


# Charlotte Enastacia Boucher


## Curriculum Vitae

 Natural and Agricultural Science  
Department Microbial, Biochemical and Food  
Biotechnology  
Biochemistry Division  
University of the Free State

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Nationality: South African  
Gender: Female  
Race: Coloured  
Identity no: 8210120184087  
Age: 35 years  
Marital status: Married  
Marital surname: Van Jaarsveld  
Languages: English, Afrikaans, Xhosa  
Birthplace: Queenstown, Eastern Cape  
Drivers' license: Code B

### Education

- Ph.D. Biochemistry, 2014  
University of the Free State, Bloemfontein, South Africa  
Promoters: Profs R.R. Bragg & J. Albertyn  
Thesis Title: A Genome-wide expression survey of chicken immune genes,  
with Infectious Coryza as disease model
- M.Sc. Biochemistry, 2007  
University of the Free State, Bloemfontein, South Africa  
Supervisors: Profs R.R. Bragg & J. Albertyn  
Dissertation Title: Investigation of the oncolytic characteristics of pathogenic strains of Newcastle  
disease virus
- Hons. Biochemistry, 2004  
University of the Free State, Bloemfontein, South Africa  
Emphasis on Molecular Biology, Virology and Cell cultures
- B.Sc. Degree in Biochemistry with additional major in Microbiology, 2003  
University of the Free State Bloemfontein, South Africa

## Citation Indices

 [https://scholar.google.com/citations?user=JUPNQ\\_cAAAAJ&hl=en](https://scholar.google.com/citations?user=JUPNQ_cAAAAJ&hl=en)

<https://orcid.org/0000-0002-9810-5892>

### Google:

Citations: 44

*h*-index: 4

*i10*-index: 2

### Scopus:

Citations: 24

*h*-index: 3

## Research Expertise

### Scientific Domain:

Natural Sciences

### Primary Research Field:

Biological sciences

### Secondary Research Field:

Molecular and cell biology

Veterinary science

### Fields of Specialisation:

Veterinary biotechnology

Infectious diseases

Molecular biology

Immunology

Biochemistry

## Experience

### Lecturer

2015-current:

Department Microbial, Biochemical and Food Biotechnology  
University of the Free State, Bloemfontein, South Africa

### Junior Lecturer

2010-2015:

Department Microbial, Biochemical and Food Biotechnology  
University of the Free State, Bloemfontein, South Africa

### **Both Academic positions encompasses two facets,**

1. teaching undergraduates and postgraduate students
2. research, supervising and co-supervising postgraduate students

### Modules presented and currently presenting

1. BCC 214 (BOCH2614) (16 credit) 2010-2013:  
Biochemistry for Agriculture and Health Sciences  
Weighting: 50% Theory
2. BOC 634 (BOCB6814) (16 credit) 2010-2012; re – 2017:  
Bioinformatics  
Weighting: 50% Theory and practical's
3. BOC 344 (BOCS3724) (16 credit) 2010-2015:  
Structure, Function and Topology of Membranes  
Weighting: 2010-2012: 50% Theory / 100% practical's  
2013: 100% Theory and practical's  
2014: 75%: Theory and practical's  
2015: 100% Theory and practical's

4. BOC 216 (BOCB2616) (16 credit) 2013-2016:  
Biochemistry of Biological Compounds  
Weighting: 2013: 25% Practical's  
2014: 50% Theory; 75% practical's  
2015: 100% Theory and practical's  
2016: 100% Theory and practical's
5. BOCE3714 (16 credit) 2017-current:  
Advanced Enzyme kinetics and Metabolism  
Weighting: 100% Theory and practical's

### **Teacher / Educator**

2008-2010:

Heatherdale Senior Secondary School  
Heidedal, Bloemfontein, South Africa

Position necessitated teaching the FET Natural & Physical Science curricula to learners of Grade 10-12.

