

Macedonian Biomedical Scientists Are Not Adequately Represented in BiomedExperts Database

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Abstract

Aim. The aim of this study was to analyze publication activity of Macedonian biomedical scientists reported in BioMedExperts and to propose improvements and corrections in order to present Macedonian science more objectively.

Material and methods. For this investigation BiomedExperts database was searched for scientific experts in a total of 145 countries, as well as scientific profiles originating from Republic of Macedonia (June 17, 2008). Affiliation in Macedonia concerned number and %, first authors, middle authors, last authors and co-authors were analyzed.

Results. Macedonian authors with 410 papers contribute with 0.006% in the BiomedExperts. All neighboring countries, except Albania (0.001%), have higher percentage of scientific papers in BiomedExperts: Greece (0.468%), Serbia (0.111%), and Bulgaria (0.092%). We can see that only 54 scientists are presented under the name of Republic of Macedonia. They published 825 scientific papers, from which 580 are affiliated with the Republic of Macedonia (70.3%). Most of the Macedonian biomedical scientific authors (7.50) are middle authors, much less are first authors (4.06) and the rest of the authors are last authors (3.72). Macedonian biomedical scientists in average have 14.69 co-authors in their scientific papers.

Conclusion. Macedonian biomedical scientists are not adequately represented in BiomedExperts database and scientists are encouraged to register, log in, and correct personal profiles.

Introduction

There are numerous attempts to create different scientific social networks in the world. Building international partnerships is part of active participation in EU research programmes (1). The CORDIS program has an established Partners Service and a specialised service for FP7 (2-3), fostering public-private partnerships(4) to design, propose and launch new projects. The Partners Service is a free on-line service, tailor-made to find the best research partners for the projects, either in the context of EU-funded Research and Development projects or within a broader search for technology-orientated partnerships. The service in-

cludes details on thousands of active partnership requests from companies, research institutions and universities across Europe and around the world (5).

The Specific Support Action "Medical Research Initiative South Eastern Europe - *MedResIn*" has been set up to strengthen scientific and technological interaction and cooperation in biomedical research between the EU and South Eastern Europe, especially the Western Balkan countries. Its aim is to facilitate future participation of Medical Universities/Faculties and Schools from Western Balkan countries in the relevant Priorities of the European Framework Programmes (6).

The West Balkan Research database is online directory that provides a database of universities, institutions and companies active in research and development (R&D) in West Balkan Countries (WBCs). It allows searching the West Balkan research landscape against all themes of activities defined within the 7th EU-Framework Programme (FP7), organisation type and geographical region for a simple and successful identification of R&D collaboration partners. Specifically, it is targeted towards creating a platform for the transition to FP7 in order to provide the best possible starting conditions for biomedical research in Western Balkan countries (7). There are 910 R&D organisation profiles: Serbia 414, Montenegro 45, Bosnia-Herzegovina 156, Republic of Macedonia 212, Croatia 51, Albania, 27, and other 5.

The ERA WESTBALKAN+ initiative is supporting the Western Balkan Countries (Albania, Bosnia and Herzegovina, Croatia, Republic of Macedonia, Montenegro and Serbia) in participating in the 7th EU Framework Programme (FP7). It brings to the active researchers and experts in FP7-Theme "Health", a unique opportunity to establish new contacts, discuss current FP7 research topics and identify cooperation needs (8). In total, 37 company profiles are presented: Austria 9, Bosnia-Herzegovina 8, Croatia 6, Republic of Macedonia 3, Montenegro 3, and Serbia 8.

Collexis launched BioMedExperts.com (BME) in January 2008 in order to facilitate collaboration and to increase biomedical research among healthcare and life sciences professionals worldwide. With 1.4 million pre-generated researcher profiles with pre-established network connections from more than 120 countries, BioMedExperts.com is designed to help users connect with each other, free of charge, through the display and analysis of the networks of co-authors with whom each investigator is connected to publish scientific papers (9).

The aim of this study was to analyze biomedical scientific activity of Macedonia authors, reported in BioMedExperts, and to propose improvements and corrections in order to present Macedonian science more objectively.

Material and Methods

Scientists and researchers' profiles in BiomedExperts database are automatically created if they have published at least 3 articles in the past ten years that are indexed in Medline. Any scientist or researcher, known as BME experts, can access the

system to revise and update his or her personal details, publications, and preferences. There is not yet a tool available for searching by institution.

