1.7	(268)

7. CARDIOVASCULAR SYSTEM

The clinical drugs acting on the cardiovascular system represent one of the most important families in number of different classes and in number of drugs in each class. This family of agents consisted in 14 subclasses, namely: Angiotensin Converting Enzyme (ACE) inhibitors, angiotensin II antagonists, ant-iadregenic agents, antiarrhythmics, alpha-blockers, beta-blockers, calcium channel blockers, cardiac stimulants, high-cei-ling diuretics, low-ceiling diuretics, peripheral vasodilator diuretics, thiazide diuretics, serum lipid-reducing agents and vasodilators. Some classes such as the beta-adrenergic blocker enantiomers have been intensively studied in chiral separations (Figure 6).

One successful chiral separation over three was performed with a polysaccharide CSP. The Pirkle-type, protein, cyclodextrin and macrocyclic glycopeptide-based CSPs were the next four almost equally successful CSPs (Table 7).

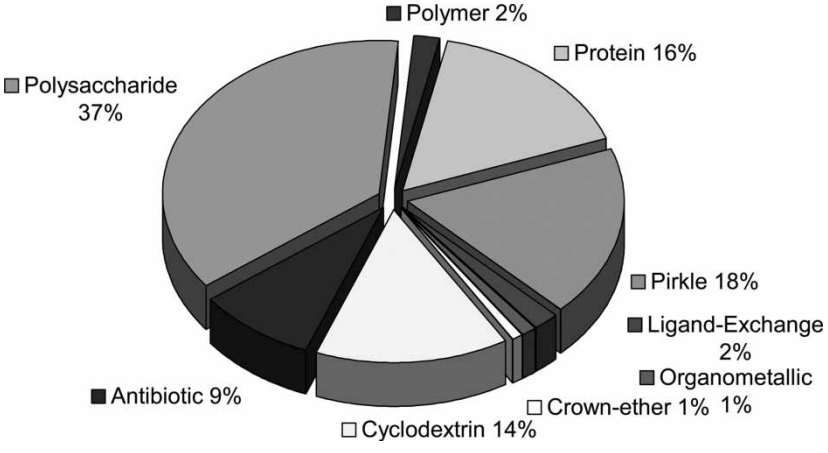
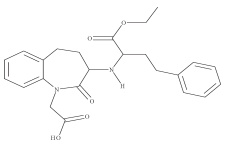
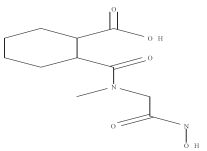
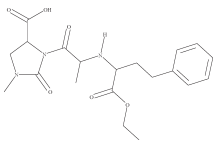
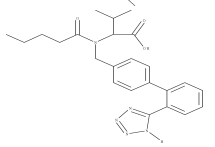
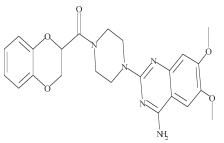
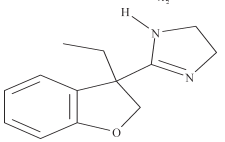
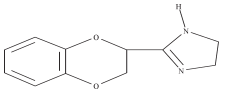


Figure 6. Chiral stationary phases able to separate the enantiomers of blood and blood-forming organ drugs.

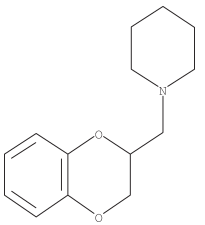
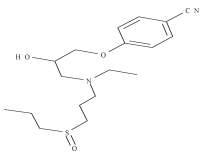
Table 7.

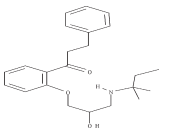
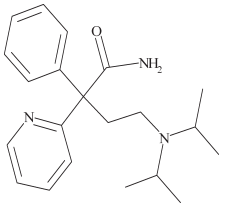
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
S,S/R,R-Benazapril		Ace Inhibitor	Chiral-AGP	85/15-Phosphate buffer 0.06M, pH = 4/EtOH	S,S	R,R	3.5	3.83	(269)
S,S/R,R-Benazapril			Chiral-AGP	87.5/12.5-Phosphate buffer 0.06M, pH = 4/MeCN	S,S	R,R	1.6	1.93	(269)
S,R/R,S-Benazapril			Chiral-AGP	85/15-Phosphate buffer 0.06M, pH = 4/EtOH			2.64	3.79	(269)
S,R/R,S-Benazapril			Chiral-AGP	87.5/12.5-Phosphate buffer 0.06M, pH = 4/MeCN			2	2.87	(269)
Idrapril		Ace Inhibitor	Chiral-AGP	97.5/2.5-Phosphate buffer 10 mM, pH = 3/MeOH	1S,2R	1R,2S	2.02	7.48	(270)
Idrapril			Chiral-AGP	97.5/2.5-Phosphate buffer 10 mM, pH = 3/MeCN			1.67	4.84	(270)
Idrapril stereomer			Chiral-AGP	97.5/2.5-Phosphate buffer 10 mM, pH = 3/MeOH			3.07	6.45	(270)
Idrapril stereomer			Chiral-AGP	97.5/2.5-Phosphate buffer 10 mM, pH = 3/MeCN			2.4	4.93	(270)
Imidapril		Ace Inhibitor	Chiralpak (WH)	3/1-H_2O, CuSO4 3 mM/ MeCN	R,S,R 15	S,R,S 22			(271)
			Chiralpak (WH)	3/1-H_2O, CuSO4 3 mM/ MeCN	S,S,R 10	R,R,S 12.5			(271)
Valsartan		Angiotensin II	Chiral AGP	98/2-Phosphate buffer pH = 7/ i-PrOH	R	S	1.82		(272)

Doxazosin		Antiadregenic agent	Chiral-AGP	87/13-Phosphate buffer 0.035M, pH = 7.25/MeCN	R	S		1	(273)
			TrichSep-100	Acetate buffer 0.05M, pH = 6.5/i-PrOH 0.065M			2.19	2.93	(274)
Efaroxan		Antiadregenic agent	Cyclobond I	95/5-TEAA buffer (1%) pH = 4.1/MeOH			1.2	1.1	(275)
Idazoxan		Antiadregenic agent	Cyclobond I SP	TEAA buffer (1%) pH = 4.1			1.07	0.55	(276)
			Chirobiotic V	80/20-TEAA buffer (1%) pH = 4/MeCN			1.06	0.7	(277)

(*continued*)

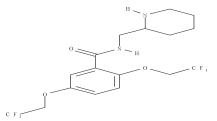
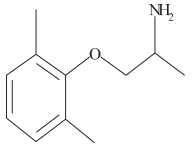
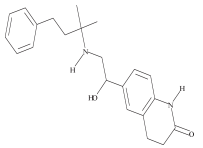
Table 7. Continued.

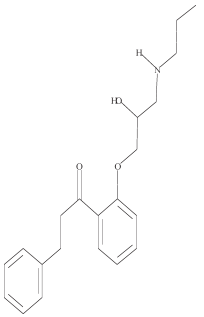
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Piperoxan		Anti-adregenic agent	Sumichiral OA-4000	240/140/20/1-Hexane/CH_2ClCH_2Cl/EtOH/TFA			1.07		(278)
			Sumichiral OA-4100	240/140/20/1-Hexane/CH_2ClCH_2Cl/EtOH/TFA			1.11		(278)
			Sumichiral OA 4400	240/140/20/1-Hexane/CH_2ClCH_2Cl/EtOH/TFA			1.22		(278)
			Sumichiral OA-4500	240/140/20/1-Hexane/CH_2ClCH_2Cl/EtOH/TFA			1.07		(278)
			Sumichiral OA-4600	240/140/20/1-Hexane/CH_2ClCH_2Cl/EtOH/TFA			1.06		(278)
			Sumichiral OA-4800	240/140/20/1-Hexane/CH_2ClCH_2Cl/EtOH/TFA			1.33		(278)
			Cyclobond I 2000 SN	80/20-Acetate buffer pH = 4.5/MeCN			1.15	0.6	(279)
			Cyclobond I 2000 SN	80/20-TEAA buffer pH = 4.5/MeCN			1.15	0.6	(280)
Almokalant		Anti-arrhythmic	Chiralcel OD	Hexane/1-PrOH (15%)/Et_2NH (0.1%)/H_2O 0.4 g/l	2R,3R	2S,3S	1.63		(281)
			Chiralpak AD	Hexane/1-PrOH (14%)/MeCN (6%)/Et_2NH (0.1%)	2R,3R	2S,3S	2.66		(281)
			Trichsep-100	99/1-Phosphate buffer pH = 7.6, TBAB 2 mM/i-PrOH	R,R	S,S	3.61	1	(282)
			Trichsep-100	99/1-Phosphate buffer pH = 7.6, TBAB 2 mM/i-PrOH	R,S	S,R	1.79	1	(282)

Diprafenone		Anti-arrhythmic	Chiralcel OD	90/10-Hexane/i-PrOH	(+)	(−)	1.77	4.72	(283)
Disopyramide		Anti-arrhythmic	Ceramospher Chiral Ru-1	99/1-MeOH/Et_3N			1.91		(284)
			Chiralcel OF	82/18/0.1-Hexane/i-PrOH/ Et_2NH	S(+) 7	R(−) 14			(285)
			Chiralcel OG	90/10-Hexane/i-PrOH			1.46	1.18	(286)
			Chiralpak AD-H	85/15/0.1-Hexane/EtOH/ $EtSO_3H$			2.5		(287)
			Chiralpak IA	60/40/0.1-Hexane/$MeCO_2Et$/ Et_2NH			1.39	7.98	(288)
			Chiral-AGP	99.5/0.5-$MeCO_2NH_4$ 2.5 mM, pH = 4.1/i-PrOH			4.64		(289)
			Chiral-AGP	94/6-Sodium phosphate buffer 10 mM, pH = 7/i-PrOH			2.91	5.93	(289)
			Chiral-AGP	90/10-Phosphate buffer 10 mM, pH = 7/NaCl 0.1M/i-PrOH	R	S	1.47	2.17	(290)
			EnantioPac	Phosphate buffer 0.02M, pH = 7/NaCl 0.1M/i-PrOH 1.33M			2.7		(291)
			EnantioPac	93/7-NaH_2PO_4 buffer pH = 7.13/i-PrOH				3.5	(292)
			EnantioPac	95.7/4.3-Phosphate buffer pH = 6.2/i-PrOH, DMAO 1.95 mM	R	S	3.3	3.05	(293)

(*continued*)

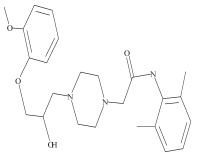
Table 7. Continued.

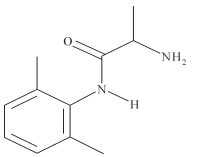
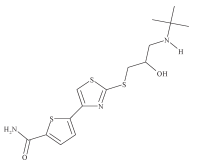
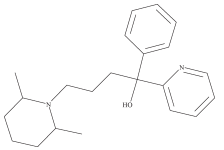
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Flecainide		Anti-arrhythmic	Chiralcel OD	92/8-Hexane/i-PrOH			1.18	1.81	(294)
			Chiralpak AD	96/4/0.1-Hexane/i-PrOH/Et_2NH	S(+) 21	R(−) 25			(285)
			TrichSep-100	Phosphate buffer pH = 6/i-PrOH 0.65M			3.79	4.71	(274)
			TrichSep-100	Acetate buffer 0.05M, pH = 6.5/i-PrOH 0.065M			3.7	3	(274)
Mexiletine		Anti-arrhythmic	Chiralcel OD-H	98/2/05-Hexane/EtOH/Et_2NH	R 17.1	S 18.2			(295)
			Chiral-AGP	98/2-Sodium phosphate buffer 0.01M, pH = 7.5/i-PrOH			1.1	1.6	(296)
			Ultron-ES-OVM	95/5-Sodium phosphate buffer 0.01M, pH = 7/MeOH			1.2	2.6	(296)
Pirmenol,HCl		Antiarrhythmic	Chiralpak (WH)	$CuSO_4$ 0.25 mM, HCO_2H 0.078M, pH = 4.7, 25/75-MeOH/H_2O, Et_3N	(+)	(−)		0.9	(297)
Pirmenol,HCl			Chiral Hypro-Cu-100	$CuSO_4$ 0.25 mM, HCO_2H 0.11M, pH = 4.7, 1/4-H_2O/MeCN, Et_3N	(−)	(+)		1.4	(297)
Pirmenol			Chiralcel OJ	98.9/1.0/0.1-Hexane/i-PrOH/Et_2NH	(+)	(−)	1.25		(298)

Propafenone		Antiarrhythmic	Cyclobond I SN	99/1/0.5-MeCN/MeOH/ H_2O ($MeCO_2H/Et_3N$-2/1)			1.09		(299)
			Chiralcel OD	93/7/0.2-Hexane/2-Butanol/ Et_2NH	S(+)	R(−)	1.24	2.16	(283)
			Chiralcel OD	90/10-Hexane/i-PrOH				0.7	(283)
			Chiralcel OD-R	70/30-$NaClO_4$ 0.25M, pH = 5/MeCN	S(+)	R(−)	1.1		(300)
			Chiralcel OJ	95/4.975/0.025-Hexane/ EtOH/TFA			1.11	0.86	(301)
			Chiralpak AD	40/60-H_2O, $Na_2B_4O_7$,H_3BO_3 20 mM, pH = 9/MeCN			1.24		(302)
			Chiralpak AD	85/15-Hexane/EtOH/Et_2NH (0.1%)	R(−)	S(+)	1.89		(300)
			Chiralpak AD	85/15-Hexane/EtOH	R(−)	S(+)	1.63		(300)
			Chiralpak AD	85/15-Hexane/EtOH/TFA (0.2%)			1.25		(300)
			Chiralpak AD	50/50-MeOH/EtOH			2.2	5.05	(303)
			Chiralpak AD-H	100/0.1-MeOH/Et_2NH	5	8			(304)

(*continued*)

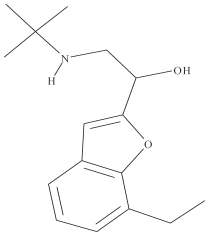
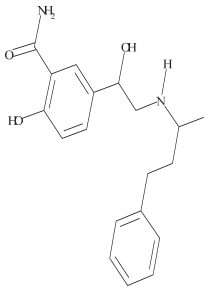
Table 7. Continued.

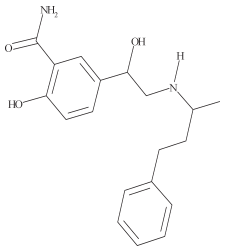
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			Chiralpak AD-RH	60/40-Borate buffer 20 mM, pH = 9/MeCN		1.29			(305)
			Chiralpak IA	60/40/0.1-Hexane/THF/Et_2NH		1.43	3.3		(288)
			Chiral-AGP	95/5-Phosphate buffer 0.02M, pH = 4.6/i-PrOH		1.15			(306)
			Chiral-AGP	100/9-$MeCO_2NH_4$ buffer 10 mM, pH = 5.96/n-PrOH	S 28	R 34			(307)
			Chiral-CBH	95/5 $MeCO_2Na$ buffer 10 mM, pH = 5.5, Na_2EDTA 50μM/i-PrOH		2.04	4.1		(308)
			TrichSep-100	Acetate buffer 0.05M, pH = 6.5/i-PrOH 0.065M		2.42	0.93		(274)
			TrichSep-100	Phosphate buffer pH = 6/i-PrOH 0.65M		2.38	0.97		(274)
			Ultron ES-OVM	95/5-Phosphate buffer 20 mM, pH = 5/MeOH	S(+)	R(−)	1.13		(300)
Ranolazine		Antiarrhythmic	EnantioPac	NaH_2PO_4 4 mM/Na_2HPO_4 4 mM, pH = 7, NaCl 10 mM/i-PrOH (4%)	S(−)	R(+)	1.42	1.4	(309)

Tocainide		Antiarrhythmic	Crownpak CR(+)	$HClO_4$ 0.1M	R(−)	S(+)	1.44	0.97	(310)
			Chirobiotic V	100/0.02/0.01-MeOH/$MeCO_2H$/Et_3N			1.06	0.76	(311)
			Chiralcel OD	85/15/0.1-Isohexane/EtOH/Et_2NH			1.29	0.51	(311)
			EnantioPac	Phosphate buffer 0.02M, pH = 6/TBAB0.002M			1.45		(291)
			EnantioPac	Phosphate buffer 0.02M, pH = 7/TPA 1 mM			1.49		(312)
Arotinolol		Alpha, beta-blocker	Cyclobond I	95/5-MeCN/MeOH, $MeCO_2H$ 0.3gl/Et_3N 0.25 ml	14.89	16.74			(313)
			Chirobiotic T	100/0.1/0.1-MeOH/$MeCO_2H$/Et_3N	S(+)	R(−)	1.26		(314)
Brefanolol		Alpha, beta-blocker	Chiralcel OJ	85/15/0.01-Hexane/i-PrOH/Et_2NH	R 12	S 14			(315)

(*continued*)

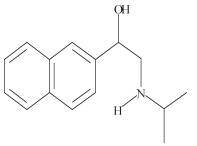
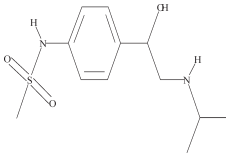
Table 7. Continued.

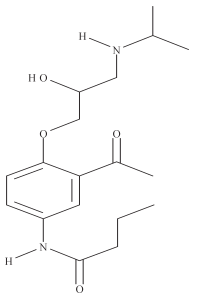
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Bufuralol		Alpha, beta-blocker	(R)-alpha-Burke 1	19/1-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 0.5 g/l	S(−)	R(+)	4.08		(316)
Bufuralol, HCl			(R)-alpha-Burke 2	10/90-EtOH/MeCN, HCO_2NH_4 20 mM			1.33	4.34	(317)
Bufuralol, HCl			(R)-alpha-Burke 2	90/10-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 20 mM			2.56		(318)
			(S)-alpha-Burke 2	95/5-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM			2.32	9.35	(317)
			(S)-alpha-Burke 2	50/50-EtOH/MeCN, $MeCO_2NH_4$ 10 mM			1.35	4.07	(317)
			(S)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/ MeOH, $MeCO_2NH_4$ 15 mM			1.58	1.5	(319)
			(S)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM			1.77	1.96	(319)
			Pirkle 1-J	90/10-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 20 mM			2.01		(320)
			Chiralcel OD	95/5/0.1-Hexane/EtOH/ Et_2NH	R 9.4	S 10.5			(321)
Labetalol		Alpha, beta-blocker	(R)-alpha-Burke 2	90/10- CH_2Cl_2/EtOH, $MeCO_2NH_4$ 20 mM			1.16	1.14	(317)
Labetalol			(R)-alpha-Burke 2	10/90-EtOH/MeCN, HCO_2NH_4 20 mM			1.15	0.82	(317)
Labetalol			Chirex 3020	60/35/5-Hexane/CH_2Cl-CH_2Cl/EtOH-TFA (20/1)			1.22		(322)
RR/SS-Labetalol			Chirex 3022	58/35/7/0.7-Hexane/$ClCH_2$-CH_2Cl/EtOH-TFA (20/1)/ MeOH	S,S(+)	R,R(−)	1.4	2.86	(323)
RS/SR-Labetalol			Chirex 3022	58/35/7/0.7-Hexane/$ClCH_2$-CH_2Cl/EtOH-TFA (20/1)/ MeOH	(+)	(−)	1.11	0.78	(323)

RR/SS-Labetalol			Chirex 3022	55.75/35/9/0.25-Hexane/$ClCH_2CH_2Cl$/EtOH/TFA	S,S 33	R,R 43		(324)
RS/SR-Labetalol			Chirex 3022	55.75/35/9/0.25-Hexane/$ClCH_2CH_2Cl$/EtOH/TFA	S,R 37	R,S 51		(324)
Labetalol A			Chiral-AGP	Phosphate buffer 0.02M, pH = 7.1/TBAP 0.015M	S,R 19	R,S 28		(325)
Labetalol B			Chiral-AGP	Phosphate buffer 0.02M, pH = 7.1/TBAP 0.015M	S,S 23	R,R 34		(325)
Labetalol A		Alpha, beta-blocker	Chiral-AGP	NaH_2PO_4 0.02M, pH =7.1 (H_3PO_4), TBAB	S,R 11.5	R,S 16.3		(326)
Labetalol B			Chiral-AGP	NaH_2PO_4 0.02M, pH =7.1 (H_3PO_4), TBAB	S,S 13.47	R,R 20.45		(326)
Labetalol A			EnantioPac	98/2-Phosphate buffer 0.02M, pH = 7/i-PrOH			1.25	(291)
Labetalol A			EnantioPac	Phosphate buffer 0.02M, pH = 7/TBAB 0.003M			2.1	(291)
Labetalol A			EnantioPac	Phosphate buffer 0.02M, pH = 7.0, NaCl 0.1M/Propylene glycol 0.25M			1.71	(312)
Labetalol A			EnantioPac	Phosphate buffer 0.02M, pH = 7/$C_7H_{15}CO_2H$ 0.01M			1.35	(312)
Labetalol B			EnantioPac	Phosphate buffer 0.02M, pH = 7/$C_3H_7CO_2H$ 0.05M			1.36	(291)
Labetalol B			EnantioPac	Phosphate buffer 0.02M, pH = 7, NaCl 0.1M, Ethylene glycol 0.32M			1.37	(312)

(*continued*)

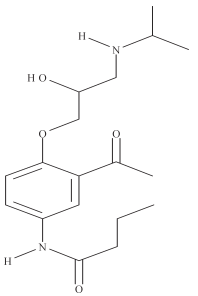
Table 7. Continued.

