Summary report on research accreditation

I. General information

Name of organization	**Institute of Microbiology and Biotechnology**
Organization type (*to underline*)	Research institute Higher education institution Ministerial research institute
Research direction (s) of organization	– Directed microbial synthesis of bioactive substances and biotechnological processes for production of multifunctional preparations; – implementation of microbiological indicators for monitoring the impact of anthropogenic factors on soil quality and for predicting the sustainability of agricultural technologies on the soil organic matter content; – microbial biodiversity monitoring and conservation.
Correlation with strategic research direction (s) of activity in the field of science and innovation for 2013-2020	– Materials, innovative technologies and products; – Biotechnology
Evaluated period	2011-2015
Web of organization	www.imb.asm.md

II. Research capacity (annual average for evaluated period)

Total number of employees	**99.8**					
Number of scientific researchers	**58.8**					
Number of researchers who possess honorific titles, scientific degrees, scientific and scientific-didactical titles	ASM full members **3.4**	ASM corresp. Members **0.8**	Professor **9.4**	Associated Professor **18.8**	Dr.hab. **9.8**	Dr. (PhD) **30.8**
Number of researchers involved in international projects	European Commission Programmes **5.4**	United Nations Programmes and Funds -	Bilateral Programmes financed from the national budget **6.4**	Others -		
Number of young researchers (under 35 years old)	PhD students **2**		Others **17.6**			
Financial resources - revenues (thousand MDL)	Public budget **5585.4**		Special means **933.9**			
Categories of special means (thousand MDL)	National **32.2**		International **901.7**			
Distribution of	Salary	Procurement of scientific equipment	Traveling for scientific purposes	Other		

expenditures (thousand MDL)	**4476.3**	**128.8**	(travel, accommodation, per-diems, etc.) **143.3**	**552.4**
List of 3 basic research methods, equipments, technologies (per accredited field)	HPLC and gas chromatography; Spectrometry; Optical microscopy.			
List of provided scientific services	-			
List of editorial activities	Currently the Institute of Microbiology and Biotechnology, in cooperation with other institutes, publishes journal: "Bulletin of ASM. Life Sciences" (Category B) ISSN 1857-064X http://www.bsl.asm.md/node/6			

III. Distribution of the number of research projects and themes during the evaluated period

ASM institutional projects	2011 **3**	2012 **3**	2013 **3**	2014 **3**	2015 **3**
ASM projects in the frame of State Programmes	2011 **1**	2012 **1**	2013 0	2014 **1**	2015 **1**
ASM technological transfer projects	2011 **1**	2012 0	2013 0	2014 0	2015 0
ASM projects for equipment procurement	2011 0	2012 **1**	2013 0	2014 0	2015 0
ASM projects for young researchers	2011 0	2012 **2**	2013 **2**	2014 0	2015 0
ASM projects in the frame of bilateral programmes	2011 **2**	2012 **1**	2013 **1**	2014 **1**	2015 **1**
International projects/grants	2011 0	2012 0	2013 **1**	2014 **2**	2015 **1**
List of 3 representative international projects/grants	1. FP7-PEOPLE-2012-IRSES. Nutritional labelling study in Black Sea region countries (NUTRILAB). Nr. 318946, 36 months, total amount of the project- 488 500 EUR. 2. FEMS National & Regional Congress Grant, nr.NRCG 2014-2 MD-SSM 3. 10.820.04.17RoA. Bioaccumulation and recovery of metal microcomponents from alkaline slurry resulting from the solubilisation of uranium ore, using cyanobacteria and microalgae				
Research contracts	2011 **3**	2012 0	2013 0	2014 0	2015 0
List of 3 representative research contracts	1. Economic contract " Biopreparation for soybean nitrogen fixation: production and technology for its application. Beneficiary - "Alfa-Nistru" mun. Soroca, April-May 2011; 2. Economic contract " Biopreparation for soybean nitrogen fixation:				

	production and technology for it application. Beneficiary - LLC "Agro Cive" Edinet, March-April 2011; 3 Economic contract " Biopreparation for soybean nitrogen fixation: production and technology for it application. Beneficiary - LLC "Alina-LUX" mun. Chişinău, April-May 2011

