Modification Form for Permit BIO-LHRI-0075

Permit Holder: Bonnie Deroo

Approved Personnel
(Please stroke out any personnel to be removed)

~~Erin Parker~~

Caitlin Cudmore

Alexandra Zalewski

Adrian Buensuceso

Additional Personnel
(Please list additional personnel here)

Susan Kuruvilla

	Please stroke out any approved Biological Agent(s) to be removed	Write additional Biological Agent(s) for approval below. Give the full name
Approved Microorganisms	E.coli DH5alpha	
Approved Primary and Established Cells	Rodent (primary):granulosa cells. Human (established): HEK 293, MCF-7, KHN, PANC-1. Rodent(established): GFSHR-17	
Approved Use of Human Source Material	Human ovarian cells.	
Approved Genetic Modifications (Plasmids/Vectors)	(plasmids): pcDNA3, pGL3-basic. (genes): mNld2, hSpon1, mSpon1, mComp.	plasmids: 2×PRE-TK-luciferase C3-luciferase
Approved Use of Animals	mice	
Approved Biological Toxin(s)	Luteinizing hormone, Human chorionic gonadotropin, follicule stimulating hormone, pregnant mare's serum gonadotropin, 17-beta-estradiol	

* *PLEASE ATTACH A MATERIAL SAFETY DATA SHEET OR EQUIVALENT FOR NEW BIOLOGICAL AGENTS.*
** *PLEASE ATTACH A BRIEF DESCRIPTION OF THE WORK THAT EXPLAINS THE BIOLOGICAL AGENTS USED AND HOW THEY WILL BE STORED, USED AND DISPOSED OF..*

As the Principal Investigator, I have ensured 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

Signature of Permit Holder: _____

Current Classification: 2 **Containment Level for Added Biohazards:** 2

Date of Last Biohazardous Agents Registry Form: Mar 30, 2011

Date of Last Modification (if applicable): _____

BioSafety Officer(s): _____ Oct. 25/11

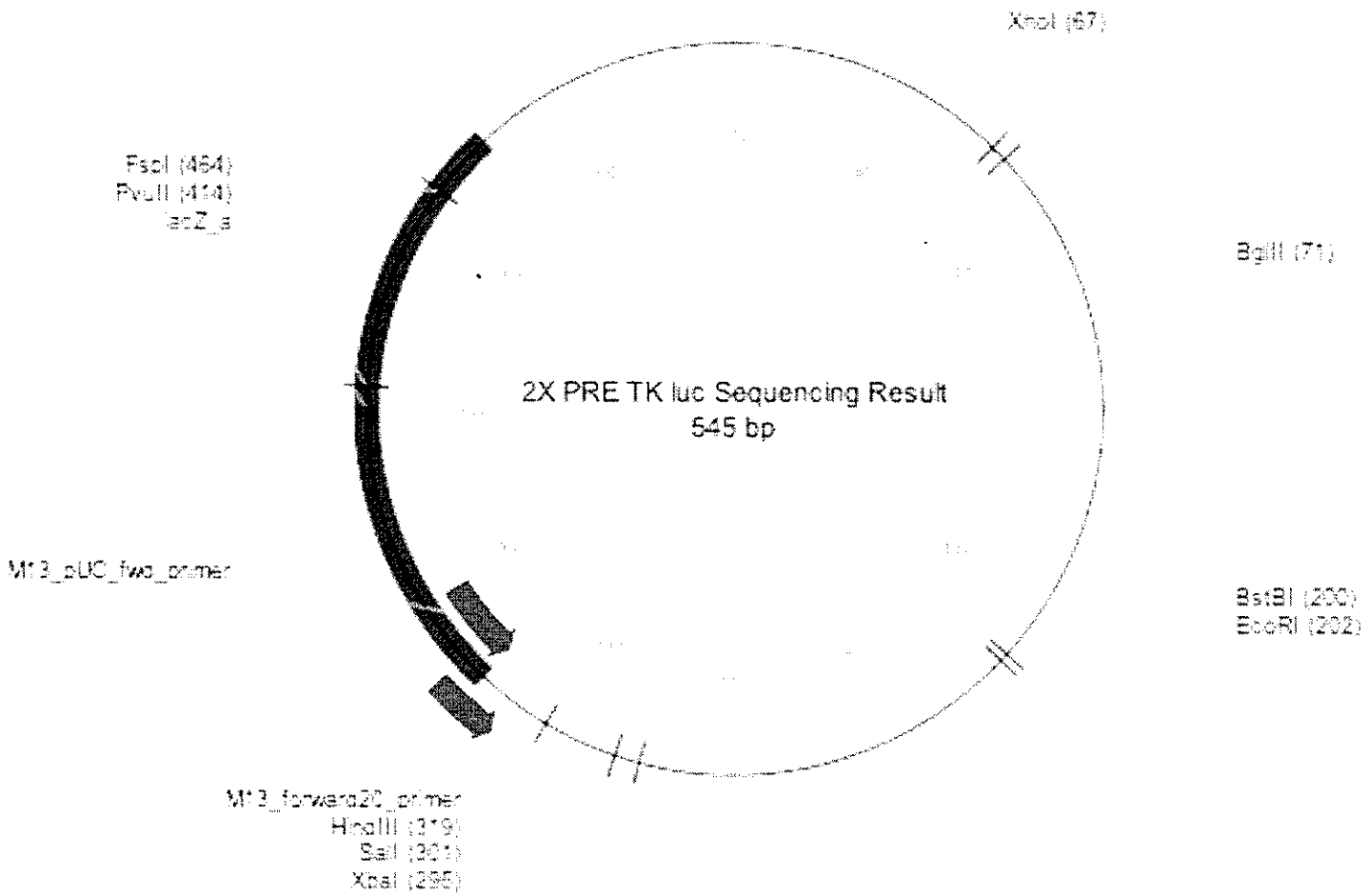
Chair, Biohazards Subcommittee: _____ **Date:** _____

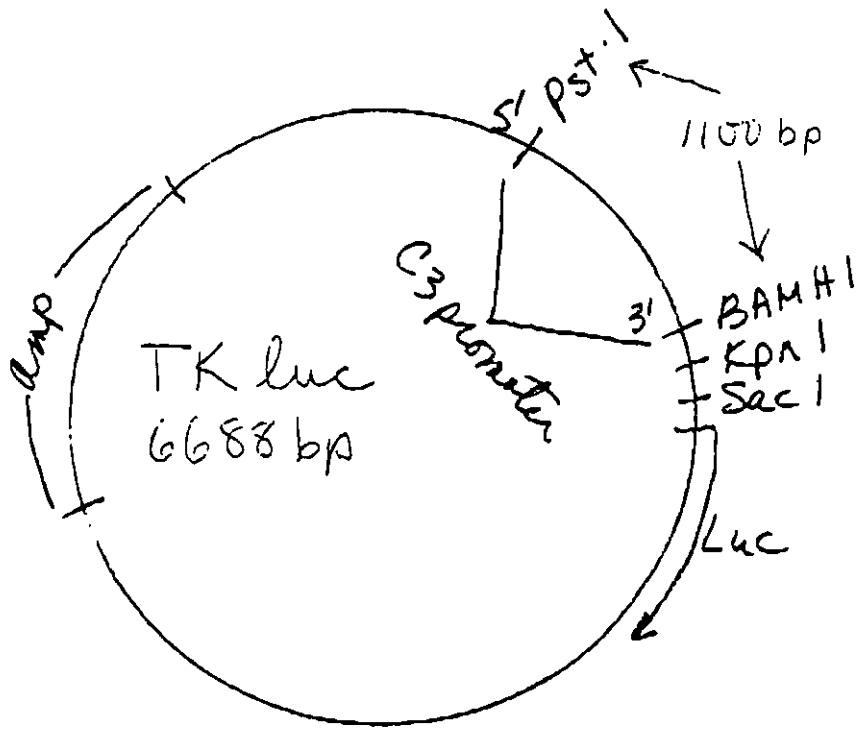
22 September, 2011

RE: Modification Form for Permit BIO-LHRI-0075
Description of biological agents added to protocol, how they will be used, stored, and disposed of.

1. **2X-PRE-TK-luciferase**: This is a reporter plasmid in which the reporter protein, luciferase is driven by two human Progesterone Response Elements and the minimal thymidine kinase promoter. We will transfect this reporter into MCF-7 cells, along with the Progesterone Receptor, and after treatment with progesterone, we will examine the activation of this reporter by detecting luciferase levels.
2. **C3-luciferase**: This is a reporter plasmid in which the reporter protein, luciferase is driven by the human Complement 3 promoter, which is known to be estrogen responsive. We will transfect this reporter into MCF-7 cells, which contain endogeneous levels of the Estrogen Receptor, then examine the activation of this promoter construct by detecting luciferase levels after estrogen treatment of cells.

Plasmids are not disposed of except after use in experiments with cultured cells; thus, their eventual disposal location is in biohazardous waste containers. Plasmids are stored at -20°C.


XhoI (57)
FseI (464)
PvuII (414)
lacZ_a
BglII (71)
2X PRE TK luc Sequencing Result
545 bp
M13_pLUC_fwd_primer
BstBI (200)
EcoRI (202)
M13_forward20_primer
HindIII (319)
SalI (301)
XbaI (295)



C3 T1 Deletion Map

THE UNIVERSITY OF WESTERN ONTARIO
BIOLOGICAL AGENTS REGISTRY FORM
Approved Biohazards Subcommittee: October 14, 2010
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).

Completed forms are to be returned to Occupational Health and Safety, (OHS), (Support Services Building, Room 4190) 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

PRINCIPAL INVESTIGATOR	Bonnie J. Deroo
DEPARTMENT	Biochemistry
ADDRESS	Rm. A4-144, Children's Health Research Institute, 800 Commissioners Road East, London, ON N6C 2V5
PHONE NUMBER	519-685-8500 X55988
EMERGENCY PHONE NUMBER(S)	519-614-8371 (mobile)
EMAIL	bderoo2@uwo.ca

Location of experimental work to be carried out: Building(s) _4th floor VRL, Deroo bay__ Room(s)_A4-114_

*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:__CIHR, NSERC, UWO_____
GRANT TITLE(S): _Grant numbers: R4169A01 (startup), R4169A03 (NSERC), R4169A05 (CIHR)

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

Name	UWO E-mail Address	Date of Biosafety Training
Erin Parker	eparke3@uwo.ca	September 2005
Adrian V. Buensuceso	adrianvincent@gmail.com	September 2008
Alexandra Zalewski	azalews3@uwo.ca	September 2009
Caitlin Cudmore	ccudmore@uwo.ca	September 2009

Please explain the biological agents and/or biohazardous substances used and how they will be stored, used and disposed of. Projects without this description will not be reviewed.

E. coli
We transform these bacteria with plasmids, then grow up to IL cultures so that ample plasmid quantities may be isolated for use in transfection studies in some of our cell lines (see below). These bacteria are lysed (and therefore destroyed) during the isolation of the plasmids. Any bacteria remaining in growth flasks are killed by bleach.

Plasmids

We carry out little plasmid "genetic modification" in the lab, but we have done the following:

pCDNA3: We have used this as a "backbone" vector into which we clone the coding regions for genes of interest. We have so far created the following expression plasmid using this vector: mNid2-pcDNA3.

pGL3-basic: We have used this as a "backbone" vector into which we clone the promoter regions for genes of interest. We have so far created the following reporter plasmids using this vector: mComp-pGL3, mSpon1-pGL3, and hSpon1-pGL3.

Plasmids are not disposed of except after use in experiments with cultured cells; thus, their eventual disposal location is in biohazardous waste containers. Plasmids are stored at -20°C.

Primary mouse ovarian granulosa cells
We routinely isolate granulosa cells from mouse ovaries, and either freeze the cells immediately at -80°C or culture them for up to two days in standard tissue culture medium without serum, after which the cells die. If cultured, we frequently treat the cells with FSH or 17beta-estradiol for up to 48h. In either case, the RNA or protein is isolated from the isolated cells. No live cells remain after these experiments.

Human granulosa cells from patients
We isolate RNA from patient granulosa cells obtained from the University Hospital IVF clinic. Granulosa cells are initially isolated from a mixture that also contains red blood cells and ovarian fluid. Any containers or plastics that come in contact with these patient samples are extensively bleached during and after the isolation procedure. Isolated granulosa cells are stored at -80°C.

Cell lines
We routinely work with three main cell lines: PANC-1, MCF-7, GFSHR-17, and KGN cells. We also sporadically use HEK293 cells. PANC-1 cells are used to study the location of the protein, Thioredoxin Interacting Protein by confocal microscopy. MCF-7 cells are used for promoter-reporter (luciferase) studies using plasmids as described above. GFSHR-17 and KGN cells are not transfected, but are treated with various reagents or substances, and then gene expression or cell morphology is studied in response to these agents. HEK293 cells are used to over-express various proteins using transfection of expression plasmids. We then use these cell extracts as controls for protein-related experiments, such as Western blots. All cell lines are stored in a 150°C ultra-low freezer. After they are cultured and/or transfected, any remaining cells are disposed in biohazardous waste containers.

Luteinizing hormone (LH) and **Follicle stimulating hormone (FSH)**: These peptides are stored at -80°C. We use these peptides to treat either primary mouse granulosa cells or the GFSHR-17 and KGN cell lines, after which we isolate RNA or protein for downstream analysis. The medium containing these reagents is treated with bleach before disposal.

Pregnant mare's serum gonadotropin and **human chorionic gonadotropin**: We store these compounds at -80°C and use them for injection into mice. Mice that receive these compounds are later dissected and the ovaries removed for further study. The remainder of the animal is disposed of in proper storage containers.

17beta-estradiol: Estradiol is stored in ethanol at -20°C. We use this compound to treat cell lines such as MCF-7, GFSHR-17 and KGN, as well as primary mouse granulosa cells.

Please include a one page research summary or teaching protocol.

