

## **Statistical evaluation of the cyclodextrin related literature published in the Cyclodextrin News in 2013**

The most important events of the year for the cyclodextrin researchers were as follows:

- 3<sup>rd</sup> European Conference on Cyclodextrins in Antalya (Turkey).
- 4<sup>th</sup> National Conference CD.TE.C (Chemistry and Technology of Cyclodextrin) organized by the Italian Cyclodextrin Society in Giardini Naxos (Italy)
- 7th Asian Cyclodextrin Conference in Bangkok (Thailand)
- 30<sup>th</sup> National Cyclodextrin Symposium organized by the Japanese Society of Cyclodextrins
- Orphan designation for Hydroxypropyl- $\beta$ -cyclodextrin for the treatment of Niemann-Pick disease, type C granted (EMA COMP, European Medicinal Agency Committee for Orphan Medicinal Products)
- Clinical trial to see the safety of HPBCD given directly to the cerebrospinal fluid for Niemann Pick Disease Type C patients at National Institute of Health (NIH, Baltimore, USA) started in February, stopped in May and restarted in October.
- A serious dispute has been started on the medical use of Sugammadex.

The number of publications and patents increased further in 2013 (Fig. 1). It should be, however, considered that a lot of publications to be published in hard copy in 2014 have already been made available online in the year 2013. This is a change in the policy of the publishers in the last years. This is the reason of the difference in the number of all printed and all printed + online columns for 2013 in Fig. 1.

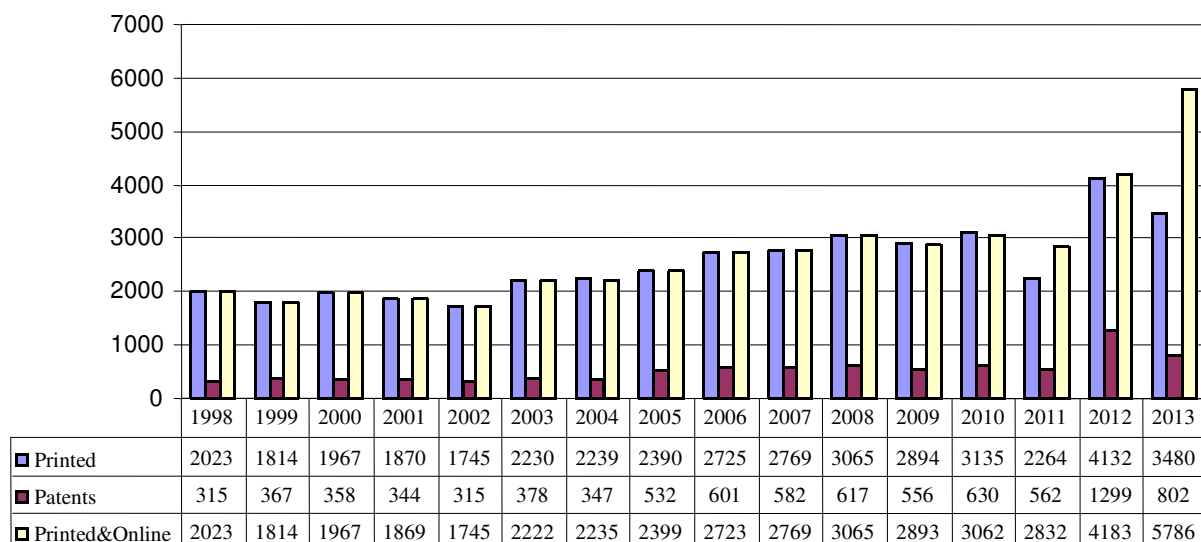


Fig. 1 Number of publications in the past 15 years

The distribution of the publications among the main fields in the CD News classification system has not been changed significantly in the past four years (Fig. 2). The leading application is still the pharmaceutical, followed by chemical and biotechnological applications. There are still numerous papers on studying the structure of cyclodextrin complexes. It is good to know that the production of CDs with modified enzymes from different starches as well as syntheses of new CD derivatives are still frequently studied (Chemistry of CDs). The analytical applications in capillary electrophoresis and HPLC became a routine as well as the extraction of cholesterol from cell membranes by using methylated CDs or HPBCD.