### **University Committee service & Community Involvement**

Selection committee member of F1 first year students 2011:  
Chairperson of departmental Tea club committee 2012:  
Departmental Staff-Student Representative 2011-2014:  
Mentor for 1st Generation Rectors programme for developing schools, Manguang. 2013-2015:  
Departmental selection committee for postgraduate studies 2016-2017:

### **Expert Panels**

National Research Foundation (NRF) Thuthuka Advisory Panel 2016:  
DAAD-NRF Masters & Doctoral Programme 2015:  
NRF TWAS & FISS Doctoral and Postdoctoral Advisory Panel 2015:

### **Professional memberships**

Member of the South African Society for Microbiology (SASM)

### **Honors / Awards**

University award for excellent academic achievement 2004:  
Bio products award for best Biochemistry Honours Student 2005:  
Golden Key society member 2003-2007:  
Member of Vice-Chancellor's Prestige Scholar programme (PSP) 2015-2017:

### **Grants Awarded**

National Research Foundation Scarce skill bursary holder 2004-2010:  
National Research Foundation, Human Capacity development grant: [R200 000] 2011:  
1. Research Study, INRA, France. Collaborator: Dr. C Madzak  
National Research Foundation, Thuthuka grant PhD-track: [~R210 000/ annum] 2011-2013:  
Interdisciplinary grants, Research and Development, University of the Free State 2014:  
1. A preliminary biochemical delineation of skin secretions in some South African toads.  
Department of Zoology [R65 000]; Collaborator, Ms. L Heyns  
2. Development of diagnostic Reagents for Haemostatic disorders, Department Haematology  
[R100 000]; Collaborators, Profs Bragg & Meiring

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3. Development of recombinant antigens of detection of Crimean Congo haemorrhagic fever virus using a novel expression system, Department Medical Virology [R100 000]; Collaborators Profs Bragg and Burt

National Research Foundation, KIC travel grant [R20 000] 2014:

Seed funding from Technology Innovation Agency (TIA) [R490 000] 2014:

1. Development of diagnostic typing system for *Avibacterium paragallinarum*

Interdisciplinary grants, Research and Development, University of the Free State 2015:

1. A preliminary biochemical delineation of skin secretions in some South African toads. Department of Zoology [R45 000]; Collaborator, Ms. L Heyns

Seed funding from Technology Innovation Agency (TIA) [R500 000] 2015:

1. Production of enzymes for use in animal feed; Collaborators, Prof Bragg, Mr. F de Wit

Seed funding from Technology Innovation Agency (TIA) [R350 000] 2016:

1. Exploring Bacteriophage enzymes as potential alternatives to antibiotic treatment

National Research Foundation, Thuthuka grant Post PhD track: [~R3300 000/ annum] 2015-2017:

National Research Foundation, KIC travel grant [R71 000] 2017:

### Supervisory Experience (Summary, see Addition I for details)

South African students	Supervisor	Co-supervisor	Other African countries students	Supervisor	International students	Supervisor
<b>Degree</b>	<b>Total</b>					
Honours	10	5	5	1	1	
Masters	7	2	5	1	1	1
Doctoral	4	1	3			

### Examinations: Internal and / or External Reviewer

#### Internal Examiner

2017:

Candidate: Mlandu, C.

Degree: MSc Biochemistry, University of the Free State, Bloemfontein

Exploring Horizontal gene transfer and phage infections in a South African deep subsurface bacterial population

#### Internal Examiner

2016:

Candidate: Schabort, W.P.D

Degree: PhD Biochemistry, University of the Free State, Bloemfontein

A combined systems biology and genomics approach to the study of metabolism in *Kluyveromyces marxianus*

#### External reviewer

Biochemistry Honours Literature and Research proposals (BIC0097),

2016-2017:

Department of Biochemistry, Auckland Park Campus

University of Johannesburg, Gauteng

Biochemistry 2<sup>nd</sup> and 3<sup>rd</sup> year modules

2015:

Department of Biochemistry, Auckland Park Campus

University of Johannesburg, Gauteng

### Journals: External Reviewer

African Journal of Microbiology Research

2014:

1. Manuscript ID AJMR/17.06.14/6969 "A Production process for the isolation of blood meal from animal blood & microbial investigation in blood meal"