Grant R4169A03

When the cells in our body use oxygen, they naturally produce very reactive molecules known as "free radicals" which can damage the body. This damage may lead to cancer. However, cells protect themselves from free radical damage using other molecules known as "free radical scavengers". These scavengers convert the dangerous free radicals molecules into less reactive molecules that no longer harm the cell. One free radical scavenger that is common in human cells is a very small protein known as Thioredoxin. However, Thioredoxin does not act alone, but must make contact with other proteins to scavenge free radicals. One of these other proteins is called Thioredoxin Interacting Protein (Txnip). Thioredoxin and Txnip interact in the cell and form what is called a dimer (meaning two proteins interact). However, it is very likely that other proteins also interact with Thioredoxin and Txnip, and that Thioredoxin and Txnip form part of a larger protein complex made up of many proteins. So far, very few proteins are known that are part of this complex. Therefore, the purpose of my research program is to find the proteins, which are part of the Thioredoxin/Txnip complex. We expect to find several proteins that are part of this complex and that make contact with Thioredoxin and/or Txnip. Knowing what makes up this complex will tell us more information about where and how Thioredoxin scavenges free radicals in the cell. Understanding how Thioredoxin carries out its role as a scavenger is important because laboratory experiments indicate that scavengers such as Thioredoxin may prevent cancer. If we understand Thioredoxin better, it may lead to the development of anti-cancer medications or strategies to prevent cancer in Canadians.

Grant R4169A05

The most common cause of infertility in women is impaired ovulation, and although few genetic causes of infertility are known, a genetic basis for infertility is suspected. Genes associated with the production of a healthy egg are likely candidates for female infertility because many carefully-timed signals from both the brain and the ovary are required for the production of a healthy egg. Estrogen is not only produced by a woman's ovary, but the ovary itself requires estrogen for proper function. Estrogen is required by the ovary for the production and release of a healthy fertilizable egg, and in mice, lack of estrogen results in reduced fertility. Our goal is to understand the role of estrogen within the ovary, and the mechanisms by which estrogen regulates ovarian function. To pursue this goal, we study mice that are unable to respond to estrogen because they lack a protein, Estrogen Receptor Beta, which is normally present in the ovary. These mice are less fertile because they do not ovulate: eggs cannot be released, but are "stuck" within the ovary. We have found that one reason for this is that the extracellular matrix, the substance that holds cells together within the ovary, is not properly formed. By studying the matrix of these infertile mice, we can better understand why estrogen is required for ovulation. Understanding the role of estrogen in ovulation may provide genetic clues to the basis of some cases of infertility in women.

1.0 Microorganisms

1.1 Does your work involve the use of biological agents? √ YES O 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? O 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:

_____
_____

1.2 Please complete the table below:

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
E. coli DH5alpha	O Yes √ No	O Yes √ No	O Yes √ No			√ 1 O 2 O 2+ O 3
Luteinizing hormone (LH) /human chorionic gonadotropin	O Yes √ No	O Yes √ No	O Yes √ No			√ 1 O 2 O 2+ O 3
Follicle stimulating hormone (FSH) /pregnant mare's serum gonadotropin	O Yes √ No	O Yes √ No	O Yes √ No			√ 1 O 2 O 2+ O 3
17beta-estradiol	O Yes √ No	O Yes √ No	O Yes √ No			√ 1 O 2 O 2+ O 3

*Please attach a Material Safety Data Sheet or equivalent from the supplier.

2.0 Cell Culture

2.1 Does your work involve the use of cell cultures? √ YES O 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	O Yes O No		Not applicable
Rodent	√ Yes O No	AUS 2008-047	granulosa cells of mouse ovary
Non-human primate	O Yes O No		
Other (specify)	O Yes O 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 O No	HEK293, MCF-7, KGN, PANC-1	2 (all)	Drs. A. Babwah, J. Torchia, RIKEN Clone Bank, Dr. Chris Pin
Rodent	√ Yes O No	GFSHR-17	2 (all)	The Weizmann Institute
Non-human primate	O Yes O No			
Other (specify)	O Yes O 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 O 1 √ 2 O 2+ O 3

3.0 Use of Human Source Materials

3.1 Does your work involve the use of human source materials? √ YES O 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		O Yes O Unknown		O 1 O 2 O 2+ O 3
Human Blood (fraction) or other Body Fluid		O Yes O Unknown		O 1 O 2 O 2+ O 3
Human Organs or Tissues (unpreserved)	University Hospital IVF clinic: human ovarian cells	O Yes √ Unknown	N/A	O 1 √ 2 O 2+ O 3
Human Organs or Tissues (preserved)		Not Applicable		Not Applicable

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 O NO If no, please proceed to Section 5.0

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

Bacteria Used for Cloning *	Plasmid(s) **	Source of Plasmid	Gene Transfected	Describe the change that results from transformation or tranfection
E. coli DH5alpha	*pcDNA3, pGL3-basic*	*Dr. J. Mymryk*	*mNid2, hSpon1, mSpon1, mComp*	*changes in gene expression, cell proliferation, and steroidogenesis*

* Please attach a Material Data Sheet or equivalent if available.
** Please attach a plasmid map.

4.3 Will genetic modification(s) of bacteria and/or cells involving viral vectors be made?
O 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.

4.4 Will genetic sequences from the following be involved?

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

4.5 Will virus be replication defective? O YES O NO N/A

4.6 Will virus be infectious to humans or animals? N/A O YES O NO N/A

4.7 Will this be expected to increase the containment level required? O YES O NO N/A

5.0 Human Gene Therapy Trials

5.1 Will human clinical trials be conducted involving a biological agent? O 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

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

5.2 Will the biological agent be able to replicate in the host? O YES O NO

5.3 How will the biological agent be administered? _____

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

5.5 Has human ethics approval been obtained? O YES, number: _____ O NO O PENDING

6.0 Animal Experiments

6.1 Will live animals be used? √ YES O NO If no, please proceed to section 7.0

6.2 Name of animal species to be used_____mouse_____

6.3 AUS protocol # ____2008-047_____

6.4 Will any of the agents listed in section 4.0 be used in live animals O YES, specify: _____ √ NO

6.5 Will the agent(s) be shed by the animal: O YES O NO, please justify: N/A

_____

_____

7.0 Use of Animal species with Zoonotic Hazards

7.1 Will any animals with zoonotic hazards or their organs, tissues, lavages or other body fluids including blood be used (see list below)? O YES √ No If no, please proceed to section 8.0

7.2 Will live animals be used? O YES O No

7.3 If yes, please specify the animal(s) used:

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

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

_____

8.0 Biological Toxins

8.1 Will toxins of biological origin be used? √ YES O NO If no, please proceed to Section 9.0

8.2 If YES, please name the toxin(s)_luteinizing hormone/human chorionic gonadotropin, follicle stimulating hormone/pregnant mare's serum gonadotropin, 17beta-estradiol_____
Please attach information, such as a Material Safety Data Sheet, for the toxin(s) used.

8.3 What is the LD_{50} (specify species) of the toxin: (PMSG/FSH: Oral/Mouse/120 mg/kg), (hCG/LH: LD_{50} is unknown, but can affect fetus and reproductive system development at a variety of doses (see MSDS), (17beta-estradiol: LD_{50} is unknown).

8.4 How much of the toxin is handled at one time*? _Approximate maximum handled is 100 IU for PMSG and hCG, and maximum for FSH or LH is 100 μg (because the FSH and LH are shipped as dry powder at 100 μg, which we then dissolve and aliquot into smaller volumes, 100 μg is the maximum handled at any one time), and 50 mg of 17beta-estradiol.

8.5 How much of the toxin is stored*? _We typically have on-hand 100 micrograms of FSH or LH and 5 mg of 17beta-estradiol. PMSG and hCG are obtained from the Victoria Research Laboratories usually the day of the experiment or the day prior, so we do not tend to store these in the laboratory.

8.6 Will any biological toxins be used in live animals? √ YES, Please provide details: In some experiments, we inject these three hormones as an acute dose (either singly, or sometimes in combination) into live mice, and then after a certain period of time, the mice are sacrificed and tissues removed for analysis. Typical dose for a 28-day-old mouse is 5IU of PMSG or hCG and 0.4 mg of 17beta-estradiol. O NO

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

9.0 Insects

9.1 Do you use insects? O YES √ NO If no, please proceed to Section 10.0

9.2 If YES, please give the name of the species. _____

9.3 What is the origin of the insect? _____

9.4 What is the life stage of the insect? _____

9.5 What is your intention? O Initiate and maintain colony, give location: _____
O "One-time" use, give location: _____

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

_____

_____

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

_____

_____

10.0 Plants

10.1 Do you use plants? O 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 plant? _____

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

10.5 What is your intention? O Grow and maintain a crop O "One-time" use

10.6 Do you do any modifications to the plant? O YES O NO
If yes, please describe: _____

_____

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

_____

_____

_____

10.8 Is the CFIA permit attached? O YES O NO
If YES, Please attach the CFIA permit & describe any CFIA permit conditions:

_____

_____

11.0 Import Requirements

11.1 Will any of the above agents be imported? √ YES, please give country of origin FSH & LH: USA O NO
If no, please proceed to Section 12.0

11.2 Has an Import Permit been obtained from HC for human pathogens? O YES N/A O NO

11.3 Has an import permit been obtained from CFIA for animal or plant pathogens? O YES N/A O NO

11.4 Has the import permit been sent to OHS? O YES, please provide permit # _____ O NO N/A

12.0 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.

SIGNATURE _____

13.0 Containment Levels

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

13.2 Has the facility been certified by OHS for this level of containment?
√ YES, permit # if on-campus_____
O NO, please certify
O NOT REQUIRED for Level 1 containment

certified Level 2
Nov. 26, 2010
Mike Ryder

14.0 Procedures to be Followed

14.1 Please describe additional risk reduction measures will be taken beyond containment level 1, 2, 2+ or 3 measures that are unique to this agent.

_____
_____
_____

14.2 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:

Wash with water and/or soap for skin exposure for all agents listed in Section 1.2. Needlestick injury due to self-injection with LH, FSH, or 17beta-estradiol: fill out Accident Report for both LHSC/LHRI and UWO and monitor wound and general health of injured worker regularly after incident.

14.3 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.wph.uwo.ca/

SIGNATURE _____

Date: 23 November 2010

15.0 Approvals

1) UWO Biohazards Subcommittee: SIGNATURE: _____
Date: Mar 30 2011

2) Safety Officer for the University of Western Ontario
SIGNATURE: _____
Date: Mar 30/11

3) Safety Officer for Institution where experiments will take place (if not UWO):
SIGNATURE: _____
Date: Nov. 26, 2010

Approval Number: BIO-LHRI-0075 Expiry Date (3 years from Approval): March 29, 2014

Special Conditions of Approval:

Subject: Re: Biological Agents Registry Form: Deroo
From: Bonnie Deroo <bderoo2@uwo.ca>
Date: Wed, 30 Mar 2011 10:37:57 -0400
To: Jennifer Stanley <jstanle2@uwo.ca>

Hi Jennifer,

hSpon1 (human Spon1) and mSpon1 (mouse Spon1) are the human and mouse genes coding for the Spondin 1 protein.
Spondin 1 is not an oncogene. It is an extracellular signaling protein that regulates cell adhesion and proliferation, and has been shown to have these effects in neural cells.

If you require any more information, please let me know, and thanks for the voicemail letting me know the urgency of your request. Things pile up so quickly.

Have a great day!
--Bonnie

On Mon, Mar 28, 2011 at 3:13 PM, Jennifer Stanley <jstanle2@uwo.ca> wrote:

> Hi Dr. Deroo
> I have one left-over question from your form.
> What do the genes hspon1 and mspon1 do?
> Are these genes oncogenes?
> Regards
> Jennifer

--
Bonnie Deroo, PhD
Department of Biochemistry
The University of Western Ontario, Canada
(mailto: bderoo2@uwo.ca)
Telephone +1 519 685 8600 X55988

On Mon, Jan 31, 2011 at 10:48 AM, Jennifer Stanley <jstanle2@uwo.ca> wrote:
Hello Dr. Deroo -

Your form was reviewed at the recent Biohazards Subcommittee meeting.
Please make the following changes and re-send:

Table 3.2 should reflect that the human organs are Level 2.
Section 8 (toxins) should be completed to reflect the use of the hormones. (We realize that these are not traditional "biological toxins" but because they can be harmful in small quantities, the Committee would like this section completed.

Regards
Jennifer

Conforms to 93/112/EC and ISO 11014-1

SAFETY DATA SHEET

CALBIOCHEM®

Order Number

Customer Number

1. Identification of the substance/preparation and of the company/undertaking

Product name : Luteinizing Hormone, Human Pituitary, Iodination Grade

Catalog # : 869003

Supplier : Manufactured by EMD Biosciences, Inc.
10394 Pacific Center Court
San Diego, CA 92121
(858)450-5558/(800)854-3417
FAX: (858)453-3552

Chemical formula : N/A

Synonym : hLH

Emergency telephone number : Call Chemtrec®
(800)424-9300 (within U.S.A.)
(703)527-3887 (outside U.S.A.)

2. Composition / information on ingredients

Substance/Preparation : Substance

Chemical name*	CAS No.	EC Number	Symbol	R-Phrases
1) Luteinizing Hormone, Human Pituitary, Iodination Grade	39341-83-8	Not available.	T	R60

3. Hazards identification

Physical/chemical hazards : Not applicable.

Human health hazards : CAUTION!
POSSIBLE BIRTH DEFECT HAZARD.
MAY CAUSE BIRTH DEFECTS BASED ON ANIMAL DATA.
MAY CAUSE DAMAGE TO THE FOLLOWING ORGANS: REPRODUCTIVE SYSTEM, OVARY, TESTES.

4. First-aid measures

First-Aid measures

Inhalation : If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion : Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin Contact : In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Eye Contact : Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Aggravating conditions : Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

5. Fire-fighting measures

Flammability of the Product : May be combustible at high temperature.

Extinguishing Media

Suitable : SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Hazardous thermal (de)composition products : These products are nitrogen oxides (NO, NO2...).

Special fire-fighting procedures : Fire fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.

Protection of fire-fighters : Be sure to use an approved/certified respirator or equivalent.

6. Accidental release measures

Personal precautions : Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Small Spill and Leak : Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill and Leak : Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary systen

7. Handling and storage

Handling : Keep locked up. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not breathe dust. Wear suitable protective clothing. If you feel unwell, seek medical attention and show the label when possible.

Storage : Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above -20°C (-4°F).

Packaging materials

Recommended use : Use original container.

8. Exposure controls/personal protection

Engineering measures : Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Hygiene measures : Wash hands after handling compounds and before eating, smoking, using lavatory, and at the end of day.

Ingredient Name	Occupational Exposure Limits
1) Luteinizing Hormone, Human Pituitary, Iodination Grade	Not available.

