The University *of* Western Ontario
BIOLOGICAL AGENTS REGISTRY FORM
Approved Biohazards Subcommittee: August 12, 2011
Biosafety Website: www.uwo.ca/humanresources/biosafety/

This form must be completed by each Principal Investigator holding a grant administered by the University of Western Ontario (UWO) or in charge of a laboratory/facility where the use of Level 1, 2 or 3 biological agents is described in the laboratory or animal work proposed. The form must also be completed if any work is proposed involving animals carrying zoonotic agents infectious to humans or involving plants, fungi, or insects that require Public Health Agency of Canada (PHAC) or Canadian Food Inspection Agency (CFIA) permits.

This form must be updated at least every 3 years or when there are changes to the biological agents being used.

Containment Levels will be established in accordance with Laboratory Biosafety Guidelines, 3rd edition, 2004, Public Health Agency of Canada (PHAC) or Containment Standards for Veterinary Facilities, 1st edition 1996, Canadian Food Inspection Agency (CFIA).

Electronically completed forms are to be submitted to Occupational Health and Safety, (OHS), (Support Services Building, Room 4190 or to jstanle2@uwo.ca) for distribution to the Biohazards Subcommittee. For questions regarding this form, please contact the Biosafety Officer at extension 81135 or biosafety@uwo.ca. If there are changes to the information on this form (excluding grant title and funding agencies), contact Occupational Health and Safety for a modification form. See website: www.uwo.ca/humanresources/biosafety.

Please ensure that all questions are fully and clearly answered. Failure to do so will lead to the form being returned, which will cause delays in your approval and frustration for you and your colleagues on the Committee.

If you are re-submitting this form as requested by the Biohazards Subcommittee, please make modifications to the form in bold print, highlighted in yellow. Please re-submit forms electronically.

PRINCIPAL INVESTIGATOR:	**Dr. Argyrios Margaritis**
DEPARTMENT:	**Chemical and Biochemical Engineering**
ADDRESS:	**TEB 377**
PHONE NUMBER:	**519-661-2146**
EMERGENCY PHONE NUMBER(S):	" "
EMAIL:	**amarg@uwo.ca**

Location of experimental work to be carried out :

Building :	**SEB, TEB**	Room(s):	**2035, 2033 & 313**
Building :		Room(s):	
Building :		Room(s):	

***For work being performed at Institutions affiliated with the University of Western Ontario, the Safety Officer for the Institution where experiments will take place must sign the form prior to its being sent to the University of Western Ontario Biosafety Officer (See Section 15.0, Approvals).**

FUNDING AGENCY/AGENCIES: **NSERC**

GRANT TITLE(S): **LIGNOCELLULOSIC BUTANOL PRODUCTION FROM ANGRICULTURAL WASTE RESIDUES USING SOLVENTOGENIC CLOSTRIDIA**

UNDERGRADUATE COURSE NAME(IF APPLICABLE):

List all personnel working under Principal Investigators supervision in this location:

Name	UWO E-mail Address	Date of Biosafety Training
Dr. Peter Kilonzo Postdoc	**pkilonz2@uwo.ca**	**2005-Present**

Please explain how the biological agents are used in your project and how they are stored and disposed of. The BARF without this description will not be reviewed.

YEAST STOCKS

Yeast (e.g., S. cerevisiae) stocks are typically frozen in 20% glycerol at -80°C for long-term storage. Viability of frozen yeast cells depends on the specific strain and the health of the cells at the time of freezing. Cultures to be stored are typically started from "patched out" clones and grown in a suitable medium with agitation overnight.

Yeast Glycerol Stocks

Patch out clones on an appropriate plate. Incubate at 30°C for 2 days. Inoculate 6 ml of yeast extract-peptone-dextrose (YPD) medium with a "match head-full" of cells from the plate (this is a large inoculum; the culture will be turbid before incubation). Incubate at 30°C with agitation overnight. Add 2 ml of sterile 80% glycerol and mix thoroughly. Transfer 0.5-ml aliquots into 1 mL internally threaded Cryo ELITE cryogenic vials. Thoroughly shake the Cryo ELITE vials and freeze at -60°C or lower (typically -80°C). Yeast tend to die if frozen at temperatures above -55°C. Yeast strains can be stored at -80°C indefinitely by using this method. Note that strains grown in YPD medium before freezing have better long-term viability than those grown in selective medium.