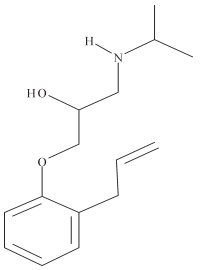
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Pronethalol		Alpha, beta-blocker	(R)-alpha-Burke 1	19/1-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 0.5 g/l			1.31		(316)
			(R)-alpha-Burke 2	90/10-MeCN/EtOH, HCO_2NH_4 20 mM			1.03	0.58	(317)
			(R)-alpha-Burke 2	90/10- CH_2Cl_2/EtOH, $MeCO_2NH_4$ 20 mM			1.16	1.59	(317)
			EnantioPac	Phosphate buffer 0.02M, pH = 7/DMAO 0.001M/i-PrOH 0.17M			1.26		(291)
Sotalol		Alpha, beta-blocker	Chiralcel OF	85/15/0.2-Hexane/EtOH/Et_2NH			1.08	0.6	(327)
Sotalol			Chiralpak AD	80/20/0.1-Hexane/i-PrOH/Et_2NH	(+)	(−)	1.69	2.97	(328)
Sotalol,HCl			Chiral-AGP	Phosphate buffer 10 mM, pH = 7/$C_5H_{11}CO_2H$ 50 mM			1.44		(329)
Sotalol			Chiral-CBH	90/10-Sodium phosphate buffer 0.01M, pH = 7/i-PrOH	R	S	1.63	3.92	(308)
Sotalol			Chiral-CBH	85/15-Phosphate buffer 19 mM, pH = 7/i-PrOH	R	S	2.9		(330)
Sotalol, HCl			EnantioPac	NaH_2PO_4-Na_2HPO_4 buffer 0.01M, pH = 7/$C_5H_{11}CO_2H$ 0.075M	(−)	(+)	1.8	1.91	(309)

Acebutolol, HCl		Beta-blocker	(R)-alpha-Burke 1	95/5-CH_2Cl_2/MeOH, $MeCO_2NH_4$ 0.5 g/l	1.07	0.9	(331)
Acebutolol, HCl			(R)-alpha-Burke 2	90/10- CH_2Cl_2/EtOH, $MeCO_2NH_4$ 20 mM	1.09	0.96	(317)
Acebutolol			(R)-alpha-Burke 2	10/90-EtOH/MeCN, HCO_2NH_4 20 mM	1.08	1.07	(317)
			(S)-alpha-Burke 2	85/5-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM	1.1	0.48	(319)
			(S)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/ MeOH, $MeCO_2NH_4$ 15 mM	1.08	0.36	(319)
			Chirex 3022	55/35/10-Hexane/CH_2Cl_2/ EtOH, TFA (5%)	1.17	2.1	(279)
			Opticrown RCA(+)	80/20/0.1/0.5MeCN/i-PrOH/ TFA/Et_3N	1.35	2.8	(332)
			CHIDEX-MKP	80/20-TEAA buffer 1% pH = 4.33/MeOH	1.3	3	(333)
			CHIDEX-MKP	70/30-TEAA 98 mM, pH = 5.30/MeOH	1.3	2.55	(334)
			CHIDEX-SKP	70/30-Et_3N buffer (1%) pH = 5.11/MeOH	1.33	1.06	(335)
			Chirobiotic T	100/0.01/0.01-MeOH/ $MeCO_2H$/Et_3N	1.07	1.1	(336)
			Chirobiotic T	5/95-TEAA (0.5%) pH = 5/ MeOH	1.06	0.98	(336)
			Chirobiotic T	55/45/0.3/0.2-MeCN/MeOH/ $MeCO_2H$/Et_3N	1.12	2.16	(337)

(*continued*)

Table 7. Continued.

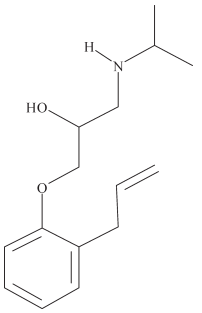
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Acebutolol		Beta-blocker	Chiralcel OD	90/10/0.1-Hexane/EtOH/Et_2NH			1.15	1.6	(338)
			Chiralcel OD	80/20/0.2/0.34-Hexane/EtOH/TFA/Et_3N	(+)	(−)	1.29		(339)
			Chiralcel OF	Hexane/i-PrOH (17 or 18%)/Et_2NH (0.1%)			1.11		(340)
			Chiralcel OJ	95/4.975/0.0094/0.0156-Hexane/EtOH/TFA/Et_3N			1.78	3.98	(301)
			Chiralcel OJ	10/90/0.1-H_2O/MeCN/Et_2NH			1.23	5.61	(341)
			Chiralpak AD	85/15/0.1-Hexane/i-PrOH/Et_2NH	S(−)	R(+)	1.54		(342)
			Chiralpak AD-H	75/25/0.1-Hexane/EtOH/$MeSO_3H$			1.61	4.1	(287)
			Chiralpak AD-H	85/15/0.1-Hexane/EtOH/Et_2NH			1.29	3.29	(287)
			Chiralpak AD-R	100/0.1-MeOH/Et_2NH			1.65		(343)
			Chiralpak AD-R	70/30/0.1-MeOH/H_2O/Et_2NH			2.1		(343)
			Chiralpak AD-R	30/35/35/0.1-H_2O/MeOH/EtOH/Et_2NH			1.58		(343)
			Chiralpak AD-R	50/50/0.1-MeOH/EtOH/Et_2NH			1.31		(343)
			Chiralpak AD-R	100/0.1-MeCN/Et_2NH			1.19		(343)
			Chiralpak AD-R	5/95/0.1-H_2O/MeCN/Et_2NH			1.55		(343)
			Chiralpak AD-RH	MeCN, Ethanolamine (0.1%)	(+)	(−)	1.49	1.94	(344)
			Chiralpak AD-RH	95/5-MeCN/EtOH, Ethanolamine (0.1%)	(+)	(−)	2.23	6.43	(344)

			Chiral-CBH	95/5-$MeCO_2Na$ buffer 10 mM, pH = 5.5, Na_2EDTA 50μM/i-PrOH		4.16	7.33	(308)
Alprenolol, HCl		Beta-blocker	(R)-alpha-Burke 1	95/5-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 0.5 g/l		1.2	1.6	(331)
Alprenolol, HCl			(R)-alpha-Burke 2	90/5/5-CH_2Cl_2/EtOH/MeOH, $MeCO_2NH_4$ 10 mM		1.44		(318)
Alprenolol			(S)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM		1.19	0.74	(319)
			(S)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/MeOH, $MeCO_2NH_4$ 15 mM		1.15	0.64	(319)
			Pirkle 1-J	85/10/5-CH_2Cl_2/EtOH/MeOH, $MeCO_2NH_4$ 15 mM		1.28		(320)
			Opticrown RCA(+)	80/20/0.1/0.5MeCN/i-PrOH/TFA/Et_3N		1.31	2.48	(332)
			Cyclobond I	98/2/0.4/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N	(−) (+)		1.5	(345)
			Ultron ES-PhCD	80/20-Phosphate buffer 20 mM, pH = 4.6/MeCN		1.28	3.82	(346)
			CHIDEX-MKP	80/20-TEAA buffer 1% pH = 5.33/MeOH		1.5	2.18	(333)
			CHIDEX-MKP	70/30-TEAA 98 mM, pH = 5.30/MeOH	1.5	1.85		(334)
			CHIDEX-SKP	70/30-Et_3N buffer (1%) pH = 5.11/MeOH	1.81	2.63		(335)
			Chirobiotic T	5/95-TEAA (0.5%) pH = 5/MeOH	1.12	1.42		(336)
			Chirobiotic T	60/40-H2O, TEAA buffer (1%) pH = 4.1 ($MeCO_2H$)/MeOH		1.04	0.4	(337)

(*continued*)

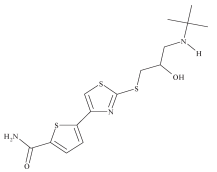
Table 7. Continued.

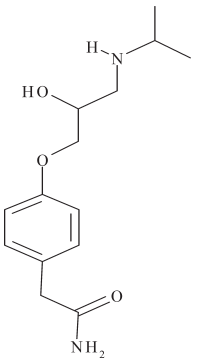
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			Chirobiotic T	55/45/0.3/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.14	2.62	(337)
			Chirobiotic T	100/0.02/0.01-MeOH/$MeCO_2H$/Et_3N			1.14	1.4	(347)
			Chirobiotic T	34/66-MeOH, $CF_3CO_2NH_4$ (0.1%)/MeOH			1.13	1.71	(348)
			Chirobiotic V	100/0.02/0.01-MeOH/$MeCO_2H$/Et_3N			1.1	1.36	(347)
			Chirobiotic V	95/5/2/1-MeCN/MeOH/$MeCO_2H$/Et_3N			1.05		(349)
			Chirobiotic TAG	60/40-H2O, TEAA buffer (1%) pH = 4.1($MeCO_2H$)/MeOH			1.06	0.65	(337)
			Chirobiotic TAG	55/45/0.3/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.07	1.5	(337)
			Chirobiotic MTAG	55/45/0.3/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.08	1.2	(337)
			Chiralcel OD	80/20/0.1-Heptane/i-PrOH/Et_2NH	(+)	(−)	4.63		(306)
			Chiralcel OD	80/20/0.2/0.34-Hexane/EtOH/TFA/Et_3N	(+)	(−)	2.81		(339)
			Chiralcel OD	90:10 Hexane/i-PrOH	(+)	(−)	3.87		(350)
			Chiralcel OD-RH	90/10-MeCN/i-PrOH, Ethanolamine (0.1%)	(+)	(−)	1.65	1.62	(344)
			Chiralcel OD-RH	MeCN, Ethanolamine (0.1%)	(+)	(−)	1.57	2.46	(344)
			Chiralcel OD-RH	60/40-Phosphate buffer 50 mM pH = 9, $NaClO_4$ 250 mM/MeCN				1.52	(351)
			Chiralcel OD-RH	60/40-Borate buffer 20 mM, pH = 9/MeCN				1.5	(351)

			Chiralcel OD-RH	60/40-Phosphate buffer 50 mM, pH = 9/MeCN			0.68	(351)
			Chiralpak AD	70/30-K_2HPO_4-Na_3PO_4 20 mM, pH = 10/MeCN		1.25		(302)
Alprenolol		Beta-blocker	Chiralpak AD	95/5/1-Hexane/EtOH/n-$C_3H_7NH_2$		1.76		(352)
			Chiralpak AD	90/10-Hexane/EtOH		1.27		(353)
			Chiralpak AD-H	85/15/0.1-Hexane/EtOH/Et_2NH		1.89		(287)
			Chiralpak AD-H	85/15/0.1-Hexane/EtOH/$EtSO_3H$		1.35		(287)
			Chiralpak AD-R	50/50/0.1-MeOH/EtOH/Et_2NH		1.66		(343)
			Chiralpak AD-R	95/5/0.1-MeOH/H_2O/Et_2NH		1.64		(343)
			Chiralpak AD-R	100/0.1-MeOH/Et_2NH		1.49		(343)
			Chiralpak AD-R	30/35/35/0.1-H_2O/MeOH/EtOH/ Et_2NH		1.39		(343)
			Chiralpak AD-R	100/0.1-MeCN/Et_2NH		1.14		(343)
			Chiralpak AD-R	15/85/01-H_2O/MeCN/Et_2NH	1.32			(343)
			Chiralpak AD-RH	90/10-MeCN/EtOH, Ethanolamine (0.1%)	(+) (−)	1.5	0.7	(344)
			Chiralpak AD-RH	MeCN, Ethanolamine (0.1%)	(+) (−)	1.38	1.07	(344)
			Chiralpak AD-RH	60/40-Phosphate buffer 50 mM, pH = 9/MeCN			1.87	(351)
			Chiralpak AD-RH	60/40-Phosphate buffer 50 mM pH = 9, $NaClO_4$ 250 mM/MeCN			1.53	(351)
			Chiralpak AD-RH	60/40-Borate buffer 20 mM pH = 9/MeCN			2.11	(351)
			Chiralpak IA	90/10/0.1-Hexane/THF/Et_2NH		1.42	3.95	(288)

(*continued*)

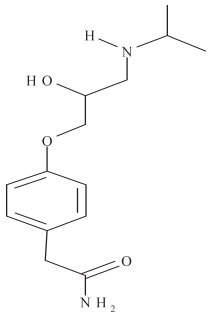
Table 7. Continued.

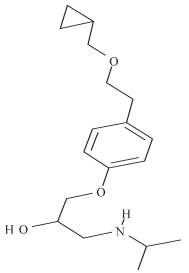
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			Chiral-AGP	97/3-Sodium acetate buffer 0.01M, pH = 4/MeCN			1.53	1.93	(289)
			Chiral-AGP	Phosphate buffer 0.01M, pH = 7.2/MeCN 2.85M			1.83		(354)
			Chiral-AGP	Phosphate buffer 0.01M, pH = 7.2/EtOH 1.76M			1.49		(354)
			Chiral-CBH	Sodium acetate buffer 0.01M, pH = 5	R	S	5.96		(355)
			Chiral-CBH	Sodium Phosphate buffer 0.01M, pH = 7	R	S	9.74		(355)
Alprenolol		Beta-blocker	TrichSep-100	99.5/0.5-Acetate buffer 0.05M, pH=5 (I = 0.01)/i-PrOH	R	S	4.3		(356)
			Ultron ES-OVM	90/10-KH_2PO_4 buffer 20 mM, pH = 5.1/EtOH			1.12	0.31	(357)
Arotinolol		Beta-blocker	Cyclobond I	95/5-MeCN/MeOH, $MeCO_2H$ 0.3gl, Et_3N 0.25 ml	14.89	16.74			(313)
			Chirobiotic T	100/0.1/0.1-MeOH/ $MeCO_2H/Et_3N$	(+)S	(−)R	1.26		(314)
			(R)-alpha-Burke 1	90/10-CH_2Cl_2/MeOH, $MeCO_2NH_4$ 0.5 g/l			1.08	0.9	(331)
			(R)-alpha-Burke 2	90/10-CH_2Cl_2/MeOH, $MeCO_2NH_4$ 20 mM			1.11	1.11	(317)
			(R)-alpha-Burke 2	10/90-EtOH/MeCN,HCO_2-NH_4 20 mM			1.08	1.19	(317)
			(R)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/ MeOH, $MeCO_2NH_4$ 15 mM			1.13		(318)

			Sumichiral OA-2500	58/36/6-Hexane/CH_2ClCH_2Cl/MeOH			1.33	1.41	(358)
			Sumichiral OA-4700	350/410/40/2-Hexane/CH_2Cl_2/MeOH/TFA	15.89	17.37			(359)
			Chirex 3022	55/35/10-Hexane/CH_2Cl_2/EtOH, TFA (5%)			1.17	1.4	(279)
Atenolol		Beta-blocker	Sumichiral OA-5500	H_2O, $CuSO_4$ 1 mM			1.07		(360)
			Opticrown RCA(+)	50/50/0.1/0.1-MeOH/MeCN/Et_3N/$MeCO_2H$	(−)	(+)	1.1	1.16	(332)
			Cyclobond I	95/5/0.3/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.11	1.29	(361)
			Cyclobond I	90/10-TEAA (0.1%) pH = 5.5/i-PrOH	7.83	9.71			(362)
			ChiraDex	90/10/0.3/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.08	0.43	(363)
			CHIDEX-MKP	80/20-TEAA buffer 1% pH = 4.33/MeOH			1.31	0.98	(333)
			Chirobiotic T	5/95-TEAA (0.5%) pH = 5/MeOH			1.09	1.13	(336)
			Chirobiotic T	55/45/0.3/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.12	2.16	(337)
			Chirobiotic T	50/50-MeOH, $CF_3CO_2NH_4$ (0.1%)/MeOH			1.13	1.52	(348)
			Chirobiotic T	100/0.1/0.1-MeOH/Et_3N/$MeCO_2H$			1.19	1.5	(364)
			Chirobiotic T	15/85-H_2O/MeOH, $MeCO_2NH_4$ 0.025M			1.09	1.1	(364)
			Chirobiotic T	100/0.1/0.1-MeOH/TEAA/$MeCO_2H$			1.12	1.4	(365)
			Chirobiotic T	14/56/30/2/2-CH_2Cl_2/MeCN/MeOH/$MeCO_2H$/Et_3N	11.9	13			(366)

(*continued*)

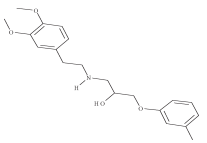
Table 7. Continued.

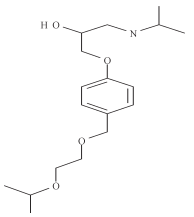
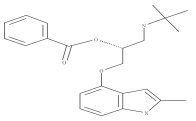
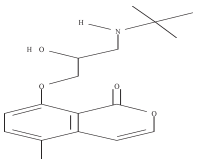
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			Chirobiotic V	MeOH, $CF_3CO_2NH_4$ (0.05%)	7.34	8.12			(367)
			Chirobiotic TAG	60/40-H2O, TEAA buffer (1%) pH = 4.1($MeCO_2H$)/MeOH			1.06	0.56	(337)
			Chirobiotic TAG	55/45/0.3/0.2-MeCN/MeOH/ $MeCO_2H/Et_3N$			1.04	0.6	(337)
			Chiralcel OD	60/40/0.2/0.2-Hexane/EtOH/ $Et_2NH/MeCO_2H$	R(+)	S(−)	4	4.2	(368)
			Chiralcel OD	60/40/0.1-Hexane/i-PrOH/ Et_2NH	R	S	1.89		(369)
			Chiralcel OD-H	80/20/0.1-Hexane/i-PrOH/ Et_2NH			1.73		(370)
			Chiralcel OD-RH	MeCN, Ethanolamine (0.1%)	(+)	(−)	1.21	1.17	(344)
Atenolol		Beta-blocker	Chiralcel OD-RH	95/5-MeCN/i-PrOH, Ethanolamine (0.1%)	(+)	(−)	1.28	1.2	(344)
			Chiralpak AD-H	85/15/0.1-Hexane/EtOH/ $EtSO_3H$			1.15	2.35	(287)
			Chiralpak AD-H	85/15/0.1-Hexane/EtOH/ Et_2NH			1.08	1.55	(287)
			Chiralpak AD-R	15/85/01-H_2O/MeOH/Et_2NH			1.1		(343)
			Chiralpak AD-R	95/5/0.1-H_2O/MeCN/Et_2NH			1.06		(343)
			Chiralpak AD-RH	95/5-MeCN/i-PrOH, Ethanolamine (0.1%)	(−)	(+)	1.2	1.4	(344)
			Chiral-AGP	95/5-Phosphate buffer 10 mM, pH = 7/MeOH			1.11	0.6	(329)
			Chiral-AGP	Phosphate buffer 0.01M, pH = 7			1.36	1	(371)
			Chiral AGP	Phosphate buffer (1.25-25 mM) pH = (5-7)/MeCN or EtOH)			1.2	1.2	(372)

			Chiral-CBH	95/5-NaH_2PO_4 10 mM, pH = 6, Na_2EDTA 50μM/i-PrOH			2.26	4.19	(308)
			EnantioPac	Phosphate buffer 0.01M, pH = 7.5	R	S	1.22	1.05	(373)
			EnantioPac	Phosphate buffer 0.01M, pH = 7.1/MeCN (0.25%)	R	S	1.13		(373)
			(R)-alpha-Burke 1	95/5-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 0.5 g/l		1.18	1.5		(331)
			(R)-alpha-Burke 2	90/10- CH_2Cl_2/EtOH, $MeCO_2NH_4$ 20 mM		1.18	1.48		(317)
Betaxolol		Beta-blocker	(R)-alpha-Burke 2	10/90-EtOH/MeCN, HCO_2NH_4 20 mM			1.1	1.57	(317)
Betaxolol, HCl			(R)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/ MeOH, $MeCO_2NH_4$ 10 mM			1.25		(318)
Betaxolol, HCl			Pirkle 1-J	10/90-EtOH/CH_2Cl_2, $MeCO_2NH_4$ 15 mM			1.27		(320)
Betaxolol			Cyclobond I	97/3/0.24/0.36-MeCN/ MeOH/$MeCO_2H$/Et_3N			1.07	1.14	(338)
			Chiralcel OD	80/20/0.1-Hexane/i-PrOH/ Et_2NH	R	S	3.02	10.8	(338)
			Chiralcel OD	85/15-Hexane/i-PrOH			1.73	2.7	(374)
			Chiralcel OJ	95/4.975/0.025-Hexane/i-PrOH/TFA			1.25	1.05	(301)
			Chiralcel OJ	95/5-Hexane/i-PrOH			1.22	0.63	(301)
			Chiralcel OJ	95/4.975/0.025-Hexane/i-PrOH/Et_3N			1.11	0.68	(301)
			Chiralpak AD	85/5/1-Hexane/EtOH/n-$C_3H_7NH_2$			1.46		(352)

(*continued*)

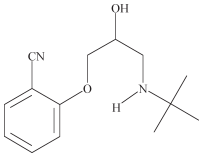
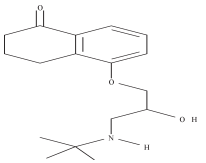
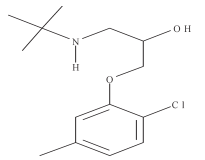
Table 7. Continued.

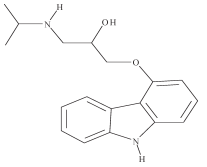
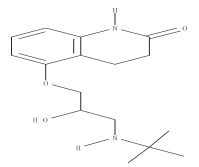
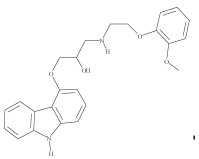
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			Chiral-CBH	95/5-$MeCO_2Na$ 10 mM, pH = 5.5, Na_2EDTA 50μM/i-PrOH			3.63	6.45	(308)
			TrichSep-100	Acetate buffer 0.05M, pH = 6.5/i-PrOH 0.065M		3	3.66		(274)
			TrichSep-100	Phosphate buffer pH = 6/i-PrOH 1.30M		4.53	4.8		(274)
			(S)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/MeOH, $MeCO_2NH_4$ 15 mM			1.27	0.45	(319)
			(S)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM			1.15	0.3	(319)
Bevantolol		Beta-blocker	Chiralcel OD	100/0.2-EtOH/Et_2NH	R(+)	S(−)	2.8	3.33	(375)
			Chiralcel OD	30/70/0.2-Hexane/t-BuOH/Et_2NH	R(+)	S(−)	6.65	7.19	(375)
			Chiralcel OD-R	50/50-H_2O, $NaClO_4$ 0.12M/MeCN	R(+)	S(−)	1.79	1	(375)
Bevantolol		Beta-blocker	Chiral-AGP	85/15-Phosphate buffer 10 mM, pH = 7/MeOH			1.39	2.8	(329)

Bisoprolol		Beta-blocker	(R)-alpha-Burke 1	95/5-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 0.5 g/l	1.15	1.4	(331)
Bisoprolol, hemifumarate			(S)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM	1.17	0.65	(319)
Bisoprolol, hemifumarate			(S)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/MeOH, $MeCO_2NH_4$ 15 mM	1.14	0.47	(319)
Bisoprolol			Sumichiral OA-2500	60/30/10-Hexane/$ClCH_2CH_2Cl$/MeOH	1.19	1.42	(376)
Bisoprolol			Cyclobond I	99/1/0.24/0.36-MeCN/MeOH/$MeCO_2H$/Et_3N	1.05	0.7	(338)
Bisoprolol, hemifumarate			Chiralcel OD	80/20/0.1-Hexane/i-PrOH/Et_2NH	2	6.9	(338)
Bisoprolol			Chiral-CBH	95/5-NaH_2PO_4 10 mM, pH = 6, Na_2EDTA 50μM/i-PrOH	3.95	7.82	(308)
Bopindolol		Beta-blocker	(S)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM	1.5	0.87	(319)
			(S)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/MeOH, $MeCO_2NH_4$ 15 mM	1.39	0.83	(319)
			Resolvosil BSA 7	Na_2HPO_4 0.1M/NaH_2PO_4 0.1M/i-PrOH (0.5%)	1.81	1	(377)
Bucumolol		Beta-blocker	Ultron ES-PhCD	75/25-Phosphate buffer 20 mM, pH = 4.6/MeCN	1.34	3.62	(346)

(*continued*)

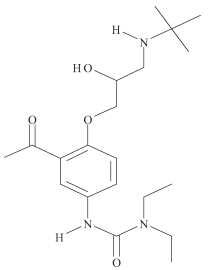
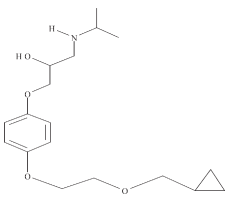
Table 7. Continued.