Personal protective equipment

Respiratory system : Wear appropriate respirator when ventilation is inadequate.

Skin and body : Lab coat.

Eyes : Safety glasses.

Protective Clothing (Pictograms) :

9. Physical and chemical properties

Physical state : Solid.

Color : Not available.

Molecular Weight : 28500 g/mole

Solubility : Easily soluble in cold water.

Flash point : Not available.

Explosive properties : Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.

10. Stability and reactivity

Stability : The product is stable.

Conditions to avoid : Not available.

Hazardous Decomposition Products : These products are nitrogen oxides (NO, NO2...).

11. Toxicological information

RTECS # : **OK6367000**

Local effects

Skin irritation : Not available.

Acute toxicity : LD50: Not available.
LC50: Not available.

Chronic toxicity : Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Other Toxic Effects on Humans : Not available.
No specific information is available in our database regarding the other toxic effects of this material for humans.
May cause congenital malformations in the foetus.

Not available.

Specific effects

Carcinogenic effects : Not available.

Mutagenic effects : Not available.

Reproduction toxicity : Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED].

Teratogenic effects : Classified POSSIBLE for human.

12. Ecological information

Ecotoxicity : Not available.

Toxicity of the Products of Biodegradation : The product itself and its products of degradation are not toxic.

13. Disposal considerations

Methods of disposal; Waste of residues; Contaminated packaging : Waste must be disposed of in accordance with federal, state and local environmental control regulations.

14. Transport information

International transport regulations

Land - Road/Railway

ADR/RID Class : Not controlled under ADR (Europe).

Sea

IMDG Class : Not controlled under IMDG.

Air

IATA-DGR Class : Not controlled under IATA.

Special Provisions for Transport Not applicable.

15. Regulatory information

EU Regulations

Hazard symbol(s) :

Classification : Toxic

Risk Phrases : R60- May impair fertility.

Safety Phrases : S22- Do not breathe dust.
S36/37/39- Wear suitable protective clothing, gloves and eye/face protection.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

Contains : - Luteinizing Hormone, Human Pituitary, Iodination Grade

U.S. Federal Regulations : TSCA: No products were found.
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: No products were found.
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: No products were found.
SARA 313 toxic chemical notification and release reporting: No products were found.
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean air act (CAA) 112 accidental release prevention: No products were found.
Clean air act (CAA) 112 regulated flammable substances: No products were found.
Clean air act (CAA) 112 regulated toxic substances: No products were found.

HCS Classification : CLASS: Target organ effects.

State Regulations :

WHMIS (Canada) : CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

No products were found.

16. Other information

Hazardous Material Information System (U.S.A.)

Health *	0
Fire Hazard	1
Reactivity	0
Personal Protection	a

National Fire Protection Association (U.S.A.)

Notice to Reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SIGMA-ALDRICH

MATERIAL SAFETY DATA SHEET

Date Printed: 07/27/2007
Date Updated: 02/01/2006
Version 1.6

Section 1 - Product and Company Information

Product Name	CHORIONIC GONADOTROPIN FROM HUMAN &
Product Number	C0434
Brand	SIGMA
Company	Sigma-Aldrich Canada, Ltd
Address	2149 Winston Park Drive Oakville ON L6H 6J8 CA
Technical Phone:	9058299500
Fax:	9058299292
Emergency Phone:	800-424-9300

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
CHORIONIC GONADOTROPIN FROM HUMAN PREGNANCY URINE	9002-61-3	No

Chemical Family Human source material.

Synonyms Ambinon * Antuitrin S * APL * APL (hormone) * Apoidina * Chorigon * Choriogonadotropin * Choriogonin * Chorionic gonadotrophin * Chorionic gonadotropic hormone * Chorionic gonadotropin * Chorulon * Coriantin * Follutein * Gonabion * Gonadex * HCG * Human chorionic gonadotropin * Korotrin * Physex * Praedyn * Pregnyl * Primogonyl * Randonos * Synaphorin

RTECS Number: MD6953000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Biohazard.
Handle as if capable of transmitting infectious agents.

HMIS RATING

HEALTH: 0
FLAMMABILITY: 0
REACTIVITY: 0
SPECIAL HAZARD(S): Human Source

NFPA RATING

HEALTH: 0
FLAMMABILITY: 0
REACTIVITY: 0
SPECIAL HAZARD(S): Human Source

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Use extinguishing media appropriate to surrounding fire conditions.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Wash spill site with 10% bleach and ventilate area after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Avoid inhalation. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.
Store at -20°C

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance — Physical State: Solid

Property	Value	At Temperature or Pressure
Molecular Weight	N/A	
pH	N/A	
BP/BP Range	N/A	
MP/MP Range	N/A	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY

Stable: Stable.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, and nitrogen oxides.

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: May cause eye irritation.
Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: May be harmful if swallowed.

SIGNS AND SYMPTOMS OF EXPOSURE
Potentially biohazardous material.

CHRONIC EXPOSURE - TERATOGEN

Species: Rat
Dose: 875 MG/KG
Route of Application: Subcutaneous
Exposure Time: (15-17D PREG)
Result: Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord).

Species: Hamster
Dose: 60 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (4-6D PREG)
Result: Effects on Embryo or Fetus: Fetal death.

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD
Result: Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Species: Woman
Dose: 36 MG/KG
Route of Application: Unreported
Exposure Time: (6D PRE)
Result: Effects on Fertility: Other measures of fertility

Species: Rat
Dose: 150 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (1-3D PREG)
Result: Effects on Fertility: Other measures of fertility
Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea).

Species: Rat
Dose: 40 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (10D MALE)
Result: Paternal Effects: Spermatogenesis (including genetic material, sperm morphology,motility, and count).

Species: Rat
Dose: 1250 UG/KG
Route of Application: Subcutaneous
Exposure Time: (1D PRE)
Result: Maternal Effects: Ovaries, fallopian tubes. Maternal Effects: Uterus, cervix, vagina.

Species: Rat
Dose: 5250 UG/KG
Route of Application: Subcutaneous
Exposure Time: (7-13D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Rat
Dose: 16 MG/KG
Route of Application: Subcutaneous
Exposure Time: (4D MALE)
Result: Paternal Effects: Other effects on male.

Species: Rat
Dose: 8890 UG/KG
Route of Application: Intravenous
Exposure Time: (1D PRE)
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea).

Species: Rat
Dose: 83 UG/KG
Route of Application: Intramuscular
Exposure Time: (9D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Rat
Dose: 125 MG/KG
Route of Application: Parenteral
Exposure Time: (4D PRE)
Result: Maternal Effects: Ovaries, fallopian tubes. Maternal Effects: Uterus, cervix, vagina.

Species: Rat
Dose: 420 MG/KG
Route of Application: Parenteral
Exposure Time: (7D MALE)
Result: Paternal Effects: Testes, epididymis, sperm duct.

Species: Rat
Dose: 200 MG/KG
Route of Application: Parenteral
Exposure Time: (1D MALE)
Result: Paternal Effects: Other effects on male.

Species: Rat
Dose: 1650 MG/KG
Route of Application: Unreported
Exposure Time: (1-22D PREG)
Result: Effects on Newborn: Growth statistics (e.g., reduced weight gain).

Species: Rat
Dose: 50 MG/KG
Route of Application: Unreported
Exposure Time: (4D PREG)
Result: Maternal Effects: Parturition.

Species: Rat
Dose: 21212 NG/KG

Route of Application: Unreported
Exposure Time: (7-13D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Rat
Dose: 12 MG/KG
Route of Application: Unreported
Exposure Time: (1D MALE)
Result: Paternal Effects: Other effects on male.

Species: Rat
Dose: 280 IU/KG
Route of Application: Unreported
Exposure Time: (2W MALE)
Result: Paternal Effects: Testes, epididymis, sperm duct.

Species: Mouse
Dose: 24 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (6D PRE)
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea).

Species: Mouse
Dose: 400 IU/KG
Route of Application: Intraperitoneal
Exposure Time: (1D PRE)
Result: Maternal Effects: Oogenesis.

Species: Mouse
Dose: 560 MG/KG
Route of Application: Subcutaneous
Exposure Time: (7-13D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Mouse
Dose: 6 MG/KG
Route of Application: Intramuscular
Exposure Time: (3D PRE)
Result: Maternal Effects: Uterus, cervix, vagina.

Species: Monkey
Dose: 10 MG/KG
Route of Application: Subcutaneous
Exposure Time: (5D PRE)
Result: Maternal Effects: Menstrual cycle changes or disorders.

Species: Monkey
Dose: 224 MG/KG
Route of Application: Intramuscular
Exposure Time: (18-36D PREG)
Result: Maternal Effects: Menstrual cycle changes or disorders.

Species: Monkey
Dose: 30 MG/KG
Route of Application: Unreported
Exposure Time: (15D PRE)
Result: Maternal Effects: Parturition.

Species: Pig
Dose: 833 UG/KG
Route of Application: Intravenous
Exposure Time: (1D PRE)
Result: Effects on Fertility: Other measures of fertility

Species: Pig
Dose: 833 UG/KG
Route of Application: Intramuscular
Exposure Time: (1D PRE)
Result: Effects on Fertility: Other measures of fertility

Species: Hamster
Dose: 240 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (1-3D PREG)
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea).

Species: Hamster
Dose: 280 MG/KG
Route of Application: Subcutaneous
Exposure Time: (7-13D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Disposal should be made in accordance with existing disposal practices employed for infectious waste at your institution. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: None
Non-Hazardous for Transport: This substance is considered to be non-hazardous for transport.

IATA
Non-Hazardous for Air Transport: Non-hazardous for air transport.

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION
Symbol of Danger: B
Indication of Danger: Biohazard.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Biohazard.
US Statements: Handle as if capable of transmitting infectious agents.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: No
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

MSDS : Follicle-stimulating hormone
CAS : 9002-68-0
SYNONYMS : * Anthrogon
* Follitropin
* FSH
* FSH-P
* Gonad stimulating factor
* Hebin
* Luteoantine
* Menotrophin
* Menotropins
* Prolan B
* Thylakentrin
* Urinary hebin

Catalog of Chemical Suppliers, Buyers, Custom Synthesis Companies And Equipment Manufacturers
[Follicle-stimulating hormone 9002-68-0]

Suppliers:

Not Available

Buyers:

Not Available

*** CHEMICAL IDENTIFICATION ***

RTECS NUMBER : LP6330000
CHEMICAL NAME : Follicle-stimulating hormone
CAS REGISTRY NUMBER : 9002-68-0
LAST UPDATED : 198910
DATA ITEMS CITED : 5
COMPOUND DESCRIPTOR : Reproductive Effector Hormone

SYNONYMS/TRADE NAMES :
* Anthrogon
* Follitropin
* FSH
* FSH-P
* Gonad stimulating factor
* Hebin
* Luteoantine

* Menotrophin
* Menotropins
* Prolan B
* Thylakentrin
* Urinary hebin

*** HEALTH HAZARD DATA ***

** REPRODUCTIVE DATA **

TYPE OF TEST : TDLo - Lowest published toxic dose
ROUTE OF EXPOSURE : Subcutaneous
SPECIES OBSERVED : Rodent - rat
DOSE : 2 mg/kg
SEX/DURATION : female 2 day(s) pre-mating
TOXIC EFFECTS :
Reproductive - Maternal Effects - ovaries, fallopian tubes
REFERENCE :
SCIEAS Science. (American Assoc. for the Advancement of Science, 1333 H St., NW, Washington, DC 20005) V.1- 1895- Volume(issue)/page/year: 204,854,1979

TYPE OF TEST : TDLo - Lowest published toxic dose
ROUTE OF EXPOSURE : Subcutaneous
SPECIES OBSERVED : Rodent - rat
DOSE : 25 gm/kg
SEX/DURATION : female 1-10 day(s) after conception
TOXIC EFFECTS :
Reproductive - Fertility - other measures of fertility
REFERENCE :
JPETAB Journal of Pharmacology and Experimental Therapeutics. (Williams & Wilkins Co., 428 E. Preston St., Baltimore, MD 21202) V.1- 1909/10- Volume(issue)/page/year: 49,146,1933

TYPE OF TEST : TDLo - Lowest published toxic dose
ROUTE OF EXPOSURE : Intracerebral
SPECIES OBSERVED : Rodent - rat
DOSE : 625 ug/kg
SEX/DURATION : female 4-9 day(s) after conception
TOXIC EFFECTS :
Reproductive - Maternal Effects - ovaries, fallopian tubes
REFERENCE :
ENDOAO Endocrinology (Baltimore). (Williams & Wilkins Co., 428 E. Preston St., Baltimore, MD 21203) V.1- 1917- Volume(issue)/page/year: 83,1273,1968

TYPE OF TEST : TDLo - Lowest published toxic dose
ROUTE OF EXPOSURE : Parenteral
SPECIES OBSERVED : Rodent - rat
DOSE : 24 gm/kg
SEX/DURATION : male 6 day(s) pre-mating
TOXIC EFFECTS :
Reproductive - Paternal Effects - testes, epididymis, sperm duct
REFERENCE :
ANREAK Anatomical Record. (Alan R. Liss, Inc., 41 E. 11th St., New York, NY 10003) V.1- 1906/08- Volume(issue)/page/year: 65,261,1936

TYPE OF TEST : TDLo - Lowest published toxic dose
ROUTE OF EXPOSURE : Intratesticular
SPECIES OBSERVED : Rodent - rat
DOSE : 8 ug/kg
SEX/DURATION : male 1 day(s) pre-mating
TOXIC EFFECTS :
Reproductive - Paternal Effects - testes, epididymis, sperm duct
REFERENCE :
PSEBAA Proceedings of the Society for Experimental Biology and Medicine. (Academic Press, Inc., 1 E. First St., Duluth, MN 55802) V.1- 1903/04- Volume(issue)/page/year: 120,671,1965