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PLoS One

1. Manuscript ID PONE-D-15-41749 "A Versatile Panel of Reference Gene Assays for the Measurement of Chicken mRNA by Quantitative PCR." 2014:
2. Manuscript ID PONE-D-14-14636R1 "Phage Display and Synthetic Peptides as Promising Biotechnological Tools for the Serological Diagnosis of Leprosy." 2015:

Journal of Veterinary Diagnostics

2016:

1. Manuscript ID 15-0206 entitled "Evaluation of a proposed polymerase chain reaction methodology for the serotyping of *Avibacterium paragallinarum*

## Publications

### Peer-reviewed Journals

1. Hellmuth, J.E., Hitzeroth, A.C., Bragg, R.R., **Boucher, C.E.** Evaluation of the ERIC-PCR as a probable method to differentiate *Avibacterium paragallinarum* serovars. (2017). Avian Pathology, 46(3). 272-277. DOI: 10.1080/03079457.2016.1259610. ISSN: 03079457.
2. Qhanya, L.B., Mthakathi, N.T., **Boucher, C.E.**, Mashele, S.S., Theron, C.W., Syed, K. Isolation and characterisation of endocrine disruptor nonylphenol-using bacteria from South Africa. (2017) South African Journal of Science, 113. (5-6). DOI: 10.17159/sajs.2017/20160287. ISSN: 19967489.
3. Meyburgh, C.M., Bragg, R.R., **Boucher, C.E.** Lactococcus garvieae: An emerging bacterial pathogen of fish. (2017). Diseases of Aquatic Organisms, 123 (1). 67-79. DOI: 10.3354/dao03083. ISSN: 01775103.
4. Parvez, M., Qhanya, L.B., Mthakathi, N.T., Kgosiemang, I.K.R., Bamal, H.D., Pagadala, N.S., Xie, T., Yang, H., Chen, H., Theron, C.W., Monyaki, R., Raseleman, S.C., Salewe, V., Mongale, B.L., Matowane, R.G., Abdalla, S.M.H., Booie, W.I., Van Wyk, M., Olivier, D., **Boucher, C.E.**, Nelson, D.R., Tuszyński, J.A., Blackburn, J.M., Yu, J.-H., Mashele, S.S., Chen, W., Syed, K. Molecular evolutionary dynamics of cytochrome P450 monooxygenases across kingdoms: Special focus on mycobacterial P450s. (2016). Scientific Reports, 6, art. no. 33099. DOI: 10.1038/srep33099. ISSN: 20452322.
5. **Boucher, C.E.**, Theron, C.W., Hitzeroth, A.C., Bragg, R.R. Regulation of chicken immunity-related genes and host response profiles against *Avibacterium paragallinarum* pathogen challenge. (2015). Veterinary Immunology and Immunopathology, 167 (1-2). 70-74. DOI: 10.1016/j.vetimm.2015.06.005. ISSN: 01652427.
6. **Boucher, C.E.**, Theron, C.W., Jansen, A.C., Bragg, R.R. Transcriptional profiling of chicken immunity-related genes during infection with *Avibacterium paragallinarum*. (2014). Veterinary Immunology and Immunopathology, 158 (3-4). 135-142. DOI: 10.1016/j.vetimm.2013.12.004. ISSN: 01652427.
7. Moretti, S.A., **Boucher, C.E.**, Bragg, R.R. Molecular characterisation of mycoplasma gallisepticum genotypes from chickens in Zimbabwe and South Africa. (2013). South African Journal of Science, 109 (11-12). DOI: 10.1590/sajs.2013/20130117. ISSN: 00382353.
8. Bekker, A., Hugo, C., Albertyn, J., **Boucher, C.E.**, Bragg, R.R. Pathogenic Gram-positive cocci in South African rainbow trout, *Oncorhynchus mykiss* (Walbaum). (2011). Journal of Fish Diseases, 34 (6). 483-487. DOI: 10.1111/j.1365-2761.2011.01259.x. ISSN: 01407775.
9. **Boucher, C.E.**, Bragg, R.R., Albertyn, J. An alternative method for the establishment of virulence of Newcastle disease virus isolates. (2010). African Journal of Microbiology Research, 4 (21). 2313-2317. DOI: 10.1111/j.1365-2761.2011.01259.x. ISSN: 19960808.