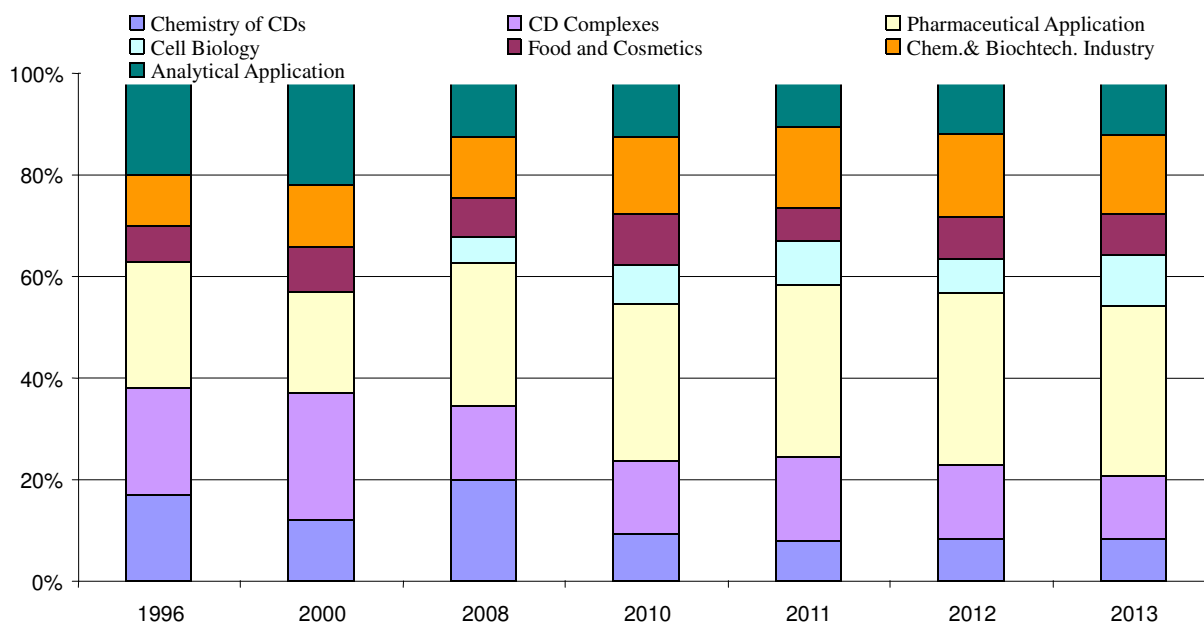
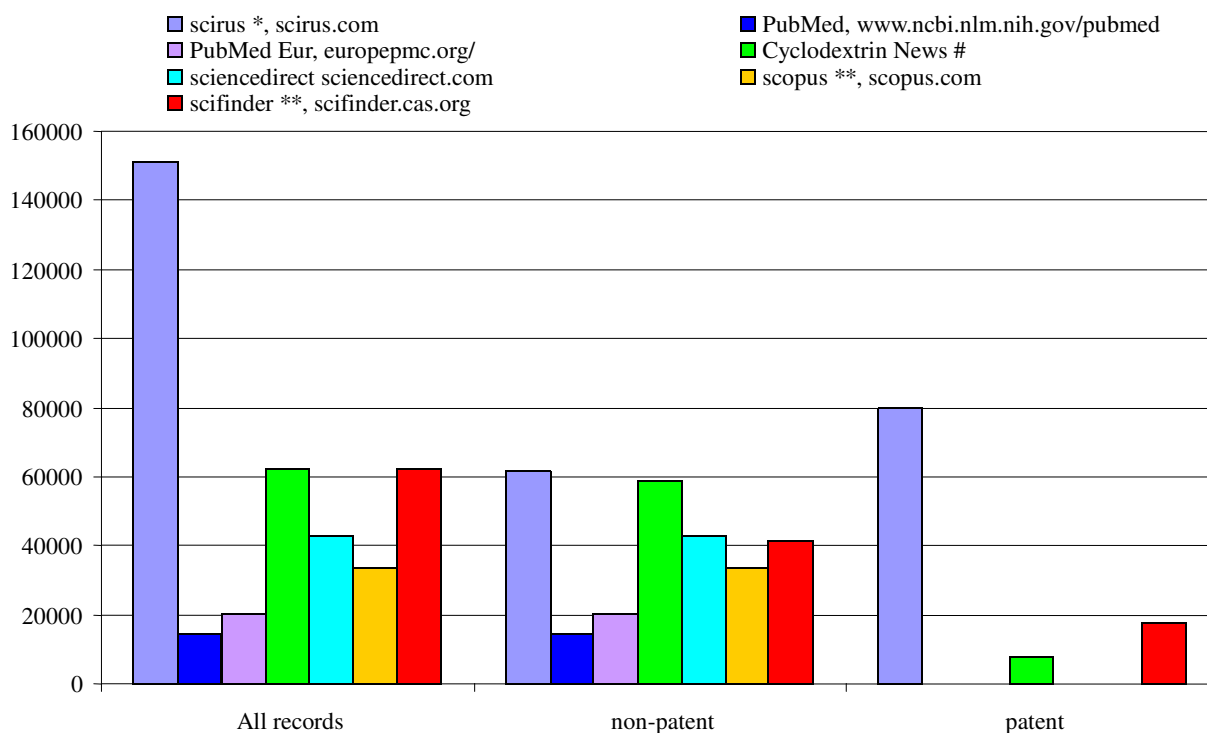


