Critique of research paper essays examples

Environment, Nature

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The work analyzed within the framework of this assignment is " Synthesis of magneto-sensitive iron-containing nanoparticles by yeasts" prepared by Vainshtein M., Belova N., Kulakovskaya T., Suzina N. and Sorokin V. It is dedicated to study of forming magneto-sensitive nanoparticles in the conditions of applied magnetic fields. In particular, the stimulation role of magnetic fields is investigated and tested. As a result, the works allows us to see results of magneto-sensitive nanoparticles biosynthesis by the help of yeasts.

Summary of the Methods and Achievements of the Work Reported

The second species considered, S. cerevisiae SUF was incubated using the medium with Fe(II)SO4 × 7H2O, 0. 05. Inoculum took place with introduction of baker's dry yeast, which was enriched with sorbitan monostearate, 11. 0. In both cases of yeasts, were used two types of incubation – with abnormal magnetic field (SMF – static magnetic field) and with natural geomagnetic field. Incubation took place at laboratory temperature. The media were stimulated with iron to facilitate production of inorganic nanoparticles

containing iron.

As opposed to the work of Belova and Pancheluga (2010), where weak alternating magnetic field was studied, in this work the authors used SMF formed by a steel magnet fixed on the glass vessel. Magnetic sensitivity of the nanoparticles that were formed in the result of the experiment was checked by attraction to the steel magnet. As opposed to the work by Vainshtein, Suzina and Sorokin (1997), there was no cell motion in the suspension, which in the previous work took place for bacteria. Attraction of nanoparticles was observed by the authors in the case of C. humicola – oriented movement towards the magnet of the foam – and in the case of S. cerevisiae – accumulation of the foam to the magnet, joining into clusters.

Transmission electron microscopy was another method used by the scientists. To complete it, ultrathin sections were prepared by the way of centrifuging and washing the cells, and further fixing them with 1. 5 % glutaraldehyde in cacodylate buffer (0. 05 M, pH 7. 2; 4 °C; 1 h) and with 1 % OsO4 (4 °C; 12 h) in the same buffer. Prepared specimens were located in the 300-mesh copper grid and supporting Formvar film with evaporated carbon was coated. JEM-100B transmission electron microscope was used for the research. The last method used by the authors for research was X-ray analysis. They did it to estimate the energy-dispersion spectra of the composition of elements.

It is worth considering the fact that although there were used different yeast species, completely different media, iron compounds, experiments, magnetic field, in both cases the required particles were obtained. If we consider the experiments in detail, we will see that those involving S. cerevisiae

employed high concentrations of Fe (II), which resulted in forming of relatively large particles with irregular morphology. The other set of experiments with C. humicola used chelated Fe(III), which resulted in forming regular nanoparticles in applied alternating magnetic field, showing their translocation through the envelope of the cells and presence outside of them. All the resulting particles were similar in the size and shape.

Another important result achieved by the scientist was unclear role of the magnetic fields in the inorganic nanoparticles formation. This question is interesting for many scientists working in this field. This particular work has shown that in the conditions of applied weak static magnetic field, Ca2+ was incremented during exposure. The comparative analyses conducted within the framework of the experiment showed certain important differences between the cells formed in the result of different magnetic fields application. S. cerevisiae in SMF conditions formed large and irregular electron-dense nanoparticles, while in the conditions of natural geomagnetic field, the nanoparticles turned out to be smaller and with lower density. C. humicola formed many inorganic nanoparticles in the AMF conditions. In the natural geomagnetic conditions, there were no or few inorganic nanoparticles formed. It allows us to suggest that weak AMF leads to considerable increment of iron that penetrates into cells, which could facilitate nanoparticles formation.

The important result of the conducted research work was the fact that nanoparticles formed as a result of the experiment were magneto-sensitive and iron-bearing. The fact that the particles were containing iron was verified by X-ray microanalyses, which has also confirmed that these nanoparticles

mainly were iron oxides, as iron was predominant over the other chemical elements. Overall, the experiments conducted by the authors showed how magneto-sensitive iron-containing nanoparticles could be formed using different yeast species and magnetic fields. The novelty of the work lies in the investigation of yeasts for the purpose of nanoparticles formation, as in the past only bacterial species were researched and tested in this relation. Currently, there are various investigations of the yeasts, the changes they undergo as a result of exposure to different magnetic fields, and biosynthesis of nanoparticles that are magneto-sensitive. Until now, nanoparticles production by yeast cultures was mainly exploited in semiconductors synthesis (Dameron et al., 1989; Kowshik et al., 2002; Motta et al., 2001; Novak et al., 2007). Still, it will be beneficial for many other spheres of science to use this opportunity and property of the yeasts. In particular, the authors of this work suggest its active usage for target drug delivery carriers, which would greatly help the medical industry. In this work the authors used proper methods that allowed them to achieve valuable and important results in the work.