Retrieval of Frozen Yeast Stocks

Never thaw frozen yeast stocks. Use a sterile loop, sterile wooden stick, or sterile disposable pipette to scratch the surface of the stock. Streak appropriate agar plates (e.g., YPD or selective agar plates) for single colonies. Recap the frozen stock and return it to storage at -80°C. Incubate the plate at 30°C for 2 days. Yeast can be stored at 4°C for ~6 months on YPD agar plates or for ~2 months on selective plates (i.e., SC plates with added supplements). Plates should be stored upside down at 4°C during this time. For long-term storage, seal the plates or place them in bags to keep them from drying out.

Supplementing YPD medium with adenine prevents the toxicity caused by the red pigment produced by ade2 strains that are stored at 4°C.

BACTERIAL STOCKS

Most bacterial (e.g., Clostridium acetobutylicum, Clostridium beijerinckii) stocks are frozen in 7% Dimethyl Sulfoxide (DMSO) or 15% glycerol at -80°C for long-term storage. Viability of frozen cells depends on the she specific strain and the health of the cells at the time of freezing. Cultures to be stored are typically started from a single colony and grown in a suitable medium with agitation overnight (~10 – 15 hours).

DMSO Stocks

Transfer 1 mL of an overnight culture into a labeled 1.5 mL Wheaton Cryo ELITE Cryogenic vial and add 80 µL of DMSO. (Use DMSO from a bottle specifically dedicated for bacterial stock preparation. Never pipette directly from the stock bottle; aseptically remove an aliquot from the bottle and use the aliquot of DMSO to prepare the cultures.) Cap the cryogenic vial and mix gently. Store at -80°C. Long-term viability of stocks depends on the particular strain, but some bacterial stocks have been known to maintain good viability for up to 10 years after initial storage in DMSO.

Glycerol Stocks

Transfer 0.5 mL of an overnight culture into a labeled 1.5 mL Wheaton Cryo ELITE Cryogenic vial and add 0.5 mL of sterile 30% glycerol. Cap the tube and mix gently. Store at -80°C. Long-term viability of stocks depends on the particular strain. Alternatively, grow bacteria in medium containing 8 – 10% glycerol in plastic multiwall plates and store at -80°C. This method is typically used for storing cosmid, bacteriophage P1, BAC, and cDNA libraries.

Retrieval of Frozen Bacterial Stocks
Never thaw frozen bacterial stocks in DMSO or glycerol. Use sterile loop, sterile wooden stick, or sterile disposable pipette to scratch the surface of the stock. Streak appropriate agar plates (e.g., LB agar plates) for single colonies. Recap the frozen stock and return it to storage at -80°C. Incubate the plate overnight at 37°C. The colonies on a plate can be used for up to 1 week to inoculate cultures. Plates should be stored upside down at 4°C during this time.

All preparation work is done within the laminar sterile hood Biosafety cabinet level 1. Unused liquid media are collected and stored in labeled waste bottles. Petri-dishes that have the remaining of solid media are autoclaved and stored in special bags for disposal. Remains of fermentation broths are autoclaved at 121oC for 60 min prior to disposal. Wire loops, wooden sticks, or pipettes used during cell culture preparation are normally sterilized by autoclaving under similar conditions.

Clostridium beijerinckii will be used to ferment soluble starch to butanol, acetone and ethanol. The anaerobic fermentation data will be used to develop a new kinetic model that relates the growth of Clostridium beijerinckii cells and production of butanol, acetone and, ethanol at different pH conditions and starch concentrations.

Please include a ONE page research summary or teaching protocol in lay terms.
Forms with summaries more than one page will not be reviewed.

Abstract:

Clostridium acetobutylicum ATCC 824 and C. beijerinckii are grown on a variety of different sugars [D-(+)-glucose, D-(+)-xylose, D-(+)-mannose, D-(+)-galactose, D-(-)-arabinose, and D-(+)-cellobiose] found in agricultural waste hydrolysates and assayed for acetone, butanol, and ethanol (ABE) production. The order of sugar utilization by the culture is D-(+)-glucose > D-(+)-cellobiose > D-(+)-mannose > D-(+)-xylose > D-(-)-arabinose > D-(+)-galactose. The high D-(+)-glucose utilization of 98% results in higher cell density of 2.49 g/L with the highest growth rate of 0.293 h-1, than other sugars. In this system, ABE concentration of 18.3 g/L, is triggered by a total acid concentration of 11.5 g/L, but growth cessation takes place at a total butanol and acid concentration of 24.1 g/L. Although the culture utilizes 92% sugar from D-(+)-cellobiose and 86% from D-(+)-xylose, the resultant biomass concentration (1.53 and 1.82 g/L) is very low. In these systems, a total acid concentration between 14 and 15 g/L triggers 19.0 and 13.9 g/L ABE g/L from D-(+)-cellbiose and D-(+)-xylose, respectively. Relatively high yield (0.33 g/g), productivity (0.47 g/L.h), and low growth rate of 0.069 h-1 results from the D-(+)-cellobiose system. In both systems, growth cessation occurs at a total butanol and acid concentration between 25 and 27 g/L. Culture grown on mixed sugars utilizes 70-90% total sugars. A total acid concentration between 23 and 28 g/L triggers only 13-16 g/L ABE, with relatively high yield and productivity of 0.37 and 0.43 g/L.h, whereas growth inhibition occurs at a total butanol and acid concentration between 30 and 39 g/L.
This research continues to obtain more kinetic data in order to develop the kinetic modelf for cell growth of Clostridium acetobutylicum at different sugar concentrations.

acetobutylicum ATCC 824

2 Abstract

Production of glucoamylase by recombinant Saccharomyces cerevisiae C468/pGAC9 (ATCC 20690) in a continuous stirred tank bioreactor is studied at different dilution rates. Plasmid stability is found to be growth (dilution rate) dependent; it increases with the dilution rate. Bioreactor productivity and specific productivity also increase with the dilution rate. A kinetic equation is used to model the plasmid stability kinetics. The growth rate ratio between plasmid-carrying and plasmid-free cells decreases from 1.397 to 1.215, and segregational instability or probability of plasmid loss from each cell division decreases from 0.059 to 0.020 as the dilution rate increases from 0.10 to 0.37 1/h. The specific growth rates increase with dilution rate, while the growth rate difference between plasmid-carrying and plasmid-free cell populations is negligible. This is attributed to the low copy number of the hybrid plasmid pGAC9. Thus, the growth rate has no significant effect on plasmid instability. The proposed kinetics is consistent with experimental results, and the model simulates the experimental data well.

1.0 Microorganisms

1.1 Does your work involve the use of biological agents? ☒ YES ☐ NO
(non-pathogenic and pathogenic biological agents including but not limited to bacteria and other microorganisms, viruses, prions, parasites or pathogens of plant or animal origin)? If no, please proceed to Section 2.0

Do you use microorganisms that require a permit from the CFIA? ☐ YES ☒ NO

If YES, please give the name of the species ____________________

What is the origin of the microorganism(s)? ____________________

Please describe the risk (if any) of escape and how this will be mitigated:

Please attach the CFIA permit.

Please describe any CFIA permit conditions: **N/A**

1.2 Please complete the table below:

Full Scientific Name of Biological Agent(s)* (Be specific)	Is it known to be a human pathogen? YES/NO	Is it known to be an animal pathogen? YES/NO	Is it known to be a zoonotic agent? YES/NO	Maximum quantity to be cultured at one time? (in Litres)	Source/ Supplier	PHAC or CFIA Containment Level
Clostridium acetobutylicum ATCC 824*	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No	**210 mL**	**ATCC**	☒ 1 ☐ 2 ☐ 2+ ☐ 3
Clostridium beijerinckii**	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No			☒ 1 ☐ 2 ☐ 2+ ☐ 3
Saccharomyces cerevisae***	☐ Yes ☒ No	☐ Yes ☒ No	☐ Yes ☒ No			☒ 1 ☐ 2 ☐ 2+ ☐ 3
	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No			☐ 1 ☐ 2 ☐ 2+ ☐ 3
	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No			☐ 1 ☐ 2 ☐ 2+ ☐ 3
	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No			☐ 1 ☐ 2 ☐ 2+ ☐ 3
	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No			☐ 1 ☐ 2 ☐ 2+ ☐ 3
	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No			☐ 1 ☐ 2 ☐ 2+ ☐ 3

**Please attach a Material Safety Data Sheet or equivalent from the supplier if the bacterium used is not on this link:* http://www.uwo.ca/humanresources/docandform/docs/ohs/CFIA_Ecoli_list.pdf