Fig. 2 Distribution of the publications (including patents) among the fields of applications



The various databases contain different, only partly overlapping data concerning the cyclodextrin-related publications. Fig. 3 shows the number of hits in various literature databases. Especially, the patents are underrepresented in most of these databases. Scirus and ScienceDirect have no duplicate/index/content list removal function, which increases the number of hits. In Fig. 3 the numbers of hits after filtering out the duplicates are represented. Unfortunately, Scirus, the most comprehensive database concerning the CD-related publications and patents has been stopped. The unique feature of the Cyclodextrin News database is that it contains also conference presentations not referred by the other databases. Unfortunately, this database is not public any more after approx. 5 years of publicity in the 2005-2010 period.



\* Scirus is abandoned at 01-31-2014, no patent data collection after 12-31-2013., R.I.P.  
 \*\* Subscription based only  
 # Contains conference data which are not visible by the major search engines

Fig. 3 Number of cyclodextrin-related hits in the various databases

Fig. 4 shows how the journal preference of the CD researchers has changed. The data on the top 15 journals were collected from ScienceDirect from the beginning (from 1890). It is very interesting that most of the CD-related papers were published in Journal of Chromatography A (21% of the 13990 published in the top 15 journals in this period), followed by International Journal of Pharmaceutics (12%) and Carbohydrate Research (9%). In 2003 the rank order was very similar: Journal of Chromatography A (21% of the top 434 in this year), followed by International Journal of Pharmaceutics (12%) and Tetrahedron: Asymmetry (12%); while in 2013



International Journal of Pharmaceutics (20% of the 829) and Carbohydrate Polymers (19%) are the first and Journal of Chromatography A (7%) and European Journal of Pharmaceutics and Biopharmaceutics (7%) are on the second position.