BioMedExperts contains tools that allow users to: 1) search the network of profiles and articles by expert name or keyword and analyze the profiles of more than 1.4 million scientists by expertise, region and more; 2) customize their own profiles; 3) communicate with other members of BioMedExperts (users can invite others to their own personal network and email experts from within the entire BioMedExperts community to establish and grow professional affiliations); 4) set up article alerts [users can receive alerts on new articles by topic or by name (for example, users can easily track articles published by co-authors)].

Searching can be done by keyword and personal name, or by browsing country or semantic groups. Semantic groups are a fixed set of keywords, such as: *anatomy, chemicals and drugs, genes and molecular sequences, and physiology*. MyBiomedExperts contains: personal profile, recent publications, co-authors, network view, geo network view, and time and places of publications.

For this investigation, BiomedExperts database was searched for scientific experts in a total of 145 countries, as well as scientific profiles originating from Republic of Macedonia (June 17, 2008). Affiliation in Macedonia concerned, number and %, first authors, middle authors, last authors and co-authors were analyzed.

Results

Listing of the 145 countries in BiomedExperts which have more than 50 publications in PubMed (June 17, 2008) is given in Table 1. A total of 6.777.332 scientific papers, issued from the countries, are deposited in BiomedExperts. The highest percentages of published papers (36.20%) are from United States of America. On the second place are United Kingdom of Great Britain and Northern Ireland (7.47%), followed by Japan (6.45%), Germany (6.80%), France (4.85%), Italy (4.38%), Canada (4.04%), and others.

Macedonia with a total number of 410 papers contributes with 0.006% in the BiomedExperts. All neighboring countries, except Albania (0.001%), have higher percentage of scientific papers in BiomedExperts: Greece (0.468%), Serbia (0.111%), and Bulgaria (0.092%). Other countries from the Former Socialistic Republic of Yugoslavia are also presented

Table 1: Listing of the 145 countries in BiomedExperts which have more than 50 publications in Pubmed (June 17, 2008).

Country	Number	%	Country	Number	%	Country	Number	%
Albania	81	0.0012	Greenland	69	0.0010	Philippines	939	0.0139
Algeria	82	0.0012	Guatemala	192	0.0028	Poland	49231	0.7264
Argentina	24398	0.3600	Guinea	69	0.0010	Portugal	17152	0.2531
Armenia	548	0.0081	Guinea-Bissau	100	0.0015	Puerto Rico	2094	0.0309
Australia	138646	2.0457	Hungary	29088	0.3702	Qatar	522	0.0077
Austria	54615	0.8058	Iceland	1369	0.0202	Republic of Korea	55269	0.8155
Azerbaijan	112	0.0017	India	71872	1.0605	Republic of Moldova	74	0.0011
Bahrain	330	0.0049	Indonesia	1434	0.0212	Romania	7882	0.1163
Bangladesh	1867	0.0275	Iraq	360	0.0053	Russian Federation	25981	0.3834
Belarus	1132	0.0167	Ireland	16052	0.2368	Rwanda	113	0.0017
Belgium	69632	1.0274	Islamic Republic of Iran	10678	0.1561	Saudi Arabia	9413	0.1389
Benin	238	0.0035	Israel	64147	0.9465	Schweiz	98816	1.4580
Bolivia	192	0.0028	Italy	296900	4.3808	Senegal	1499	0.0221
Bosnia and Herzegovina	1125	0.0166	Jamaica	130	0.0019	Serbia	7503	0.1107
Botswana	243	0.0036	Japan	437460	6.4548	Sierra Leone	56	0.0008
Brazil	79200	1.1686	Jordan	2206	0.0325	Singapore	19170	0.2829
Bulgaria	6236	0.0920	Kazakhstan	54	0.0008	Slovakia	8921	0.1316
Burkina Faso	516	0.0076	Kenya	3451	0.0509	Slovenia	6097	0.0900
Burundi	79	0.0012	Kuwait	2668	0.0394	Socialist Republic of Vietnam	658	0.0097
Cambodia	98	0.0014	La Réunion	216	0.0032	South Africa	20479	0.3022
Cameroon	1242	0.0183	Lao People's Democratic Republic	73	0.0011	Spain	157838	2.3289
Canada	273720	4.0388	Latvia	536	0.0079	Sri Lanka	667	0.0098
Central African Republic	82	0.0012	Lebanon	2621	0.0387	Sudan	837	0.0123
Chile	11761	0.1735	Lithuania	2654	0.0392	Sweden	134514	1.9848
Colombia	3043	0.0449	Luxembourg	645	0.0095	Syrian Arab Republic	246	0.0036
Costa Rica	1044	0.0154	Madagascar	195	0.0029	Taiwan	48510	0.7158
Côte d'Ivoire	803	0.0118	Malawi	523	0.0077	Thailand	15802	0.2332
Croatia	8111	0.1197	Malaysia	5739	0.0847	The Democratic Republic of the Congo	315	0.0046
Cuba	3164	0.0467	Mali	320	0.0047	The former Yugoslav Republic of Macedonia	410	0.0060
Cyprus	291	0.0043	Martinique	123	0.0018	The Netherlands	151684	2.2381
Czech Republic	25830	0.3811	Mexico	4171	0.0615	Togo	247	0.0036
Denmark	59707	0.8810	Morocco	3215	0.0474	Trinidad and Tobago	231	0.0034
Dominican Republic	59	0.0009	Mozambique	209	0.0031	Tunisia	5544	0.0818
Ecuador	424	0.0063	Myanmar	174	0.0026	Turkey	61498	0.9074
Egypt	10320	0.1523	Nepal	682	0.0101	Uganda	1008	0.0149
El Salvador	59	0.0009	Netherlands Antilles	142	0.0021	Ukraine	2742	0.0405
Estonia	2129	0.0314	New Caledonia	128	0.0019	United Arab Emirates	1442	0.0213
Ethiopia	1518	0.0224	New Zealand	29078	0.4290	United Kingdom of Great Britain and Northern Ireland	506255	7.4698
Fiji	133	0.0020	Nicaragua	258	0.0038	United Republic of Tanzania	808	0.0119
Finland	57867	0.8538	Niger	225	0.0033	United States of America	2453151	36.1964
France	328423	4.8459	Nigeria	10404	0.1535	Uruguay	1824	0.0269
French Guiana	79	0.0012	Norway	41324	0.6097	Uzbekistan	253	0.0037
French Polynesia	154	0.0023	Oman	1076	0.0159	Venezuela	4500	0.0664
Gabon	391	0.0058	Pakistan	5294	0.0781	Yemen	180	0.0027
Gambia	625	0.0092	Palestinian Territories	156	0.0023	Zambia	476	0.0070
Georgia	218	0.0032	Panama	518	0.0076	Zimbabwe	1720	0.0254
Germany	460912	6.8006	Papua New Guinea	585	0.0086	Philippines	939	0.0139
Ghana	656	0.0097	Paraguay	104	0.0015			
Greece	31740	0.4683	People's Republic of China	181979	2.6851			