*** END OF RECORD ***

Search More follitropin msds GO

ALL Chemical Property And Toxicity Analysis PAGES IN THIS GROUP

NAME	CAS
Formamide, N-(4-(5-nitro-2-thienyl)-2-thiazolyl)-	58139-46-1
Formamide,N-(5-oxo-4,5-dihydro-1,2-dithiolo(4,3-b)pyrrol-6-yl)-	21787-66-6
Formamide,N-(2-oxo-2-(4-(2-phenylethyl)phenyl)ethyl)-	126150-86-5
Formamide,N-((tert-pentylamino)(3-pyridylamino)methylene)-	67026-78-2
Follicle-regulatory protein (pig)	67026-78-2
Formamide,N-(1-(9-(phenylmethyl)-9H-carbazol-3-yl)ethyl)-	52969-60-5
Formamide, N-(1-(phenylmethyl)cyclopentyl)-	20937-45-5
Formamide, 2-piperidino-1-piperidinocarbonyl-	6050-25-5
Formamide, N-n-propyl-	6281-94-3
Formamide, N-(1-(9-propylcarbozol-3-yl)ethyl)-	52916-25-3
Formamide,N-(3-(3-(1-(1-pyrrolidinyl)ethyl)phenoxy)propyl)-	78043-80-8
Formamide,N-(2,3,6,7-tetrahydro-1H,5H-benzo(ij)quinolizin-9-yl)-	101418-51-3
Formamide, N-(4-(thiocarbamoyl)-5-imidazolyl)-	19494-94-1
Formamide, N-(2,2,2-trichloro-1-(morpholinyl)ethyl)-	60029-23-4
Formamide,N-((4-((3-(trifluoromethyl)phenyl)amino)-3-pyridinyl)sulfonyl)-	56175-87-2
Follicle-stimulating hormone	9002-68-0
Formamidine, N'-(5-acenaphthenyl)-N,N-dimethyl-	101398-41-8
Formamidine, N-(p-acetamidophenyl)-N',N'-dimethyl-,hydrochloride	2417-13-2
Formamidine, N'-(9-acridinyl)-N,N-dimethyl-	101398-42-9
Formamidine, N'-(9-acridinyl)-N,N-dimethyl-, compdwith methyl iodine	101398-43-0
Formamidine, N'-(1,3-benzodioxol-5-yl)-N,N-dimethyl-	62331-09-3
Formamidine,N'-(2,1,3-benzothiadiazol-4-yl)-N,N-dimethyl-	101398-44-1
Formamidine,N'-(1,3-benzothiadiazol-4-yl)-N,N-dimethyl-, compd.with methyl iodine	101398-45-2
Formamidine, N'-benzyl-N-N-dimethyl-	27159-75-7
Formamidine, N'-(2-benzyloxyethyl)-N,N-dimethyl-	101398-46-3
Formamidine, N,N'-bis(3-methoxyphenyl)-	3200-36-0
Follicle Stimulating Hormone, SJ-0021SUBSTANCE DEFINITION :A Recombinant human Follicle Stimulating HormoneREFERENCE :YACHDS Yakuri to Chiryo. Pharmacology and Therapeutics. (Raifu SaiensuShuppan K.K., 2-5-13, Yaesu, Chuo-ku, Tokyo 104, Japan) V.1- 1972-	3200-36-0
Formamidine,1-(6-bromo-2-methyl-4-quinolyl)-N-phenyl-,dihydrochloride	78812-07-4
Formamidine,N'-(3-bromo-9-oxo-2-fluorenyl)-N,N-dimethyl-	101398-47-4
Formamidine,N'-(4-tert-butyl-1-cyclohexyl)-N,N-dimethyl-	101398-48-5
Formamidine, N'-carvacryl-N,N-dimethyl-	101398-49-6
Formamidine,1-chloro-N'-(3,4-dichlorophenyl)-N,N-dimethyl-	6022-33-9
Formamidine,N'-(5-chloro-2,4-dimethoxyphenyl)-N,N-dimethyl-	62331-11-7
Formamidine,N'-(3-chloro-2-methylphenyl)-N,N-dimethyl-	13181-62-9
Formamidine,N'-(3-(2-chloro-10-phenothiazinyl)propyl)-N,N-dimethyl-, hydrochloride	101398-50-9
Formamidine,N'-(alpha-(4-chlorophenyl)benzyl)-N,N-dimethyl-	101398-51-0
Formamidine, N'-(p-chlorophenyl)-N,N-dimethyl-	2103-46-0
Follicular fluid, porcine	2103-46-0
Formamidine,N-((p-chlorophenyl)thio)-N-methyl-N'-(2,4-xylyl)-	55311-62-1
Formamidine, N'-(5-chloropyridin-2-yl)-N,N-dimethyl-	36172-58-4
Formamidine, N-(4-chloro-o-tolyl)-	57151-04-9
Formamidine, N'-(4-chloro-o-tolyl)-N,N-dimethyl-	6164-98-3

Formamidine, N'-(4-chloro-o-tolyl)-N,N-dimethyl-,hydrochloride	19750-95-9
Formamidine, N-(4-chloro-o-tolyl)-N'-methyl-	21787-80-4
Formamidine,N'-(4-cyano-3-cyanomethyl-1-phenylpyrazol-5-yl)-N,N-dimethyl-	101398-52-1
Formamidine, 1-cyano-N,N'-diphenyl-	6343-76-6
Formamidine, N-((dibenzylamino)thio)-N'-(2,4-xylyl)-	73839-60-8
Formamidine, N,N'-dicarbamoyl-	6289-14-1
FO-439	6289-14-1
Follicular fluid, porcine, retentateSUBSTANCE DEFINITION :The porcine follicular fluid preparation has a molecular weight greater than10,000 and is charcoal treatedREFERENCE :CCPTAY Contraception. (Geron-X, Inc., POB 1108, Los Altos, CA 94022) V.1-1970-	6289-14-1

SIGMA-ALDRICH

MATERIAL SAFETY DATA SHEET

Date Printed: 04/13/2007
Date Updated: 02/01/2006
Version 1.4

Section 1 - Product and Company Information

Product Name	GONADOTROPIN FROM PREGNANT MARES' SERUM
Product Number	G4877
Brand	SIGMA
Company	Sigma-Aldrich Canada, Ltd
Address	2149 Winston Park Drive Oakville ON L6H 6J8 CA
Technical Phone:	9058299500
Fax:	9058299292
Emergency Phone:	800-424-9300

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
GONADOTROPIN FROM PREGNANT MARE SERUM	9002-70-4	No

Synonyms: Anteron * Antex-490 * Antostab * Eleagol * Equine cyonin * Equine gonadotrophin * Equine gonadotropin * Gestyl * Gonadotraphon FSH * Gonadyl * Gorman * Lobulantina * PMS * PMSG * Predalon-S * Priatin * Primantron * Seragon * Seragonin * Serogan * Serotropin * Serum gonadotrophin * Serum gonadotropic hormone * Serum gonadotropin

RTECS Number: TU4517000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Toxic.
Toxic if swallowed.
Target organ(s): Reproductive system.

HMIS RATING

HEALTH: 2*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.
Store at -20°C

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance	Color: White Form: Powder

Property	Value	At Temperature or Pressure
pH	N/A	
BP/BP Range	N/A	
MP/MP Range	N/A	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	Solubility in Water:1 mg/ml H2O clear, very faintly yellow	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: Toxic if absorbed through skin.
Eye Contact: May cause eye irritation.
Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. Toxic if inhaled.
Ingestion: Toxic if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Reproductive system.

SIGNS AND SYMPTOMS OF EXPOSURE
Exposure can cause sensitivity reactions, abdominal discomfort, ovarian rupture, and intraperitoneal hemorrhage.

TOXICITY DATA

Oral
Mouse
120 mg/kg
LD50

CHRONIC EXPOSURE - TERATOGEN

Species: Rat Rat
Dose: 11700 UG/KG 11700 UG/KG
Route of Application: Intraperitoneal Intraperitoneal
Exposure Time: (5-7D PREG) (5-7D PREG)
Result: Effects on Embryo or Fetus: Fetal death. Effects on Embryo or Fetus: Fetal death.

Species: Rat Rat
Dose: 10 MG/KG 10 MG/KG
Route of Application: Subcutaneous Subcutaneous
Exposure Time: (1D PRE) (1D PRE)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Mouse Mouse
Dose: 1 GM/KG 1 GM/KG
Route of Application: Subcutaneous Subcutaneous
Exposure Time: (1D PRE) (1D PRE)
Result: Specific Developmental Abnormalities: Craniofacial (including nose and tongue). Effects on Embryo or Fetus: Fetal death. Specific Developmental Abnormalities: Musculoskeletal system. Effects on Embryo or Fetus: Fetal death. Specific Developmental Abnormalities: Craniofacial (including nose and tongue). Specific Developmental Abnormalities: Musculoskeletal system.

Species: Hamster Hamster
Dose: 37500 UG/KG 37500 UG/KG
Route of Application: Intraperitoneal Intraperitoneal
Exposure Time: (4-6D PREG) (4-6D PREG)
Result: Effects on Embryo or Fetus: Fetal death. Effects on Embryo or Fetus: Fetal death.

CHRONIC EXPOSURE - MUTAGEN

Species: Mouse Mouse
Route: Intraperitoneal Intraperitoneal
Dose: 750 UG/KG 750 UG/KG
Mutation test: Cytogenetic analysis Cytogenetic analysis

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD
Result: Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Species: Rat Rat
Dose: 188 MG/KG 188 MG/KG
Route of Application: Intraperitoneal Intraperitoneal
Exposure Time: (1-3D PREG) (1-3D PREG)
Result: Effects on Fertility: Other measures of fertility Effects on Fertility: Other measures of fertility

Species: Rat Rat
Dose: 188 MG/KG 188 MG/KG
Route of Application: Intraperitoneal Intraperitoneal
Exposure Time: (5-7D PREG) (5-7D PREG)
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea).

Species: Rat Rat
Dose: 18750 UG/KG 18750 UG/KG
Route of Application: Subcutaneous Subcutaneous
Exposure Time: (1D PRE) (1D PRE)
Result: Maternal Effects: Parturition. Maternal Effects: Parturition.

Species: Rat Rat
Dose: 37500 UG/KG 37500 UG/KG
Route of Application: Subcutaneous Subcutaneous
Exposure Time: (18D PREG) (18D PREG)
Result: Effects on Fertility: Abortion. Effects on Fertility: Abortion.

Species: Rat Rat
Dose: 12500 UG/KG 12500 UG/KG
Route of Application: Subcutaneous Subcutaneous
Exposure Time: (5D PREG) (5D PREG)
Result: Effects on Fertility: Other measures of fertility Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Fertility: Other measures of fertility

Species: Rat Rat

Dose: 50 MG/KG 50 MG/KG
Route of Application: Subcutaneous Subcutaneous
Exposure Time: (1D PRE) (1D PRE)
Result: Maternal Effects: Ovaries, fallopian tubes. Maternal Effects: Uterus, cervix, vagina. Maternal Effects: Uterus, cervix, vagina. Maternal Effects: Ovaries, fallopian tubes.

Species: Rat Rat
Dose: 12500 UG/KG 12500 UG/KG
Route of Application: Subcutaneous Subcutaneous
Exposure Time: (2D PREG) (2D PREG)
Result: Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated). Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated).

Species: Rat Rat
Dose: 453 MG/KG 453 MG/KG
Route of Application: Intramuscular Intramuscular
Exposure Time: (7D PRE) (7D PRE)
Result: Maternal Effects: Uterus, cervix, vagina. Maternal Effects: Ovaries, fallopian tubes. Maternal Effects: Uterus, cervix, vagina. Maternal Effects: Ovaries, fallopian tubes.

Species: Rat Rat
Dose: 1120 IU/KG 1120 IU/KG
Route of Application: Unreported Unreported
Exposure Time: (2W MALE) (2W MALE)
Result: Paternal Effects: Testes, epididymis, sperm duct. Paternal Effects: Testes, epididymis, sperm duct.

Species: Mouse Mouse
Dose: 10 MG/KG 10 MG/KG
Route of Application: Subcutaneous Subcutaneous
Exposure Time: (2D PREG) (2D PREG)
Result: Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated). Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated).

Species: Mouse Mouse
Dose: 50 MG/KG 50 MG/KG
Route of Application: Subcutaneous Subcutaneous
Exposure Time: (8-11D PREG) (8-11D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Fertility: Abortion. Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Fertility: Abortion.

Species: Mouse Mouse
Dose: 50 MG/KG 50 MG/KG
Route of Application: Subcutaneous Subcutaneous
Exposure Time: (12-15D PREG) (12-15D PREG)
Result: Maternal Effects: Parturition. Maternal Effects: Postpartum. Maternal Effects: Postpartum. Maternal Effects: Parturition.

Species: Mouse Mouse
Dose: 50 MG/KG 50 MG/KG

Route of Application: Subcutaneous Subcutaneous
Exposure Time: (3D PREG) (3D PREG)
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea).

Species: Hamster Hamster
Dose: 300 MG/KG 300 MG/KG
Route of Application: Intraperitoneal Intraperitoneal
Exposure Time: (1-3D PREG) (1-3D PREG)
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea).

Section 12 - Ecological Information

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Toxic solids, organic, n.o.s.
UN#: 2811
Class: 6.1
Packing Group: Packing Group III
Hazard Label: Toxic substances.
PIH: Not PIH

IATA
Proper Shipping Name: Toxic solid, organic, n.o.s.
IATA UN Number: 2811
Hazard Class: 6.1
Packing Group: III

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION
Symbol of Danger: T
Indication of Danger: Toxic.
R: 25
Risk Statements: Toxic if swallowed.
S: 45
Safety Statements: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic.
Risk Statements: Toxic if swallowed.
Safety Statements: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US Statements: Target organ(s): Reproductive system.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: No
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 3.0
Revision Date 07/13/2007
Print Date 08/20/2007

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : **beta -Estradiol**

Product Number : E8875
Brand : Sigma

Company : Sigma-Aldrich Canada, Ltd
2149 Winston Park Drive
OAKVILLE ON L6H 6J8
CANADA
Telephone : +1 9058299500
Fax : +1 9058299292
Emergency Phone # : 800-424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1,3,5-Estratriene-3,17beta -diol
17beta -Estradiol
3,17beta -Dihydroxy-1,3,5(10)-estratriene
Dihydrofolliculin

Formula : C18H24O2
Molecular Weight : 272.39 g/mol

CAS-No.	EC-No.	Index-No.	Concentration [%]
Estradiol			
50-28-2	200-023-8	-	-

3. HAZARDS IDENTIFICATION

Emergency Overview

Target Organs

Female reproductive system., Male reproductive system.

WHMIS Classification

Not Rated

Not Rated

HMIS Classification

Health Hazard: 0
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.

Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties

Flash point	no data available
Ignition temperature	no data available

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods for cleaning up
Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling
Avoid exposure - obtain special instructions before use. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	powder
Colour	white

Safety data

pH	no data available
Melting point	176 °C (349 °F)
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Water solubility	no data available

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products

Hazardous decomposition products formed under fire conditions.
Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity

no data available

Irritation and corrosion

no data available

Sensitisation

no data available

Chronic exposure

The National Toxicology Program (Tenth Report on Carcinogens) has determined that steroidal estrogens are known to be human carcinogens based on sufficient evidence of carcinogenicity in humans, which indicates a causal relationship between exposure to steroidal estrogens and human cancer. This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Genotoxicity in vitro - rat - Other cell types
DNA damage

Genotoxicity in vivo - rat - Oral
Morphological transformation.

May cause reproductive disorders.

Signs and Symptoms of Exposure

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.
Target Organs	Female reproductive system., Male reproductive system.,

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

no data available

Ecotoxicity effects

Toxicity to fish	LC50 - Oryzias latipes - 0.002 µg/l - 96 h

Further information on ecology

no data available

13. DISPOSAL CONSIDERATIONS

Product
Observe all federal, state, and local environmental regulations.Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

TSCA Status
Not On TSCA Inventory

	CAS-No.
Estradiol	50-28-2

DSL Status
All components of this product are on the Canadian DSL list.

WHMIS Classification

Not Rated	Not Rated

16. OTHER INFORMATION

Further information
 The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

ATCC® Product Information

Cell Line(s) Info

Cell Line Designation: MCF-7
ATCC® Catalog No. HTB-22™

Table of Contents:

Cell Line Description

Organism: *Homo sapiens* (human)
Tissue: mammary gland; breast adenocarcinoma; derived from metastatic site: pleural effusion
Age: 69 years
Gender: female
Ethnicity: Caucasian
Morphology: epithelial
Doubling time: about 29 hours
Growth Properties: adherent
Oncogene: wnt7h +
Antigens Expressed: Blood Type O; Rh+
Products: insulin-like growth factor binding proteins (IGFBP) BP-2; BP-4; BP-5
DNA profile (STR analysis)

Amelogenin: X
CSF1PO: 10
D13S317: 11
D16S539: 11,12
D5S818: 11,12
D7S820: 8,9
TH01: 6
TPOX: 9,12
vWA: 14,15

Depositor: C.M. McGrath
Comments: The MCF7 line retains several characteristics of differentiated mammary epithelium including ability to process estradiol via cytoplasmic estrogen receptors and the capability of forming domes.
Growth of MCF7 cells is inhibited by tumor necrosis factor alpha (TNF alpha). Secretion of IGFBP's can be modulated by treatment with anti-estrogens.
Karyology: modal number = 82; range = 66 to 87. The stemline chromosome numbers ranged from hypertriploidy to hypotetraploidy, with the 2S component occurring at 1%.
There were 29 to 34 marker chromosomes per S metaphase; 24 to 28 markers occurred in at least 30% of cells, and generally one large submetacentric (M1) and 3 large subtelocentric (M2, M3, and M4) markers were recognizable in over 80% of metaphases.
No DM were detected. Chromosome 20 was nullisomic and X was disomic.
Note: Cytogenetic information is based on initial seed stock at ATCC. Cytogenetic instability has been reported in the literature for some cell lines.

Purified DNA from this line is available as ATCC® HTB-22D™ (10µg)
Total RNA from this line is available as ATCC® HTB-22R™ (100µg)

Biosafety Level: 1

Appropriate safety procedures should always be used with this material. Laboratory safety is discussed in the following publication: *Biosafety in Microbiological and Biomedical Laboratories,* 4th ed. HHS Publication No. (CDC) 93-8395. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Washington DC: U.S. Government Printing Office; 1999. The entire text is available online at www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm.

Use Restrictions

These cells are distributed for research purposes only. ATCC recommends that individuals contemplating commercial use of any cell line first contact the originating investigator to negotiate an agreement. Third party distribution of this cell line is discouraged, since this practice has resulted in the unintentional spreading of cell lines contaminated with inappropriate animal cells or microbes.

Handling Procedure for Frozen Cells

To insure the highest level of viability, thaw the vial and initiate the culture as soon as possible upon receipt. If upon arrival, continued storage of the frozen culture is necessary, it should be stored in liquid nitrogen vapor phase and not at –70°C. Storage at –70°C will result in loss of viability.

SAFETY PRECAUTION: ATCC highly recommends that protective gloves and clothing always be used and a full face mask always be worn when handling frozen vials. *It is important to note that some vials leak when submersed in liquid nitrogen and will slowly fill with liquid nitrogen. Upon thawing, the conversion of the liquid nitrogen back to its gas phase may result in the vessel exploding or blowing off its cap with dangerous force creating flying debris.*

1. Thaw the vial by gentle agitation in a 37°C water bath. To reduce the possibility of contamination, keep the O-ring and cap out of the water. Thawing should be rapid (approximately 2 minutes).

2. Remove the vial from the water bath as soon as the contents are thawed, and decontaminate by dipping in or spraying with 70% ethanol. *All of the operations from this point on should be carried out under strict aseptic conditions.*
3. It is recommended that the cryoprotective agent be removed immediately. Centrifuge the cell suspension at

American Type Culture Collection
P.O. Box 1549
Manassas, VA 20108 USA
www.atcc.org

800-638-6597 or 703-365-2700
Fax: 703-365-2750
E-mail: tech@atcc.org
Or contact your local distributor.

approximately 125 xg for 5 to 10 minutes. Discard the supernatant and resuspend the cell pellet in an appropriate amount of fresh growth medium.

4. Transfer the cell pellet to an appropriate size vessel. *It is important to avoid excessive alkalinity of the medium during recovery of the cells. It is suggested that, prior to the addition of the vial contents, the culture vessel containing the growth medium be placed into the incubator for at least 15 minutes to allow the medium to reach its normal pH (7.0 to 7.6).*

5. Incubate the culture at 37°C in a suitable incubator. A 5% CO_2 in air atmosphere is recommended if using the medium described on this product sheet.

Note: Present batches of MCF7 cells are exhibiting the following growth pattern:
The cells usually attach as three-dimensional clusters and eventually grow to a 80-90% confluent monolayer. However, we are finding that most of the clusters remain in suspension until after the 2nd subculture.
After first subculture all the cells will not attach. There will be clusters in suspension. Break up the clusters the best you can by gently pipetting with a small bore pipette (5 ml or smaller). After a few days incubation, the cells should reattach as three-dimensional islands (there will be some clusters that do not reattach). Growth will eventually spread out from the islands and the culture should, after the second subculture, flatten and become 70-80% confluent.

Handling Procedure for Flask Cultures

The flask was seeded with cells (see specific batch information) grown and completely filled with medium at ATCC to prevent loss of cells during shipping.

1. Upon receipt visually examine the culture for macroscopic evidence of any microbial contamination. Using an inverted microscope (preferably equipped with phase-contrast optics), carefully check for any evidence of microbial contamination. Also check to determine if the majority of cells are still attached to the bottom of the flask; during shipping the cultures are sometimes handled roughly and many of the cells often detach and become suspended in the culture medium (but are still viable).

2. **If the cells are still attached,** aseptically remove all but 5 to 10 ml of the shipping medium. The shipping medium can be saved for reuse. Incubate the cells at 37°C in a 5% CO_2 in air atmosphere until they are ready to be subcultured.

3. **If the cells are not attached,** aseptically remove the entire contents of the flask and centrifuge at 125 x g for 5 to 10 minutes. Remove shipping medium and save. Resuspend the pelleted cells in 10 ml of this medium and add to 25 cm^2 flask. Incubate at 37°C in a 5% CO_2 in air atmosphere until cells are ready to be subcultured.

Subculturing Procedure

Volumes used in this protocol are for 75 cm2 flask; proportionally reduce or increase amount of dissociation medium for culture vessels of other sizes.
Note: if floating cells are present, it is recommended that they be transferred at the first two (2) subcultures as described below. It is not necessary to transfer floating cells for subsequent subcultures.

1. Remove culture medium to a centrifuge tube.

2. Briefly rinse the cell layer with 0.25% (w/v) Trypsin - 0.53 mM EDTA solution to remove all traces of serum, which contains trypsin inhibitor.

3. Add 2.0 to 3.0 ml of Trypsin-EDTA solution to flask and observe cells under an inverted microscope until cell layer is dispersed (usually with 5 to 10 minutes).

   Note: To avoid clumping do not agitate the cells by hitting or shaking the flask while waiting for the cells to detach. Cells that are difficult to detach may be placed at 37°C to facilitate dispersal.

4. Add 6.0 to 8.0 ml of complete growth medium and aspirate cells by gently pipetting.

5. Transfer the cell suspension to the centrifuge tube with the medium and cells from Step #1 and spin at approximately 125 xg for 5 to10 minutes. Discard the supernatnant.

6. Resuspend the cell pellet in fresh growth medium. Add appropriate aliquots of cell suspension to new culture vessels. Maintain cultures at a cell concentration between 2x10(4) and 2 x 10(5) cells/cm2.
   Subcultivation Ratio: 1:3 to 1:6.

7. Place culture vessels in incubators at 37°C.

Note: For more information on enzymatic dissociation and subculturing of cell lines consult Chapter 13 in **Culture Of Animal Cells: A Manual Of Basic Technique** by R. Ian Freshney, 5th edition, published by Wiley-Liss, N.Y., 2005.

Medium Renewal

Two to three times weekly

Complete Growth Medium

The base medium for this cell line is ATCC-formulated Eagle's Minimum Essential Medium, Catalog No. 30-2003. To make the complete growth medium, add the following components to the base medium:

- 0.01mg/ml bovine insulin
- fetal bovine serum to a final concentration of 10%

This medium is formulated for use with a 5% CO_2 in air atmosphere.

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ATCC tested fetal bovine serum is available as ATCC® Catalog No. 30-2020 (500ml) or ATCC® Catalog No. 30-2021 (100ml).

Cryoprotectant Medium

Complete growth medium described above supplemented with 5% (v/v) DMSO.
Cell culture tested DMSO is available as ATCC® Catalog No. 4-X.

Additional Information

Additional product and technical information can be obtained from the catalog references and the ATCC Web site at www.atcc.org, or by e-mail at tech@atcc.org.

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(additional references may be available in the catalog at www.atcc.org)

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Product Information Sheet for ATCC® CRL-1573™

Cell Line Designation: 293 (HEK293)
ATCC® Catalog No. CRL-1573™

Table of Contents:

Cell Line Description

Organism: *Homo sapiens* (human)
Tissue: kidney; transformed with adenovirus 5 DNA
Age: fetus
Morphology: epithelial
Growth properties: adherent
Doubling time: about 19 hours
Tumorigenic: tumors developed within 21 days at 100% frequency (5/5) in nude mice inoculated subcutaneously with 10(7) cells.
Receptors expressed: vitronectin
Virus susceptibility: human adenoviruses
DNA profile (STR analysis)

Amelogenin: X
CSF1PO: 11,12
D13S317: 12,14
D16S539: 9,13
D5S818: 8,9
D7S820: 11,12
TH01: 7,9.3
TPOX: 11
vWA: 16,19

Depositors: F.L. Graham
Comments: Although an earlier report suggested that the cells contained Adenovirus 5 DNA from both the right and left ends of the viral genome, it is now clear that only left end sequences are present. The line is excellent for titrating human adenoviruses.
The cell line does not adhere to the substrate when left at room temperature for any length of time, therefore, live cultures may be received with the cells detached. The cells will re-attach to the flask over a period of several days in culture at 37C.
The cells express an unusual cell surface receptor for vitronectin composed of the integrin beta-1 subunit and the vitronectin receptor alpha-v subunit.
The Ad5 insert was cloned and sequenced, and it was determined that a colinear seqment from nts 1 to 4344 is integrated into chromosome 19 (19q13.2).

Karyotype: This is a hypotriploid human cell line. The modal chromosome number was 64, occurring in 30% of cells. The rate of cells with higher ploidies was 4.2 %.
The der(1)t(1;15) (q42;q13), der(19)t(3;19) (q12;q13), der(12)t(8;12) (q22;p13), and four other marker chromosomes were common to most cells. Five other markers occurred in some cells only. The marker der(1) and M8 (or Xq+) were often paired.
There were four copies of N17 and N22. Noticeably in addition to three copies of X chromosomes, there were paired Xq+, and a single Xp+ in most cells.
Note: Cytogenetic information is based on initial seed stock at ATCC. Cytogenetic instability has been reported in the literature for some cell lines.
Purified DNA: from this line is available as ATCC Catalog No. CRL-1573D™ (10 µg).

Biosafety Level: 2

Appropriate safety procedures should always be used with this material. Laboratory safety is discussed in the following publication: *Biosafety in Microbiological and Biomedical Laboratories,* 4th ed. HHS Publication No. (CDC) 93-8395. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Washington DC: U.S. Government Printing Office; 1999. The entire text is available online at www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm.

Use Restrictions

These cells are distributed for research purposes only. 293 cells, their products, or their derivatives may not be distributed to third parties. ATCC recommends that individuals contemplating commercial use of any cell line first contact the originating investigator to negotiate an agreement.

Handling Procedure for Frozen Cells

To insure the highest level of viability, thaw the vial and initiate the culture as soon as possible upon receipt. If upon arrival, continued storage of the frozen culture is necessary, it should be stored in liquid nitrogen vapor phase and not at –70°C. Storage at –70°C will result in loss of viability.

SAFETY PRECAUTION: ATCC highly recommends that protective gloves and clothing always be used and a full face mask always be worn when handling frozen vials. *It is important to note that some vials leak when submersed in liquid nitrogen and will slowly fill with liquid nitrogen. Upon thawing, the conversion of the liquid nitrogen back to its gas phase may result in the vessel exploding or blowing off its cap with dangerous force creating flying debris.*

1. Thaw the vial by gentle agitation in a **37°C** water bath. To reduce the possibility of contamination, keep the O-ring and cap out of the water. Thawing should be rapid (approximately 2 minutes).

2. Remove the vial from the water bath as soon as the contents are thawed, and decontaminate by dipping in or spraying with 70% ethanol. *All of the operations from this*

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point on should be carried out under strict aseptic conditions.