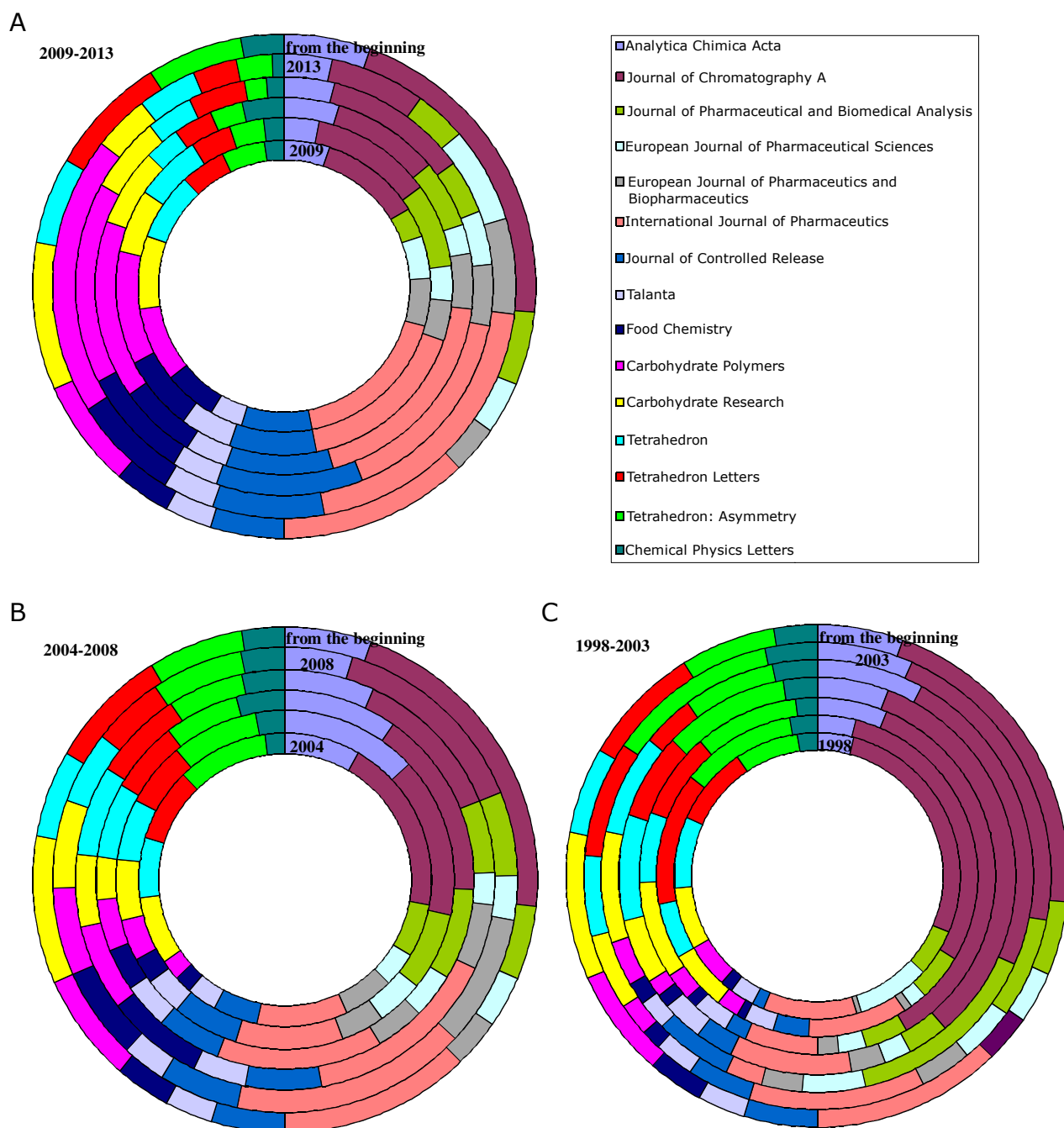


Fig. 4 Distribution of CD-related papers in the top 15 journals in three periods: 2009-2013 (A), 2004-2008 (B), and 1998-2003 (C)

The most frequently used keywords in the publications have been also collected (Table 1). It is easy to observe that the most popular keyword given by the authors is NMR. Among the very frequent keywords we can find capillary electrophoresis, chiral selector, and in the recent years drug delivery, lipid raft, polyethylene glycol (PEG),



antioxidant activity.

Table 1 Top ten informative keywords given by the authors and the frequency in the published literature

From the beginning (1890-2013)		2013		2009		2004		1999	
NMR	936	drug delivery	57	NMR	54	NMR	41	NMR	33
HPLC	904	inclusion complex	43	inclusion complex	30	inclusion complex	29	capillary electrophoresis	29
inclusion complex	675	NMR	60	lipid raft	20	capillary electrophoresis	25	inclusion complex	17
capillary electrophoresis	639	PEG	30	drug delivery	18	lipid raft	25	stationary phase	13
stationary phase	369	solid dispersion	30	antioxidant activity	14	absolute configuration	22	capillary zone	12
drug delivery	321	caco-2 cell	26	PEG	13	stationary phase	22	electronic spectrum	11
amino acid	290	stationary phase	25	Triton X-100	13	mobile phase	12	mobile phase	11
absolute configuration	274	antioxidant activity	24	PAHs	12	amino acid	11	zone electrophoresis	11
mobile phase	266	DNA	24	capillary electrophoresis	11	drug delivery	10	thiocarbonyl compound	10
lipid raft	243	ionic liquid	21	absolute configuration	10	chiral selector	9	chiral selector	9

With this statistical evaluation CycloLab wishes to the readers of the  
Cyclodextrin News a successful 2014.

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