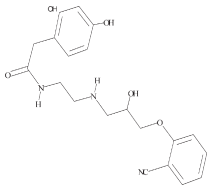
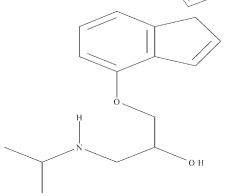
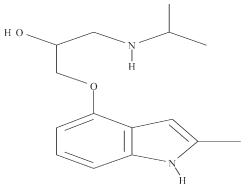
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Bunitrolol		Beta-blocker	Ultron ES-PhCD	65/35-KH_2PO_4 20 mM/MeCN	(−) 6.42	(+) 8.91			(378)
			Chiralcel OD	90/10/0.1-Heptane/i-PrOH/Et_2NH			1.14	1.32	(306)
			Chiraspher-NT	60/20/20/0.05-Hexane/EtOH/MeOH/NH_4OH (25%)	S 9.36	R 12.35			(379)
			Chiral-AGP	99/1-Phosphate buffer 0.02M, pH = 6.5/i-PrOH			1.19		(380)
Bunolol		Beta-blocker	(R)-alpha-Burke 1	95/5-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 0.5 g/l			1.14	1.5	(331)
			Cyclobond I	97/3/0.24/0.36-MeCN/MeOH/$MeCO_2H$/Et_3N	S	R	1.09	1.52	(338)
			Chiralcel OD	80/20/0.1-Hexane/i-PrOH/Et_2NH	R	S	2	6.6	(338)
			Chiral-AGP	98.5/1.5-Phosphate buffer 20 mM, pH = 6.5/i-PrOH	R	S		1.8	(338)
			Chiral-AGP	98/2-phosphate buffer 0.01M, pH = 6.5, DMAO 0.001M/i-PrOH	(+)	(−)	1.18	1.6	(381)
Bupranolol		Beta-blocker	(R)-alpha-Burke 2	10/90-EtOH/MeCN, HCO_2NH_4 20 mM			1.15	2.28	(317)
			(R)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 15 mM			1.28		(318)
			Pirkle 1-J	90/10-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 15 mM			1.47		(320)
Bupranolol		Beta-blocker	Chiralcel OD	80/20/0.1-Heptane/i-PrOH/Et_2NH			2.91		(306)
			Chiral-AGP	99.5/0.5-$MeCO_2NH_4$ buffer 0.039M, pH = 4.1/i-PrOH			1.3	1.65	(289)

			Chiral-AGP	94/6-Sodium phosphate buffer 10 mM, pH = 7/i-PrOH			1.25	1.58	(289)
Carazolol		Beta-blocker	(R)-alpha-Burke 1	85/15-CH_2Cl_2/MeOH, $MeCO_2NH_4$ 0.5 g/l			1.14	1.8	(331)
			(S)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM			1.22	0.83	(319)
			(S)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/MeOH, $MeCO_2NH_4$ 15 mM			1.19	0.77	(319)
			Cyclobond I	97/3/0.24/0.36-MeCN/MeOH/$MeCO_2H$/Et_3N			1.07	1.16	(338)
			Chiralcel OD	60/40/0.1-Hexane/i-PrOH/Et_2NH	S(−)	R(+)	1.24	1.7	(338)
			Chiral-AGP	94/6-Sodium phosphate buffer 10 mM, pH = 7/i-PrOH			1.14	0.9	(289)
			Chiral-AGP	99.5/0.5-$MeCO_2NH_4$ buffer 0.025M, pH = 4.1/i-PrOH			1.38	1.83	(289)
Carteolol		Beta-blocker	(R)-alpha-Burke 1	90/10-CH_2Cl_2/MeOH, $MeCO_2NH_4$ 0.5 g/l			1.12	1.4	(331)
			Cyclobond I	98/2/1.5/1.0 -MeCN/MeOH/$MeCO_2H$/Et_3N				1.62	(345)
			Chirobiotic V	100/0.1/0.1-MeOH/$MeCO_2H$/Et_3N	26.9	30.7			(382)
			Chiralcel OD	60/40/0.1-Hexane/i-PrOH/Et_2NH			1.98	4.1	(338)
Carvedilol		Beta-blocker	Chiralcel OF	50/50-Hexane/i-PrOH	R(+)	S(−)	2	1	(383)
Carvedilol			Chiral-AGP	90/10-Phosphate buffer 0.02M, pH = 4.6/i-PrOH			1.23		(380)
Carvedilol^{14}C			Ultron-ES-OVM	100/30-Phosphate buffer 20 mM, pH = 4.5/EtOH			1.2	1	(384)

(*continued*)

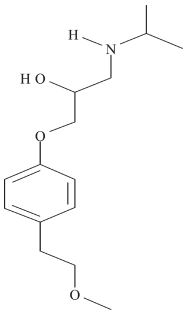
Table 7. Continued.

Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Celiprolol		Beta-blocker	(S)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 15 mM			1.11	0.38	(319)
			(S)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/MeOH, $MeCO_2NH_4$ 15 mM			1.09	0.38	(319)
			Cyclobond I	90/10-$MeCO_2NH_4$ 0.1%, pH = 5.5/MeOH	6.89	7.53			(362)
			Chirobiotic T	45/55/0.3/0.2-MeOH/MeCN/$MeCO_2H$/Et_3N			1.12	1.23	(385)
			Chirobiotic V	100/0.1/0.1-MeOH/$MeCO_2H$/Et_3N	20.3	23			(382)
			Chirobiotic V	45/55/0.3/0.2-MeOH/MeCN/$MeCO_2H$/Et_3N			1.1	1.24	(385)
			Chiralcel OD	90/10-PrOH/Et_2NH	S	R			(379)
			Chiralcel OD	80/20/0.7-Hexane/i-PrOH/Et_2NH	S(−)	R(+)	1.43	2.94	(386)
			Chiral-AGP	Phosphate buffer 10 mM, pH = 7			1.05	0.6	(329)
Cicloprolol		Beta-blocker	Chiralcel OD	80/5/15-Hexane/i-PrOH/EtOH	R	S	1.37	1.7	(374)
			Chiralcel OD	80/5/15/0.05-Hexane/i-PrOH/EtOH/Et_2NH	R	S		2.38	(387)

Epanolol		Beta-blocker	Chiral-CBH	95/5-$MeCO_2Na$ buffer 10 mM, pH = 5, di-NaEDTA 50μM/i-PrOH			2.22	3.64	(308)
Indenolol		Beta-blocker	Chirex 3022	98/2-Hexane/EtOH, TFA (20/1)			1.06	0.82	(323)
			Chiralcel OD	Gradient 99/1/0.2-Hexane/EtOH/Et_2NH to 100/0.2-EtOH/Et_2NH	(+)	(−)	1.64	7.04	(388)
Mepindolol		Beta-blocker	Chiralcel OD	70/30/0.1-Heptane/EtOH/Et_2NH			4.69		(306)
			Chiral-AGP	99/1-Phosphate buffer 0.02M, pH = 6.5/i-PrOH			1.1		(380)
			(R)-alpha-Burke 1	19/1-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 0.5 g/l			1.48		(316)
			(R)-alpha-Burke 2	90/10-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM			1.23	2.45	(317)
			(R)-alpha-Burke 2	10/90-EtOH/MeCN, HCO_2NH_4 20 mM)			1.1	1.56	(317)
			(R)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/MeOH, $MeCO_2NH_4$ 10 mM			1.28		(318)

(*continued*)

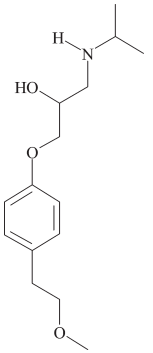
Table 7. Continued.

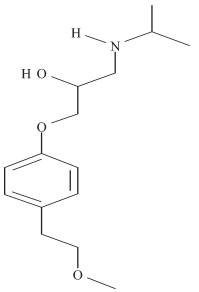
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			(S)-alpha-Burke 2	95/5-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM			1.25	2.91	(310)
Metoprolol, tartrate		Beta-blocker	(S)-alpha-Burke 2	MeOH, $MeCO_2NH_4$ 10 mM			1.05	0.94	(317)
Metoprolol, tartrate			(S)-alpha-Burke 2	50/50-EtOH/MeCN, $MeCO_2NH_4$ 10 mM			1.11	1.55	(317)
Metoprolol			(S)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM			1.18	0.63	(319)
			(S)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/ MeOH, $MeCO_2NH_4$ 15 mM			1.14	0.59	(319)
			Chirex 3022	60/35/5/0.25-Hexane/CH_2Cl-CH_2Cl/EtOH/TFA			1.08		(389)
			Sumichiral OA-2500	65/25/10-Hexane/$ClCH_2CH_2$-Cl/MeOH			1.27	1.14	(376)
			Sumichiral OA-4900	240/600/5/1-Hexane/ CH_2Cl_2/MeOH/CF_3CO_2H			1.09	1.38	(390)
			Cyclobond I	95/5/0.2/0.2-MeCN/MeOH/ $MeCO_2H$/Et_3N				3.16	(345)
			Cyclobond I	68/32-H_2O, TEAA (1%) pH = 4.1/MeOH			1.03	0.9	(391)
			ChiraDex	95/5/0.2/0.2-MeCN/MeOH/ $MeCO_2H$/Et_3N		1.1	0.61		(363)
			CHIDEX-MKP	90/10-Hexane/i-PrOH		1.26	1.18		(333)
			Chirobiotic T	55/45/0.3/0.2-MeCN/MeOH/ $MeCO_2H$/Et_3N		1.14	2.69		(337)
			Chirobiotic T	14/56/30/2/2-CH_2Cl_2/ MeCN/MeOH/$MeCO_2H$/Et_3N	S 6	R 6.8			(366)

Chirobiotic T	100/0.075-MeOH/$CF_3CO_2NH_4$	7	7.8			(392)
Chirobiotic V	100/0.02/0.01-MeOH/$MeCO_2H/Et_3N$			1.09	1.21	(311)
Chirobiotic V	34/66-MeOH, $CF_3CO_2NH_4$ (0.1%)/MeOH			1.12	1.45	(348)
Chirobiotic TAG	55/45/0.3/0.2-MeCN/MeOH/$MeCO_2H/Et_3N$			1.08	1.5	(337)
Chirobiotic MTAG	55/45/0.3/0.2-MeCN/MeOH/$MeCO_2H/Et_3N$			1.14	1.5	(337)
Chiralcel OD	40/60/0.2/0.2-Hexane/EtOH/$MeCO_2H/Et_2NH$	R	S	7.5	5.2	(368)
Chiralcel OD	90/10-Hexane/EtOH			1.4	1.1	(374)
Chiralcel OD	90/10/0.1/0.02-Hexane/n-PrOH/Et2NH/H_2O	R	S	2.4		(393)
Chiralcel OD	90/10-Hexane/i-PrOH, Ethanolamine 10 mM			1.53		(394)
Chiralcel OD	85/7.5/7.5/0.05-Hexane/EtOH/i-PrOH/Et_2NH	R(+)	S(−)	2.3	2.99	(395)

(*continued*)

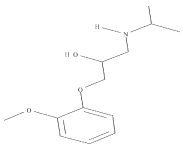
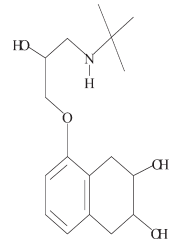
Table 7. Continued.

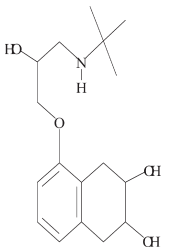
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Metoprolol		Beta-blocker	Chiralcel OD	80/20/0.1-Isohexane/i-PrOH/Et_2NH			4.34		(396)
			Chiralcel OD-H	95/5/0.1-Hexane/i-PrOH/Et_2NH			2.35		(397)
			Chiralcel OD-RH	60/40-Phosphate buffer 50 mM, pH = 9/MeCN				0.58	(351)
			Chiralcel OD-RH	60/40-Phosphate buffer 50 mM, pH = 2, KPF_6 100 mM/MeCN				1.11	(351)
			Chiralcel OD-RH	60/40 Borate buffer 20 mM, pH = 9/MeCN				0.54	(351)
			Chiralcel OJ-H	95/5-Heptane/i-PrOH/Et_2NH 0.1%			3		(397)
			Chiralcel OJ-H	95/5-Heptane/i-PrOH/CF_3-CO_2NH_4 0.1 mM			1.76		(397)
			Chiralpak AD	90/10/1-Hexane/EtOH/n-$C_3H_7NH_2$	R(+)	S(−)	1.58		(352)
			Chiralpak AD	90/10-Hexane/EtOH			1.14		(353)
			Chiralpak AD	88/10.2/1.8/0.2-Hexane/EtOH/i-PrOH/Et_2NH	R(+) 6	S(−) 7.8			(398)
			Chiralpak AD-H	85/15/0.1-Hexane/EtOH/$EtSO_3H$		1.13	1.44		(287)
			Chiralpak AD-H	95/5-Heptane/EtOH/Et_2NH (0.1%)		1.76			(397)
			Chiralpak AD-H	95/5-Heptane/i-PrOH/CF_3-CO_2NH_4 0.1 mM		1.39			(397)
			Chiralpak AD-R	100-MeOH, Et_2NH /0.1%		1.32			(343)
			Chiralpak AD-R	95/5/0.1-MeOH/H_2O/Et_2NH			1.34		(343)
			Chiralpak AD-R	30/35/35/0.1-H_2O/MeOH/EtOH/Et_2NH			1.14		(343)

			Chiralpak AD-R	50/50/0.1-MeOH/EtOH/Et_2NH			1.44		(343)
			Chiralpak AD-R	100/0.1-MeCN/Et_2NH			1.14		(343)
			Chiralpak AD-R	30/70/0.1-H_2O/MeCN/Et_2NH			1.13		(343)
			Chiralpak AD-RH	60/40-Phosphate buffer 50 mM, pH = 9/MeCN				0.29	(351)
			Chiralpak AD-RH	60/40-Borate Buffer 20 mM, pH = 9/MeCN				0.58	(351)
			Chiralpak AS-H	95/5-Heptane/i-PrOH/Et_2NH (0.1%)			1.23		(397)
Metoprolol		Beta-blocker	Chiralpak AS-H	95/5-Heptane/i-PrOH/CF_3-CO_2NH_4 0.1 mM			1.37		(397)
			Kromasil CHI-II	98/2-Hexane/i-PrOH/TFA			1.07		(399)
			Kromasil CHI-DMB	98/2-Hexane/i-PrOH/TFA			1.14		(399)
			EnantioPac	Phosphate buffer 0.02M, pH = 7/NaCl 0.1M			1.64		(291)
			EnantioPac	Phosphate buffer 0.02M, pH = 6/TPAB 0.001M			1.54		(312)
			EnantioPac	Phosphate buffer 0.02M, pH = 7/MeCN (1.25%)	R	S	1.7	1.7	(400)
			Chiral-AGP	Phosphate buffer 10 mM, pH = 7	(+)	(−)	1.55	1.9	(329)
			Chiral-AGP	Phosphate buffer 0.01M, pH = 7.2, MeOH 1.48M			1.37		(354)
			Chiral-AGP	Phosphate buffer 0.01M, pH = 7.2, MeCN 0.95M			1.11		(354)
			Chiral-CBH	95/5-NaH_2PO_4 buffer 10 mM, pH = 6, Na_2EDTA50μM /i-PrOH			3.16	7.15	(308)
			Chiral-CBH	Sodium phosphate buffer pH = 7			2.18		(401)

(*continued*)

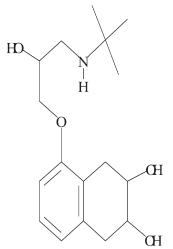
Table 7. Continued.

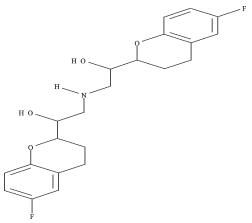
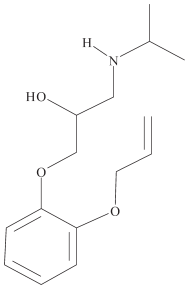
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			TrichSep-100	95/5-Phosphate buffer pH = 6.8/i-PrOH	R	S	2.9		(356)
Moprolol		Beta-blocker	Chiral-CBH	95/5-NaH_2PO_4 buffer 10 mM, pH = 6, Na_2EDTA 50μM /i-PrOH			1.91	4.21	(301)
Nadolol A		Beta-blocker	Chirex 3022	75/17/8-Hexane/$ClCH_2CH_2$-Cl/EtOH, TFA (20 + 1)	RSR(+)	SRS(−)	1.13	1.6	(323)
Nadolol B			Chirex 3022	75/17/8-Hexane/$ClCH_2CH_2$-Cl/EtOH, TFA (20 + 1)	RRS(+)	SSR(−)	1.06	0.8	(323)
Nadolol A			CHIDEX-MKP	80/20-TEAA buffer (1%) pH = 5.5/MeOH	SRS 29.31	RSR 51.74			(402)
Nadolol B			CHIDEX-MKP	80/20-TEAA buffer (1%) pH = 5.5/MeOH	RSS 29.31	SRR 34.23			(402)
Nadolol B			Chiralcel OD	80/20/0.2/0.34-Hexane/EtOH/TFA/Et_3N	(+)	(−)	2.12		(339)
Nadolol (dia)			Chiralcel OD	80/5/15-Hexane/i-PrOH/EtOH				0.97	(374)
Nadolol (dia)			Chiralcel OD	80/5/15/0.05-Hexane/i-PrOH/EtOH/Et_2NH				1.68	(387)
Nadolol A			Chiralcel OD	85/15/0.4-Hexane/EtOH/Et_2NH	R,2S3R(+)	S,2 R3S(−)	2.21		(403)
Nadolol B			Chiralcel OD	85/15/0.4-Hexane/EtOH/Et_2NH	R,2R3S(+)	S,2S3R(−)	1.53		(403)
Nadolol A + B			Chiralcel OD-RH	MeCN/Ethanolamine (0.1%)	(+)	(−)	2.57		(344)

Nadolol A + B		Chiralcel OD-RH	90/10-MeCN/i-PrOH/Ethanolamine (0.1%)	(+)	(−)	2.66	(344)
Nadolol A + B		Chiralcel OD-RH	MeCN/Ethanolamine (0.1%)	(−)	(+)	1.91	(344)
Nadolol A + B		Chiralcel OD-RH	90/10-MeCN/i-PrOH/Ethanolamine (0.1%)	(−)	(+)	2	(344)
Nadolol A		Chiralpak AD	77/20/3/0.3-Hexane/EtOH/i-PrOH/Et_2NH	2S,3R,2′S	2R,3S,2′R	1.98	(404)
Nadolol A		Chiralpak AD	80/20/0.3-Hexane/EtOH/Et_2NH	2S,3R,2′S	2R,3S,2′R	1.93	(404)
Nadolol A		Chiralpak AD	75/25/0.5-H_2O/EtOH/Et_2NH	2S,3R,2′S 24.8	2R,3S,2′R 27.5		(404)
Nadolol A		Chiralpak AD	80/20/0.1-Hexane/i-PrOH/Et_2NH	RS 15	SR 26		(405)
Nadolol B		Chiralpak AD	75/25/0.3-Hexane/EtOH/Et_2NH	2S,3R,2′R	2R,3S,2′S	6.53	(404)
Nadolol B		Chiralpak AD	73/18/9/0.3-Hexane/EtOH/i-PrOH/Et_2NH	2S,3R,2′R	2R,3S,2′S	6.07	(404)
Nadolol B		Chiralpak AD	75/25/0.5-H_2O/EtOH/Et_2NH	2S,3R,2′R 20	2R,3S,2′S 40		(404)

(*continued*)

Table 7. Continued.

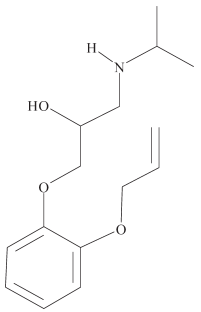
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Nadolol B		Beta-blocker	Chiralpak AD	80/20/0.1-Hexane/i-PrOH/Et_2NH	RR 16	SS 22			(405)
Nadolol A + B			Chiralpak AD-RH	MeCN/Ethanolamine (0.1%)	(+)	(−)	1.82		(344)
Nadolol A + B			Chiralpak AD-RH	90/10-MeCN/i-PrOH, Ethanolamine (0.1%)	(+)	(−)	20.1		(344)
Nadolol A + B			Chiralpak AD-RH	MeCN/Ethanolamine (0.1%)	(+)	(−)	1.82		(344)
Nadolol A + B			Chiralpak AD-RH	95/5-MeCN/MeOH, Ethanolamine (0.1%)	(+)	(−)	1.86		(344)
Nadolol A + B			Chiralpak AD-RH	90/10-MeCN/i-PrOH, Ethanolamine (0.1%)	(−)	(+)	2.02		(344)
Nadolol A + B			Chiral-AGP	KH_2PO_4 0.025M, pH = 7.5 (NH_3)/TBAB			1.8	1.7	(406)
Nadolol A + B			Chiral-AGP	KH_2PO_4 0.025M, pH = 7.5 (NH_3)/$C_7H_{15}CO_2H$ (0.05%)			1.2	0.9	(406)
Nadolol A			EnantioPac	Phosphate buffer 0.02M, pH = 6/TBAB 0.001M			3.98		(291)
Nadolol B			EnantioPac	Phosphate buffer 0.02M, pH = 6/TBAB 0.001M			3.03		(291)
Nadolol A			Ultron-ES-OVM	90/10-Phosphate buffer 20 mM, pH = 6.0/MeOH	SR 14	RS 17			(405)
Nadolol B			Ultron-ES-OVM	90/10-Phosphate buffer 20 mM, pH = 6.0/MeOH	SS 11.5	RR 20			(405)

Nebivolol		Beta-blocker	Chiralpak AD	n-PrOH	RRRS(+)	SSSR(−)	1.71	1.21	(407)
			Chiralpak AD-RH	n-PrOH	RRRS(+)	SSSR(−)	1.59	1.1	(407)
Oxprenolol		Beta-blocker	(R)-alpha-Burke 1	95/5-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 0.5 g/l			1.1	1.2	(331)
Oxprenolol, HCl			(R)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/MeOH, $MeCO_2NH_4$ 10 mM			1.11		(318)
Oxprenolol, HCl			(S)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM			1.12	0.53	(319)
			(S)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH MeOH, $MeCO_2NH_4$ 15 mM			1.09	0.39	(319)
			Chirex 3014	250/140/10/1-Hexane/CH_2Cl-CH_2Cl/EtOH/TFA			1.08		(389)
			Sumichiral OA-4100	250/140/10/1-Hexane/CH_2Cl-CH_2Cl/EtOH/TFA			1.07		(278)
			Sumichiral OA-4500	250/140/10/1-Hexane/CH_2Cl-CH_2Cl/EtOH/TFA			1.05		(278)
			Sumichiral OA-4700	250/140/10/1-Hexane/CH_2Cl-CH_2Cl/EtOH/TFA			1.06		(278)
			Sumichiral OA-4900	250/140/10/1-Hexane/CH_2Cl-CH_2Cl/EtOH/TFA			1.06		(278)
			Pirkle 1-J	90/10-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 15 mM			1.15		(320)
			Opticrown RCA(+)	80/20/0.1/0.56MeCN/i-PrOH/TFA/			1.29	2.49	(332)

(*continued*)

Table 7. Continued.