in BiomedExperts: Croatia (0.120%), Slovenia (0.090%), and Bosnia and Herzegovina (0.017%).

In the Table 2 are given scientists from the Republic of Macedonia that published at least five publications in PubMed that are reported in BiomedExperts. We can see that only 54 biomedical scientists are presented under the name of Republic of Macedonia (The Former Yugoslav Republic of Macedonia in BiomedExperts). They published 825 scientific papers, from which 580 are affiliated with the Republic of Macedonia (70.3%) and others are affiliated with other countries. The highest number of papers are published by the following scientists: *Polenakovic, Momir* (99), followed by *Efremov, Georgi D* (84), *Grcevska, Ladislava* (52), *Efremov, Dimitar G*

(51) and others.

Macedonian scientists are as first authors in 219 papers, as middle authors in 405 papers and as a last authors in 201 papers. They have a total of 793 co-authors in their scientific articles.

The average number of first authors, middle authors, last authors and co-authors of Macedonian biomedical scientists reported in BiomedExperts (June 17, 2008) are depicted on Figure 1. Most of the Macedonian scientific authors (7.50) are middle authors, much less are first authors (4.06) and the rest of the authors are last authors (3.72). The scientific papers published by Macedonian scientists in average have 14.69 co-authors.

Table 2. Searching scientists from Republic of Macedonia in BiomedExperts (June 17, 2008). Below are the authors which published at least five articles.