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### Book Chapters

1. Bragg, R.R., **Boucher, C.E.**, van der Westhuizen, W.A., Lee, J.-Y., Coetsee, E., Theron, C., Meyburgh, L. The Potential Use of Bacteriophage Therapy as a Treatment Option in a Post-Antibiotic Era. (2016). Antibiotic Resistance: Mechanisms and New Antimicrobial Approaches, pp. 309-328. Elsevier publishers. ISBN: 9780128036686; 9780128036426.
2. Bragg, R., van der Westhuizen, W., Lee, J.-Y., Coetsee, E., **Boucher, C.E.** Bacteriophages as potential treatment option for antibiotic resistant bacteria. (2014). Advances in Experimental Medicine and Biology, 807, pp. 97-110. Infectious Diseases and Nanomedicine I. Springer India. ISSN: 00652598.
3. Bragg, R., Jansen, A., Coetzee, M., van der Westhuizen, W., **Boucher, C.E.** Bacterial resistance to quaternary ammonium compounds (QAC) disinfectants. (2014). Advances in Experimental Medicine and Biology, 808. pp 1-13. Infectious Diseases and Nanomedicine II. Springer India. ISSN: 00652598.

### Articles in non-peer reviewed journals / Popular articles

1. **Boucher, C.E.** Theron, CW Jansen-Hitzerth, A.C, & Bragg R.R. (2014). The use of high throughput technology such as microarrays and real-time PCR to aid in the control of Infectious Coryza. Poultry Plumvee Bulletin. 3. 64-66.
2. Bragg, R.R., Jansen, A.C., **Boucher, C.E.**, Munsamy, Y. (2012). New Developments in the Diagnosis and Control of Beak and Feather Disease Virus. Avizandum. 24. 12-14.

### Patents

**Title:** Production of polypeptides using *Yarrowia Lipolytica* 2015:

**Inventors:** Bragg RR, **Boucher CE**, Theron CW, Jansen AC. P4573ZACO

**Description:**

This invention (Design patent) concerns the use of recombinant *Yarrowia lipolytica* cells, which display recombinant proteins of interest on their cell surfaces for desired applications. It furthermore includes the use of recombinant proteins of interest that have been isolated from *Y. lipolytica* cells after heterologous expression using the surface display vector or variations thereof, for desired applications.

### Conference Proceedings (Listed 1<sup>st</sup> / presenting author contribution)

Union of Microbiological Societies Congress, Singapore, 4-8 August 2017:

**1. Charlotte E. Boucher**, Poojah Jawallapersand.

Immunomics: In silico mapping of immune signalling pathways in chickens related to Avibacterium paragallinarum C3 serovar infection. (*Poster Presentation*) **Additional Co-authored 7 Poster presentations**

**2. Ji-Yun Lee**, Chrispian W. Theron, Robert R. Bragg, **Charlotte E. Boucher**

In vitro test for bacterial treatment using heterologously expressed bacteriophage lambda endolysin and permeabilising agents. ((Speaker/ Oral presentation- presenting author).

19<sup>th</sup> International Congress of World Veterinary Poultry Association 7-11 September 2015:

**1. Charlotte E. Boucher**, Crispian Theron, Arina Jansen- Hitzeroth and Robert R. Bragg

Regulation of chicken immunity-related genes during infection with *Avibacterium paragallinarum* serovar C3. (*Speaker/ Oral presentation*) **Additional Co-authored 5 Poster presentations**

Union of Microbiological Societies Congress, Canada, 27 July- 06 August. 2014:

**1. Charlotte E. Boucher**, Crispian Theron, Arina Jansen- Hitzeroth and Robert R. Bragg

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Transcriptional profiling of chicken immunity-related genes during infection with *Avibacterium paragallinarum*.  
(Poster Presentation) **Additional Co-authored 4 Poster presentations**