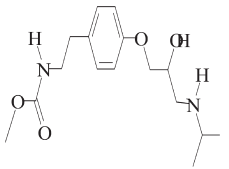
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			Cyclobond I	99/1/0.2/0.16-MeCN/MeOH/$MeCO_2H$/Et_3N				1.4	(345)
			Cyclobond I	92/8-TEAA (0.1%) pH = 5.5)/MeOH	7.9	8.88			(362)
			CHIDEX-MKP	70/30-TEAA buffer (1%) pH = 5.33/MeOH			1.09	0.5	(337)
			Chirobiotic T	5/95-TEAA (0.5%) pH = 5/MeOH			1.08	1.04	(336)
			Chirobiotic T	100/0.01/0.01-MeOH/$MeCO_2H$/Et_3N			1.07	1.08	(336)
			Chirobiotic T	545/455/2/2-MeOH/MeCN/Et_3N/$MeCO_2H$			1.3	0.9	(408)
			Chirobiotic V	495/5/2/1-MeCN/MeOH/$MeCO_2H$/Et_3N			1.13		(349)
			Chirobiotic TAG	55/45/0.3/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.05	0.99	(337)
			Chirobiotic MTAG	55/45/0.3/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.06	0.65	(337)
			Chiralcel OD	80/20/0.2/0.34-Hexane/EtOH/TFA/Et_3N	(+)	(−)	6.2		(339)
			Chiralcel OD	80/20/0.1-Hexane/i-PrOH/Et_2NH	(+)	(−)	6.3		(409)
			Chiralcel OD	20/80/0.4-Hexane/i-PrOH/Et_2NH	S(−)	R(+)	3.2	4.09	(410)
			Chiralcel OD-R	70/30-Phosphate buffer 50 mM, pH = 6, $NaClO_4$ 0.5M/MeCN	R(+)	S(−)	1.34	2.28	(411)

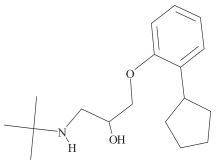
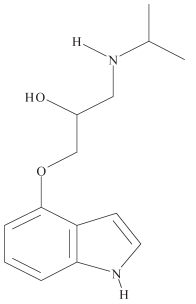


		Chiralcel OD-RH	MeCN/Ethanolamine (0.1%)	(+)	(−)	1.41	1.72	(344)
		Chiralcel OD-RH	90/10-MeCN/i-PrOH, Ethanolamine (0.1%)	(+)	(−)	1.67	1.72	(344)
		Chiralcel OD-RH	60/40-Phosphate buffer 50 mM, pH = 9/MeCN				1.19	(351)
		Chiralcel OD-RH	60/40-Phosphate buffer 50 mM, pH = 9, $NaClO_4$ 250 mM/MeCN				2.52	(351)
		Chiralcel OD-RH	60/40-Borate buffer 20 mM, pH = 9/MeCN				1.93	(351)
		Chiralpak AD	90/10-Hexane/EtOH			1.29		(353)
		Chiralpak AD	90/10/1-Hexane/EtOH/n-$C_3H_7NH_2$			1.69		(353)
		Chiralpak AD-H	85/15/0.1-Hexane/EtOH/$MeSO_3H$			1.21	3.74	(287)
Oxprenolol	Beta-blocker	Chiralpak AD-H	85/15/0.1-Hexane/EtOH/Et_2NH			1.91	6.29	(287)
		Chiralpak AD-R	50/50/0.1-MeOH/EtOH/Et_2NH			1.84		(343)
		Chiralpak AD-R	100/0.1-MeOH/Et_2NH			1.73		(343)
		Chiralpak AD-R	15/85/0.1-H_2O/MeOH/Et_2NH			1.73		(343)
		Chiralpak AD-R	30/35/35/0.1-H_2O/MeOH/EtOH/Et_2NH			1.43		(343)
		Chiralpak AD-R	30/70/0.1-$_2$O/MeCN/Et_2NH			1.18		(343)
		Chiralpak AD-RH	60/40-Phosphate buffer 50 mM, pH = 9/MeCN				0.99	(351)
		Chiralpak AD-RH	60/40-Phosphate buffer 50 mM, pH = 9, $NaClO_4$ 250 mM/MeCN				0.64	(351)

(*continued*)

Table 7. Continued.

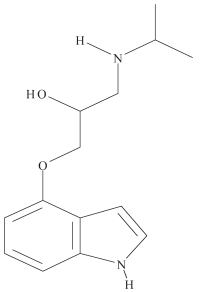
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			Chiralpak AD-RH	60/40-Borate buffer 20 mM, pH = 9/MeCN				1.32	(351)
			Chiralpak IB	95/5/0.1-MTBE/EtOH/ $NH_2(CH_2)_2NH_2$	4.12	6.46			(412)
			Chiral-AGP	99/1-Sodium acetate buffer 0.001M, pH = 4.5/i-PrOH			1.28	1.61	(289)
			Chiral-AGP	Phosphate buffer 0.01M, pH = 7.2/MeCN 2.85M			1.11		(354)
			Chiral-AGP	88.6/11.4-Phosphate buffer 0.01M, pH = 7/EtOH			1.29	1	(371)
			Chiral-AGP	Phosphate buffer pH = 5.5, Tween 20 0.7 g/l, $C_6H_{13}CO_2H$	5.8	7.6			(413)
			Chiral-CBH	Sodium phosphate buffer pH=7 (I = 0.04)			2.97		(401)
			EnantioPac	Phosphate buffer 0.02M, pH = 7/NaCl 0.1M/EtOH 1.74M			1.25		(291)
			Ultron ES-OVM	95/5-Phosphate buffer 0.02M, pH = 4.6/EtOH			1.15		(306)
Pamatolol		Beta-blocker	Chiral-CBH	95/5-NaH_2PO_4 buffer 10 mM, pH = 6, Na_2EDTA 50μM/i-PrOH			2.31	5.34	(308)

Penbutolol		Beta-blocker	Chiralcel OD	90/10/0.4-Hexane/i-PrOH/ Et_2NH	R(+)	S(−)	1.98	5.05	(414)
			Chiral-AGP	90/10-Phosphate buffer 0.02M, pH = 4.6/i-PrOH			1.37		(380)
Pindolol		Beta-blocker	(R)-alpha-Burke 1	19/1-CH_2Cl_2/EtOH, $MeCO_2$-NH_4 0.5 g/l			1.72		(316)
			(R)-alpha-Burke 2	10/90-EtOH/MeCN, HCO_2NH_4 20 mM			1.22	3.3	(317)
			(R)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2$-NH_4 20 mM			1.5		(318)
			Pirkle 1-J	80/20-CH_2Cl_2/EtOH, $MeCO_2$-NH_4 40 mM			2.06		(320)
			Opticrown RCA(+)	50/50/0.1/0.1-MeOH/MeCN/ $Et_3N/MeCO_2H$			1.14	2.29	(332)
			Cyclobond I	96/4/0.4/0.3-MeCN/EtOH/ $MeCO_2H/Et_3N$				1.6	(415)
			Cyclobond II	99/1/0.2/0.1-MeCN/MeOH/ $MeCO_2H/Et_3N$				1.72	(345)
			CHIDEX-MKP	70/30-TEAA buffer (1%) pH = 5.33/MeOH			1.34	1.43	(333)
			CHIDEX-MKP	70/30-TEAA 98 mM, pH = 5.3/MeOH			1.34	1.21	(334)
			CHIDEX-SKP	70/30-Et_3N buffer (1%) pH = 5.11/MeOH			1.33	0.88	(335)
			Chirobiotic T	5/95-TEAA (0.5%) pH = 5/ MeOH			1.09	1.12	(336)
			Chirobiotic T	60/40-H_2O, TEAA buffer (1%) pH= 4.1 ($MeCO_2H$)/MeOH			1.03	0.2	(337)

(*continued*)

Table 7. Continued.

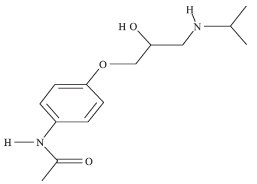
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Pindolol		Beta-blocker	Chirobiotic T	55/45/0.3/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.12	2.45	(337)
			Chirobiotic T	34/66-MeOH, $CF_3CO_2NH_4$ (0.1%)/MeOH			1.12	1.67	(348)
			Chirobiotic T	100/0.1/0.1-MeOH/Et_3N/$MeCO_2H$			1.19	1.7	(364)
			Chirobiotic T	15/85-H_2O, $MeCO_2NH_4$0.025-M/MeOH			1.06	1.3	(364)
			Chirobiotic V	100/0.02/0.01-MeOH/$MeCO_2H$/Et_3N			1.09	1.22	(311)
			Chirobiotic TAG	60/40-H_2O, TEAA buffer (1%) pH= 4.1 ($MeCO_2H$)/MeOH			1.03	0.3	(337)
			Chirobiotic TAG	55/45/0.3/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.07	1.45	(337)
			Chirobiotic MTAG	55/45/0.3/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.08	1.24	(337)
			Chiralcel OC	80/20/0.1-Hexane/i-PrOH/Et_2NH	(+)	(−)	1.21	0.98	(350)
			Chiralcel OD	80/20/0.2/0.34-Hexane/EtOH/TFA/Et_3N	(+)	(−)	13.89		(339)
			Chiralcel OD	70/30-Hexane/i-PrOH			4.13	5.1	(374)
			Chiralcel OD	80/20/0.1-Hexane/i-PrOH/Et_2NH	(+)	(−)	12.17		(409)
			Chiralcel OD	100/0.1-EtOH/Et2NH			3		(416)
			Chiralcel OD	90/10/0.1-EtOH/MeOH/Et_2NH			2.8		(416)
			Chiralcel OD	60/40/0.5-Heptane/EtOH/TFA			11.4		(416)
			Chiralcel OD	60/40-$NaClO_4$ 1M/MeCN			3.03	2.98	(417)

			Chiralcel OD-H	50/50-Heptane/i-PrOH/Et_2NH (0.1%)			11.67		(397)
			Chiralcel OD-H	50/50-Heptane/i-PrOH/$CF_3CO_2NH_4$ 0.1 mM			17.49		(397)
			Chiralcel OD-R	60/40/0.1-H_2O, pH = 11/MeCN/i-$PrNH_2$	18	36			(339)
			Chiralcel OD-R	60/40-CCl_3CO_2Na 0.1M/MeCN	R(+)	S(−)	2.02		(418)
			Chiralcel OD-R	60/40-CF_3SO_3Na 0.1M/MeCN			1.83		(418)
			Chiralcel OD-R	75/25/0.05-H_2O/MeCN/TFA				2.5	(419)
			Chiralcel OD-R	60/40-H_2O, $NaPF_6$ 0.1M/MeCN			1.99	1	(420)
Pindolol		Beta-blocker	Chiralcel OD-R	45/55-Phosphate buffer 50 mM, pH = 6/MeOH	6	7.5			(421)
			Chiralcel OD-R	80/20-Phosphate buffer 50 mM, pH = 6/MeCN	6	7.8			(421)
			Chiralcel OD-RH	MeCN/Ethanolamine (0.1%)	(+)	(−)	2.94	8.91	(344)
			Chiralcel OD-RH	90/10-MeCN/i-PrOH, Ethanolamine (0.1%)	(+)	(−)	3.74	4.85	(344)
			Chiralcel OD-RH	60/40-Phosphate buffer 50 mM, pH = 2, KPF_6 100 mM/MeCN				4.85	(351)
			Chiralcel OD-RH	60/40-Phosphate buffer 50 mM, pH = 9/MeCN				3.06	(351)
			Chiralcel OD-RH	60/40-Borate buffer 20 mM, pH = 9/MeCN				4.35	(351)
			Chiralcel OF	80/20/0.1-Hexane/i-PrOH/Et_2NH	(+)	(−)	1.43	2	(350)
			Chiralcel OG	80/20/0.1-Hexane/i-PrOH/Et_2NH	(+)	(−)	1.28	1.51	(350)

(*continued*)

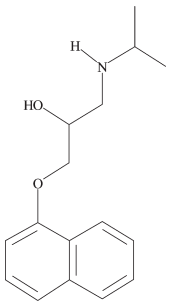
Table 7. Continued.

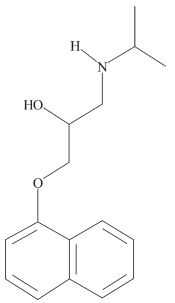
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Pindolol		Beta-blocker	Chiralcel OJ	85/15/0.1-Isohexane/EtOH/Et_2NH			1.17	0.76	(311)
			Chiralcel OJ	85/15/0.1-Isohexane/EtOH/TFA			1.06	0.16	(311)
			Chiralpak AD	70/30-K_2HPO_4-Na_3PO_4 20 mM, pH = 10/MeCN			1.28		(302)
			Chiralpak AD	50/50-Hexane/EtOH			2.01	14.07	(341)
			Chiralpak AD	90/10/1-Hexane/EtOH/n-$C_3H_7NH_2$			1.6		(352)
			Chiralpak AD	88/10.2/1.8/0.2-Hexane/EtOH/i-PrOH/Et_2NH	8.5	10.4			(422)
			Chiralpak AD-RH	90/10-MeCN/i-PrOH, Ethanolamine (0.1%)	(+)	(−)	1.5	0.7	(344)
			Chiralpak AD-RH	60/40-Borate buffer 20 mM, pH = 9/MeCN				1.65	(351)
			Chiralpak AD-RH	60/40-Phosphate buffer 50 mM, pH = 9/MeCN				0.74	(351)
			Chiralpak AD-RH	60/40-Phosphate buffer 50 mM, pH = 9, $NaClO_4$ 250 mM/MeCN				0.48	(351)
			Chiral-AGP	Phosphate buffer 10 mM, pH = 5.5			1.12	0.6	(329)
			Chiral-AGP	Phosphate buffer 0.01M, pH = 7.2/MeCN 0.95M			1.53		(354)
			Chiral-AGP	Phosphate buffer 0.01M, pH = 7.2, EtOH 2.11M			1.29		(354)

			Ultron-ES-OVM	Phosphate buffer 1.25-25 mM, pH = 5-7/MeCN or EtOH		1.6	2.3	(372)
			(R)-alpha-Burke 2	90/10-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 20 mM		1.11	0.91	(317)
			(R)-alpha-Burke 2	10/90-EtOH/MeCN, HCO_2NH_4 20 mM		1.08	1.12	(317)
			(R)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/ MeOH, $MeCO_2NH_4$ 15 mM		1.14		(318)
Practolol		Beta-blocker	(S)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM		1.12	0.62	(319)
			(S)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/ MeOH, $MeCO_2NH_4$ 15 mM		1.11	0.52	(319)
			Chiralcel OD	80/20/0.1-Heptane/i-PrOH/ Et_2NH		1.32		(306)
			Chirobiotic T	70/30/0.3/0.2-MeOH/MeCN/ $MeCO_2H/Et_3N$	10.89	11.74		(423)
			Chiral-CBH	95/5-NaH_2PO_4 buffer 50 mM, pH = 7, Na_2EDTA 50μM/ MeCN		1.36	2.51	(308)

(*continued*)

Table 7. Continued.

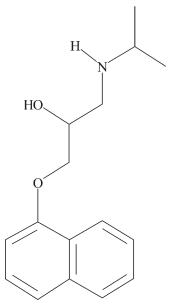
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			(R)-alpha-Burke 1	19/1-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 0.5 g/l	S(−)	R(+)	2.11		(316)
			(R)-alpha-Burke 2	10/90-EtOH/MeCN, HCO_2NH_4 20 mM			1.22	3.31	(317)
			(R)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 15 mM			1.52		(318)
Propranolol, HCl			(S)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/MeOH, $MeCO_2NH_4$ 15 mM			1.33	0.96	(319)
Propranolol, HCl			(S)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 15 mM			1.37	0.98	(319)
			Pirkle 1-J	80/20-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 40 mM			1.8		(320)
			Sumichiral OA-4100	250/140/10-Hexane/$ClCH_2CH_2Cl$/EtOH/TFA			1.08		(278)
			Sumichiral OA-4700	250/140/10-Hexane/$ClCH_2CH_2Cl$/EtOH/TFA	S	R	1.1		(278)
			Sumichiral OA-4900	250/140/10-Hexane/$ClCH_2CH_2Cl$/EtOH/TFA	R(+)	S(−)	1.13		(278)
			Chirex 3014	70/25/5/0.25-Hexane/$ClCH_2CH_2Cl$/EtOH/TFA			1.11		(322)
			Chirex 3020	76/20/4-Hexane/$ClCH_2CH_2Cl$/EtOH-TFA (20:1)			1.08		(322)
			Chirex 3022	60/35/5-Hexane/CH_2Cl_2/EtOH, TFA (5%)			1.11	1	(279)
			Sumichiral OA-5500	85/15- H_2O, $CuSO_4$ 2 mM/MeCN			1.06		(360)

Propranolol		Beta-blocker	Opticrown RCA(+)	50/50/0.1/0.1-MeOH/MeCN/ $Et_3N/MeCO_2H$			1.15	2.38	(332)
			Cyclobond I	75/25-H_2O, TEAA buffer (1%) pH= 4.1/MeOH)			1.04	1.4	(391)
			Cyclobond I	96/4/0.4/0.3-MeCN/EtOH/ $MeCO_2H/Et_3N$	S	R	1.2	2.18	(415)
			ChiraDex	95/5/0.3/0.2-MeCN/MeOH/ $MeCO_2H/Et_3N$			1.07	0.33	(363)
			Ultron ES-PhCD	65/35-Phosphate buffer 20 mM, pH = 4.6/MeCN			1.5		(424)
			CHIDEX-MKP	80/20-Hexane/i-PrOH			1.43	1.79	(333)
			CHIDEX-MKP	80/20-MeOH/i-PrOH			1.43	1.52	(334)
			CHIDEX-SKP	70/30-Et_3N buffer (1%) pH = 5.11/MeOH			2.06	2.53	(335)
			CHIDEX-SKP	60/40/1/1-H_2O/MeOH/ $MeCO_2H/Et_3N$	6	7.5			(425)
			Chirobiotic T	5/95-TEAA (0.5%) pH = 5/ MeOH			1.1	1.3	(336)
			Chirobiotic T	75/25-$CF_3CO_2NH_4$ (0.05%)/ MeOH	S	R	1.16	1.83	(337)
			Chirobiotic T	100/0.02/0.01-MeOH/ $MeCO_2H/Et_3N$			1.14	1.5	(347)

(*continued*)

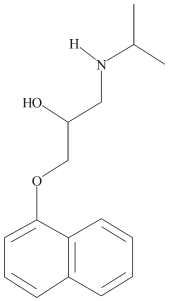
Table 7. Continued.

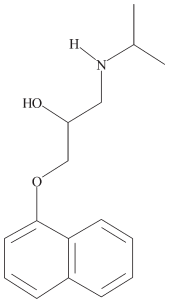
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			Chirobiotic T	545/455/2/2-MeCN/MeOH/$MeCO_2H$/Et_3N	S	R	1.17		(426)
			Chirobiotic V	80/20/0.4/0.2-MeCN/MeOH/Et_2NH/$MeCO_2H$			1.06		(277)
			Chirobiotic V	100/0.02/0.01-MeOH/Et_3N/$MeCO_2H$			1.12	1.53	(311)
			Chirobiotic V	75/25-$CF_3CO_2NH_4$ (0.05%)/MeOH	5.98	6.27			(367)
			Chirobiotic V	MeOH/TFA (0.01%)/NH_4OH (0.01%)			1.11		(427)
			Chirobiotic TAG	60/40-H_2O, TEAA buffer (1%) pH= 4.1 ($MeCO_2H$)/MeOH			1.61	5	(337)
			Chirobiotic TAG	55/45/0.3/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.03	0.6	(337)
			Chirobiotic MTAG	55/45/0.3/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.03	0.5	(337)
			Chiralcel OC	80/20/0.1-Hexane/i-PrOH/Et_2NH	(+)	(−)	1.05		(350)
			Chiralcel OD	85/15/0.1-Isohexane/EtOH/TFA	(+)	(−)	5.21	4.32	(311)
			Chiralcel OD	80/20/0.2/0.34-Hexane/EtOH/TFA/Et_3N	(+)	(−)	4.04		(339)
			Chiralcel OD	90/10/1-Hexane/i-PrOH/n-$C_3H_7NH_2$			2.62		(352)
			Chiralcel OD	80/20-Hexane/i-PrOH	R	S	1.83		(369)
			Chiralcel OD	80/5/15-Hexane/i-PrOH/EtOH			1.33	1	(374)
			Chiralcel OD	80/5/15/0.05-Hexane/i-PrOH/EtOH/Et_2NH	R	S		2.15	(387)

Propranolol		Beta-blocker	Chiralcel OD	60/40-$NaClO_4$ 1M/MeCN			1.38	1.64	(417)
			Chiralcel OD-H	80/20-Heptane/EtOH/Et_2NH (0.1 %)			2.41		(397)
			Chiralcel OD-H	80/20-Heptane/EtOH, $CF_3CO_2NH_4$ 0.1 mM			3.87		(397)
			Chiralcel OD-H	90/10/10-Hexane/EtOH/i-PrOH	R	S	1.49		(428)
			Chiralcel OD-R	60/40-CCl_3CO_2Na 0.1M/MeCN			1.39		(418)
			Chiralcel OD-R	60/40-CF_3SO_3Na 0.1M/MeCN			1.16		(418)
			Chiralcel OD-R	30/70-H_2O, $NaClO_4$ 0.5M/MeOH			1.2	0.8	(420)
			Chiralcel OD-R	60/40-Sodium perchlorate 0.1M, pH = 6/MeCN	R(+)	S(−)	1.47	1.86	(429)
			Chiralcel OD-RH	MeCN/Ethanolamine (0.1%)	(+)	(−)	1.32	2.69	(344)
			Chiralcel OD-RH	95/5-MeCN/i-PrOH, Ethanolamine (0.1%)	R(+)	S(−)	1.58	2.46	(344)
			Chiralcel OD-RH	60/40-Phosphate buffer 50 mM, pH = 5.5/MeCN				0.6	(351)
			Chiralcel OD-RH	60/40-Phosphate buffer 50 mM, pH = 2, $NaClO_4$ 500 mM/MeCN				2.74	(351)
			Chiralcel OF	92/8/0.5-Hexane/i-PrOH/Et_2NH	(+)	(−)	1.35	1.75	(430)
			Chiralcel OG	80/20/0.1-Hexane/i-PrOH/Et_2NH	(+)	(−)	1.14	0.58	(350)
			Chiralcel OJ-H	95/5-Heptane/i-PrOH/Et_2NH (0.1%)			1.15		(397)

(*continued*)

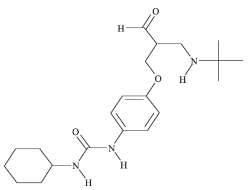
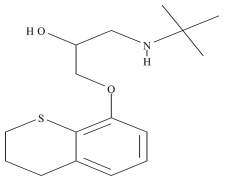
Table 7. Continued.