Additional Comments: *** Production of biofuel-biobutanol form sugars**
**** Production of biofuel biobutanol from starch**
*****Production of enzymes from sugars**

2.0 Cell Culture

2.1 Does your work involve the use of cell cultures? ☐ YES ☒ NO
(If NO, please proceed to Section 3.0)

2.2 Please indicate the type of primary cells (i.e. derived from fresh tissue) that will be grown in culture:

Cell Type	Is this cell type used in your work?	Source of Primary Cell Culture Tissue	AUS Protocol Number
Human	☐ Yes ☐ No		Not applicable
Rodent	☐ Yes ☐ No		
Non-human primate	☐ Yes ☐ No		
Other (specify)	☐ Yes ☐ No		

2.3 Please indicate the type of established cells that will be grown in culture in:

Cell Type	Is this cell type used in your work?	Specific cell line(s)*	Containment Level of each cell line	Supplier / Source of cell line(s)
Human	☐ Yes ☐ No			
Rodent	☐ Yes ☐ No			
Non-human primate	☐ Yes ☐ No			
Other (specify)	☐ Yes ☐ No			

**Please attach a Material Safety Data Sheet or equivalent from the supplier. (For more information, see www.atcc.org)*

2.4 For above named cell types(s) indicate PHAC or CFIA containment level required ☐ 1 ☐ 2 ☐ 2+ ☐ 3

Additional Comments: _____

3.0 Use of Human Source Materials

3.1 Does your work involve the use of human source materials? ☐ YES ☒ NO
If no, please proceed to Section 4.0

3.2 Indicate in the table below the Human Source Material to be used.

Human Source Material	**Source/Supplier /Company Name**	**Is Human Source Material Infected With An Infectious Agent? YES/UNKNOWN**	**Name of Infectious Agent (If applicable)**	**PHAC or CFIA Containment Level (Select one)**
Human Blood (whole) or other Body Fluid		☐ Yes ☐ Unknown		☐1 ☐2 ☐2+ ☐3
Human Blood (fraction) or other Body Fluid		☐ Yes ☐ Unknown		☐1 ☐2 ☐2+ ☐3
Human Organs or Tissues (unpreserved)		☐ Yes ☐ Unknown		☐1 ☐2 ☐2+ ☐3
Human Organs or Tissues (preserved)		Not Applicable		Not Applicable

Additional Comments: _____

4.0 Genetically Modified Organisms and Cell lines

4.1 Will genetic modifications be made to the microorganisms, biological agents, or cells described in Sections 1.0 and 2.0? ☒ YES ☐ NO If **NO**, please proceed to Section 5.0

4.2 Will genetic modification(s) involving plasmids be done? ☒ YES, complete table below ☐ NO

Bacteria Used for Cloning *	Plasmid(s) **	Source of Plasmid	Gene Transformed or Transfected	Will there be a change due to transformation of the bacteria?	Will there be a change in the pathogenicity of the bacteria after the genetic modification?	What are the consequences due to the transformation of the bacteria?
Saccharomyces cerevisiae 468	**pGAC9**	**yeast 2µ plasmid (2µ micron circle)**	**LEU gene glucoamylase gene from Aspergillus awamori**	**The S. cerevisiae host strain C468 (αleu2-3 leu2-112 his311 his3-15 mal-) (ATCC 62995) is haploid, with auxotrophic markers for leucine and histidine and carries mutation (mal-) blocking the utilization of maltose as carbon source.**		**Therefore, the host cell is complementary to the leucine prototrophy by inserting the selectable marker (LEU 2) into the expression plasmid and the presence of the glucoamylase gene on the plasmid allows the host cell to grow on maltose**

** Please attach a Material Safety Data Sheet or equivalent if available.*
*** Please attach a plasmid map.*
****No Material Safety Data Sheet is required for the following strains of E. coli:*
http://www.uwo.ca/humanresources/docandform/docs/ohs/CFIA_Ecoli_list.pdf

4.3 Will genetic modification(s) of bacteria and/or cells involving viral vectors be made?
☐ YES, complete table below ☒ NO

Virus Used for Vector Construction	Vector(s) *	Source of Vector	Gene(s) Transduced	Describe the change that results from transduction