IV. Scientific publications

Total number of publications abroad	Books 0	Chapters in books **3**	Journal papers **81**	Conference abstracts **110**
Total number of publications in ISI journals and books	Books 0	Chapters in books 0	Journal papers **16**	
Total number of publications in the country	Books 0	Chapters in books **2**	Journal papers **92**	Conference abstracts **192**
List of 5 representative publications (per accredited field)	1. Corcimaru S.; Mereniuc Gh.; Boincean B. Soil organic matter and soil microbial biomass in the Balti long-term experiments. In: *Soil as World Heritage.* Ed. D.Dent. Springer Science+Business Media Dordrecht 2014, p.261-266. ISBN: 978-94-007-6186-5. 2. Cepoi L.; Rudi L.; Chiriac T.; Valuta A.; Zinicovscaia I.; Duca Gh.; Kirkesali E.; Frontasyeva M.;, Culicov O.; Pavlov S.; Bobrikov I. Biochemical changes in cyanobacteria during the synthesis of silver nanoparticles. *Canadian Journal of Microbiology*, 2015, 61(1), p.13-21 (IF:1.316) 3. Cecal, Al.; Humelnicu, D.; Rudic, V.; Cepoi, L.; Ganju, D.; Cojocari, A. Uptake of uranyl ions from uranium ores and sludges by means of *Spirulina platensis*, *Porphyridium cruentum* and *Nostoc linckia* alga. *Bioresource Technology*, 2012, 118, 19-23**.** ISSN: 0960-8524 (IF:4.980) 4. Cecal, Al.; Humelnicu, D.; Rudic, V.; Cepoi, L.; Cojocari, A. Removal of uranyl ions From $UO_2(NO_3)_2$ solution by means of *Chlorella vulgaris* and *Dunaliella salina*. *Cent.Eur.J.Chem.*, 2012, 10 (5), 1669-1675. ISSN: 1895-1066 (IF:1.073) 5. Zinicovscaia, I.; Cepoi, L.; Chiriac, T.; Rudi, L.; Culicov O.; Frontasyeva, M. V.; Pavlov, S.; Kirkesali, E.; Gundorina, S.; Mitina, T.; Akshintsev, A.; Rodlovskaya, E. *Spirulina platensis* as biosorbent of chromium and nickel from wastewaters. *Desalination and Water Treatment.* 2015, ISSN 1944-3994 doi: 10.1080/19443994.2015. 1042061.(IF: 1.5).			
List of 5 citations	1. Cecal, Al.; Humelnicu, D.; Rudic, V.; Cepoi, L.; Ganju, D.; Cojocari, A. Uptake of uranyl ions from uranium ores and sludges by means of *Spirulina platensis*, *Porphyridium cruentum* and *Nostoc linckia* alga. *Bioresource Technology*, 2012, 118, 19-23**.** ISSN: 0960-8524 **(**IF:4.980) 17 citations http://www.sciencedirect.com/science/article/pii/S0960852412007973 2. Cecal, Al.; Humelnicu, D.; Rudic, V.; Cepoi, L.; Cojocari, A. Removal of uranyl ions From $UO_2(NO_3)_2$ solution by means *of Chlorella vulgaris* and *Dunaliella salina*. *Cent.Eur.J.Chem.*, 2012, 10 (5), 1669-1675. ISSN: 1895-1066 (IF:1.073) 3 citations			

	https://www.researchgate.net/publication/233832199_Removal_of_uranyl_ions_from_UO2NO32_solution_by_means_of_Chlorella_vulgaris_and_Dunaliella_salinas_alga 3. Zinicovscaia, I.; Duca, Gh.; Rudic, V.; Cepoi, L.; Chiriac, T.; Frontasyeva, M.; Pavlov, S.; Gundorina, S. *Spirulina platensis* as biosorbent of zinc in water. *Environmental Engineering and Management Journal.* May 2013,**5**,1079-1084 (IF: 1,117) ISSN: 1582-9596, ISSN: 1843-3707 7 citations https://www.researchgate.net/publication/235006803_Spirulina_platensis_as_biosorbent_of_zinc_in_water 4. Zinicovscaia, I.; Duca, G.; Cepoi , L.; Chiriac, T.; Rudi, L.; Mitina, T.; Frontasyeva, M.V.; Pavlov, S.; Gundorina S.F. Biotechnology of Metal Removal from Industrial Wastewater: Zinc Case Study. *CLEAN – Soil, Air, Water*, 2014, **42** (9999), 1-6. ISSN 1863-0669 (IF: 1.838). 7 citations https://www.researchgate.net/publication/259536691_Biotechnology_of_Metal_Removal_from_Industrial_Wastewater_Zinc_Case_Study 5. Zinicovscaia, I.; Duca, Gh.; Rudic, V.; Cepoi, L.; Chiriac, T.; Frontasyeva, M.; Pavlov, S.; Gundorina, S. *Spirulina platensis* as biosorbent of zinc in water. *Environmental Engineering and Management Journal.* May 2013,**5**,1079-1084 (IF: 1,117) ISSN: 1582-9596, ISSN: 1843-3707. 7 citations https://www.researchgate.net/publication/235006803_Spirulina_platensis_as_biosorbent_of_zinc_in_water