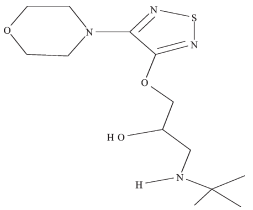
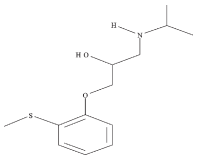
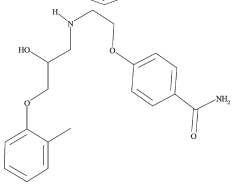
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			Chiralpak AD	70/30-H_2O, K_2HPO_4-Na3PO_4 20 mM, pH = 10/MeCN			1.09		(302)
			Chiralpak AD	90/10/1-Hexane/EtOH/n-$C_3H_7NH_2$			1.7		(352)
			Chiralpak AD	90/10-Hexane/EtOH			1.15		(353)
			Chiralpak AD	85/3.75/11.25/0.1-Hexane/EtOH/MeOH/Et_2NH	R	S	2.25	1.63	(431)
			Chiralpak AD-H	80/20/0.1-Hexane/i-PrOH/$EtSO_3H$			1.21	1.41	(287)
			Chiralpak AD-H	80/20-Heptane/i-PrOH/Et_2NH (0.1%)			2.41		(397)
			Chiralpak AD-H	80/20-Heptane/EtOH, CF_3-CO_2NH_4 (0.1 mM)			1.37		(397)
			Chiralpak AD-RH	90/10-MeCN/i-PrOH, Ethanolamine (0.1%)	(+)	(−)	1.74	1.85	(344)
			Chiralpak AD-RH	60/40-Phosphate buffer 50 mM, pH = 95/MeCN				0.56	(351)
			Chiralpak AD-RH	60/40-Phosphate buffer 50 mM, pH = 9, $NaClO_4$ 250 mM/MeCN				0.57	(351)
			Chiralpak AD-RH	60/40-Borate buffer 20 mM, pH = 9/MeCN				0.68	(351)
			Chiralpak AS-H	95/5-Heptane/i-PrOH, CF_3-CO_2NH_4 (0.1 mM)			1.13		(397)
			Chiral-AGP	99.5/0.5-MeCO_2NH_4 39.5 mM, pH = 4.1/i-PrOH			1.56		(289)
			Chiral-AGP	Phosphate buffer pH 7.2/i-PrOH 1.06M			1.24		(354)
			Chiral-AGP	Phosphate buffer 0.01M, pH = 7.2/MeCN 2.85M			1.11		(354)

			Chiral-AGP	Phosphate buffer NaH_2PO_4 pH = 6.5/Tween 20 2 g/l			1.2	1.1	(432)
Propranolol		Beta-blocker	Chiral-AGP	Phosphate buffer NaH_2PO_4 pH = 6.5/Tween 20 8 g/ $C_6H_{13}CO_2H$ 60 mM			1.48	1.8	(432)
			Chiral-AGP	Acetate buffer 0.03M, pH = 4			1.3		(433)
			Chiral-CBH	Sodium acetate buffer 0.01M, pH = 5	R	S	3.25		(355)
			Chiral-CBH	Sodium Phosphate buffer 0.01 M, pH = 7	R	S	5.83		(355)
			TrichSep-100	95/5-Phosphate buffer pH = 5.8/i-PrOH	R	S	3.7		(356)
			EnantioPac	Phosphate buffer 0.02M, pH = 7, $C_8H_{17}NMe_2$ 0.002M/ i-PrOH 0.33M			1.13		(291)
			Ultron-ES-OVM	75/25-Acetate buffer 20 mM, pH = 6/MeOH			1.09		(434)
			Ultron-ES-OVM	75/25-Borate buffer 20 mM,pH = 6/MeOH			1.11		(434)
			Ultron-ES-OVM	75/25-Tartrate buffer 20 mM, pH = 6/MeOH			1.05		(434)
			Ultron-ES-OVM	75/25-Citrate buffer 20 mM, pH = 6/MeOH			1.09		(434)
			Ultron-ES-OVM	75/25-Phosphate buffer 20 mM, pH = 6.9/i-PrOH	R	S	1.06		(435)
			Ultron-ES-OVM	97.5/2.5-Phosphate buffer 20 mM, pH = 3.9/MeCN	S	R	1.06		(435)
			Ultron-ES-OVM	80/20-Phosphate buffer 20 mM, pH = 6.9/MeCN	R	S	1.21		(435)
			Ultron-ES-OVM	99/1-Phosphate buffer 20 mM, pH = 3.2/EtOH	S	R	1.2		(435)

(*continued*)

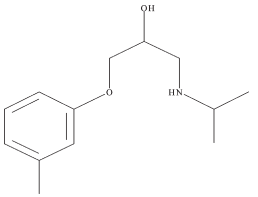
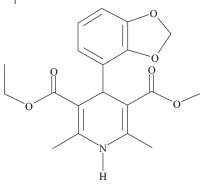
Table 7. Continued.

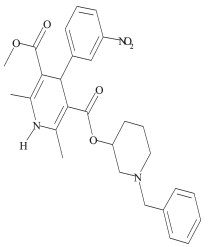
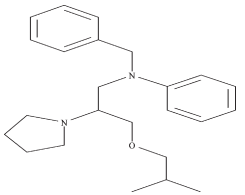
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Talinolol		Beta-blocker	Chiralcel OD	80/20/0.1-Heptane/i-PrOH/Et_2NH	(+)	(−)	1.2		(306)
			Chiraspher-NT	60/40/0.05-EtOH/MeCN/Et_3N	S(−) 8.63	R(+) 10.53			(436)
			Chiral-CBH	95/5-NaH_2PO_4 buffer 10 mM, pH = 6, Na_2EDTA 50μM/i-PrOH			1.77	3.14	(308)
Tertatolol		Beta-blocker	(R)-alpha-Burke 1	95/5- CH_2Cl_2/EtOH, $MeCO_2NH_4$ 0.5 g/l			1.26	2.7	(331)
Tertatolol, HCl			(S)-alpha-Burke 2	85/15-CH_2Cl_2/EtOH, $MeCO_2NH_4$ 10 mM			1.27	0.96	(319)
Tertatolol, HCl			(S)-alpha-Burke 2	85/10/5-CH_2Cl_2/EtOH/MeOH, $MeCO_2NH_4$ 15 mM			1.22	0.88	(319)
Tertatolol			Cyclobond I	97/3/0.24/0.36-MeCN/MeOH/$MeCO_2H$/Et_3N			1.06	1.14	(338)
Tertatolol			Cyclobond I	92/8-TEAA (0.1%) pH = 5.5/MeOH					(362)
Tertatolol			ChiraDex	95/2/0.4/0.2-MeCN/MeOH/$MeCO_2H$/Et_3N			1.08	0.4	(363)
Tertatolol, HCl			Chiralcel OD	80/20/0.1-Heptane/i-PrOH/Et_2NH	R(+)	S(−)	6.65		(306)
Tertatolol			Chiral-AGP	95/5-Phosphate buffer 0.02M, pH = 4.6/i-PrOH			1.41		(380)

Timolol		Beta-blocker	(R)-alpha-Burke 1	95/5-CH_2Cl_2/MeOH, $MeCO_2$-NH_4 0.5 g/l			1.09	1	(331)
Timolol			Cyclobond I	95/5/0.3/0.2-MeCN/MeOH/ $MeCO_2H/Et_3N$	S	R		3	(345)
Timolol, Maleate			Chiralcel OD	95/5/1-Hexane/i-PrOH/ Et_2NH	R(+)	S(−)	1.67	4.32	(437)
Timolol, Maleate			Chiralcel OD-H	958/40/2-Hexane/i-PrOH/ Et_2NH	R(+)	S(−)	1.7	4.81	(438)
Timolol			Chiral-AGP	99/1-Phosphate buffer 0.02M, pH = 6.5/i-PrOH	R	S	1.77		(338)
Timolol			Chiral-CBH	90/10-NaH_2PO_4 buffer 10 mM, pH = 6, Na_2EDTA 50μM/i-PrOH			4.1	5.34	(308)
Tiprenolol		Beta-blocker	Chiral-AGP	97/3-Sodium phosphate buffer 0.01M, pH = 6/i-PrOH			1.37	1	(289)
Tolamolol		Beta-blocker	Chiralcel OD	20/80/0.4-Hexane/EtOH/ Et_2NH			1.76	1.66	(439)
			Chiral-CBH	95/5-$MeCO_2Na$ buffer 10 mM, pH = 5, Na_2EDTA 50μM/i-PrOH			2.07	3.68	(308)

(*continued*)

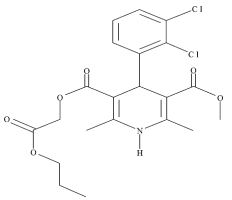
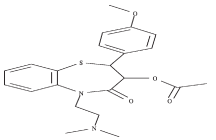
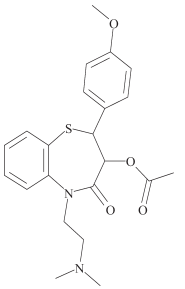
Table 7. Continued.

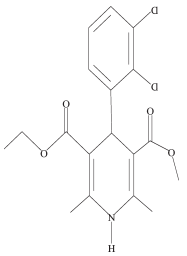
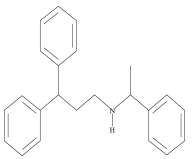
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Toliprolol		Beta-blocker	Chiralcel OD	90/10/0.1-Heptane/i-PrOH/Et_2NH			1.1	1.06	(306)
			Chiral-AGP	99/1-Phosphate buffer 0.02M, pH = 6.5/i-PrOH			1.03		(380)
			Chiral-CBH	95/5-NaH_2PO_4 buffer.10 mM, pH = 6,-Na_2EDTA 50μM/i-PrOH			6.05	10.8	(308)
Amlodipine		Calcium channel blocker	Cyclobond I RSP	6/90-TEAA buffer pH = 5.3/MeCN				1.22	(440)
			Chirobiotic V	100/0.5/0.1-MeOH/$MeCO_2H/Et_3N$	S	R	1.07	0.98	(441)
			Chiralcel OD	90/10/0.1-Heptane/EtOH/Et_2NH			1.14		(306)
			Chiralcel OF	88/12-Hexane/i-PrOH			1.13		(442)
			Chiral-AGP	95/5-Phosphate buffer 0.02M, pH = 4.6/i-PrOH			1.1		(306)
			Chiral-AGP	99/1-Acetate buffer 30 mM, pH = 4.5/1-PrOH			1.48	2.34	(443)
			Chiral-AGP	99/1-$MeCO_2NH_4$ 10 mM, pH = 4.5/1-PrOH	R(+)	S(−)		3	(444)

Benidipine		Calcium channel blocker	Sumichiral OA-2500R	250/140/20/1-Hexane/CH_2Cl-CH_2Cl/MeOH/TFA			1.04		(445)
			Sumichiral OA-3100	250/140/20/1-Hexane/CH_2Cl-CH_2Cl/MeOH/TFA			1.07		(445)
			Sumichiral OA-4500	250/140/20/1-Hexane/CH_2Cl-CH_2Cl/MeOH/TFA	(+)	(−)	1.3	4	(445)
			Sumichiral OA-4600	250/140/20/1-Hexane/CH_2Cl-CH_2Cl/MeOH/TFA			1.11		(445)
			Sumichiral OA-4700	250/140/20/1-Hexane/CH_2Cl-CH_2Cl/MeOH/TFA			1.16		(445)
			Sumichiral OA-4800	250/140/20/1-Hexane/CH_2Cl-CH_2Cl/MeOH/TFA			1.25		(445)
			Chirobiotic V	100/0.01/0.0001-MeOH/$MeCO_2H$/Et_3N	(−) 2.4	(+) 3.4			(446)
			Chiralcel OD	95/5-Hexane/EtOH	(−) 13	(+) 15			(447)
			Chiralcel OJ	87.5/12.5-Hexane/i-PrOH			1.1	0.3	(448)
			Chiralpak AD-RH	60/40-Borate buffer 20 mM, pH = 9/MeCN			1.13		(305)
Bepridil		Calcium channel blocker	Chirex 3014	62/35/3/0.15-Hexane/CH_2Cl-CH_2Cl/EtOH/TFA			1.22		(389)
			Chirex 3018	55/35/10-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.16		(322)
			Chirex 3020	77/20/3-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.09		(322)
			Chiral-AGP	9/1-Na_2HPO_4 buffer 0.01M, pH = 3.8/EtOH			1.29	1.1	(449)
			Ultron ES-OVM	70/30-KH_2PO_4 10 mM, pH = 5.3/EtOH			1.35	1.6	(450)

(*continued*)

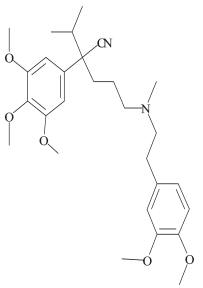
Table 7. Continued.

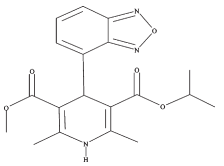
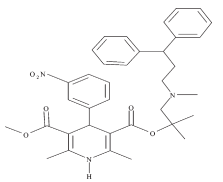
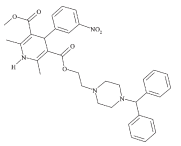
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Clevidipine		Calcium channel blocker	Chiral-AGP	64/6-Phosphate buffer 25 mM, pH = 7/MeOH	S 5.5	R 7.6			(451)
			Chiral-AGP	84/6-Phosphate buffer 25 mM, pH = 7/1-PrOH	R 4.9	S 6			(451)
			Chiral-AGP	80/20-Phosphate buffer 25 mM, pH = 7/MeCN	S 5.5	R 6.5			(451)
			Chiral-AGP	85/1-Phosphate buffer 25 mM, pH = 7/DMSO	S 2	R 4.2			(451)
Diltiazem		Calcium channel blocker	Chiralcel OC	100/1-EtOH/Et_2NH	(−)	(+)		2.1	(452)
Diltiazem			Chiralcel OC	1/1-Hexane/i-PrOH/Et_2NH (1%)	RR (−)	SS (+)	1.69	1.76	(453)
Diltiazem			Chiralcel OD	90/10-Hexane/i-PrOH	(−)	(+)	1.46	2.47	(328)
Cis-Diltiazem			Chiralcel OD	1/1-Hexane/i-PrOH/Et_2NH (1%)	RR (−)	SS (+)	1.1	0.7	(453)
Diltiazem		Calcium channel blocker	Chiralcel OF	60/40-Hexane/i-PrOH/Et_2NH (1%)			2.11	3.69	(453)
Trans-Diltiazem			Chiralcel OF	60/40-Hexane/i-PrOH/Et_2NH (1%)			1.95	3.21	(453)
Diltiazem			Chiralcel OG	1/1-Hexane/i-PrOH/Et_2NH (1%)	RR (−)	SS (+)	1.42	2.49	(453)
Trans-Diltiazem			Chiralcel OG	1/1-Hexane/i-PrOH/Et_2NH (1%)	(−)	(+)	1.15	0.99	(453)
Diltiazem			Chiral-AGP	90/10-Phosphate buffer 0.01M, pH = 7/i-PrOH	(+)	(−)	2.32	1	(454)
Trans-Diltiazem			Ultron-ES-OVM	9/1-Phosphate buffer 20 mM, pH = 6/ EtOH	(−)	(+)	2		(453)
Diltiazem			Ultron ES-OVM	3/97-Phosphate buffer 0.02M, pH 4.5/EtOH	2S,3S (+)	2R,3R (−)	5.64		(455)

Diltiazem			Ultron ES-OVM	80/20-Phosphate buffer 0.02M, pH = 4/MeOH	(−)	(+)	10.37	3.17	(456)
Diltiazem			Ultron ES-OVM	90/10-Phosphate buffer 0.02M, pH = 6/MeCN	(−)	(+)	4.37	7.99	(456)
			Chiralcel OJ	87.5/12.5-Hexane/i-PrOH	S(−)	R(+)	1.44	2.4	(448)
			Chiralcel OJ-R	89/11-Isohexane/i-PrOH	S	R	1.5	1.5	(457)
			Chiral-AGP	Phosphate buffer pH = 7/ Tween 20 0.244 mM/ $C_8H_{17}NH_2$ 1.mM	R	S	1.82		(458)
			Chiral-AGP	Phosphate buffer pH = 6/ Tween 20 0.326 mM	R	S	1.51		(458)
Felodipine		Calcium channel blocker	Chiral-AGP	Phosphate buffer pH = 6/ Tween 20 0.326 mM/(+)-(S)-2-C_8H_{17}OH 1.0 mM	R	S	1.25		(458)
			Chiral-AGP	90/10 Na_2HPO_4 pH = 7.6/i-PrOH	S	R	1.33		(459)
			Chiral-AGP	90/10-Phosphate buffer pH = 7.6/MeCN	S	R	1.32	1	(460)
			Chiral-AGP	90/10-PBS 0.01M pH = 7/i-PrOH	S(−)	R(+)	1.32		(461)
			Chiral-AGP	90/10-PBS 0.01M pH = 7, DMAO 1 mM/i-PrOH	S(−)	R(+)	1.31		(461)
Fendiline		Calcium channel blocker	Chiral-AGP	97/3-Sodium acetate buffer 0.010M, pH = 4.1/MeCN			1.43	2.03	(289)

(*continued*)

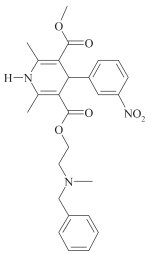
Table 7. Continued.

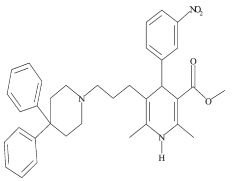
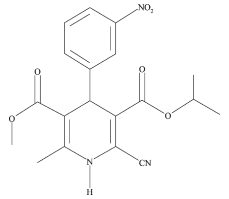
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Gallopamil		Calcium channel blocker	Chirex 3022	55/35/10-Hexane/CH_2Cl_2/EtOH, TFA (5%)			1.25	2.2	(279)
			Chiralcel OD	91/8/1-Hexane/i-PrOH/Et_2NH			1.11		(462)
			Chiralcel OD-H	98/1.6/0.4-Heptane/EtOH/Et_2NH	S	R	1.12	1.15	(463)
			Chiralpak AD	90/10/0.1-Hexane/i-PrOH/Et_2NH	S(−)	R(+)	1.39	2.82	(464)
			Chiral-AGP	90/10-Phosphate buffer 0.01M, pH = 7/MeCN			1.65	2.77	(464)
			Chiral-AGP	89/11-Ammonium acetate pH = 6.8/MeCN	R(+)	S(−)	1.57	2.56	(465)
			Chiral-AGP	87/13-Ammonium phosphate buffer pH = 6.8/MeCN	9	13			(465)
			Chiral-AGP	87/13-Potassium sodium phosphate buffer pH = 6.8/MeCN	13	20			(465)
			Ultron ES-OVM	82/18-KH_2PO_4 10 mM, pH = 6.2/EtOH				1	(466)
			(S,S) Whelk-O1	63/37-MeOH/H_2O			1.12		(467)
			Chiralcel OJ	87.5/12.5-Hexane/i-PrOH			1.48	1.73	(448)
			Chiralpak AD	85/5/10-Hexane/$CHCl_3$/i-PrOH	(−)	(+)	1.19	1.35	(468)

Isradipine		Calcium channel blocker	Chiralpak AD	90/10-Hexane/i-PrOH	(−)	(+)	1.29	1.35	(468)
			Chiral-AGP	90/10-PBS 0.01M, pH = 7/i-PrOH	S(+)	R(−)	2.34		(461)
			Chiral-AGP	90/10-PBS 0.01M, pH = 7, DMOA 1 mM/i-PrOH	S(+)	R(−)	1.69		(461)
			Chiral-AGP	85/15-Sodium phosphate buffer 0.03M, pH = 6.8/i-PrOH			2	1	(469)
			Ultron ES-OVM	75/25-KH_2PO_4 10 mM, pH = 4.7/EtOH				1	(466)
			Chirobiotic V	100/0.1/0.01-MeOH/$MeCO_2H$/Et_3N	R	S	1.18	1.61	(441)
			Chiralpak AD	95/5/0.1-Hexane/EtOH/Et_2NH	5.98	6.5			(470)
Lercanidipine		Calcium channel blocker	Chiral-AGP	80/20-KH_2PO_4 30 mM, pH = 6.5/MeCN				0.6	(450)
			Ultron-ES-OVM	70/30-KH_2PO_4 10 mM, pH = 4.72/EtOH			3.68	3	(450)
			Ultron ES-OVM	70/30-ammonium acetate 0.01M, pH = 5.9/EtOH	R(−)	S(+)	1.5		(471)
Manidipine		Calcium channel blocker	Sumichiral OA-4500	250/140/12/1-Hexane/$ClCH_2$-CH_2Cl/MeOH/TFA	(−) 15.2	(+) 16.3			(472)
			Chiralcel OJ	80/15/5-Hexane/EtOH/MeOH	R(−)	S(+)	1.3	1.2	(473)
			Chiralpak AD	83/17-Hexane/i-PrOH	R	S	1.17	1.46	(474)

(*continued*)

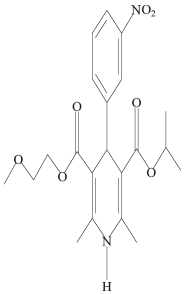
Table 7. Continued.