** Please attach a Material Safety Data Sheet or equivalent.*

4.3.1 Will virus be replication defective? ☐ YES ☒ NO

4.3.2 Will virus be infectious to humans or animals? ☐ YES ☒ NO

4.3.3 Will this be expected to increase the containment level required? ☐ YES ☒ NO

5.0 Will genetic sequences from the following be involved?

- HIV ☒ NO ☐ YES, specify
- HTLV 1 or 2 or genes from any Level 1 or Level 2 pathogens ☐ NO ☐ YES, specify
- SV 40 Large T antigen ☒ NO ☐ YES
- E1A oncogene ☒ NO ☐ YES
- Known oncogenes ☒ NO ☐ YES, specify
- Other human or animal pathogen and or their toxins ☒ NO ☐ YES, specify

5.1 Is any work being conducted with prions or prion sequences? ☒ NO ☐ YES

Additional Comments: _____

6.0 Human Gene Therapy Trials

6.1 Will human clinical trials be conducted involving a biological agent? ☐ YES ☒ NO
(including but not limited to microorganisms, viruses, prions, parasites or pathogens of plant or animal origin)
If no, please proceed to Section 6.0

6.2 If YES, please specify which biological agent will be used:
Please attach a full description of the biological agent.

6.3 Will the biological agent be able to replicate in the host? ☐ YES ☐ NO

6.4 How will the biological agent be administered?

6.5 Please give the Health Care Facility where the clinical trial will be conducted:

6.6 Has human ethics approval been obtained? ☐ YES, number: ☐ NO ☐ PENDING

7.0 Animal Experiments

7.1 Will live animals be used? ☐ YES ☒ NO If **NO**, please proceed to section 8.0

7.2 Name of animal species to be used

7.3 AUS protocol #

7.4 Will any of the agents listed in section 4.0 be used in live animals
☐ NO ☐ YES, specify:

7.5 Will the agent(s) be shed by the animal:
☐ YES ☐ NO, please justify:

8.0 Use of Animal species with Zoonotic Hazards

8.1 Will any animals with zoonotic hazards or their organs, tissues, lavages or other body fluids including blood be used (see list below)? ☐ YES ☒ NO - If **NO**, please proceed to section 9.0

8.2 Will live animals be used? ☐ YES ☐ NO

8.3 If **YES**, please specify the animal(s) used:

♦ Pound source dogs	☐ YES	☐ NO
♦ Pound source cats	☐ YES	☐ NO
♦ Cattle, sheep or goats	☐ YES, species	☐ NO
♦ Non-human primates	☐ YES, species	☐ NO
♦ Wild caught animals	☐ YES, species & colony #	☐ NO
♦ Birds	☐ YES, species	☐ NO
♦ Others (wild or domestic)	☐ YES, specify	☐ NO

8.4 If no live animals are used, please specify the source of the specimens:

9.0 Biological Toxins and Hormones

9.1 Will toxins or hormones of biological origin be used? ☐ YES ☒ NO If **NO**, please proceed to Section 10.0

9.2 If YES, please name the toxin(s) or hormones(s)
Please attach information, such as a Material Safety Data Sheet, for the toxin(s) used.

9.3 What is the LD_{50} (specify species) of the toxin or hormone

9.4 How much of the toxin or hormone is handled at one time*?

9.5 How much of the toxin or hormone is stored*?

9.6 Will any biological toxins or hormones be used in live animals? ☐ YES ☐ NO
If **YES**, Please provide details:

*For information on biosecurity requirements, please see:
http://www.uwo.ca/humanresources/docandform/docs/healthandsafety/biosafety/Biosecurity_Requirements.pdf

Additional Comments: _____

10.0 Insects

10.1 Do you use insects? ☐ YES ☒ NO - If **NO**, please proceed to Section 11.0

10.2 If YES, please give the name of the species.

10.3 What is the origin of the insect?

10.4 What is the life stage of the insect?

10.5 What is your intention? ☐ Initiate and maintain colony, give location:
☐ "One-time" use, give location:

10.6 Please describe the risk (if any) of escape and how this will be mitigated:

10.7 Do you use insects that require a permit from the CFIA permit? ☐ YES ☐ NO
If **YES**, Please attach the CFIA permit & describe any CFIA permit conditions:

11.0 Plants

11.1 Do you use plants? ☐ YES ☒ NO - If **NO**, please proceed to Section 12.0

11.2 If YES, please give the name of the species.

11.3 What is the origin of the plant?

11.4 What is the form of the plant (seed, seedling, plant, tree...)?

11.5 What is your intention? ☐ Grow and maintain a crop ☐ "One-time" use

11.6 Do you do any modifications to the plant? ☐ YES ☐ NO
If yes, please describe:

11.7 Please describe the risk (if any) of loss of the material from the lab and how this will be mitigated:

11.8 Is the CFIA permit attached? ☐ YES ☐ NO
If **YES**, Please attach the CFIA permit & describe any CFIA permit conditions:

12.0 Import Requirements

12.1 Will any of the above agents be imported? ☐ YES, country of origin ☒ NO
If **NO**, please proceed to Section 13.0

12.2 Has an Import Permit been obtained from HC for human pathogens? ☐ YES ☐ NO

12.3 Has an import permit been obtained from CFIA for animal or plant pathogens? ☐ YES ☐ NO

12.4 Has the import permit been sent to OHS? ☐ YES, please provide permit # ☐ NO

13.0 Training Requirements for Personnel Named on Form

All personnel named on the above form who will be using any of the above named agents are required to attend the following training courses given by OHS:

- Biosafety
- Laboratory and Environmental/Waste Management Safety
- WHMIS (Western or equivalent)
- Employee Health and Safety Orientation

As the Principal Investigator, I have ensured that all of the personnel named on the form who will be using any of the biological agents in Sections 1.0 to 9.0 have been trained.

An X in the check box indicates you agree with the above statement... ☐
Enter Your Name ____ ***Date:*** ____

14.0 Containment Levels

14.1 For the work described in sections 1.0 to 9.0, please indicate the highest HC or CFIA Containment Level required. ☒ 1 ☐ 2 ☐ 2+ ☐ 3

14.2 Has the facility been certified by OHS for this level of containment?
- ☒ YES, location and date of most recent biosafety inspection: **MARCH 01/2011**
- ☐ NO, please certify
- ☐ NOT REQUIRED for Level 1 containment

14.3 Please indicate permit number (not applicable for first time applicants):

15.0 Procedures to be Followed

15.1 Are additional risk reduction measures necessary beyond containment level 1, 2, 2+ or 3 measures that are unique to these agents? ☐ YES ☒ NO

If **YES** please describe:

15.2 Please outline what will be done if there is an exposure to the biological agents listed such as a needlestick injury or an accidental splash:
In case of mucous membrane or skin exposure wash well with soap and water. Complete accident/incident report. Seek medical attention if needed.

15.3 As the Principal Investigator, I will ensure that this project will follow the Western Biosafety Guidelines and Procedures Manual for Containment Level 1 & 2 Laboratories (and the Level 3 Facilities Manual for Level 3 projects). I will ensure that UWO faculty, staff and students working in my laboratory have an up-to-date Hazard Communication Form, found at http://www.shs.uwo.ca/workplace/newposition.htm

An X in the check box indicates you agree with the above statement... ☒

Enter Your Name ____ ***Date:*** Nov. 7/2011

15.4 Additional Comments: _____

16.0 Approvals

1) UWO Biohazards Subcommittee:
SIGNATURE: _____
Date: _____

2) Safety Officer for the University of Western Ontario
SIGNATURE: _____
Date: _____

3) Safety Officer for Institution where experiments will take place (if not UWO):
SIGNATURE: _____
Date: _____

Approval Number: _____ Expiry Date (3 years from Approval): _____

Special Conditions of Approval:

Bacteria

ATCC® Number:	**824™** Order this Item	Price:	**$205.00**
Organism:	*Clostridium acetobutylicum* McCoy et al. emend. Keis et al. deposited as *Granulobacter pectinovorum* (Stormer) Beijerinck		
Designations:	[CCRC 10639, CCUG 42182, DSM 792, IAM 19013, IFO 13948, JCM 1419, KCTC 1790, L.S. McClung 2291, LMG 5710, McCoy and McClung strain W, NCCB 29024, NCCB 84048, NCIMB 8052, VKM B-1787]		
Isolation:	plant-derived foodstuff (corn meal)		
Depositor:	ER Weyer		
Biosafety Level:	1		
Shipped:	freeze-dried		
Growth Conditions:	ATCC medium2107: Reinforced clostridial broth (modified) **Temperature:** 37.0°C **Atmosphere:** Anaerobic		
Permits/Forms:	In addition to the MTA mentioned above, other ATCC and/or regulatory permits may be required for the transfer of this ATCC material. Anyone purchasing ATCC material is ultimately responsible for obtaining the permits. Please click here for information regarding the specific requirements for shipment to your location.		