Name	All publications	Affiliation in Macedonia		First author	Middle author	Last author	Co-authors
		N	%				
Alabakovska, Sonja B	7	7	100.0	4	3	0	4
Amilov, Vili	5	5	100.0	0	5	0	13
Arsov, Todor	7	6	85.7	1	6	0	9
Bogdanska, JJ	5	5	100.0	3	2	0	5
Borozanov, Vladimir	10	7	70.0	0	4	6	9
Bosevski, Marjan	10	8	80.0	7	2	1	6
Cakalaroski, Koco	31	23	74.2	5	25	1	28
Dzekova, Pavlina	5	5	100.0	1	4	0	9
Dzokova, Sonja	23	16	69.6	0	16	7	19
Efremov, Dimitar G	51	7	13.7	13	26	12	79
Efremov, Georgi D	84	39	46.4	15	34	35	59
Georgievska-Ismail, Ljubic	9	5	55.6	1	5	3	5
GORACIROVA, KATERINA	11	11	100.0	0	5	6	10
Grcevska, Ladislava	52	30	57.7	33	13	6	20
Grozdanovski, R	7	7	100.0	0	6	1	14
Ivanovski, Ninoslav	38	29	74.3	16	17	5	34
Ivanovski, Vladimir	5	5	100.0	5	0	0	3
Karadzinska-Bislimska, Jovanka	6	6	100.0	2	4	0	3
Kolevski, Perko	15	12	80.0	2	11	2	16
Kulevanova, Svetlana	6	6	100.0	3	3	0	2
Kuzmanovska, Dafina B	5	5	100.0	4	1	0	2
Labudovic, Danica D	9	9	100.0	2	7	0	6
Lekovski, Ljupco	9	8	88.9	0	9	0	15
Masin-Spasovska, Jelka	9	7	77.8	4	5	0	15
Mladenovska, Kristina	7	7	100.0	5	2	0	7
Naumov, Pance	17	5	29.4	15	2	0	20
Pejov, Ljupco	7	6	85.7	5	0	2	6
Peovska, Irena	7	7	100.0	2	4	1	6
Petichkovski, Aleksandar	9	5	55.6	2	7	0	23
Petruvska, Gordana	27	19	70.4	1	17	9	27
Petruvska, Vladimir M	7	7	100.0	0	1	6	4
Plaseska-Karanfiska, Dijana	9	5	55.6	3	4	2	5
Polenakovic, Momir	99	66	66.7	17	31	51	53
Popov, Zivko	24	21	87.5	4	16	4	24
Risteska-Kuc, Snezana	6	6	100.0	0	5	1	3
Ristovska, V	8	6	75.0	1	7	0	12
Selim, Gjusen	5	5	100.0	2	3	0	10
Sikole, Aleksandar	25	21	84.0	9	12	4	38
Simjanovska, Lijana J	8	5	62.5	1	7	0	10
Spasovski, Goce B	29	22	75.9	10	17	2	50
Spiroski, Mirko	13	11	73.3	1	4	8	17
Staffov, Trajce	15	13	86.7	1	6	8	6
Stankov, Oliver	5	5	100.0	0	5	0	12
Stefova, Marina	7	6	85.7	0	4	3	6
Stojceva-Taneva, O	7	7	100.0	3	4	0	17
Stojkovski, Ljupco	11	7	63.6	0	8	3	15
Stoleski, Saso	5	5	100.0	1	1	3	3
Strezova, Ana	5	5	100.0	0	5	0	6
Todorova, Bojana B	9	9	100.0	0	4	5	6
Tosheska, Katerina N	6	6	100.0	1	3	2	5
Trajkov, Dejan	5	5	100.0	1	4	0	6
Vavlukis, Marja	8	7	87.5	3	5	0	5
Vidkova-Laskovska, Marija T	7	5	71.4	3	2	2	2

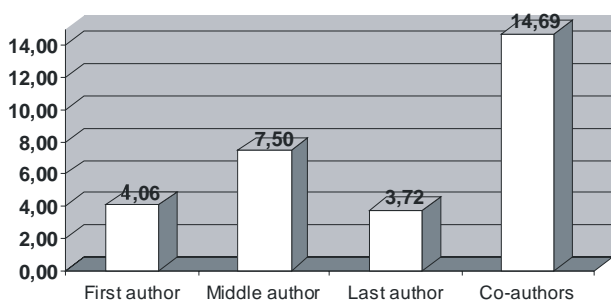


Figure 1: Average number of first authors, middle authors, last authors, and co-authors of Macedonian scientists referred in BioMedExperts (June 17, 2008).

Discussion

In this analysis, it was found that biomedical scientists from Republic of Macedonia are deposited in BiomedExpert database with participation of 0.006%. For comparison, all neighboring countries (except Albania) have higher participation. Only 54 biomedical scientists from Republic of Macedonia are presented in the database with 825 published scientific papers, from which 580 are affiliated with the Republic of Macedonia (70.3%) and the rest of the articles are published in other countries.