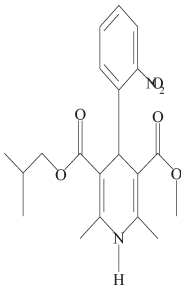
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Nicardipine		Calcium channel blocker	(S,S) Whelk-O1	73/27/0.1-Hexane/i-PrOH/$MeCO_2H$			1.52		(467)
			Sumichiral OA-4000	240/140/20/1-Hexane/CH_2ClCH_2Cl/EtOH/TFA			1.03		(278)
			Sumichiral OA-4500	250/140/10/1-Hexane/CH_2ClCH_2Cl/MeOH/TFA	(+)	(−)	1.06	1.4	(475)
			Sumichiral OA-4600	240/140/20/1-Hexane/CH_2ClCH_2Cl/EtOH/TFA			1.03		(278)
			Ceramospher Chiral Ru-1	99/1-MeOH/Et_3N			1.55		(284)
			Chirobiotic V	100/0.02/0.01-MeOH/$MeCO_2H$/Et_3N			1.57	1.5	(347)
			Chirobiotic V	90/10-MeOH/$CF_3CO_2NH_4$ (0.1%) (MeOH)			1.68	1.43	(348)
			Chiralcel OD	80/20/0.1-Heptane/i-PrOH/Et_2NH			1.09		(306)
			Chiralcel OD	75/5-Hexane/EtOH			1.09	0.63	(445)
			Chiralcel OD	95/4/1-Hexane/i-PrOH/EtOH			1.19	1.05	(445)
			Chiralcel OJ	87.5/12.5-Hexane/i-PrOH			1.1	0.56	(448)
			Chiral-AGP	87.5/12.5-KH_2PO_4 30 mM, pH = 5.2/MeCN			1.29	1.35	(450)
			Ultron-ES-OVM	70/30-KH_2PO_4 10 mM, pH = 7/EtOH			1.28	1.41	(450)

Niguldipine		Calcium channel blocker	Chiralcel OJ	87.5/12.5-Hexane/i-PrOH	(+)	(−)	1.04	0.16	(448)
Nilvadipine		Calcium channel blocker	Sumichiral OA-2000	250/140/2/1-Hexane/CH_2Cl-CH_2Cl/MeOH/TFA			1.03		(445)
			Sumichiral OA-4400	250/140/2/1-Hexane/CH_2Cl-CH_2Cl/MeOH/TFA			1.21		(445)
			Sumichiral OA-4500	250/140/2/1-Hexane/CH_2Cl-CH_2Cl/MeOH/TFA	(−)	(+)	1.39	3.6	(445)
			Sumichiral OA-4600	250/140/2/1-Hexane/CH2Cl-CH2Cl/MeOH/TFA			1.1		(445)
			Sumichiral OA-4700	250/140/2/1-Hexane/CH2Cl-CH2Cl/MeOH/TFA			1.15		(445)

(*continued*)

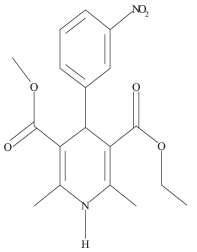
Table 7. Continued.

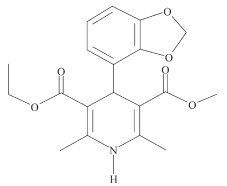
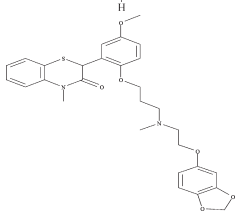
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Nilvadipine		Calcium channel blocker	Sumichiral OA-4800	250/140/2/1-Hexane/CH2Cl-CH2Cl/MeOH/TFA			1.29		(445)
			Sumichiral OA-4900	250/140/2/1-Hexane/CH2Cl-CH2Cl/MeOH/TFA			1.04		(445)
			Chiralcel OA	9/1-Hexane/i-PrOH				1	(476)
			Chiralcel OD	95/4/1-Hexane/i-PrOH/EtOH	(−)	(+)	1.16	1.36	(477)
			Chiralcel OJ	87.5/12.5-Hexane/i-PrOH			1.1	0.3	(448)
			Chiralpak AS-RH	60/40-H_2O, KPF_6 0.1M, pH=2 (H_3PO_4)/MeCN			1.06		(305)
			Chiralpak OT(+)	95/5-MeOH/H_2O	(−)	(+)		1.33	(476)
			Chiralpak OT(+)	MeOH	(−)	(+)		0.97	(476)
Nimodipine		Calcium channel blocker	Chiralcel OD	90/10/0.1-Heptane/i-PrOH/Et_2NH			1.09		(306)
			Chiralcel OJ	87.5/12.5-Hexane/i-PrOH			1.43	2.16	(448)
			Chiralcel OJ	88/12-Heptane/i-PrOH, TFA (0.2%)	(−)	(+)	1.23	1.87	(478)
			Cyclobond I	70/30-H_2O, TEAA (1%) pH = 4.1/MeOH			1.05	1.1	(391)
			ChiraDex	70/30-Acetate buffer pH=5 ($MeCO_2H$) Et_3N (0.1%)/ MeOH			1.2	1.6	(479)
			ChiraDex	80/20-Et_3N buffer (0.1%) pH = 5/MeOH			1.13	1.15	(480)
			ChiraDex	90/10-Et_3N buffer (0.1%) pH = 5/MeCN			1.12	0.99	(480)

			Chiral-AGP	90/10-Phosphate buffer 0.02M, pH = 4.6/i-PrOH			1.29		(306)
			Chiral-AGP	90/10-PBS 0.01M, pH = 7/i-PrOH	S(−)	R(+)	1.32		(461)
			Chiral-AGP	90/10-PBS 0.01M, pH = 7, DMOA 1 mM/i-PrOH	S(−)	R(+)	1.22		(461)
			Ultron ES-OVM	70/30-Phosphate buffer 0.02M, pH = 4.6/EtOH			1.39		(306)
Nisoldipine		Calcium channel blocker	Sumichiral OA-4600	250/140/0.5/1-Hexane/CH_2Cl-CH_2Cl/MeOH/TFA			1.12		(445)
			Sumichiral OA-4800	250/140/0.5/1-Hexane/CH_2Cl-CH_2Cl/MeOH/TFA			1.04		(445)
			Sumichiral OA-4900	250/140/0.5/1-Hexane/CH_2Cl-CH_2Cl/MeOH/TFA			1.08		(445)
			Chiralcel OD	90/10/0.1-Heptane/i-PrOH/Et_2NH			1.1		(306)
			Chiralcel OD	95/4/1-Hexane/i-PrOH/EtOH	(−)	(+)	1.18	1.4	(477)
			Chiralcel OD-H	97.5/2.5-Hexane/EtOH	16	17			(481)
			Chiralcel OJ	87.5/12.5-Hexane/i-PrOH			1.8	4.37	(448)
			Chiralcel OJ	88/12-Heptane/i-PrOH, TFA(0.2%)	(+)	(−)	1.55	2.4	(478)
			Cyclobond I	70/30-H_2O, TEAA (1%) pH = 4.1/MeOH			1.04	0.87	(391)
Nisoldipine		Calcium channel blocker	ChiraDex	85/15-Acetate buffer pH=5 ($MeCO_2H$) Et_3N (0.1%)/MeCN			1.12	1.06	(479)
			ChiraDex	90/10-Et_3N buffer (0.1%) pH = 5/MeOH			1.04	0.53	(480)

(*continued*)

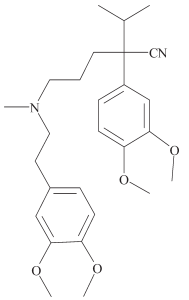
Table 7. Continued.

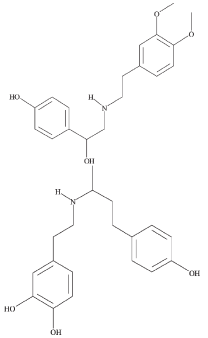
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			ChiraDex	80/20-Et_3N buffer (0.1%) pH = 5/MeCN			1.08	0.6	(480)
			Cyclobond I SN	80/20-Et_3N buffer (0.1%) pH = 5/MeOH			1.06	1.04	(480)
Nisoldipine		Calcium channel blocker	Cyclobond I SN	80/20-Et_3N buffer (0.1%) pH = 5/MeCN			1.02	0.3	(480)
			Cyclobond I SP	90/10-TEAA buffer (1%) pH = 4.1/MeCN			1.13	1.04	(276)
			Chiral-AGP	90/10-Phosphate buffer 0.02M, pH = 4.6/i-PrOH			1.38		(296)
			Chiral-AGP	90/10-PBS 0.01M, pH = 7/i-PrOH	S(+)	R(−)	2.3		(461)
			Chiral-AGP	90/10-PBS 0.01M, pH = 7, DMOA 1 mM/i-PrOH	S(+)	R(−)	1.37		(461)
			Ultron ES-OVM	70/30-Phosphate buffer 0.02M, pH = 4.6/EtOH			1.06		(296)
			Chiralcel OJ	87.5/12.5-Hexane/i-PrOH	S(−)	R(+)	1.23	1.53	(448)
			Chiralpak AD	90/10-Hexane/i-PrOH	R	S	1.16	1.12	(474)
			Chiral-AGP	90/10-Phosphate buffer 0.01M, pH = 7/i-PrOH			1.45	1	(371)
Nitrendipine		Calcium channel blocker	Chiral-AGP	90/10-PBS 0.01M pH = 7/i-PrOH	S(−)	R(+)	1.34		(461)
			Chiral-AGP	90/10-PBS 0.01M, pH = 7, DMAO 1 mM/i-PrOH	S(−)	R(+)	1.25		(461)
			Chiral AGP	85/15-NaH_2PO_4, Na_2HPO_4, NaCl pH = 6.97i-PrOH				1.81	(482)
			EnantioPac	85/15-NaH_2PO_4, Na_2HPO_4, NaCl pH = 6.97i-PrOH				1.22	(482)
			Ultron ES-OVM	70/30-Phosphate buffer 0.02M, pH = 4.6/EtOH			1.18		(296)

Oxodipine		Calcium channel blocker	Chiral-AGP	95/5-Phosphate buffer 0.01M, pH = 7.4/i-PrOH	(+)	(−)	1.57	2.1	(483)
Semotiadil			Chiralcel OG	50/450/1-Hexane/EtOH/Et_2NH	S	R	2.67	4.31	(484)
Semotiadil, fumarate		Calcium channel blocker	Chiralpak AS	EtOH	R 8.4	S 17.1			(485)
			Chirex 3014	87/10/3/0.15-Hexane/CH_2Cl-CH_2Cl/EtOH/TFA			1.1		(389)
			Chirex 3020	77/20/3-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20:1)			1.05		(322)
			Chirex 3022	60/35/5-Hexane/CH_2Cl_2/EtOH, TFA (5%)			1.19	1.3	(279)
			Cyclobond I	90/10 to 80/20-H_2O, TEAA (1%) pH = 4.1/MeCN			1.03	0.71	(391)
			ChiraDex	2/98-TEAA (1%) pH = 4.1/MeOH			1.1		(486)
			Chirobiotic T	80/20-H_2O, TEAA (1%) pH = 4.1/MeOH			1.05	0.7	(365)
			Chirobiotic V	90/10-H_2O, TEAA (1%) pH 7=/MeCN			1.05		(349)
			Chiralcel OC	50/50-$NaClO_4$ 0.05M, pH=3 ($HClO_4$)/MeCN			1.09	0.41	(487)
			Chiralcel OD	85/15-H_2O, HCO_2H pH = 3/MeCN			1.74	1.13	(487)

(*continued*)

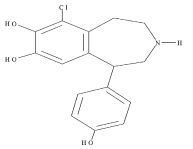
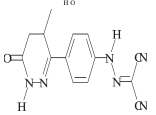
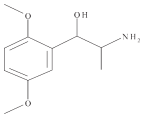
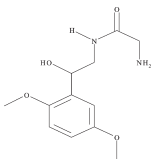
Table 7. Continued.

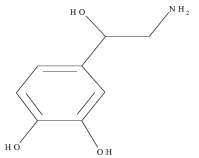
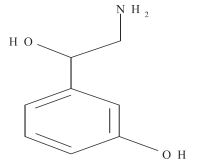
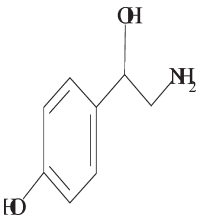
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			Chiralcel OD	67/33-$NaClO_4$ 0.05M, pH=3 ($HClO_4$)/MeCN			1.3	2.12	(487)
			Chiralcel OD	60/40-H_2O/MeCN			1.11	0.33	(487)
			Chiralcel OD	80/20-$MeCO_2Na$ 0.05M, pH = 4.5 ($MeCO_2H$)/MeCN			1.35	1.4	(487)
			Chiralcel OD	50/50-$NaClO_4$ 0.05M, pH=3 ($HClO_4$)/MeOH			1.45	0.72	(487)
			Chiralcel OD-R	60/40-$NaPF_4$ 0.1M/MeCN			1.41		(305)
			Chiralcel OD-R	50/50-PF_3SO_3Na 0.1M, pH = 10/MeCN			1.05		(305)
Verapamil		Calcium channel blocker	Chiralcel OD-R	60/40-CF_3SO_3Na3 0.2M, pH=2 (H_2SO_4)/MeCN			1.31		(305)
			Chiralcel OD-R	70/30-NaH_2PO_4 0.1M/MeCN			1.25		(305)
			Chiralcel OD-R	60/40-CCl_3COONa 0.1M/MeCN			1.25		(418)
			Chiralcel OD-R	60/40-CF_3SO_3Na 0.1M/MeCN			1.18		(418)
			Chiralcel OD-R	70/30/0.05-H_2O/MeCN/TFA				1.96	(419)
			Chiralcel OD-R	60/40-H_2O, $NaPF_6$ 0.1 M/MeCN			1.37	1	(420)
			Chiralcel OJ	910/90/1-Heptane/EtOH/Et_2NH			1.4	1.7	(488)
			Chiralcel OJ-H	90/10-Heptane/EtOH/Et_2NH (0.1 %)			1.41		(397)
			Chiralcel OJ-H	90/10-Heptane/EtOH/$CF_3CO_2NH_4$ 0.1 mM			1.05		(397)
			Chiralpak AD	90/10/0.1-Hexane/i-PrOH/Et_2NH	S(−)	R(+)	1.29	2.36	(464)
			Chiralpak AD	90/10-Hexane/i-PrOH			1.27	2.19	(489)
			Chiralpak AD-H	80/20/0.1-Hexane/i-PrOH/$EtSO_3H$			1.2	1.62	(287)

			Chiralpak AD-H	90/10-Heptane/EtOH/CF_3-CO_2NH_4 0.1 mM			1.23		(397)
			Chiralpak AD-H	90/10-Heptane/i-PrOH/Et_2NH (0.1%)			1.29		(397)
			Chiral-AGP	90/10-Phosphate buffer 0.01M, pH = 7/MeCN	R(+)	S(−)	1.41	2.15	(464)
			Chiral-AGP	89/11-Ammonium acetate pH = 6.8)/MeCN	R(+)	S(−)	1.26		(465)
			Chiral-AGP	60/40-Phosphate buffer pH = 7.6/MeOH	R	S	1.17		(490)
			EnantioPac	Phosphate buffer 0.02M, pH = 7/$C_9H_{19}CO_2H$ 0.005M/ TEAB 0.05M			1.75		(303)
			Ultron-ES-OVM	Phosphate buffer 0.011M, pH = 5.8/EtOH			1.69		(491)
Denopamine		Cardiac stimulant	Ultron ES-PhCD	50/50-KH_2PO_4 buffer 0.05M, pH = 4.6/MeOH			2.05	5.5	(492)
			Ultron ES-PhCD	80/20-KH_2PO_4 buffer 0.05M, pH = 4.6/MeN			1.38	3.61	(492)
Dobutamine		Cardiac stimulant	Chiral-CBH	95/5-NaH_2PO_4 buffer 10 mM, pH = 6, Na_2EDTA 50μM/i-PrOH			1.78	3.41	(308)
			EnantioPac	Phosphate buffer 0.02M, pH = 6, TEAB 1 mM			1.56		(312)

(*continued*)

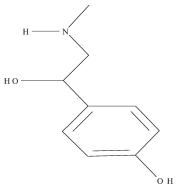
Table 7. Continued.

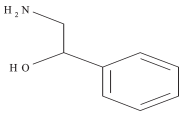
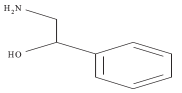
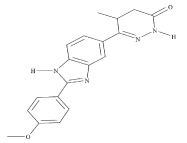
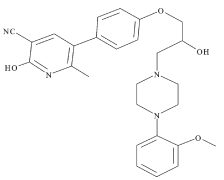
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Fenoldopam		Cardiac stimulant	Chiralcel OJ	80/20-Hexane/EtOH	S(−)	R(+)	1.32		(493)
Levosimendan		Cardiac stimulant	Cyclobond I	55/45-TEAA buffer (0.5%) pH = 5.9/meOH	S(+)	R(−)	1.1	1.39	(494)
Methoxamine		Cardiac stimulant	Chirex 3014	76/20/4-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.1		(322)
			Chirex 3020	60/35/5-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.11		(322)
			Chirex 3022	55/35/10-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.11		(322)
Midodrine		Cardiac stimulant	Chirex 3001	55/35/10-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.09		(322)
			Chirex 3014	57.5/5/7.5-Hexane/$ClCH_2$-CH_2Cl/EtOH-TFA (20/1)			1.09		(322)
			Chirex 3020	58/35/7-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.1		(322)
			Chiralcel OD-H	85/15/0.2-Hexane/i-PrOH/Et_2NH				3.2	(495)
			Chiral-AGP	Phosphate Buffer pH = 6				5.3	(495)
			Chiral-AGP	98/2-KH_2PO_4-Na_2HPO_4 10 mM, pH = 6/MeCN			1.11	1	(495)

Norepinephrine		Cardiac stimulant	Crownpak CR(+)	95/5-$HClO_4$ pH = 1.9/MeOH		0.52	(496)
			Crownpak CR(+)	$HClO_4$ pH = 1.9		0.88	(496)
			Chirobiotic T	50/50-H_2O/EtOH	1.7	1.9	(497)
			Chiral-CBH	NaH_2PO_4 buffer 10 mM, pH = 6, Na_2EDTA 50μM	1.74	3.75	(308)
			Chiral-CBH	95/5-NaH_2PO_4 buffer 10 mM, pH = 6, Na_2EDTA 50μM/MeCN	1.63	3.07	(308)
			Chiral-CBH	80/20-NaH_2PO_4 buffer 10 mM, pH = 6, Na_2EDTA 50μM/i-PrOH	2.45	5.3	(308)
Norfenefrine		Cardiac stimulant	Sumichiral OA-5000	H_2O, $Cu(MeCO_2)_2$ 5 mM, pH = 6	1.27		(498)
			Sumichiral OA-5500	H_2O, $CuSO_4$ 1 mM	1.23		(360)
			Sumichiral OA-6000	H_2O, $CuSO_4$ 0.5 mM	1.2		(499)
			Crownpak CR(+)	99/1-$HClO_4$ 0.01M/MeOH	1.2	1.8	(500)
			ChiraDex	98/2-NaH_2PO_4 25 mM, pH = 3.5/MeOH	1.13	1.28	(501)
Octopamine		Cardiac stimulant	Sumichiral OA-5000	$Cu(MeCO_2)_2$ 5 mM, pH = 6	1.28		(498)
			Sumichiral OA-5500	H_2O, $CuSO_4$ 1 mM	1.3		(360)
			Sumichiral OA-6000	H_2O, $CuSO_4$ 0.5 mM	1.14		(499)
			Crownpak CR(+)	95/5-$HClO_4$ pH = 1.9/MeOH		0.42	(496)

(*continued*)

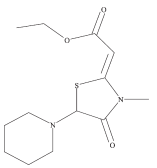
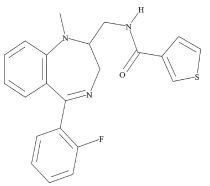
Table 7. Continued.

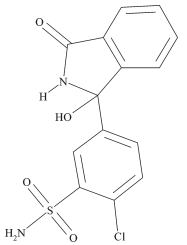
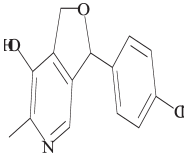
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			Crownpak CR(+)	$HClO_4$ pH = 1.9				0.8	(496)
			Chiralpak AD-H	75/25/0.1-Hexane/EtOH/$EtSO_3H$			1.67	2.95	(287)
			Chiral-CBH	80/20-NaH_2PO_4 buffer 10 mM, pH = 6, Na_2EDTA 50μM/i-PrOH			3.32	7.8	(308)
			Chiral-CBH	95/5-NaH_2PO_4 buffer 10 mM, pH = 6, Na_2EDTA 50μM/MeCN			1.82	3.48	(308)
			Chiral-CBH	NaH_2PO_4 buffer 10 mM, pH = 6, Na_2EDTA 50μM			1.9	4.83	(308)
Oxedrine		Cardiac stimulant	Chirex 3022	55/35/10-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.12		(322)
			Sumichiral OA-5000	H_2O, $MeCO_2NH_4$ 20 mM, pH = 6.4/$Cu(MeCO_2)_2$ 1 mM,	(+)	(−)	1.23	1.23	(502)
			Sumichiral OA-6000	$MeCO_2NH_4$ 20 mM, pH = 6.4/ $CuSO_4$ 1 mM,	(−)	(+)	1.62	2.25	(502)
			Sumichiral OA-6000	H_2O, $MeCO_2NH_4$ 10 mM/$Cu(MeCO_2)_2$ 1 mM	(−)	(+)	1.72	1.74	(503)
			ChiraDex	98/2-NaH_2PO_4 25 mM, pH = 3.5/n-Bu_4NH_4,HSO_4 10 mM/MeOH	(−)	(+)	1.05	0.96	(501)
			Chiral-CBH	95/5-Sodium phosphate buffer 10 mM, pH = 6/i-PrOH	(−)	(+)	1.27	2.11	(503)

Phenylethanolamine		Cardiac stimulant	Sumichiral OA-5000	$MeCO_2NH_4$ buffer 0.05M, pH = 6/$Cu(MeCO_2)_2$ 5 mM			1.38		(498)
			Sumichiral OA-5500	H_2O, $CuSO_4$ 1 mM			1.19		(360)
			Crownpak CR(+)	95/5-$HClO_4$ 0.01M/MeOH			1.1	1.4	(500)
			Opticrown RCA(+)	50/50-H_2O, H_2SO_4 10 mM/MeOH			1.4	1.52	(462)
Phenylethanolamine		Cardiac stimulant	Chiralpak AD-H	80/20/0.1-Hexane/i-PrOH/$EtSO_3H$			1.39	1.79	(287)
			Chiral-CBH	95/5-NaH_2PO_4 buffer 10 mM, pH = 6, Na_2EDTA 50μM/MeCN			1.24	1.56	(308)
			Chiral-CBH	95/5-NaH_2PO_4 buffer 10 mM, pH = 6.5, Na_2EDTA 50μM/i-PrOH			1.54	3.26	(308)
Pimobendan		Cardiac stimulant	Sumichiral OA-4400	300/120/1-Hexane/EtOH/$MeCO_2H$	(−)	(+)	1.06	0.79	(505)
			Nucleosil Chiral-2	MeCN			1.2	0.5	(506)
			Chiralcel OD	75/25/0.1-Hexane/EtOH/Et_2NH	(+)	(−)	1.6	2.7	(506)
			Chiralpak AS	50/50-Hexane/i-PrOH			1.6	1.7	(506)
Saterinone		Cardiac stimulant	Chiralcel OD	i-PrOH	S(−)	R(+)	1.45	1.1	(507)
			Chiralcel OD	1/2-H_2O/EtOH	S(−)	R(+)	1.2	0.9	(507)

(*continued*)

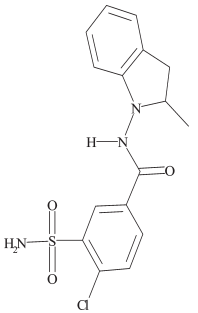
Table 7. Continued.