Discuss Criticisms of the Work

The research has its main aim formulated in the paper – expand the knowledge about magneto-sensitive nanoparticles production and yeasts used for this purpose, as well as show new vista for nanoparticles industrial production. In my viewpoint, the absence of clearly defined objectives and finalized aim act not in favor of the research, as it leads to the fact that for other researchers it becomes more difficult to use this work in their research and choose it among others. Besides, formulating objectives would have

provided better ground for analysis of the results, as it would be more obvious whether the results were achieved or not. Upon analyzing the article, I see that there are valuable results achieved by the authors and it would be very disappointing if some scientists would disregard this research due to poor organization of information presentation.

Another important detail that should be considered about the work is the works cited in it. Overall, there are 34 references in it, which is quite sufficient to conduct well-grounded experiments. Another positive side of the references involved in the research is usage of international experience. Still, there are several sources that date back a long time ago, such as 1989, and a lot of sources date back more than 10 years ago. I think that investigating more recent works would be better for the investigation purposes.

I think that one of the important things that authors do not describe in their work is the fact that geomagnetic field is different in different parts of the planet. It means that there is a possibility that the geolocation of the experiment would have influenced its results in the case of incubation without application of an additional magnetic field. There can also be involved other parameters that can be changed that could influence the result, such as the stage of growth of the yeasts, different times of exposure, other additional conditions, etc. Without all these factors taken into account it is impossible to state with confidence that such biosynthesis of magneto-sensitive iron-containing nanoparticles can be generated with the help of yeasts. Results from different geographic locations can also differ even if the experiments are conducted in the same conditions and with the same yeasts.

In the study, there are no clearly defined ways of results application and prospects for future research. I believe that all of it together with absence of clearly defined objectives witnesses to the poor organization of the parts of paper that would make it easy-to-process for the other scientists and easier-to-understand for all the interested readers. I think that any scientific work should be presented in such a way that it would be convenient to use by others, as otherwise, it loses its achievements.

Overall, many more factors should be investigated to make well-grounded and more or less universal conclusions as to the biosynthesis of magneto-sensitive iron-containing nanoparticles. There should be investigated resources and experiments from the other parts of the world, the latest works in this field, as in fact, the problems raised in the process and the results that can be achieved due to such biosynthesis are really valuable for the humanity and can be applied in different ways and spheres. The possible spheres of further investigation are presented below.

Analyze the Suggestions for Future Research

In the work there are many questions that are left without a definite answer, all of them having a potential for future research. One of the first of them is the way magnetic field influences formation of inorganic nanoparticles. The particles were generated in all the cases of the experiment, but they were different in size and shape, as well as density. It is necessary to conduct further experiments to understand how magnetic field influences this kind of experiments and how it can be facilitated for each specific purpose, such as target drug delivery carriers. Different kinds of magnetic fields should also be involved, as in this work AMF parameters were chosen based on Lednev’s

theory (Belova & Pancheluga, 2010) and there can be other results with different parameters chosen.

I believe that it is also necessary to investigate the influence of different natural geomagnetic fields on the outcome. In this case, the experiments were conducted in Russia, and in the other place on the planet with other geomagnetic fields, the results could be applicable or not. Further, other types of yeast species can be investigated and researched in various conditions, each of them at different growth stages, as it can also influence the result of the experiment. Different time of exposure should also be studied and how it influences the shape, size and density of the particles. It is also necessary to study the mechanism of bioreduction of metal ions with the help of yeasts.

Overall, the direction of research employed in this work is very interesting for bioscientists all over the world, as it provides many opportunities for the magnetic nanoparticles usage in various field of science. This paper showed a novel approach to the green biosynthesis of nanoparticles that are magneto-sensitive and iron-containing, which means that there is still room for numerous investigation in the directions stated above, as well as others. It is important to find new industrial ways of such nanoparticles formation to enhance the drug delivery systems and other spheres of science. As for the drug delivery, it is conducted by placing drugs on the nanoparticles, injecting them into the patient’s body and transporting to the target organ by an applied magnetic field. As the application area is so valuable and perspective, it is definitely necessary to conduct further experiments to find the optimal way of such nanoparticles biosynthesis.

I believe that it is also necessary to conduct further research and find new areas of application of such particles. If the biosynthetic optimal way will be found eventually, it means that the particles could be generated in the conditions of ambient temperatures and pressure, which will make the generation process much easier, than its chemical analogues. Thus, by introducing the industrial scale of production, this biotechnology will bring great benefit to the scientists and all the people who could take advantage of it.

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