V. Innovation outputs

Total number of patents	Registered in the country **49**	Registered abroad 0	Implemented **11**
Total number of new developed methods and technologies	Registered **21**	Non-registered **8**	Implemented **8**
Total number of new scientific products	Registered **7**	Non-registered 0	Implemented 0
List of 5 representative innovation outputs (per accredited field)	1. Patent MD 4091 B1, C12N 11/04. Process for obtaining immobilized cells of *Rhodococcus rhodochrous* /Angela Cincilei (MD), Svetlana Tolocichina (MD), Inna Rastimesina (MD), Anne-Marie Delort (FR), Pascale Besse-Hoggan (FR), Martine Sancelme (FR), Ion Dragalin (MD). Date of filing the application - 05.04.2010, BOPI nr.1/2011 2. Patent MD 4104 B1, C12N 1/12. Strain of *Haematococcus pluvialis* Flotow alga – source of astaxanthin / Valeriu Rudic, Vera Miscu, Ludmila Rudi, Liliana Cepoi, Iulia Iațco (MD). Date of filing the application - 22.12.2010, BOPI nr.3/2011 3. Patent MD 4205 B1, C12Q 1/30. Method for determining the activity of catalase. Nadejda Efremova, Agafia Usatîi, Elena Molodoi (MD). Date of filing the application - 26.12.2011, BOPI nr.2/2013 4. Patent MD 4200 B1, B82Y 5/00. Method for assessing the toxicity of nanoparticles by means of red microalga *Porphyridium cruentum* / Valeriu Rudic, Liliana Cepoi, Ludmila Rudi, Vera Miscu, Tatiana Chiriac, Daniela Sadovnic (MD). Date of filing the application -		

	05.07.2012, BOPI nr.2/2013. 5. Patent 4329 B1, C12P 19/04. Process for cultivation of yeast strain *Saccharomyces cerevisiae* CNMN-Y-20 / Agafia Usatîi, Natalia Chiseliţa, Nadejda Efremova, Elena Molodoi, Ludmila Fulga, Tamara Borisova (MD). Date of filing the application - 30.10.2013, BOPI nr. 2/2015

VI. Other outputs

Total number of scientific outputs for central and local authorities (draft of law, strategies etc.)	0		
Total number of scientific outputs for educational institutions	Handbooks for higher education 0	Handbooks for pre-university institutions 0	Number of researchers – supervisors of license and master theses **9**

VII. Major scientific and innovation achievements

Short description of main scientific results and their confirmation (by awards, citations, development of international projects etc.)	The Institute of Microbiology and Biotechnology has obtained important achievements in fundamental research, but as well many elaborations in medicine, agricultural biotechnology, soil fertility and food security, nanotechnology, new materials and products. Thus, there have been proposed: – principles of microbial synthesis of bioactive substances and technologies for producing microbial preparations with high content of antioxidants, ergosterol, functional carbohydrates, essential polyunsaturated fatty acids, hydrolases, etc.; – mechanisms of microalgal and cyanobacterial cell response induces to oxidative stress of varying intensity; – methodological bases of fractional extraction of bioactive principles from microbial biomass using non aggressive, environmentally friendly technologies; – methods for efficient storage of microorganisms, using selected and standardized media for optimal protection and regeneration during fungi, yeasts and bacteria lyophilization; – pedo-microbiological characterization of Moldovan automorphous soils, including their biodegradation level, and a new scheme of pedo - microbiological soil assessment; – parameters of the processes of transformation of persistent organic compounds under the action of the active microorganisms isolated from polluted soils; – products for veterinary use, obtained from wine yeasts biomass, which essentially increases the viability of fish larvae and general ichthyomass; – efficient methods for obtaining hydrolytic enzymes, carotenoids, lipids and other valuable biological active compounds under the action of low-intensity millimetre waves. – the possibility of using photosynthesizing microorganisms