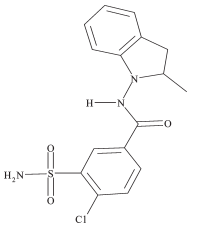
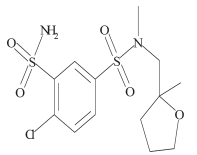
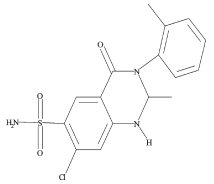
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Etozolin		High-ceiling diuretic	Cel Ac-40 XF	5/95-H_2O/EtOH				2.26	(508)
			Cel Ac-40 XF	MeOH	(−)	(+)		1.83	(508)
			Chiralcel OD	85/15-Hexane/EtOH			2.45	4	(509)
			Chiralcel OD	MeOH			1.38	1.2	(510)
			Chiralcel OD	MeCN			1.88	0.6	(510)
			Chiralcel OJ	MeOH			7.55	4	(510)
			Chiralpak AD	MeOH			3.47	7.9	(510)
			Chiralpak AD	MeCN			1.4	1.2	(510)
Tifluadom		High-ceiling diuretic	Chiralcel OD	90/10-Hexane/i-PrOH	(−)	(+)	1.45		(511)
			Chiralcel OJ	70/30-Hexane/i-PrOH	(−)	(+)	2.61		(511)
Chlorthalidone		Low-ceiling diuretic	(S,S) ULMO	50/50-Heptane/Dioxane			1.12	0.62	(512)
			(S,S) ULMO	85/15-Hexane/i-PrOH			1.1	0.72	(513)
			Chirex 3020	76/20/4-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.08		(322)
			Ceramospher Chiral Ru-1	MeOH			1.14		(284)
			Cyclobond I	70/30-H_2O, TEAA (1%) pH = 4.1/MeOH			1.44	1.95	(391)

			Cyclobond I	90/10-Phosphate buffer 100 mM, pH = 4.2/MeCN			1.28	2.02	(514)
			ChiraDex	60/40-Acetate buffer 0.05M, pH = 4/MeOH			1.47	1.1	(515)
			ChiraDex	80/20-H_2O/MeOH	23.5	37.6			(516)
			Cyclobond I SP	95/5-TEAA buffer (1%) pH = 4.1/MeCN			1.38	2.2	(276)
			Chirobiotic T	80/20-H_2O/MeOH			1.14	1.98	(517)
			Chiraspher	50/50-Hexane/Dioxane			1.2		(417)
			Kromasil CHI-DMB	95/5-Hexane/i-PrOH			1.87		(518)
			(R,R)-P-CAP	80/20/0.1-Heptane/EtOH/TFA			1.23	1.61	(519)
Chlorthalidone		Low-ceiling diuretic	(S,S)-P-CAP	90/10/0.1-MeCN/MeOH/TFA			1.38	2.5	(519)
			(S,S)-P-CAP	90/10-MeCN/MeOH			1.38	2	(519)
			Chiral-AGP	95/5-Phosphate buffer 0.01M, pH = 7/MeCN			2.45	1	(371)
			Chiral-AGP	99.5/0.5-Acetate buffer 0.03M, pH = 4/i-PrOH			3		(433)
			Resolvosil	99/1-Phosphate buffer 50 mM, pH = 6.5/1-PrOH			1.26		(520)
			Resolvosil BSA-10	Sodium phosphate 100 mM, pH = 6	(−)	(+)			(521)
Cicletanine		Low-ceiling diuretic	Chiralcel OD-RH	60/40-H_2O/MeCN			1.25	1.89	(517)
			Chiralcel OJ	3/1-Hexane/i-PrOH	R(−) 4	S(+) 6			(522)
			Chiralcel OJ-R	80/20-$HClO_4$, $NaClO_4$ 0.5M, pH = 2/MeCN			1.23	1.56	(517)
			Chirobiotic T	78/22-TEAA (0.1%) pH = 4.1/MeOH			1.08	0.97	(517)

(*continued*)

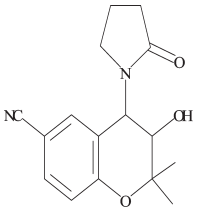
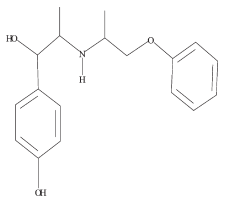
Table 7. Continued.

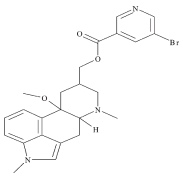
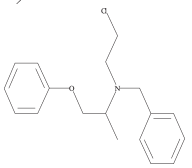
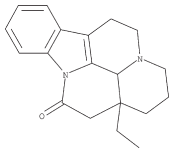
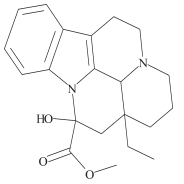
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Indapamide		Low-ceiling diuretic		(R,R) ULMO	70/30-Heptane/i-PrOH		1.56	1.36	(523)
			(S,S) ULMO	70/30/0.1-Heptane/i-PrOH/Et_2NH			1.56	1.36	(524)
			(S,S) Whelk-O 1	50/50-Hexane/i-PrOH			1.68		(467)
			Chirex 3022	60/35/5-Hexane/CH_2Cl-CH_2Cl/EtOH-TFA (20:1)			1.1	1.15	(427)
			Ceramospher Chiral Ru-1	MeOH			1.29		(284)
			ChiraDex	90/10-H_2O/MeOH			1.23	0.27	(363)
			Cyclobond I SN	80/20-TEAA buffer (1%) pH = 7.1/MeCN			1.18		(525)
			CHIDEX-SKP	70/30-Et_3N buffer (1%) pH = 5.11/MeOH			1.14	0.85	(335)
			Chirobiotic V	50/50-Hexane/i-PrOH			1.13		(349)
			Chirobiotic V	90/10-H_2O, TEAA buffer 1%, pH = 7/MeCN			1.12		(349)
			Chirobiotic V	90/10-TEAA (1%) pH = 7/MeCN			1.05	0.21	(427)
			Chiralcel OD	50/50-MeOH/EtOH			2.39	6.81	(303)
			Chiralcel OD	60/40-$NaClO_4$ 0.5M/MeCN			1.39	1.74	(417)
			Chiralcel OD	50/50-Hexane/EtOH			1.88	3.66	(427)
			Chiralcel OD-R	60/40-H_2O/MeCN			2		(419)
			Chiralcel OJ	50/50-MeOH/EtOH			1.7	2.76	(303)
			Chiralcel OJ-R	70/30-H_2O/MeCN			1.34		(526)

Indapamide		Low-ceiling diuretic	Chiralcel OJ-R	70/30-$HClO_4$, $NaClO_4$ 0.5M, pH = 2/MeCN	(−)	(+)	1.44		(526)
			Chiralcel OJ-R	70/30-$NaClO_4$ 0.5M/MeCN			1.35		(526)
			Chiralcel OJ-R	70/30-$HClO_4$ pH = 2/MeCN			1.38		(526)
			Chiralpak AD	50/50-Hexane/EtOH			1.15	0.44	(427)
			Chiralpak IA	80/20/0.1-MTBE/EtOH/Et_2NH			1.75	4.32	(288)
			Chiralpak IA	60/40/0.1-Hexane/$MeCO_2Et$/Et_2NH			1.23	3.99	(288)
			(R,R)-P-CAP	60/40/0.1-Heptane/EtOH/TFA			1.06	0.6	(519)
			(R,R)-P-CAP	95/5-CH_2Cl_2/MeOH			1.03	0.49	(519)
Mefruside		Low-ceiling diuretic	Chiralcel OD-RH	65/35-H_2O/MeCN			1.04	0.7	(517)
			Chiralcel OJ-R	80/20-$HClO_4$, $NaClO_4$ 0.5M, pH = 2/MeCN			1.09	0.9	(517)
Metolazone		Low-ceiling diuretic	Chirobiotic V	75/25-TEAA (0.1%) pH = 6/MeOH			1.3	1.31	(311)
			Chiralpak AD	85/15/0.1-Isohexane/EtOH/TFA			1.42	0.66	(311)

(*continued*)

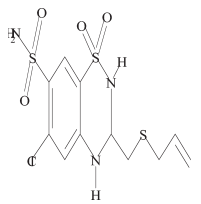
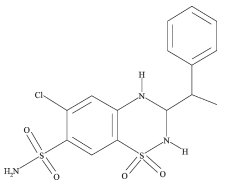
Table 7. Continued.

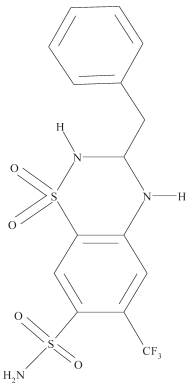
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Cromakalim		Peripheral vasodilator diuretic	ChiraDex	80/20-H_2O/MeOH	(+)	(−)	1.38	1	(486)
			Chirobiotic T	95/5-Hexane/EtOH	(−)	(+)	1.13	1.27	(527)
			Chirobiotic TAG	75/25-Hexane/EtOH	(−)	(+)	1.12	1.25	(527)
			Chiralcel OD	80/20/0.1-Hexane/i-PrOH/Et_2NH			1.78	3.4	(279)
			Chiraspher	70/30/0.1-MTBE/dioxane/Et_2NH			1.08		(306)
			Chiraspher	70/30/0.1-Heptane/Dioxane/Et_2NH			1.07		(306)
			Chiraspher	70/25/5/0.1-Heptane/Dioxane/i-PrOH/Et_2NH			1.04		(306)
			Chiral-AGP	99/1-Phosphate buffer 0.01M, pH = 7/MeOH			1.25		(528)
			Ultron ES-OVM	88/12-Phosphate buffer 0.02M, pH = 4.6/EtOH			1.45		(306)
Isoxsuprine		Peripheral vasodilator diuretic	Chirex 3014	55/35/10-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.4		(322)
			Chirex 3020	55/35/10-Hexane/$ClCH_2CH_2$-Cl/EtOH-TFA (20/1)			1.37		(322)
1R2S,2′RS/1S2R, 2′RS			Chiralpak AD	80/20-Hexane/i-PrOH			2.2		(529)
1R2S,2′RS/1S2R, 2′RS			Chiralpak AD	80/20/0.1-Hexane/i-PrOH/Et_3N					(529)

Nicergoline		Peripheral vasodilator diuretic	Chirobiotic V	60/40-TEAA buffer (0.1%) pH = 4/MeOH			1.11	1.23	(530)
Phenoxybenzamine		Peripheral vasodilator diuretic	Chiralcel OD	90/10-Hexane/i-PrOH	(−)	(+)	1.13	0.7	(328)
			Chiralpak AD-H	85/15/0.1-Hexane/EtOH/$EtSO_3H$			1.37	5.34	(287)
			EnantioPac	Phosphate buffer 0.02M, pH = 7/DMAO 1 mM/i-PrOH 0.17M			1.37		(291)
Vinburnine		Peripheral vasodilator diuretic	Chiral-AGP	75/25-Phosphate buffer 0.01M, pH = 7/MeCN	cis(−)	trans(−)	1.35		(531)
			Chiral-HSA	90/10-Phosphate buffer 0.01M, pH = 7/MeCN	cis(−)	trans(−)	1.73		(531)
Cis-Vincamine		Peripheral vasodilator diuretic	Chiralpak AD	90/10-Hexane/EtOH	3S14S(+)	3R14R(−)	3.52	3.4	(532)
Trans-Vincamine			Chiralpak AD	90/10-Hexane/EtOH	3R14S(+)	3S14R(−)	1.68	0.6	(532)
Trans-Vincamine (−) + Trans-Epivincamine (−)			Chiral-AGP	80/20-Phosphate buffer 0.01M, pH = 6/i-PrOH			2.72		(531)
Trans-Vincamine (−) + Trans-Epivincamine (+)			Chiral-HSA	90/10-Phosphate buffer 0.1M, pH = 7/i-PrOH	(+)	(−)	1.12		(531)

(*continued*)

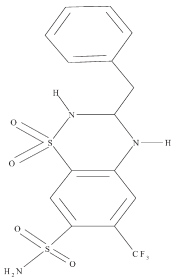
Table 7. Continued.

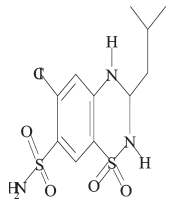
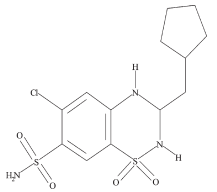
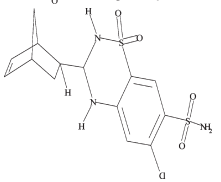
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Altizide		Thiazide diuretic	(S,S) ULMO	70/30-Hexane/i-PrOH			1.56	3.79	(513)
			(S,S) ULMO	70/30-Hexane/EtOH, $MeCO_2$-NH_4 (1%)			1.09		(513)
			Cyclobond I SN	80/20-TEAA buffer (1%) pH = 4.5/MeCN			1.03		(525)
			Chirobiotic T	80/20- H_2O, TEAA (1%) pH = 4.1/MeOH			1.06	0.8	(365)
			Chirobiotic T	80/20-H_2O/MeOH			1.16	1	(365)
			Chirobiotic T	80/20-TEAA buffer 0.01M, pH = 4.1/MeOH			1.1	0.9	(408)
			Chirobiotic T	70/30-Hexane/EtOH			1.1	0.7	(408)
			(S,S)-P-CAP	95/5-MeCN/MeOH, $MeCO_2$-NH_4 10 mM			1.1	0.5	(519)
Bemetizide		Thiazide diuretic	Chirobiotic T	80/20-H_2O/MeOH			1.08	0.88	(517)
			Chiralcel OJ-R	80/20-$HClO_4$, $NaClO_4$ 0.5M, pH = 2/MeCN			1.28	1.5	(517)

Bendroflumethiazide		Thiazide diuretic	(S,S) ULMO	70/30/0.1-Heptane/i-PrOH/Et_2NH	1.63	1.31	(512)
			(S,S) ULMO	50/50-Heptane/Dioxane	1.16	1.2	(512)
			(S,S) ULMO	80/20-Heptane/EtOH	1.36	2.17	(512)
			(S,S) Whelk-O 1	50/50-Hexane/i-PrOH	1.16		(467)
			Chirex 3001	55/35/10/0.5-Hexane/CH_2ClCH_2Cl/EtOH/TFA	1.11		(322)
			Chirex 3005	58/35/7/0.25-Hexane/CH_2ClCH_2Cl/EtOH/TFA	1.07		(389)
			Chirex 3014	58/35/7/0.25-Hexane/CH_2ClCH_2Cl/EtOH/TFA	1.14		(389)
			Chirex 3017	50/35/15/0.75-Hexane/CH_2ClCH_2Cl/EtOH/TFA	1.01		(389)
			Chirex 3018	55/35/10/0.5-Hexane/CH_2ClCH_2Cl/EtOH/TFA	1.09		(389)
			Chirex 3020	58/35/7/0.25-Hexane/CH_2ClCH_2Cl/EtOH/TFA	1.17		(322)
			Ceramospher Chiral Ru-1	MeOH	1.47		(284)
			Cyclobond I SN	70/30-TEAA buffer (1%) pH = 4.5/MeCN	1.1	1	(525)
			Cyclobond I 2000 SN	70/30-TEAA buffer pH = 4.5/MeCN	1.22	1.9	(280)
			CHIDEX-MKP	70/30-H_2O/MeCN	1.49	3.76	(333)
			CHIDEX-MKP	30/70-H_2O/MeOH	1.49	3.19	(334)
			CHIDEX-SKP	70/30-Et_3N buffer (1%) pH = 5.1/MeCN	1.74	4.53	(335)
			Chirobiotic T	80/20-TEAA buffer (0.01) pH = 4.1/MeOH	1.3	1.3	(347)
			Chirobiotic T	80/20-H_2O/MeOH	1.12	1.73	(517)
			Chirobiotic V	90/10-TEAA buffer (1%) pH = 4/MeCN	1.13	0.8	(277)

(*continued*)

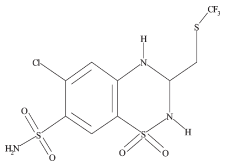
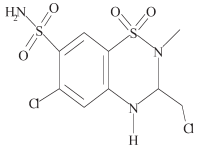
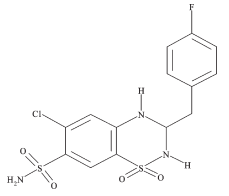
Table 7. Continued.

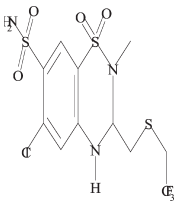
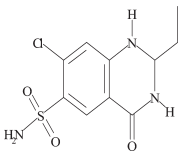
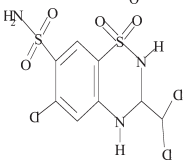
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
			Chirobiotic V	75/25-TEAA buffer (0.1%) pH = 6/MeOH			1.15	1.2	(347)
			Chirobiotic V	90/10-H_2O, TEAA buffer (1%) pH = 7.0/MeCN			1.25		(349)
			Chirobiotic V	50/50-Hexane/i-PrOH			1.24		(349)
			Chiralcel OJ-R	80/20-$HClO_4$, $NaClO_4$ 0.5M, pH = 2/MeCN			1.1	0.94	(517)
			Chiralcel OD-RH	65/35-H_2O/MeCN			1.08	1.17	(517)
			Chiralpak AD	85/15/0.1-Isohexane/i-PrOH/TFA			1.29	1.11	(311)
			Chiraspher	40/60-H_2O/MeOH			1.17	1.21	(417)
			Chiraspher	80/20-MTBE/THF	(+)	(−)		1	(533)
			(R,R)-P-CAP	50/50/0.1-Heptane/i-PrOH/TFA			1.12	0.8	(519)
			(S,S)-P-CAP	95/5-MeCN/MeOH, $MeCO_2$-NH_4 10 mM			1.11	0.51	(519)
Bendroflumethiazide		Thiazide diuretic	Chiral-AGP	Phosphate buffer 0.02M, pH = 7			2.01		(354)
			Chiral-AGP	Phosphate buffer 0.02M, pH = 7, (−)-Terodiline 17 μM			1.7		(354)
			Chiral-AGP	96/4-Phosphate buffer 0.01M, pH = 7/n-PrOH			1.73		(371)
			EnantioPac	99/-NaH_2PO_4 buffer 6.6-10 mM pH = 7.02/i-PrOH			2.16		(534)
			Resolvosil	99/1-Phosphate buffer, 50 mM, pH = 8.1/1-PrOH			2.2		(520)

Butizide		Thiazide diuretic	(R,R) ULMO	70/30-Heptane/i-PrOH	1.69	1.69	(523)
			(S,S) ULMO	80/20-Heptane/EtOH	1.46	1.69	(512)
			(S,S) ULMO	70/30-Heptane/Dioxane	1.42	2.89	(512)
			(S,S) ULMO	70/30/0.1-Heptane/i-PrOH/Et_2NH	1.67	1.27	(512)
			(S,S) ULMO	70/30-Heptane/i-PrOH, $MeCO_2NH_4$ (1%)	1.5		(513)
			Chiralcel OD-RH	60/40-H_2O/MeCN	1.28	1.22	(517)
			Chiralcel OJ-R	80/20-$HClO_4$, $NaClO_4$ 0.5M, pH = 2/MeCN	1.16	1.18	(517)
			Chirobiotic T	95/5-H_2O/MeOH	1.07	1.07	(517)
Cyclopenthiazide		Thiazide diuretic	(S,S) ULMO	70/30-Hexane/i-PrOH	1.61	3.53	(513)
			(S,S) ULMO	70/30-Hexane/EtOH, $MeCO_2NH_4$ (1%)	1.1		(513)
			Chiralpak AS-RH	60/40-H_2O, KPF_6 0.1M/MeCN	1.26		(305)
Cyclothiazide		Thiazide diuretic	(S,S) ULMO	70/30-Hexane/i-PrOH	1.47	2.71	(513)
			(S,S) ULMO	70/30-Heptane/i-PrOH, $MeCO_2NH_4$ (1%)	1.37		(513)
			Cyclobond I	65/35-Hexane/EtOH	1.1	1.5	(535)

(*continued*)

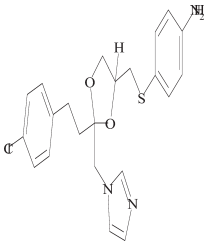
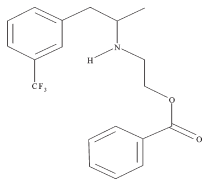
Table 7. Continued.

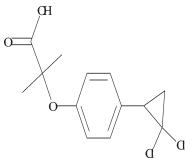
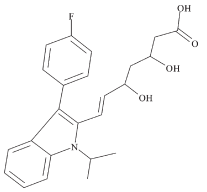
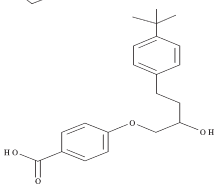
Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Epitizide		Thiazide diuretic	(S,S) ULMO	70/30-Hexane/i-PrOH			1.79	5.4	(513)
			(S,S) ULMO	70/30-Heptane/i-PrOH/ $MeCO_2NH_4$ (1%)			1.65		(513)
Methylchlothiazide		Thiazide diuretic	(S,S) ULMO	80/20-Hexane/i-PrOH			1.04	0.11	(513)
			Chiralpak AS-RH	80/20-H_2O, KPF_6 0.1M/ MeCN			1.08		(305)
			Resolvosil	99/1-Phosphate buffer 50 mM, pH = 7.6/n-PrOH			1.2		(520)
Paraflutizide		Thiazide diuretic	Chiraspher	40/60-H_2O/MeOH			1.17	0.84	(417)

Polythiazide		Thiazide diuretic	(S,S) ULMO	80/20-Hexane/i-PrOH	1.05	0.18	(513)
			Chirobiotic T	95/5-H_2O/MeOH	1.09	1.12	(517)
			Chiralcel OD-RH	65/35-H_2O/MeCN	1.08	0.96	(517)
			Resolvosil	99/1-Phosphate buffer 50 mM, pH = 7.6/1-PrOH	2.1		(520)
			Resolvosil BSA-7	97/3-Phosphate buffer 50 mM, pH = 8/1-PrOH	2.1		(536)
			Resolvosil BSA-7	Phosphate buffer 50 mM, pH = 6.5/n-PrOH (3%)/ $C_6H_{13}OH$ 0.75 mM	1.9		(536)
			Resolvosil BSA-7	Phosphate buffer 50 mM, pH= 8/n-PrOH (3%)/$C_5H_{10}CO_2H$ 0.75 mM	1.8		(536)
			Resolvosil BSA-7	Phosphate buffer 50 mM, pH = 8/n-PrOH (3%)/ $C_6H_{13}NH_2$ 0.75 mM	1.9		(536)
Quinethazone		Thiazide diuretic	(S,S) ULMO	75/25-Hexane/i-PrOH	1.06	0.19	(513)
			Chiralpak AS-RH	80/20-H_2O, KPF_6 0.1M/ MeCN	1.17		(305)
Trichloromethiazine		Thiazide diuretic	(S,S) ULMO	70/30-Heptane/i-PrOH/ $MeCO_2NH_4$ (1%)	1.7		(513)
			(S,S) ULMO	70/30-Hexane/i-PrOH	1.43	2.8	(513)
			Resolvosil	99/1-Phosphate buffer 50 mM, pH = 8.1/1-PrOH	1.32		(520)

(*continued*)

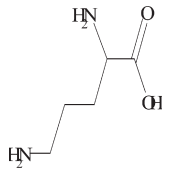
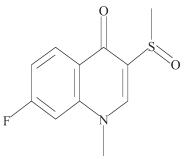
Table 7. Continued.

Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Cis-Azalanstat			Chiralcel OD-R	5/95-Perchlorate buffer 0.5M/MeOH			1.5		(537)
Trans-Azalanstat			Chiralcel OD-R	5/95-Perchlorate buffer 0.5M/MeOH			1.6		(537)
Trans-Azalanstat			Chiralpak AD	68/32-Hexane/i-PrOH			3.5		(537)
Cis-Azalanstat		Serum lipid reducing agent	Chiralpak AS	68/32-Hexane/i-PrOH	R,R	S,S	1.7		(537)
Trans-Azalanstat			Chiralpak AS	68/32-Hexane/i-PrOH	R,S	S,R	1.2		(537)
Cis-Azalanstat			Ultron ES-OVM	78/22-Phosphate buffer 0.02M, pH = 4.6/EtOH	R,R 10	S,S 18			(537)
Trans-Azalanstat			Ultron ES-OVM	78/22-Phosphate buffer 0.02M, pH = 4.6/EtOH	R,S 10	S,R 15.7			(537)
Benfluorex		Serum lipid reducing agent	Chiral-AGP	96/4-TEAA buffer 0.010M, pH = 5/i-PrOH			1.42	2.8	(289)

Ciprofibrate		Serum lipid reducing agent	Cyclobond I SN	95/5/0.5/0.4-MeCN/MeOH/$MeCO_2H$/Et_3N	12.84	14.45			(313)
			Cyclobond I SN	80/20/1-MeCN/EtOH/$MeCO_2H$			1.2	1.5	(538)
			Nucleodex beta-PM	25/75-NaH_2PO_4 50 mM, pH = 4/MeOH			1.26		(539)
Fluvastatin sodium		Serum lipid reducing agent	Chiralcel OD-H	92.5/7.5/0.2-Hexane/EtOH/TFA	S,S(−) 11	R,R(+) 14			(540)
Fluvastatin			Chiralcel OD-H	90/10/0.2-Hexane/EtOH/TFA	3S,5R(−) 10	3R,5S(+) 12			(541)
			Chiracel OD-R	60/40-Phosphate buffer pH = 2.5/MeCN	3S,5R	3R,5S	1.11	1.54	(542)
Lifibrol		Serum lipid reducing agent	Chiralcel OD-H	100/1.25/5/0.1-Hexane/MeCN/i-PrOH/TFA	S 27.2	R 48.8			(543)

(*continued*)

Table 7. Continued.

Drug Name	Structure	Medical Class	CSP Trade Name	Mobile Phase	First	Second	α	Rs	Ref
Ornithine		Serum lipid reducing agent	Sumichiral OA-5000	$CuSO_4$ 1 mM	L	D	1.21		(498)
			Sumichiral OA-6000	H_2O, $CuSO_4$ 0.5 mM	D	L	1.32		(499)
			MCI CRS10W	H_2O, $CuSO_4$ 0.1 mM, pH = 5.6	D	L	1.26		(544)
			Chirosolve D-Pipec.	$CuSO_4$ 0.5 mM			1.33	0.58	(545)
			Chiralpak AD	90/10-Hexane/i-PrOH, $EtSO_3H$ (0.2%)			1.37	4.36	(353)
			Chiralpak AD	90/10-Hexane/EtOH, $EtSO_3H$ (0.2%) cyclobutylamine (0.1%)			1.13	0.69	(353)
Flosequinan		Vasodilator	Chiralcel OD	EtOH	S(−) 11.5	R(+) 26.4			(546)
			Chiralcel OD	50/50-MeOH/EtOH	S(−) 7	R(+) 13			(547)

The first part of the compilation of clinical racemic drug chiral separations includes the six first ATC drug classes: 1-Alimentary tract and metabolism, 2-Anti-infectives, 3-Antineoplastic and immunomodulating agents, 4-Antiparasitic, insecticides and repellents, 5-Blood and blood-forming organ drugs, and 6-Cardio-vascular system. The seven remaining classes: 7-Dermatological drugs, 8-Genito-urinary system and sex-hormons, 9-Musculo-skeletal system, 10-Nervous system, 11-Respiratory system, 12-Sensory organs and 13-Various drugs, will be listed in Part II of this compilation. Part III will list all separation found in the ChirBase database that used supercritical fluid chromatography. The alphabetic index include only the drugs listed in this first part. A full index including all ATC drugs will be found at the end of Part II.

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ABBREVIATIONS

Bu	Butyl
DAS	9,10-dimethoxyantracene-2-sulfonate sodium
DMAO	N,N-Dimethyloctylamine
EDTA	Ethylenediaminetetraacetic acid
Et	Ethyl
GORD	gastro-oesophageal reflux disease
Pr	Propyl
Me	Methyl
MTBE	Methyl*tertio*-butylether
PBS	Phosphate buffered saline
Ph	Phenyl
TEAB	Tetraethylammonium bromide
TBAB	Tetrabutylammonium bromide
TBAP	Tetrabutylammonium phosphate
TEAA	Triethylammonium acetate
THF	Tetrahydrofuranne
TFA	Trifluoroacetic acid
TPA	Tetrapropylammonium
TPAB	Tetrapropylammonium bromide
Tween 20	Polyoxyethylenesorbitan monolaurate

Alphabetic Index of enantiomeric drugs

Drug Name	Therapeutic cat.	Medical Class
Acebutolol	Beta-blocker	Cardiovascular System
Acenocoumarol	Antithrombotic	Blood and blood forming organs
Adenallene	Antiviral	Antiinfectives for systemic use
Almokalant	Antiarrhythmic	Cardiovascular system
Alprenolol	Beta-blocker	Cardiovascular system
Altizide	Thiazide diuretic	Cardiovascular system
Amfepramone	Antiobesity	Alimentary tract and metabolism
Aminoglutethimide	Hormone antagonist	Antineoplastic and immunomodulating agents
Amlodipine	Calcium channel blocker	Cardiovascular system
Arotinolol	Alpha, beta-blocker	Cardiovascular system
Atenolol	Beta-blocker	Cardiovascular system
Bemetizide	Thiazide diuretic	Cardiovascular system
Bendroflumethiazide	Thiazide diuretic	Cardiovascular system
Benfluorex	Serum lipid reducing agent	Cardiovascular system
Benidipine	Calcium channel blocker	Cardiovascular system
Bepridil	Calcium channel blocker	Cardiovascular system
Beraprost	Antithrombotic	Blood and blood forming organs
Betaxolol	Beta-blocker	Cardiovascular system
Bevantolol	Beta-blocker	Cardiovascular system
Bicalutamide	Hormone antagonist	Antineoplastic and immunomodulating agents
Biotin	Vitamin	Alimentary tract and metabolism
Bisoprolol	Beta-blocker	Cardiovascular system
Bopindolol	Beta-blocker	Cardiovascular system
Brefanolol	Alpha, beta-blocker	Cardiovascular system
Bucumolol	Beta-blocker	Cardiovascular system
Bufuralol	Alpha, beta-blocker	Cardiovascular system
Bunitrolol	Beta-blocker	Cardiovascular system
Bunolol	Beta-blocker	Cardiovascular system
Bupranolol	Beta-blocker	Cardiovascular system
Butizide	Thiazide diuretic	Cardiovascular system
Calanolide	Antiviral	Antiinfectives for systemic use
Carazolol	Beta-blocker	Cardiovascular system

(*continued*)

Table 8. Continued.

Drug Name	Therapeutic cat.	Medical Class
Carteolol	Beta-blocker	Cardiovascular system
Carvedilol	Beta-blocker	Cardiovascular system
Celiprolol	Beta-blocker	Cardiovascular system
Chloramphenicol	Antibacterial	Antiinfectives for systemic use
Chloroquine	Antimalarial	Antiparasitic, insecticides drugs and repellents
Chlorthalidone	Low-ceiling diuretic	Cardiovascular system
Cianidanol	Antidiarrheal	Alimentary tract and metabolism
Cicletanine	Low-ceiling diuretic	Cardiovascular system
Cicloprolol	Beta-blocker	Cardiovascular system
Cinchonine	Antimalarial	Antiparasitic, insecticides drugs and repellents
Ciprofibrate	Serum lipid reducing agent	Cardiovascular system
Cis-Allethrin	Ectoparasiticide	Antiparasitic, insecticides drugs and repellents
Cisapride	Propulsive	Alimentary tract and metabolism
Cis-Azalanstat	Serum lipid reducing agent	Cardiovascular system
Cis-Cyfluthrin	Insecticide	Antiparasitic, insecticides drugs and repellents
Cis-Cypermethrin	Insecticide	Antiparasitic, insecticides drugs and repellents
Cis-Permethrin	Ectoparasiticide	Antiparasitic, insecticides drugs and repellents
Cis-Phenothrin	Ectoparasiticide	Antiparasitic, insecticides drugs and repellents
Cis-Tetramethrin	Insecticide	Antiparasitic, insecticides drugs and repellents
Cis-Vincamine	Peripheral vasodilator diuretic	Cardiovascular system

(*continued*)

Table 8. Continued.

Drug Name	Therapeutic cat.	Medical Class
Cis-Zalcitabine	Urinary antiseptic	Antiinfectives for systemic use
Clevidipine	Calcium channel blocker	Cardiovascular system
Clinafloxacin	Antibacterial	Antiinfectives for systemic use
Clopidogrel	Antithrombotic	Blood and blood forming organs
Cromakalim	Peripheral vasodilator diuretic	Cardiovascular system
Cyclopenthiazide	Thiazide diuretic	Cardiovascular system
Cyclophosphamide	Alkylating agent	Antineoplastic and immunomodulating agents
Cyclothiazide	Thiazide diuretic	Cardiovascular system
Cytallene	Antiviral	Antiinfectives for systemic use
Decamethrin	Insecticide	Antiparasitic, insecticides drugs and repellents
Denopamine	Cardiac stimulant	Cardiovascular system
Dexpanthenol	Vitamin	Alimentary tract and metabolism
Diltiazem	Calcium channel blocker	Cardiovascular system
Diprafenone	Antiarrhythmic	Cardiovascular system
Disopyramide	Antiarrhythmic	Cardiovascular system
Dobutamine	Cardiac stimulant	Cardiovascular system
Doxazosin	Antiadregenic agent	Cardiovascular system
Efaroxan	Antiadregenic agent	Cardiovascular system
Epanolol	Beta-blocker	Cardiovascular system
Epitizide	Thiazide diuretic	Cardiovascular system
Etozolin	High-ceiling diuretic	Cardiovascular system
Fadrozole	Hormone antagonist	Antineoplastic and immunomodulating agents
Felodipine	Calcium channel blocker	Cardiovascular system
Fendiline	Calcium channel blocker	Cardiovascular system
Fenfluramine	Antiobesity	Alimentary tract and metabolism
Fenoldopam	Cardiac stimulant	Cardiovascular system
Flecainide	Antiarrhythmic	Cardiovascular system
Flosequinan	Vasodilator	Cardiovascular system
Flumecinol	Liver therapy	Alimentary tract and metabolism

(*continued*)

Table 8. Continued.

Drug Name	Therapeutic cat.	Medical Class
Fluvastatin	Serum lipid reducing agent	Cardiovascular system
Gallopamil	Calcium channel blocker	Cardiovascular system
(E)-Gemifloxacin	Antibacterial	Antiinfectives for systemic use
(Z)-Gemifloxacin	Antibacterial	Antiinfectives for systemic use
Glutamic acid	Digestive	Alimentary tract and metabolism
Glutamine	Diet	Alimentary tract and metabolism
(R,R),(S,S)-Glycopyrronium	Gastrointestinal disorder	Alimentary tract and metabolism
Halofantrine	Antimalarial	Antiparasitic, insecticides drugs and repellents
Idazoxan	Antiadregenic agent	Cardiovascular system
Idrapril	Ace Inhibitor	Cardiovascular system
Ifosfamide	Alkylating agent	Antineoplastic and immunomodulating agents
Imidapril	Ace Inhibitor	Cardiovascular system
Indapamide	Low-ceiling diuretic	Cardiovascular system
Indenolol	Beta-blocker	Cardiovascular system
Indinavir	Antiviral	Antiinfectives for systemic use
Indobufen	Antithrombotic	Blood and blood forming organs
Irinotecan	Antineoplatic	Antineoplastic and immunomodulating agents
Isoxsuprine	Peripheral vasodilator diuretic	Cardiovascular system
Isradipine	Calcium channel blocker	Cardiovascular system
Labetalol A	Alpha, beta-blocker	Cardiovascular system
Labetalol B	Alpha, beta-blocker	Cardiovascular system
Lansoprazole	G.O.R.D.	Alimentary tract and metabolism
Leminoprazole	G.O.R.D.	Alimentary tract and metabolism
Lercanidipine	Calcium channel blocker	Cardiovascular system

(*continued*)

Table 8. Continued.

Drug Name	Therapeutic cat.	Medical Class
Levamisole	Antinematodal	Antiparasitic, insecticides drugs and repellents
Levocarnitine Antihyperlipoproteinemic	Alimentary tract and metabolism	
Levosimendan	Cardiac stimulant	Cardiovascular system
Lifibrol	Serum lipid reducing agent	Cardiovascular system
Lorglumide	Hormone antagonist	Antineoplastic and immunomodulating agents
Malathion	Ectoparasiticide	Antiparasitic, insecticides drugs and repellents
Mandelic acid	Urinary antiseptic	Antiinfectives for systemic use
Manidipine	Calcium channel blocker	Cardiovascular system
Mefloquine	Antimalarial	Antiparasitic, insecticides drugs and repellents
Mefruside	Low-ceiling diuretic	Cardiovascular system
Mepenzolate	Gastrointestinal disorder	Alimentary tract and metabolism
Mepindolol	Beta-blocker	Cardiovascular system
Methotrexate	Antimetabolite	Antineoplastic and immunomodulating agents
Methoxamine	Cardiac stimulant	Cardiovascular system
Methylchlothiazide	Thiazide diuretic	Cardiovascular system
Metolazone	Low-ceiling diuretic	Cardiovascular system
Metomidate	Immunosuppressive agent	Antineoplastic and immunomodulating agents
Metoprolol	Beta-blocker	Cardiovascular system
Mexiletine	Antiarrhythmic	Cardiovascular system
Midodrine	Cardiac stimulant	Cardiovascular system
Moprolol	Beta-blocker	Cardiovascular system
Nadolol A	Beta-blocker	Cardiovascular system
Nadolol A + B	Beta-blocker	Cardiovascular system
Nadolol B	Beta-blocker	Cardiovascular system
Nandrolone	Anabolic steroid	Alimentary tract and metabolism

(*continued*)

Table 8. Continued.

Drug Name	Therapeutic cat.	Medical Class
Nebivolol	Beta-blocker	Cardiovascular system
Nicardipine	Calcium channel blocker	Cardiovascular system
Nicergoline	Peripheral vasodilator diuretic	Cardiovascular system
Nifurtimox	Antiprotozoal	Antiparasitic, insecticides drugs and repellents
Niguldipine	Calcium channel blocker	Cardiovascular system
Nilvadipine	Calcium channel blocker	Cardiovascular system
Nimodipine	Calcium channel blocker	Cardiovascular system
Nisoldipine	Calcium channel blocker	Cardiovascular system
Nitrendipine	Calcium channel blocker	Cardiovascular system
Norepinephrine	Cardiac stimulant	Cardiovascular system
Norfenefrine	Cardiac stimulant	Cardiovascular system
Octopamine	Cardiac stimulant	Cardiovascular system
Ofloxacin	Antibacterial	Antiinfectives for systemic use
Omeprazole	G.O.R.D.	Alimentary tract and metabolism
Ondansetron	Antiemetic	Alimentary tract and metabolism
Ornithine	Serum lipid reducing agent	Cardiovascular system
Oxamniquine	Antitrematodal	Antiparasitic, insecticides drugs and repellents
Oxedrine	Cardiac stimulant	Cardiovascular system
Oxodipine	Calcium channel blocker	Cardiovascular system
Oxprenolol	Beta-blocker	Cardiovascular system
Oxyphenecyclimine	Gastrointestinal disorder	Alimentary tract and metabolism
Oxyphenonium	Gastrointestinal disorder	Alimentary tract and metabolism
Pamatolol	Beta-blocker	Cardiovascular system
Pantoprazole	G.O.R.D.	Alimentary tract and metabolism
Paraflutizide	Thiazide diuretic	Cardiovascular system
Penbutolol	Beta-blocker	Cardiovascular system
Phenethicillin	Antibacterial	Antiinfectives for systemic use
Phenmetrazine	Antiobesity	Alimentary tract and metabolism

(*continued*)

Table 8. Continued.

Drug Name	Therapeutic cat.	Medical Class
Phenoxybenzamine	Peripheral vasodilator diuretic	Cardiovascular system
Phenprocoumon	Antithrombotic	Blood and blood forming organs
Phenylethanolamine	Cardiac stimulant	Cardiovascular system
Phylloquinone K1	Antihemorrhagic	Blood and blood forming organs
Pimobendan	Cardiac stimulant	Cardiovascular system
Pindolol	Beta-blocker	Cardiovascular system
Piperoxan	Antiadregenic agent	Cardiovascular system
Piprozolin	Bile therapy	Alimentary tract and metabolism
Pirmenol, HCl	Antiarrhythmic	Cardiovascular system
Polythiazide	Thiazide diuretic	Cardiovascular system
Practolol	Beta-blocker	Cardiovascular system
Praziquantel	Antitrematodal	Antiparasitic, insecticides drugs and repellents
Primaquine	Antimalarial	Antiparasitic, insecticides drugs and repellents
Proglumide	G.O.R.D.	Alimentary tract and metabolism
Pronethalol	Alpha, beta-blocker	Cardiovascular system
Propafenone	Antiarrhythmic	Cardiovascular system
Propicillin	Antibacterial	Antiinfectives for systemic use
Propranolol	Beta-blocker	Cardiovascular system
Quinacrine	Anticestodal	Antiparasitic, insecticides drugs and repellents
Quinethazone	Thiazide diuretic	Cardiovascular system
Quinine	Antimalarial	Antiparasitic, insecticides drugs and repellents
Rabeprazole	G.O.R.D.	Alimentary tract and metabolism
Ranolazine	Antiarrhythmic	Cardiovascular system
Rogletimide	Hormone antagonist	Antineoplastic and immunomodulating agents
Roxifiban	Antithrombotic	Blood and blood forming organs

(*continued*)

Table 8. Continued.

Drug Name	Therapeutic cat.	Medical Class
RS/SR-Labetalol	Alpha, beta-blocker	Cardiovascular system
S,S/R,R-Benazapril	Ace Inhibitor	Cardiovascular system
Saterinone	Cardiac stimulant	Cardiovascular system
Semotiadil	Calcium channel blocker	Cardiovascular system
Shikonin	Phytogenic	Antineoplastic and immunomodulating agents
Sibutramine	Antiobesity	Alimentary tract and metabolism
Sotalol	Alpha, beta-blocker	Cardiovascular system
Talinolol	Beta-blocker	Cardiovascular system
Tegafur	Antimetabolite	Antineoplastic and immunomodulating agents
Tertatolol	Beta-blocker	Cardiovascular system
Tetramethrin	Insecticide	Antiparasitic, insecticides drugs and repellents
Thalidomide	Immunosuppressive agent	Antineoplastic and immunomodulating agents
Threo-Cloramphenicol	Antibacterial	Antiinfectives for systemic use
Tifluadom	High-ceiling diuretic	Cardiovascular system
Timepidium	Gastrointestinal disorder	Alimentary tract and metabolism
Timolol	Beta-blocker	Cardiovascular system
Timoprazole	G.O.R.D.	Alimentary tract and metabolism
Tiprenolol	Beta-blocker	Cardiovascular system
Tocainide	Antiarrhythmic	Cardiovascular system
Tolamolol	Beta-blocker	Cardiovascular system
Toliprolol	Beta-blocker	Cardiovascular system
Tosufloxacin	Antibacterial	Antiinfectives for systemic use
Trans-Allethrin	Ectoparasiticide	Antiparasitic, insecticides drugs and repellents
Trans-Azalanstat	Serum lipid reducing agent	Cardiovascular system
Trans-Cyfluthrin	Insecticide	Antiparasitic, insecticides drugs and repellents

(*continued*)

Table 8. Continued.

Drug Name	Therapeutic cat.	Medical Class
Trans-Cypermethrin	Insecticide	Antiparasitic, insecticides drugs and repellents
Trans-Permethrin	Ectoparasiticide	Antiparasitic, insecticides drugs and repellents
Trans-Phenothrin	Ectoparasiticide	Antiparasitic, insecticides drugs and repellents
Trans-Tetramethrin	Insecticide	Antiparasitic, insecticides drugs and repellents
Trans-Vincamine	Peripheral vasodilator diuretic	Cardiovascular system
Trans-Zalcitabine	Urinary antiseptic	Antiinfectives for systemic use
Trichloromethiazine	Thiazide diuretic	Cardiovascular system
Tridihexethyl	Gastrointestinal disorder	Alimentary tract and metabolism
Trofosfamide	Alkylating agent	Antineoplastic and immunomodulating agents
Troglitazone R,S-S,R	Antidiabetic	Alimentary tract and metabolism
Troglitazone S,S-R,R	Antidiabetic	Alimentary tract and metabolism
Valsartan	Angiotensin II antagonist	Cardiovascular system
Verapamil	Calcium channel blocker	Cardiovascular system
Vinburnine	Peripheral vasodilator diuretic	Cardiovascular system
Voriconazole	Antimycotic	Antiinfectives for systemic use
Warfarin	Antithrombotic	Blood and blood forming organs

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