3. Transfer the vial contents to a centrifuge tube containing 9.0 ml complete growth medium and spin at approximately 125 xg for 5 to7 minutes.

4. Resuspend cell pellet with the recommended complete growth medium (see the specific batch information for the culture recommended dilution ratio) and dispense into a 25 cm^2 or a 75 cm^2 culture flask. *It is important to avoid excessive alkalinity of the medium during recovery of the cells. It is suggested that, prior to the addition of the vial contents, the culture vessel containing the complete growth medium be placed into the incubator for at least 15 minutes to allow the medium to reach its normal pH (7.0 to 7.6).*

5. Incubate the culture at 37°C in a suitable incubator. A 5% CO_2 in air atmosphere is recommended if using the medium described on this product sheet.

Handling Procedure for Flask Cultures

The flask was seeded with cells (see specific batch information) grown and completely filled with medium at ATCC to prevent loss of cells during shipping.
The cell line does not adhere to the substrate when left at room temperature for any length of time, therefore, live cultures may be received with the cells detached. The cells will re-attach to the flask over a period of several days in culture at 37°C.

1. Upon receipt visually examine the culture for macroscopic evidence of any microbial contamination. Using an inverted microscope (preferably equipped with phase-contrast optics), carefully check for any evidence of microbial contamination. Also check to determine if the majority of cells are still attached to the bottom of the flask; during shipping the cultures are sometimes handled roughly and many of the cells often detach and become suspended in the culture medium (but are still viable).

2. **If the cells are still attached,** aseptically remove all but 5 to 10 ml of the shipping medium. The shipping medium can be saved for reuse. Incubate the cells at 37°C in a 5% CO_2 in air atmosphere until they are ready to be subcultured.

3. **If the cells are not attached,** aseptically remove the entire contents of the flask and centrifuge at 125 xg for 5 to 10 minutes. Remove shipping medium and save. Resuspend the pelleted cells in 10 ml of this medium and add to 25 cm^2 flask. Incubate at 37°C in a 5% CO_2 in air atmosphere until cells are ready to be subcultured.

Subculturing Procedure

Volumes used in this protocol are for 75 cm^2 flask; proportionally reduce or increase amount of dissociation medium for culture vessels of other sizes.

1. Remove and discard culture medium.

2. Add 2.0 to 3.0 ml of 0.25% (w/v) Trypsin-0.53mM EDTA solution to flask and observe cells under an inverted microscope until cell layer is dispersed (usually within 5 to 10 minutes).

Note: To avoid clumping do not agitate the cells by hitting or shaking the flask while waiting for the cells to detach. Cells that are difficult to detach may be placed at 37°C to facilitate dispersal.

3. Add 6.0 to 8.0 ml of complete growth medium and aspirate cells by gently pipetting.

4. Add appropriate aliquots of the cell suspension to new culture vessels. An inoculum of 2 X 10 (3) to 6 X 10 (3) viable cells/cm^2 is recommended.
Subcultivation Ratio; 1:10 to 1:20 weekly.

5. Incubate cultures at 37°C.

6. Subculture when cell concentration is between 6 and 7 X 10(4) cells/cm^2

Note: For more information on enzymatic dissociation and subculturing of cell lines consult Chapter 13 in **Culture Of Animal Cells: A Manual Of Basic Technique** by R. Ian Freshney, 5th edition, published by Wiley-Liss, N.Y., 2005.

Medium Renewal

Two to three times weekly.

Complete Growth Medium

The base medium for this cell line is ATCC-formulated Eagle's Minimum Essential Medium, Catalog No. 30-2003. To make the complete growth medium, add the following components to the base medium:

- fetal bovine serum to a final concentration of 10%

This medium is formulated for use with a 5% CO_2 in air atmosphere.
ATCC tested fetal bovine serum is available as ATCC Catalog No. 30-2020 (500ml) and ATCC Catalog No. 30-2021 (100ml).

Cryoprotectant Medium

Complete growth medium described above supplemented with 5% (v/v) DMSO.
Cell culture tested DMSO is available as ATCC Catalog No. 4-X.

Additional Information

Additional product and technical information can be obtained from the catalog references and the ATCC Web site at www.atcc.org, or by e-mail at tech@atcc.org.

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RCB1154 : KGN	
Comment	Granulosa cell tumor. Possible to produce progesterone after HCG addition. Cell growth is slow.
Animal	human
Sex	Female
Age	69 years
Tissue	ovary, peritoneum
Morphology	other
Anchoraged	Yes
Medium	(DMEM:HamF12=1:1)+10%FBS
Antibiotics	Free
Growth temp	37°C
CO_2 concentration	5%
Passage method	0.25% trypsin
Split ratio	1:8 split
Subculture frequency	once/2 weeks
Cloned	No
Lifespan	infinite
Mycoplasma	-
Virus	HIV-1(-)
Isozyme analysis	LD, NP
Chr distrb	43-46(50):43(1),44(1),45(45),46(3)
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Product Information Sheet for CRL-1469

Cell Line Designation: PANC-1
ATCC® Catalog No. CRL-1469

Table of Contents:

Cell Line Description

Organism: *Homo sapiens* (human)
Tissue: pancreas; duct; epithelioid carcinoma
Age: 56 years
Gender: male
Ethnicity: caucasian
Morphology: epithelial
Growth properties: adherent
DNA profile (STR analysis)
Amelogenin: X
CSF1PO: 10,12
D13S317: 11
D16S539: 11
D5S818: 11,13
D7S820: 8,10
TH01: 7,8
TPOX: 8,11
vWA: 15
Depositors: M. Lieber
Comments: Growth is inhibited by 1 unit/ml L-asparaginase.
The cells will grow in soft agar.
Karyotype: Chromosome studies indicate a modal number of 63 with 3 distinct marker chromosomes and a small ring chromosome. This is a hypertriploid human cell line. The modal chromosome number was 61, occurring in 32% of cells. However, cells with 63 chromosomes also occurred at a high frequency (22%). The rate of cells with higher ploidies was 8.5%.
Note: Cytogenetic information is based on initial seed stock at ATCC. Cytogenetic instability has been reported in the literature for some cell lines.

Biosafety Level: 1

This cell line is not known to harbor an agent known to cause disease in healthy adult humans. Handle as a potentially biohazardous material under at least Biosafety Level 1 containment. This cell line has **NOT** been screened for Hepatitis B, human immunodeficiency viruses or other adventitious agents. Cell lines derived from primate lymphoid tissue may fall under the regulations of 29 CFR 1910.1030 Bloodborne Pathogens. ATCC recommends that appropriate safety procedures be used when handling all cell lines, especially those derived from human or other primate material. Detailed discussions of laboratory safety procedures are provided in **Laboratory Safety: Principles and Practice** (Fleming et al., 1995) the ATCC manual on quality control (Hay et al., 1992), the Journal of Tissue Culture Methods(Caputo, 1988), and in the U.S. Government Publication, ***Biosafety in Microbiological and Biomedical Laboratories***, 4th ed. HHS Publication No. (CDC) 93-8395. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Washington DC: U.S. Government Printing Office; 1999. The entire text is available online at www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm

Use Restrictions

These cells are distributed for research purposes only. ATCC recommends that individuals contemplating commercial use of any cell line first contact the originating investigator to negotiate an agreement. Third party distribution of this cell line is discouraged, since this practice has resulted in the unintentional spreading of cell lines contaminated with inappropriate animal cells or microbes.

Handling Procedure for Frozen Cells

To insure the highest level of viability, thaw the vial and initiate the culture as soon as possible upon receipt. If upon arrival, continued storage of the frozen culture is necessary, it should be stored in liquid nitrogen vapor phase and not at –70°C. Storage at –70°C will result in loss of viability.

SAFETY PRECAUTION: ATCC highly recommends that protective gloves and clothing always be used and a full face mask always be worn when handling frozen vials. *It is important to note that some vials leak when submersed in liquid nitrogen and will slowly fill with liquid nitrogen. Upon thawing, the conversion of the liquid nitrogen back to its gas phase may result in the vessel exploding or blowing off its cap with dangerous force creating flying debris.*

1. Thaw the vial by gentle agitation in a 37°C water bath. To reduce the possibility of contamination, keep the O-ring and cap out of the water. Thawing should be rapid (approximately 2 minutes).

2. Remove the vial from the water bath as soon as the contents are thawed, and decontaminate by dipping in or spraying with 70% ethanol. *All of the operations from this point on should be carried out under strict aseptic conditions.*

3. Transfer the vial contents to a centrifuge tube containing 9.0 ml complete culture medium and spin at approximately 125 xg for 5 to7 minutes.

4. Resuspend cell pellet with the recommended complete growth medium (see the specific batch information for the culture recommended dilution ratio) and dispense into a 25 cm^2 or a 75 cm^2 culture flask. *It is important to avoid excessive alkalinity of the medium during recovery of the cells. It is suggested that, prior to the addition of the vial contents, the culture vessel containing the complete growth medium be placed into the incubator for at least 15 minutes to allow the medium to reach its normal pH (7.0 to 7.6).*

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5. Incubate the culture at 37°C in a suitable incubator. A 5% CO_2 in air atmosphere is recommended if using the medium described on this product sheet.

Handling Procedure for Flask Cultures

The flask was seeded with cells (see specific batch information) grown and completely filled with medium at ATCC to prevent loss of cells during shipping.

1. Upon receipt visually examine the culture for macroscopic evidence of any microbial contamination. Using an inverted microscope (preferably equipped with phase-contrast optics), carefully check for any evidence of microbial contamination. Also check to determine if the majority of cells are still attached to the bottom of the flask; during shipping the cultures are sometimes handled roughly and many of the cells often detach and become suspended in the culture medium (but are still viable).

2. **If the cells are still attached,** aseptically remove all but 5 to 10 ml of the shipping medium. The shipping medium can be saved for reuse. Incubate the cells at 37°C in a 5% CO_2 in air atmosphere until they are ready to be subcultured.

3. **If the cells are not attached,** aseptically remove the entire contents of the flask and centrifuge at 125 xg for 5 to 10 minutes. Remove shipping medium and save. Resuspend the pelleted cells in 10 ml of this medium and add to 25 cm^2 flask. Incubate at 37°C in a 5% CO_2 in air atmosphere until cells are ready to be subcultured.

Subculturing Procedure

Volumes used in this protocol are for 75 cm2 flask; proportionally reduce or increase amount of dissociation medium for culture vessels of other sizes.

1. Remove and discard culture medium.

2. Briefly rinse the cell layer with 0.25% (w/v) Trypsin-053mM EDTA solution to remove all traces of serum which contains trypsin inhibitor.

3. Add 2.0 to 3.0 ml of Trypsin-EDTA solution to flask and observe cells under an inverted microscope until cell layer is dispersed (usually within 5 to 15 minutes).
Note: To avoid clumping do not agitate the cells by hitting or shaking the flask while waiting for the cells to detach. Cells that are difficult to detach may be placed at 37°C to facilitate dispersal.

4. Add 6.0 to 8.0 ml of complete growth medium and aspirate cells by gently pipetting.
5. Add appropriate aliquots of the cell suspension to new culture vessels.
Subcultivation Ratio: 1:2 to 1:4.

6. Incubate cultures at 37°C.

Note: For more information on enzymatic dissociation and subculturing of cell lines consult Chapter 10 in ***Culture of Animal Cells, a manual of Basic Technique*** by R. Ian Freshney, 3rd edition, published by Alan R. Liss, N.Y., 1994.

Medium Renewal

2 to 3 times weekly.

Complete Growth Medium

The base medium for this cell line is ATCC-formulated Dulbecco's Modified Eagle's Medium, Catalog No. 30-2002.
To make the complete growth medium, add the following components to the base medium:

- fetal bovine serum to a final concentration of 10%

This medium is formulated for use with a 5% CO_2 in air atmosphere. (Standard DMEM formulations contain 3.7 g/L sodium bicarbonate and a 10% CO_2 in air atmosphere is then recommended).
ATCC tested fetal bovine serum is available as ATCC Catalog No. 30-2020.

Cryoprotectant Medium

Complete growth medium described above supplemented with 5% (v/v) DMSO.

Cell culture tested DMSO is available as ATCC Catalog No. 4-X.

Additional Information

Additional product and technical information can be obtained from the catalog references and the ATCC Web site at www.atcc.org, or by e-mail at tech@atcc.org.

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(additional references are available in the catalog at www.atcc.org)

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GFSHR-17

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Rapid Paper

Establishment of steroidogenic granulosa cell lines expressing follicle stimulating hormone receptors

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Summary

Follicle stimulating hormone (FSH) plays an important role in the regulation of oogenesis, spermatogenesis and production of steroid hormones. Receptors to FSH, which are uniquely expressed in ovarian granulosa and testicular Sertoli cells, are rapidly lost in tissue culture conditions and upon cell transformation. We have succeeded, by triple transfection of primary rat granulosa cells with SV40 DNA, Ha-*ras* oncogene and an FSH receptor expression plasmid, to establish stable steroidogenic cell lines expressing FSH receptors. The cell lines respond to rat, ovine and bovine FSH, which stimulate progesterone production at levels comparable to primary granulosa cells obtained from preovulatory follicles. No steroidogenic response is detected upon stimulation with ovine luteinizing hormone or human chorionic gonadotropin. The steroidogenic response is accompanied by de novo appearance of adrenodoxin which serves as a marker for the mitochondrial steroidogenic enzyme system. These cells express approximately 27,000 receptors per cell with a K_d of 100–115 pM. This K_d is close to the value calculated for the native receptor. The ED_{50} for the steroidogenic response to ovine FSH is 200 pM, suggesting a tight coupling between receptor activation and the steroidogenic response. FSH induces pronounced morphological changes in the established cell lines, which are also characteristic of primary granulosa cells. These FSH responsive cell lines can serve as a useful model for the study of the structure and function of the FSH receptor and the effect of oncogenes on its expression.