<table>
<tr><td></td><td colspan="5">(Spirulina platensis, Nostoc linckia, Dunaliella salina, Porphyridium cruientum) as biological metal accumulators in aquatic environments and as "factories" for producing silver nanoparticles.</td></tr>
<tr><td>Number of researchers invited as speakers at international conferences</td><td>2011
1</td><td>2012
0</td><td>2013
0</td><td>2014
0</td><td>2015
0</td></tr>
<tr><td>Short description of technological transfer and innovation results and their certification by implementation</td><td colspan="5">One of the priorities of the Institute of Microbiology and Biotechnology is the technology transfer, achieved by the implementation of scientific results in economy. The most relevant implemented results are the following:
1. Dietary supplement BILEV for bread products (based on the patent MD 3538). Certificate of implementation 30.05.2011. Beneficiary: Technical University of Moldova;
2. Dietary supplement ERGOS-B15 for bread products (based on the patents MD 3570, MD 4044). Certificate of implementation 07.11.2011. Beneficiary: Technical University of Moldova;
3. Food for juvenile phytophagous fishes (based on the patent MD 717 Z). Certificate of implementation from 17.07.2014. Beneficiary: IE ”Marin Alexandru”
4. Process for production of $Fe_2Se_3O_9 \cdot 6H_2O$ iron selenite and process for cultivation of Spirulina platensis cyanobacterium with the use thereof (based on Patent MD 4123). Certificate of implementation Nr. 01-10/2 from 30.10.2013. Beneficiary: LTD FICOTEHFARM;
5. N-(Δ 8,13 -Bicyclohomofarnesenoyl)-3-amino-1,2,4-triazole compound and process for cultivation of Nostoc linckia cyanobacterium with its use (based on Patent MD 4327). Certificate of implementation Nr.02/11 from 25.11 2015.
Two products (AteroBioR and ImunoBioR) were transmitted for serial production to "Eurofarmaco" SA.</td></tr>
<tr><td>Number of defended dr./dr. hab. theses per year</td><td>2011
2/0</td><td>2012
4/0</td><td>2013
0</td><td>2014
1/0</td><td>2015
1/0</td></tr>
</table>

VIII. Present/further involvement in the Horizon 2020 (FP7)

The project FP7-PEOPLE-2012-IRSES *Nutritional labelling study in Black Sea region countries (NUTRILAB)*, nr. 318946 was implemented in 2013-2015, the Institute of Microbiology and Biotechnology being the Lead Partner.

Between 2011 and 2015 a range of project proposals were submitted in the frame of different FP7 and Horizon 2020 programmes: FP7- KBBE (KnowledgeBased-Bio-Economy), FP7- PEOPLE-IRSES (Marie Curie International Research Staff Exchange Scheme), FP7-IAAP (Marie Curie Industry-Academia Partnerships and Pathways), H2020-SFF (Sustainable food security), H2020-BG (Blue Growth), H2020-MSCA-RISE (Marie Skłodowska-Curie Research and Innovation Staff Exchange).

IX. Accredited research field and its evaluation by the National Council for Accreditation and Attestation of the Republic of Moldova (very good/good/ satisfactory)

Microbiology and biotechnology – good

X. Category (A/B/C) attributed by the National Council for Accreditation and Attestation of the Republic of Moldova to the organization

Category B

XI. Institutional development actions planned for the next 5 years (maximum ½ page).

- Active participation in all national and international calls for projects, related to the research areas of IMB (at least one submitted project for each identified call);
- Identification of economic agents interested in IMB achievements; producing informational materials available to the target users; organizing seminars to familiarize the public with elaborations of IMB (at least one seminar per year);
- Elaboration and application for registration of patents based on innovative research and maintenance of obtained patents;
- Annual publication of at least 4 articles in ISI and SCOPUS scientific journals;
- Identification of web resources specialized in the field of microbiology and biotechnology; publication of at least two electronic materials per year;
- Submission of documents to the National Council for Accreditation and Attestation for authorization with the right of PhD supervisor for at least 2 IMB researchers during the next evaluation period;
- Elaboration of didactic resources by IMB researchers involved in educational process; editing of at least 3 teaching materials during the next evaluation period;
- Participation in regular editions of Invention and Innovation Exhibitions in Moldova and abroad with presentation of obtained innovative results (at least 4 participations per year);
- Participation in TV and radio programs to popularize the microbiology and biotechnology and to promote the results of IMB (at least 3 issues per year);
- Identifying funding sources for research mobility and participation to scientific conferences (at least 2 submitted projects per year).