Republic of Macedonia is located in the Central Balkans, bordering Bulgaria, Greece, Albania, Serbia and Kosovo province, covering an area of 25.710 kms. According to the 2002 census, the country's population was 2.022.577. Data on the declared ethnic affiliation from the 2002 census reported that 64.1% of the population identify themselves as Macedonian, 25.17% as Albanian, 3.95% as Turks, 2.66% as Roma, 1.78% as Serbs, 0.84% as Bosniacs, 0.48% as Vlachs and 1.04% others (State Statistical Office of the Republic of Macedonia. Census 2002) (10). The country seceded peacefully from Socialistic Federative Republic of Yugoslavia after an independence referendum, held in September 1991.

In BiomedExperts database, constitutional name of Republic of Macedonia is replaced with reference name The Former Yugoslav Republic of Macedonia. Since, science is based on original data gathering, thus it is unacceptable for a scientific database to change the original constitutional name of one country (Republic of Macedonia). Therefore, I hope that in the near future, the terrible mistake will be corrected and Republic of Macedonia will be recognized in BiomedExperts with its constitutional name.

The real number of published biomedical scien-

tific papers from Macedonian scientists during the past 10 years (1998-2008) is not known. The search of PubMed [("macedonia (republic)"[MeSH Terms] OR ("macedonia"[All Fields] AND "(republic)"[All Fields]) OR "macedonia (republic)"[All Fields] OR "macedonia"[All Fields] AND ("1998/07/19"[PDate] : "2008/07/15"[PDate]))] for the very same period of time, shows significantly higher number of published papers (704 in PubMed compared with 410 in BiomedExperts).

There are several reasons for the observed difference; 1) Probably bigger number of Macedonian scientists publishes less than the inclusion criterion of 3 papers; 2) Many of the Macedonian biomedical scientists are not always careful to specify the precise affiliation and designate the corresponding author (probably because they do not use native English language); 3) Several North Greece institutions are declared as Macedonian; 4) Problems with character transliteration of names and surnames, use of character "v", apostrophes (') and other spelling difficulties.

Some of the scientists from the Republic of Macedonia have two or more different surnames based on different pronunciation and/or transliteration. One example is the surname *Petlichkovski, A* and *Petlickovski, A*. In this example, Macedonian Cyrillic "ch" can be transliterated as "ch" or as "c". In such cases authors can be divided as two different individuals and if they have less than 5 papers, they can be excluded from the country list in the database. Thus, it is advisable that Macedonian biomedical scientific authors with the transliterated characters in their surnames, check for ambiguities and correct them in the BiomedExperts database.

Macedonian scientists are sometimes presented differently by giving either the whole first name or only the first character of the first name. One example is *Zafirovska, K* and *Zafirovska, Katica*, who is in fact the same scientist. In the first case (i.e. *Zafirovska, K*), this author is represented with 3 papers, and in the second case (*Zafirovska, Katica*) this author is represented with 3 papers, or 6 papers in total. If all 6 papers are connected with the same scientists (*Zafirovska, Katica*) the author would be represented in the list of the Macedonian scientists, because fulfills the criterion of 5 published papers. There are numerous similar examples.

Our analysis also indicates that several authors have been differently affiliated during the past 10 years. One of the examples is *Popov, Zivko* with 15 publications affiliated to different institutions in Paris, France between years 1988-2004, and 24 publications affili-

ated to the Faculty of Medicine in Skopje, Republic of Macedonia from 1997-2008 year. His total number of published papers in BiomedExperts represents in fact 39 publications, instead of 24 recorded. Most of the Macedonian scientist during their study period abroad on fellowships did not declare the affiliations in the Republic of Macedonia, from where they originate.

We noticed that several biomedical scientists from the Republic of Macedonia, with respectable number of published articles in PubMed, are part of the BiomedExperts, but are not affiliated with originating country (Republic of Macedonia). One of the examples is *Tasic, Velibor* from the Clinic of Paediatrics at the Faculty of Medicine in Skopje with 31 publications in BiomedExperts. Several other examples were identified. It is not possible to discover the reason for such exclusion of several authors from their affiliated country (Republic of Macedonia) in the BiomedExperts database.

In fact, personal responsibility of Macedonian biomedical scientists is to be adequately presented in the BiomedExperts database and other databases. To fulfill this aim they should register to the free service of BiomedExperts (<http://www.biomedexperts.com/Portal/Registration.aspx>), log in, manage their personal profiles and check validity of the data. By doing that, they will contribute to represent Macedonian science in the real light and will increase awareness for objectivity in scientific databases in the world.

In summary, Macedonian scientists are not adequately represented in BiomedExperts database and they are encouraged to register, log in, and correct their real personal profiles.

It is a question of time to conclude whether BiomedExperts database will remain a valuable and permanent tool for scientists over the world in creating a scientific social network or one of the several temporary initiatives.

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