



FEDERAL EDUCATION AGENCY

**STATE EDUCATIONAL INSTITUTION
HIGHER PROFESSIONAL EDUCATION
"UDMURT STATE UNIVERSITY"**

BIOLOGICAL AND CHEMICAL UNIVERSITY

**Department of Botany and Plant Ecology
Specialty 011600 Biology**

ALLOW FOR PROTECTION

Head Department, Doctor of Biological Sciences

Professor Baranova O. G

24/06/2006

Qualification (diploma) work

**"The effect of activated water parameters on
bacteria of the species Escherichia coli. "**

Work is done by:

student 0-011600-54 group

Karataeva S. Yu.

Scientific adviser

Senior Lecturer

Magradze E.I.

Consultant

Candidate of Physico-Mathematical Sciences

V.G. Shironosov

Izhevsk

2006

CONTENTS

INTRODUCTION.....	2
CHAPTER 1. REVIEW OF LITERATURE	
1.1 Experimental data on the effect of electrochemically treated liquids on various biological objects.....	4
1.2. The structure and properties of water.....	9
1.2. 1. Bulk water structure.....	9
1.2. 2. Water radiation.....	12
1.2.3. Water as a solvent.....	13
1.2. 4. Conductivity of aquatic environments.....	14
1.3. The concept of electrochemical activation. Properties of electrochemically activated water compared to untreated water.....	15
1.3. 1. Contactless activation.....	18
1.4. The reasons for the biological effect of electrochemically activated water.....	21
CHAPTER II. METHODS AND MATERIALS	
2. 1. Materials.....	29
2. 2. Methods.....	29
2. 2. 1. Preparation of EXA solution.....	29
2. 2. 2. Contactless activation. Cultivation Escherichia coli.....	30
2. 2. 3. Photometry. Calibration.....	31
2. 2. 4. Graphics and mathematical analysis.....	33
CHAPTER III. EXPERIMENTAL RESULTS AND THEIR DISCUSSION	
3.1. Contactless media activation.....	36
3.2. The effect of non-contact activation of the nutrient medium on the growth of Escherichia coli cells depending on the relaxation time of the active solution.....	37
3. 2. 1. The results of experiments on the activation of the culture fluid immediately after disconnecting the current.....	38
3. 2. 2. The results of experiments on the activation of the culture fluid after 5 hours of relaxation of the active solution.....	41
3. 2. 3. The results of experiments on the non-contact activation of the culture fluid after 15 hours of relaxation of the active solution.....	45
3. 2. 4. Generalization of the results of three series of experiments.....	48
CONCLUSIONS.....	50
LIST OF REFERENCES.....	51
APPLICATION.....	59
LIST OF ABBREVIATIONS.....	69

Conclusions

1. A methodology has been developed for the influence of BA water on *E. coli* cell culture.
2. A study of the growth kinetics of the culture of *Escherichia coli* with non-contact activation of the culture fluid immediately after the shutdown of the electrolyzer revealed that as a result of exposure, cell growth is inhibited, the growth rate is reduced at the very initial stages. Growth inhibition continues in subsequent stages.
3. A study of the growth kinetics of the culture of *Escherichia coli* with non-contact activation of the culture fluid after 5 hours of relaxation of the active solution did not reveal any inhibitory or stimulating effects.
4. A study of the kinetics of growth in non-contact activation of the culture fluid after 15 hours of relaxation of the active solution revealed a positive effect on the growth of microorganisms *Escherichia coli*, which was manifested in the achievement of large biomass values in the experiment with respect to control at the same time.
5. It was found that with decreasing the ORP of the culture fluid by the BA method, regardless of the relaxation time of the active solution, the growth of cells of the species *Escherichia coli* stabilizes, due to which there is a smaller scatter of optical density data within the experimental group.