18<sup>th</sup> International Congress of the World Veterinary Poultry Association, France, 19-23 August 2013:  
**1. Charlotte E Boucher**, Arina Corli Jansen and Robert Richard Bragg: Differential expression of chicken immune related genes and host response profiles against *A. paragallinarum* serovar C3 infection. (Speaker / Oral presentation) **Additional Co-authored 4 Poster presentations and 1 Oral presentation**

17<sup>th</sup> Biennial Congress for the South African Society for Microbiology (SASM), Bela-Bela, Limpopo 2013:  
**Additional Co-authored 5 Poster presentations**

**2011:** 17<sup>th</sup> Annual World Veterinary Poultry Congress, Cancun Mexico, 14-18 August

**1. Boucher, C.E**, Bragg, R.R and Albertyn, J. The use of Microarrays to aid in the control of Infectious Coryza:  
(Poster presentation) **Additional Co-authored 1 Poster presentation**

16<sup>th</sup> Biennial Congress for the South African Society for Microbiology (SASM), Cape Town, 6-9 November 2011:  
**Additional Co-authored 5 Poster presentation**

## Collaborations

1. Lunsklip Fisheries, Mpumalanga, South Africa (Industry) 2010-2013:  
Project: Small scale production of an autogenous vaccine
2. Department Medical Virology, University of the Free State. (PI. Prof F. Burt) 2014-2015:  
Project: Development of recombinant antigens for detection of Crimean Congo haemorrhagic fever virus using a novel expression system
3. Department Zoology, University of the Free State. (PI. Ms. L Heyns) 2014-2015:  
Project: A preliminary Biochemical delineation of skin secretions in some South African toads
4. Department Haematology, University of the Free State: (PI. Prof M. Meiring) 2013-2017:  
Project: development of diagnostic Reagents for Haemostatic disorders
5. Huazong Agricultural College, Wuhan, China (PI. Dr W. Chen) 2015-2016:  
Project: Applications of Bioinformatic tools in analysing the genome of *Avibacterium* serovar C2
6. Institut National De La Recherche Agronomique (INRA), France. (PI. Dr C. Madzak) 2011-2017:  
Project: Yeast Biotechnology
7. Department Biochemistry, University of Johannesburg. (PI. Dr L Piater) 2016-2017:  
Project: Proteomic overview of *Avibacterium paragallinarum*

## References:

Prof M.S. Smit  
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Charlotte E. Boucher

Dr. Shaun W. Peters  
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Institute for Plant Biotechnology  
Stellenbosch University  
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[swpeters@sun.ac.za](mailto:swpeters@sun.ac.za)

## **Addition I: Supervisory Experience / Record of Student supervision**

### **PhD projects: Completed**

#### **Completed: 2017:**

1. Expression of Avian pathogenic *Escherichia coli* (APEC) virulence factors Iss and HlyF, as potential sub-unit vaccine candidates  
Wouter van der Westhuizen, Chrispian W. Theron, Charlotte E. Boucher, Robert Bragg  
Co-supervisor

### **PhD projects: Current / Ongoing**

1. Proteomic overview of *Avibacterium paragallinarum*, with focus on immunogenic proteins  
Marisa Coetzee, Lizelle Piater, Charlotte E. Boucher  
Supervisor

2. Investigation into Landa prophage induction and lytic enzyme production as source of treatment for bacteria.  
Ji-Yun Lee, Chrispian W. Theron, Charlotte E. Boucher, Robert Bragg  
Co-supervisor

3. Investigating the potential role of prophages present in *Avibacterium paragallinarum* isolates  
Elke Coetsee, Charlotte E. Boucher, Robert Bragg  
Co-supervisor

### **MSc projects: Completed**

#### **Awarded: 2012:**

1. The study of *Mycoplasma gallisepticum* and closely related field strains in Southern Africa using molecular methods.  
Serena Moretti, Charlotte E. Boucher, Robert Bragg  
Co-Supervisor