Introduction

The gonadotropic glycoprotein hormones play a major role in controlling ovarian function. Follicle-stimulating hormone (FSH) stimulates the development of ovarian follicles and steroidogenesis, while luteinizing hormone (LH) initiates ovulation and luteinization (see reviews by Hsueh et al., 1984; Amsterdam and Rotmensch, 1987; Knobil and Hotchkiss, 1988). These two hormones, which are released from the anterior pituitary, exert their effects on ovarian cells via binding to specific membrane glycoprotein receptors, containing 7 transmembrane domains characteristic of G protein-coupled receptors, which exert their major effect by activation of the hormone stimulated adenylate cyclase (Johnson and Dhanasekaran, 1989; Loosfelt et al., 1989; McFarland et al., 1989; Sprengel et al., 1990). Interestingly, the gonadotropin receptors differ from other G protein-coupled receptors since they contain a large extracellular domain displaying amino terminal leucine rich sequence repeats which appear to form amphipathic peptide surfaces involved in protein-protein interaction. While the extracellular N-terminal region of the receptor is the site of high-affinity gonadotropin binding, low-affinity interactions with the ligand pocket formed by the seven transmembrane domains (assumed to occur following a conformational change in the receptor) is important for receptor activation and hence for G protein-coupled signal transduction (e.g. Braun et al., 1991).

The FSH receptor molecule (FSHR) and the gene coding for the receptor molecule are closely related to the LH receptor gene and its product, the LHR. These receptors display a 50% amino acid sequence similarity

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in their large extracellular domains and 80% identity across the seven trans-membrane segments (McFarland et al., 1989; Sprengel et al., 1990; Heckert et al., 1992). Nevertheless they are different in the size of the genes and the number of exons as well as in their polypeptide chain and in the glycosylation of the extracellular domain (McFarland et al., 1989; Sprengel et al., 1990; Heckert et al., 1992; Tilly et al., 1992). Moreover, FSH receptors are expressed at early stages of follicular development before the expression of LH receptors. Stimulation by FSH leads to the expression of LH receptors (Hsueh et al., 1984; Nimrod et al., 1977; Erickson et al., 1979).

In spite of the key role that FSHR plays in regulating the development and maturation of the ovarian follicle and thus controlling the reproductive cycle (for review see Hsueh et al., 1984; Amsterdam and Rotmensch, 1987; Richards and Hedin, 1988), very little is known about the signal transduction mechanisms by which FSH exerts its effects on growth and differentiation of granulosa cells in vivo.

Numerous efforts to study the mechanism of FSH action in primary cultures of granulosa cells revealed that although the major signal transduction mechanism of FSH is activation of the hormone sensitive adenylate cyclase (for example see Erickson et al., 1979; Richards and Hedin, 1988; Amsterdam et al., 1981; Knecht et al., 1981; Adashi and Resnick, 1984), other alternative mechanisms, such as mobilization of intracellular calcium may mediate FSH action (Flores et al., 1990, 1992; Grasso and Reichert, 1990; Grasso et al., 1991). Protein kinase C (PKC) was also implicated in modulation of FSH stimulation of adenylate cyclase (Nikula et al., 1990). Synergistic effects of FSH with steroid hormones, glucocorticoids and peptide growth factors were also observed in cultured granulosa cells, related to the effect of FSH on both growth and differentiation of these cells (Adashi et al., 1981; Amsterdam et al., 1988b). Nevertheless, the biochemical basis for such cross-talk between different signal transduction pathways has not yet been fully characterized.

The expression of FSHR is extremely sensitive to in vitro conditions and its life span in primary cultures is limited to a short period of 1–2 days. In fact, there are no stable steroidogenic cell lines derived from primary granulosa cells that express FSH receptor molecules. We have succeeded recently in establishing steroidogenic granulosa cell lines by cotransfection of primary cells with Simian virus 40 (SV40) DNA and Harvey-*ras* (Ha-*ras*) oncogene. These cells preserved their cAMP response to forskolin, but unfortunately lost their response to both FSH and LH (Amsterdam et al., 1984; Suh and Amsterdam, 1990). The establishment of the steroidogenic granulosa cell lines by oncogene transfection (Amsterdam et al., 1988a; Suh and Amsterdam, 1990), and the cloning of the gene coding for the FSHR (Sprengel et al., 1990; Minegish et al., 1991; Tilly et al., 1992) have opened the possibility of establishing steroidogenic cell lines which will be able to express the FSHR in transfected cells.

In this work we report that cotransfection of primary granulosa cells obtained from preovulatory follicles, by SV40 DNA, Ha-*ras* oncogene and an FSHR expression plasmid, yields cell lines which constitutively express FSHR. Moreover, in these cell lines, FSH can efficiently stimulate progesterone production at levels comparable to primary cells stimulated by gonadotropic hormone, and thus can serve as a useful model for the study of the molecular and the cellular events initiated by the interaction of FSH with its specific receptor.

Materials and methods

Reagents. Highly purified ovine (o)FSH for iodination (NIDDK-oFSH-I-1), and for cell stimulation (NIAMDD-oFSH-14), bovine (b) FSH (NIH-FSH-B1), rat (r) FSH (NIAMD-rFSH-B-1) and ovine LH (NIAMDD-oLH-23) were kindly provided by the National Institutes of Health, Bethesda, MD. Highly purified hCG-CR-123 was kindly provided by Dr. E. Canfield of Columbia University, NY. Anti-adrenodoxin antibody and anti-progesterone antibody were kindly provided by Drs. I. Hanukoglu and F. Kohen of the Department of Hormone Research, The Weizmann Institute of Science.

Plasmids. pSVBam contains the entire SV40 genome (Michalovitz et al., 1986). PEJ.6.6 encodes activated human Ha-*ras* oncogene (Shih and Weinberg, 1982). pSV-FSHR encodes the complete coding sequence for rat FSHR. For the construction of the SV40 promoter based expression plasmid pSV-FSHR, the cytomegalovirus promoter/enhancer region (approx. 700 bp) of pRFHSR-3 (Braun et al., 1991) was replaced by the SV40 promoter/enhancer region (approx. 400 bp) of pSV2neo (Clontech). The expression plasmid pSV-FSHR thus contains the entire coding region of the testicular rat FSHR cDNA as an *Eco*RI/*Bam*HI restriction fragment (nucleotides −71 to 2095) (Sprengel et al., 1990) downstream to the cytomegalovirus promoter/enhancer region of expression plasmid pRK5 (Schall et al., 1990).

Transfection of granulosa cells. Granulosa cells were isolated from 25-day old immature female rats, 48 h after injection with 15 IU pregnant mare serum gonadotropin (PMSG). The procedure for preparation of the cells has been described (Amsterdam et al., 1979).

Primary cultures on 100 mm dishes were transfected simultaneously with 2 μg of pSVBam, 5 μg pEJ6.6 and 5 μg of pSV-FSHR using the calcium phosphate precipitation procedure (Van der Eb and Graham, 1980).

Densely growing foci of transformed cells were visualized, selected and expanded into cell lines. The detailed procedures have been described previously (Amsterdam et al., 1988a; Suh and Amsterdam, 1990). Initial screening for lines expressing a functional FSHR was performed by stimulating the cells with FSH for 3 h and screening for cell rounding which occurs as a consequence of elevation of intracellular cAMP (Amsterdam et al., 1981; Knecht et al., 1981). The FSH responsive cell lines (named GFSHR lines) were further characterized by ^{125}I-FSH binding and cAMP and steroidogenic responses to FSH.

Cell cultures. Cells were maintained on Nunc Petri dishes (100 mm) containing 8 ml DMEM/F12 medium (1 : 1) supplemented with penicillin (100 U/ml), streptomycin (100 μg/ml) and 5% fetal calf serum (FCS). For biochemical assays, cells were cultured in medium containing 5% FCS for 24 h on 35 mm Nunc Petri dishes (0.5×10^6 cells/dish) or on Nunc 24-well plates (0.25×10^5 cells/well), and the medium was replaced by serum-free medium containing 100 nM dexamethasone (Dex) and the appropriate stimulant. In some experiments, stimulation of cells was performed in the presence of 5% FCS, either with or without dexamethasone, as indicated.

Steroid hormone, cAMP and protein assays. Progesterone, accumulating in the culture medium of granulosa cells, was determined by radioimmunoassay (RIA) (Suh and Amsterdam, 1990; Amsterdam et al., 1979; Erlanger et al., 1959; Kohen et al., 1975). Antiserum for progesterone was a generous gift of Dr. F. Kohen of the Department of Hormone Research, the Weizmann Institute. cAMP in the medium and in cells was measured by a protein binding method (Amsterdam et al., 1988a; Amsterdam et al., 1979; Gilman, 1970). Cells were cultured in DMEM/F12 containing 0.1 mM 3-isobutyl-1-methylxanthine (IBMX). For measurement of intracellular cyclic adenosine 3′-5′-monophosphate (cAMP), cells were washed twice with phosphate-buffered saline, pH 7.3 (PBS), lysed with 1 ml of 50 mM sodium acetate (pH 4.5) containing 0.1 mM IBMX, harvested into Eppendorf tubes using a rubber policeman, and heated for 10 min at 90°C. The cell debris was precipitated by centrifugation for 5 min ($12,000 \times g$), and cAMP in the supernatant was measured. Protein was determined by the Bradford method (Bradford, 1976). All measurements for each treatment were performed in triplicate.

Iodination procedure. Radioiodination of highly purified oFSH was carried out by the iodogen method (Fraker and Speck, 1978). Na^{125}I (0.5 mCi) was added to 10 μg of FSH in an iodogen-coated tube and reacted for 3 min on ice. Radiolabeled FSH (^{125}I-FSH) was eluted from a Sephadex G-50 column by 1% bovine serum albumin (BSA) in PBS (BSA-PBS). 1 ml fractions were collected into plastic test tubes (10×75 mm). The fraction containing most of the radiolabeled hormone ($1.5–1.9 \times 10^8$ CPM) was used for the binding assay. Specific activity of the radiolabeled ligand (^{125}I-FSH) was between 3×10^4 and 4×10^4 cpm/ng protein.

^{125}I-oFSH binding assay. FSHR expressed in GFSHR-17 cells was measured by a displacement binding assay using radiolabeled ligand. For displacement binding, a fixed amounts of ^{125}I-FSH (2.5×10^5 cpm) were used for binding to 2.5×10^6 cells in the presence of increasing concentrations of unlabeled FSH. Cells were removed from tissue culture plates by brief incubation (2 min) with calcium- and magnesium-free PBS containing 2 mM ethylene diamine tetra acetic acid (EDTA) pH 7.4. Medium was removed after 5 min centrifugation at $600 \times g$ and cells were resuspended in 0.1% BSA-PBS. Samples of cells (2.5×10^6 in 50 μl) were lysed at room temperature by adding 250 μl of 10 mM phosphate buffer, pH 7.4, containing 0.5% BSA and 0.5 mM phenylmethylsulfonylfluoride (PMSF) to inhibit any traces of proteolytic activity (lysis buffer) (Suh et al., 1992). Overnight incubation at 25°C of cell lysates with the hormone was carried out in a final volume of 0.30 ml, in Eppendorf tubes. Following incubation, bound and free ligand was separated by 5 min centrifugation in an Eppendorf centrifuge ($12,000 \times g$). The pellets containing the cell membranes were washed three times by resuspension and recentrifugation with the lysis buffer. Radioactivity in the cell pellets was measured in a γ-counter (LKB 1277 Gammamaster). Non-specific binding was measured in the presence of 24 nM of unlabelled oFSH ($\times$30–35-fold of the ^{125}I-FSH) and amounts to 16% of total binding. This value was subtracted from the total binding to obtain specific binding.

Phase contrast and immunofluorescence. Cultures were fixed with 2.5% glutaraldehyde in PBS and photographed at 400 $\times$ magnification using a Zeiss photomicroscope III, equipped with a water immersion lens. For immunofluorescence studies, cells were grown and stimulated on square coverglasses (22×22 mm) in the presence of 5% FCS. The presence of the serum was essential to avoid detachment of the cells during the fixation, staining and rinsing of the cultures. The cells were fixed and reacted first with an anti-adrenodoxin antibody and then with rhodamine-labeled second antibody (Hanukoglu et al., 1990). The specimens were visualized using a Zeiss photomicroscope III equipped with a vertical fluorescence illuminator.

Statistical analysis. Analysis of progesterone, cAMP and number of cells was performed using the *t*-test for comparison of means. Differences between treatment groups were considered statistically significant at $P < 0.05$.

Data in Figs. 2–6 were from representative experiments which were performed at least twice in different

cell preparations; n refers to replicates in individual experiments.

Results

Cotransfection of primary cultures of rat granulosa cells with SV40, Ha-*ras* and pSVFSHR yielded 57 distinct foci of growth that were expanded into cell lines, as described in Materials and Methods. The lines were tested for their response to 1.6 nM oFSH by their shape changes (rounding up) and production of progesterone during 48 h incubation with the hormone. Upon FSH stimulation, 8 lines were found to exhibit morphological changes, and showed at least 10-fold higher progesterone production than non-stimulated cells (20–400 ng progesterone/mg protein compared to 1–3 ng progesterone/mg protein, $n = 3$, $P < 0.001$). The average number of cells/mg protein was 4×10^6 cells. In this paper, we describe the characteristics of a cell line (GFSHR-17) that yields the highest FSH-stimulated progesterone production among the 8 responsive lines.

Morphological appearance of cells. Non-stimulated cells appeared as elongated clusters which very often seemed to be in contact by elongated cell processes. Considerable rounding of the cells was already evident 30–60 min after stimulation with 1.6 nM oFSH, while the cells remained in contact through their long cell processes. This morphological change includes more than 95% of the cell population and persists at least 12 h after the onset of stimulation (Fig. 1A and 1B).

Steroidogenic cellular response to gonadotropic hormones. Non-stimulated GFSHR-17 cells produced only traces of progesterone during 24 h incubation at 37°C, either in the presence or absence of 5% FCS (Fig. 2). When cells were stimulated with 1.6 nM FSH, the production of progesterone increased 15-fold in serum-free medium and 26-fold in the presence of 5% FCS ($n = 3$, $P < 0.001$). Addition of dexamethasone (100 nM) further increased progesterone production by approximately 4-fold, compared to cultures stimulated by FSH alone, in both serum-free and serum-containing medium ($n = 3$, $P < 0.001$). In contrast, dexamethasone did not exert any effect on progesterone production in non-stimulated cultures. When cells were stimulated with 50 μM forskolin in the presence or absence of serum, progesterone production was increased by 4–8-fold compared to cells stimulated by FSH alone ($n = 3$, $P < 0.001$). The synergistic effect of dexamethasone in forskolin-stimulated cells was similar to the effect that the glucocorticoid hormone exerted in FSH-stimulated cells.