Related Links

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824.pdf

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Biological Reference Material and Consensus Standards for the life science community

Bacteria

ATCC® Number: **858™** Order this Item Price: **$255.00**

Organism:	*Clostridium beijerinckii* Donker emend. Keis et al.
Designations:	LMD 25.10 [NCIB 11373, NCTC 2264, VPI 11896]
Isolation:	pasteurized garden soil
Depositor:	J van der Toorn
History:	ATCC <<--J van der Toorn<<--H.J.L. Donker 7 (<<--- A.J. Kluyver <<--- H.J.L. Donker)
Biosafety Level:	1
Shipped:	freeze-dried
Growth Conditions:	ATCC medium38: Beef liver medium for anaerobes **Temperature:** 37.0°C Duration: anaerobic
Permits/Forms:	In addition to the MTA mentioned above, other ATCC and/or regulatory permits may be required for the transfer of this ATCC material. Anyone purchasing ATCC material is ultimately responsible for obtaining the permits. Please click here for information regarding the specific requirements for shipment to your location.
References:	5543: Donker HJLBijdrage tot de Kennis der Botersuur-, butylacoholen acetonigistingen Ph.D. thesis, Delft Univ. Technol., 1926

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Return to Top

Fungi ,Yeasts and Yeast Genetic Stock

ATCC® Number:	62995™ Order this Item	Price:	$275.00

Organism:	*Saccharomyces cerevisiae* Meyen ex E.C. Hansen deposited as *Saccharomyces cerevisiae* Hansen, teleomorph
Alternate State:	*Candida robusta* Diddens et Lodder
Designations:	NRC 5140 [ATCC 66527, C468, CMCC 1398, LL20, NCYC 1445]
Depositors:	RK Latta
Biosafety Level:	1
Shipped:	frozen
Genotype/ORF/ Gene Name:	MATalpha leu2-3 leu2-112 his3-11 his3-15 [psi+] [cir+]
Growth Conditions:	ATCC medium 1245: YEPD **Temperature:** 25.0°C
Permits/Forms:	In addition to the MTA mentioned above, other ATCC and/or regulatory permits may be required for the transfer of this ATCC material. Anyone purchasing ATCC material is ultimately responsible for obtaining the permits. Please click here for information regarding the specific requirements for shipment to your location.
Applications:	transformation host [20995] [20124]
Mating Type:	alpha
Karyotype:	Ploidy: haploid
Comments:	Expression of Aspergillus awamori glucoamylase gene [20314] [21188] Sensitive to Kluyveromyces lactis toxin [20534]
Subcollection:	Yeasts

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- Biological Reference Material and Consensus Standards for the life science community

References:

Clone

ATCC® Number:	**20690** Order this Item	Price:	**$275.00**

Designation:	pGAC9 [pYepGAC9]
Depositors:	Cetus Corp., A Belt, Cetus Corp.
Insert Source:	*Saccharomyces cerevisiae* Meyen ex E.C. Hansen
Insert Information:	DNA: cDNA Insert lengths(kb): 2.109999895095825 Gene product: glucoamylase
Biosafety Level:	1
Shipped:	frozen
Permits/Forms:	In addition to the MTA mentioned above, other ATCC and/or regulatory permits may be required for the transfer of this ATCC material. Anyone purchasing ATCC material is ultimately responsible for obtaining the permits. Please click here for information regarding the specific requirements for shipment to your location.
Vector:	Size (kb): 10.6700000762939500 Vector: pAC1 (plasmid) Promoters: Promoter enolase I Construction: pBR322, peno 46, LEU2, 2 micron Marker(s):LEU2,ampR Construct size (kb): 10.67000007629395 Features: marker(s): ampR, LEU2 promoter: enolase I replicon: pMB1, 2 micron terminator: enolase I
Comments:	Production of glucoamylase [12209] The insert contains the full-length cDNA and 3' poly(A), minus the four introns. [12209]
Media Description:	ATCC medium 1212: Yeast synthetic minimal medium
References:	12209: Nunberg J, et al. Glucoamylase cDNA. US Patent 4,794,175 dated Dec 27 1988

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