Monitoring toxicity in raw water of the Cache la Poudre River and Sheldon Lake, Colorado, USA using biomarkers and molecular marker technology.

by

Paul Johan Oberholster

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University of Pretoria
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Supervisor: Prof TE Cloete

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DECLARATION

I the undersigned hereby declare that the work carried out in this thesis is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Paul Johan Oberholster
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List of Abbreviations

aa	Amino acid
ABS	Absorbed photon flux
Adda	3-amino-9-methoxy-2,6,8-trimethyl-10-phenyldeca-4,6-dienoic acid
AFLP	Amplified Fragment Length Polymorphism
ATP	Adenosine triphosphate
AMP	Adenosine monophosphate
AP	Alkaline phosphatase
APHA	American Public Health Association
ASTM	American Standard Test Method
AUSRIVAS	Australian river bioassessment system
BCIP	5-bromo-4-chloro-3-indolyl phosphate
bp	Base pair
CCAP	Culture Collection of Algae and Protozoa, UK
Co	Company
CTAB	N-cetyl-N-N-N-trimethyl ammonium bromide
DAF	DNA amplification fingerprinting
dATP	Deoxyadenine triphosphate
dCTP	Deoxycytidine triphosphate
ddH_2O	Double distilled water
dGTP	Deoxyguanosine triphosphate
DIG	Digoxigenin
DIN	Dissolved inorganic nitrogen
DMF	Dimethylformamide
DNA	Deoxyribonucleic acid
dNTP	Deoxynuclein triphosphate
DTE	Dithioerythritol
DTT	Dithiothreitol
dTTP	Deoxythymine triphosphate
dUTP	Deoxyuracil triphosphate
EC	Enzyme code
EDTA	Ethylenediamine tetra-acetic acid, disodium magnesium
ELISA	Enzyme-linked immunosorbent assay
EPA	Environmental Protection Agency
ET	Electron transport past Q_{A-}
e-value	expectancy value
F_0	Minimal fluorescence of a dark adapted sample
F_m	Maximal fluorescence of a dark adapted sample
GC	Gas chromatography
Hepes	4-(2-Hydroxyethyl)iperazine-1-ethanesulfonic acid
HPLC	High performance liquid chromatography
I_k,	the light intensity at the onset of light saturated photosynthesis in µmol photon m^{-2} s^{-1}
i.p.	intraperitoneally
IPTG	Isopropyl-β-D-galactoside

i.v.	intravenous
kb	Kilobase
kDa	Kilodalton
LB	Luria Bertrani
LD_{50}	Lethal dose
LDH	Lactate dehydrogenase
MC	Microcystin
Mdha	N-methyl-dehydroalanine
MI	Marker Index
MMPB	3-methoxy-2-methyl-4-phenylbutric acid
mRNA	Messenger ribonucleic acid
NBT	Nitroblue tetrazolium salt
NIES	National Institute for Environmental Studies, Japan
PAH	polycyclic aromatic hydrocarbons
P^{B}_{max}	maximum biomass specific photosynthetic rate in µmol O_2 mg chl a^{-1} h^{-1}
PCC	Pasteur Culture Collection
PCR	Polymerase Chain Reaction
PCR-RFLPs	Polymerase Chain Reaction-Restriction Fragment Length Polymorphisms
PcoA	Principal coordinate analysis
PIC	Polymorphic Information Content
PP	Protein phosphatase
PPi	Inorganic pyrophosphate
RC	Reaction Centre
rDNA	Ribosomal deoxyribonucleic acid
rRNA	Ribosomal ribonucleic acid
SDS	Sodium dodecyl sulfate
SSC (20X)	0.3 M NaCitrate, 3 M NaCl, pH 7.0
SRP	soluble reactive phosphorus
STET	0.1 M NaCl, 10 mM Tris-HCl, 1 mM EDTA, 5 % Triton®X-100
TAE (1X)	40 mM Tris-acetate, 1 mM EDTA, pH 8.0
TE	10mM Tris-HCl, 1 mM EDTA, pH 8.0
Tes	N-[Tris(hydroxymethyl)methyl]-2-aminoethane-sulfonic acid
TOC	Total organic carbon
Tris	2-amino-2-(hydroxymethyl)-1,3-propanediol
tRNA	Transfer ribonucleic acid
UP	University of Pretoria
UPGMA	Unweighted Pair Group Method using Arithmetic averages
UV	Ultraviolet
UV	Strain in the University of the Free State Culture collection
WHO	World Health Organization
X-gal	5-bromo-4-chloro-3-indolyl-β-D-galactoside
X-phosphate	Toluidinium salt

List of Units

LD_{50} Dose of toxin that kills 50 % of the animals tested.
LC_{50} Lethal concentration of toxin that kills 50% of the tested organisms.
LT_{50} Lethal time that toxin take to kill 50% of the tested organisms.

Restriction Enzyme

One unit is the enzyme activity that completely cleaves 1µg λDNA in 1 h at enzyme specific temperature in a total volume of 25 µL.

Taq DNA Polymerase

One unit is the quantity of enzyme required to catalyse the incorporation of 10 nmol of dNTP's into acid insoluble material in 30 minutes at 74 °C.

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