#### **Awarded: 2014:**

1. An expression system for the heterologous production *Beak and Feather Disease Virus* (BFDV) coat protein.  
Yuri Munsamy, Charlotte E. Boucher, Robert Bragg  
Co-Supervisor
2. Screening for prophage sequences within the genome of *Avibacterium paragallinarum* reference isolates.  
Elke Coetzee, Charlotte E. Boucher, Robert Bragg  
Co-Supervisor
3. Study of *qacJ* gene in *Staphylococcus aureus*.  
Marisa Coetzee, Arina Jansen, Charlotte E. Boucher and Robert Bragg  
Co-supervisor



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### **MSc projects: Current and ongoing**

1. *Immunomics: In silico* mapping of immune signalling pathways in chickens related to *Avibacterium paragallinarum* C3 serovar infection.

Poojah Jawallapersand, Walter Janse van Rensburg, Charlotte E. Boucher  
Supervisor

2. Comparative genome analysis of *Avibacterium paragallinarum* serogroups.

Eduan Hellmuth, Errol Cason, Charlotte E. Boucher  
Supervisor

3. Identification of virulence factors of *Lavotococcus garvieae* isolated from Rainbow trout (*Oncorhynchus mykiss*) in South Africa

Cornelia M. Meyburgh, Robert Bragg, Charlotte E. Boucher  
Supervisor

4. Identification, purification, and characterization of keratinolytic enzymes of *Chryseobacterium*

Elebert P. Mwanza, George Charimba, Wouter van der Westhuizen, Celia Hugo, Charlotte E. Boucher  
Supervisor

5. Development of serological and molecular diagnostic techniques for diagnosis of Beak and *Feather Disease Virus*.

Jeanne van Niekerk, Robert R. Bragg, Charlotte E. Boucher and Chrispian W. Theron.  
Co-supervisor

### **Hons projects: Completed:**

#### **Awarded 2012:**

1. Classification of *Lactococcus garvieae* in the South African rainbow trout (*Oncorhynchus mykiss*)

Ayo Abimbola, Charlotte Boucher, Robert Bragg and Celia Hugo  
Co-Supervisor

#### **Awarded 2015:**

1. Evaluating existing molecular serotyping techniques for *Avibacterium paragallinarum* with reference to South American isolates.

Izelle De Beer, Robert Bragg and Charlotte Boucher  
Supervisor

2. Development and testing of molecular techniques for detection of BFDV

Xaba K.K, Charlotte Boucher, Arina Jansen-Hitzeroth  
Supervisor

3. Development and testing of a serological test for detection of antibodies against BFDV

Leani Myburgh, Charlotte Boucher, Robert Bragg  
Co-Supervisor

#### **Awarded 2016:**

1. Potential role of NAD<sup>+</sup> in *Avibacterium paragallinarum*

Phuluso R. Mamphaga, Robert Bragg, Charlotte E. Boucher  
Supervisor

2. Methods for in vitro evaluation of antimicrobial activity of certain medicinal plant extracts

Gerhard P Potgieter, Esta van Heerden, Charlotte E. Boucher  
Supervisor

3. Evaluation of virucidal activity of QAC based disinfectants against poultry viruses

Odelia van der Merwe, Charlotte E. Boucher, Robert Bragg  
Co-supervisor

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4. Evaluating a novel disinfecting treatment to combat QAC resistance in the nosocomial pathogen *Staphylococcus epidermidis* utilizing a bacteriophage encoded enzyme.

Liese Kilian, Charlotte E. Boucher, Robert Bragg  
Co-supervisor

**Hons projects: Current and ongoing:**

1. Virulence-associated genes in *Avibacterium paragallinarum* serogroups and related species.

Sebotsana P. Rasebotsa, Marisa Coetzee, Charlotte E. Boucher  
Supervisor

2. Protein profiling of outer membrane vesicles isolated from *Avibacterium paragallinarum*

Adeyanju O. Adenaike, Wouter van der Westhuizen, Charlotte E. Boucher  
Supervisor

3. Detection of peptide sequences in *Avibacterium paragallinarum* using a peptide phage display library.

Soveij S. Marais, Charlotte E. Boucher, Wouter van der Westhuizen, Elke Coetzee, Robert Bragg  
Co-supervisor