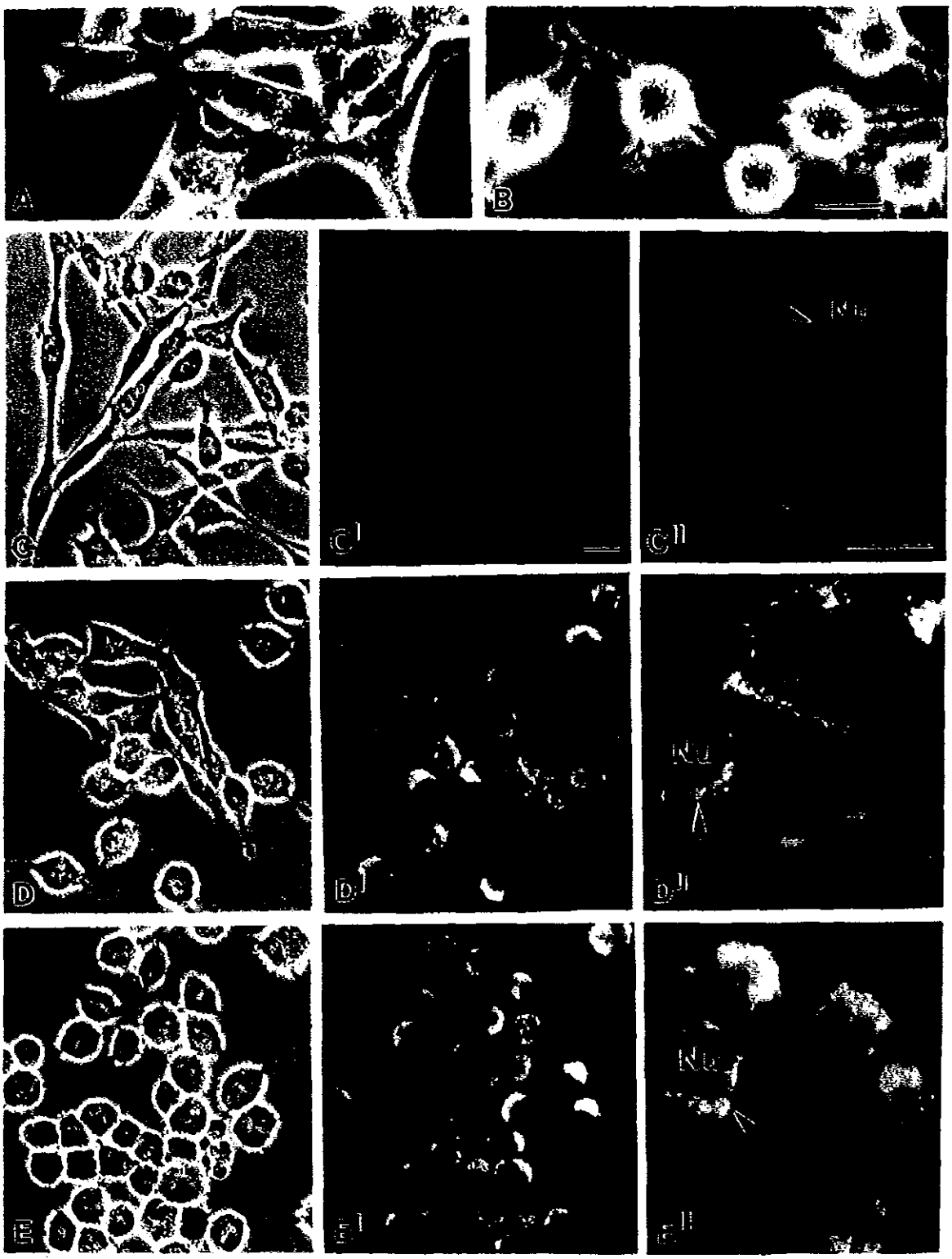
The specificity of the cellular response of GFSHR-17 to different gonadotropins were evaluated in comparison to primary preovulatory cells from which the line was derived (Fig. 3). GFSHR-17 cells and primary preovulatory cells (prepared according to Amsterdam et al., 1979) were stimulated with FSH from different species as well as by oLH and human chorionic gonadotropin (hCG) which specifically binds to LH receptors (for review see Amsterdam and Lindner, 1984).

In GFSHR-17 cells there was a clear stimulation by oFSH (88-fold), bFSH (248-fold) and rFSH (47-fold) compared to non-stimulated cells ($P < 0.001$; $n = 3$). Primary cells showed a similar pattern of progesterone production in response to the FSH from the different sources. No significant difference in progesterone levels between GFSHR-17 and primary cells was found following stimulation with either oFSH or rFSH ($P > 0.1$). Saturating doses of LH or hCG (1.6 nM) did not cause any significant rise in progesterone levels in GFSHR-17 line. In contrast, primary cells demonstrated, as expected, a clear response to oLH (4.2-fold; $P < 0.001$; $n = 3$) and hCG (4-fold; $P < 0.001$; $n = 3$). The inability of the transformed cells to respond to LH and hCG is probably due to the loss of endogenous gonadotropin receptors (Suh and Amsterdam, 1990; Amsterdam et al., 1992).

Characterization of FSH receptors. Binding of ^{125}I-FSH to cell membranes could be displaced in a dose-dependent manner by increasing concentrations of unlabeled FSH with an ED_{50} of 45 ± 5 pM (Fig. 4A). Scatchard analysis revealed high affinity binding sites to FSH (Fig. 4B). The K_d calculated for the high affinity binding sites was 107 ± 9 pM (mean $\pm$ SEM, $n = 4$) and the number of FSH receptors per cell was $27{,}000 \pm 2300$ (mean $\pm$ SEM, $n = 4$).

Dose and time dependence of FSH stimulated progesterone production. The intracellular level of cAMP in cells stimulated by a saturating dose of FSH (3.0 nM) increased by 20-fold within 30 min after onset of stimulation (16.3 pM/10^6 cells compared to 0.8 pM/10^6 cells; $n = 3$, $p < 0.001$). The elevated level of cAMP returned to non-stimulated levels after 3 h of stimulation (not shown) due to desensitization to the stimulant characteristic also of primary granulosa cells and transformed cells which express the LH receptors (Suh et al., 1992). When progesterone production was mea-

Fig. 1. Changes in morphology and immunostaining for adrenodoxin in GFSHR-17 cells following FSH stimulation. Phase contrast images of non-stimulated cells (A) and cells stimulated for 3 h with FSH (B). Cells stained for adrenodoxin were control cells (C', C") or cells treated, with either 1.6 nM oFSH (D', D") or 50 μM forskolin (E', E"). C, D, and E are phase contrast images of the identical areas of the cultures as in C', D' and E'. Individual mitochondria are visible in the high magnification images (arrowheads in C", D" and E"). Nuclei (Nu) remain unstained. Cell processes are marked by arrows (A–E). magnifications: A, B × 1200; C, D, E, C', D', E' × 500; C", D", E" × 1400. Bar represents 10 μM.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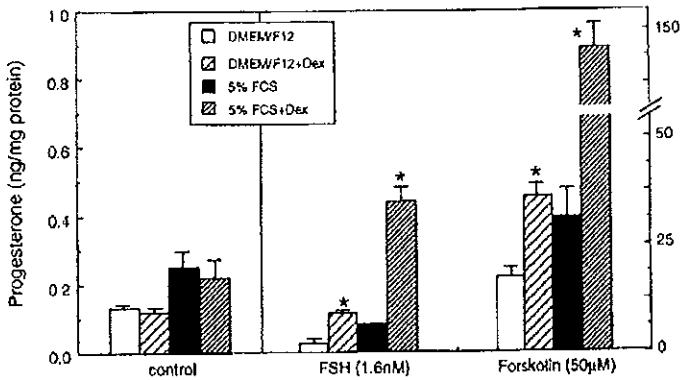

Fig. 2. Effect of dexamethasone and serum on progesterone production in GFSHR-17 cells. Cells (5×10^4) were incubated in DMEM:F12 medium in the presence or absence of 100 nM dexamethasone with or without 5% FCS, as indicated in the Fig. 2. 1.6 nM oFSH or 50 μM forskolin were added to the culture medium. After 24 h, progesterone and protein were assayed. Results were calculated as the means ± SEM in triplicate plates. Note different y axis scale for control and stimulated cells (FSH and forskolin). All FSH and forskolin stimulated cultures are significantly higher ($p < 0.001$) compared to the parallel non stimulated cultures (control). Dexamethasone significantly elevated progesterone production in stimulated cultures (* $p < 0.001$).

sured as a response to increasing concentrations of FSH in GFSHR-17 cells, a typical saturation curve was observed with an ED_{50} of 200 pM of FSH reaching a plateau at 0.4 nM FSH (Fig. 5A).

When the development of the steroidogenic response with time was analyzed, it was found that stimulation of progesterone production was only detected after 12 h or longer incubation with forskolin or FSH (Fig. 5B). After 48 h, the amount of progesterone production in forskolin-treated cells was 3 times higher than in FSH stimulated cells ($n = 3$, $P < 0.001$).

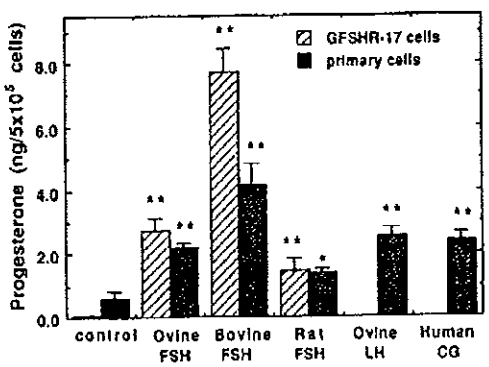

Fig. 3. Progesterone production in GFSHR-17 and primary cells stimulated by gonadotropins. GFSHR-17 cells and primary cultures obtained from PMSG treated immature rats (prepared according to Amsterdam et al., 1979) were stimulated for 48 h at 37°C. Data for each FSH hormone was obtained using concentration of 10^{-3} U//ml which was within the linear portion of dose response curve obtained for each gonadotropin at concentration range of 10^{-5}–10^{-2} U/m (not shown). LH and hCG concentration was 1.6 nM which is in the upper linear range of a dose response curve for these hormones (not shown). oLH and hCG did not cause any significant rise of progesterone production in GFSHR-17 cells above basal levels (< 0.02 ng/5×10^5 cells). Data are mean ± SEM ($n = 3$) Stimulated cultures are significantly higher than controls * $p < 0.01$; ** $p < 0.001$.

The number of cells was determined during the 48 h period of incubation of the cells at 37° in a serum-free medium with no added hormone or in the presence of 1.6 nM FSH or 50 μM forskolin (Fig. 6). The rate of growth was found to be inversely related to proges-

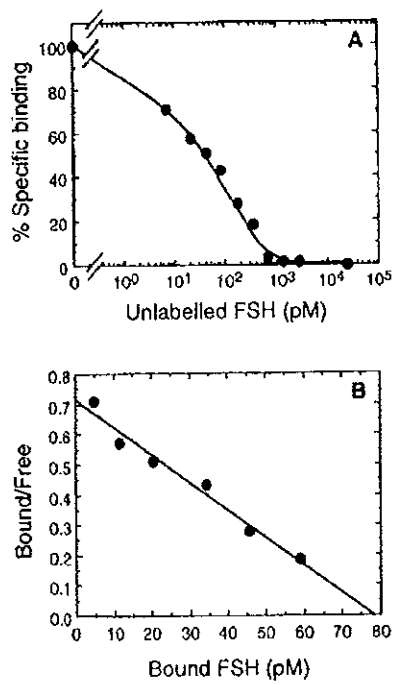

Fig. 4. Characterization of oFSH binding to GFSHR-17 cells. (A) Displacement of ^{125}I-oFSH binding by increasing concentrations of unlabeled hormone. Data are plotted following subtraction of non-specific binding (see Materials and methods). (B) Scatchard plot of ^{125}I-oFSH calculated from the displacement curve in A. Data are means of duplicate assays. Deviation from the mean did not exceed 7%.

terone production. In non-stimulated cultures the number of cells after 48 h increased 4.2-fold, compared to zero time, whereas in FSH and forskolin-stimulated cultures it increased only 3.3- and 2.4-fold respectively.

Adrenodoxin appearance in FSH stimulated cells. In order to examine whether FSH stimulated progesterone production is due to de novo synthesis of the mitochondrial steroidogenic enzymes, cells were immunostained for adrenodoxin, 24 h (Fig. 1) and 48 h (not shown) after onset of the FSH stimulation using specific antiserum to this enzyme and the indirect immunofluorescence technique. Location of intensive staining in mitochondria was evident both after 24 and 48 h of stimulation, leaving the nuclei of the cells unstained (Fig. 1D). In non-stimulated cells, only weak staining of mitochondria was evident (Fig. 1C). Cells stained after stimulation with 50 μM forskolin showed even more intense mitochondrial staining, than FSH-stimulated cells (Fig. 1E).

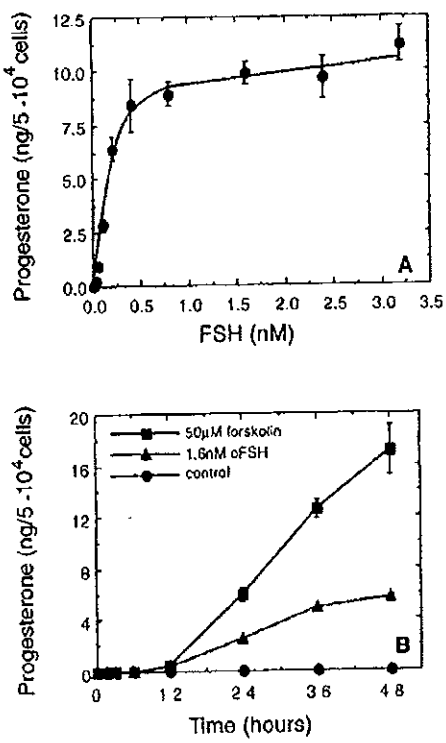

Fig. 5. Dose and time response for stimulation by oFSH of progesterone production by GFSHR-17 cells. (A) Cells (5×10^4) were incubated for 48 h at 37°C in the presence of increasing concentration of oFSH and progesterone was assayed in triplicate. Values in nonstimulated cells were < 4.0 pg. (B) Cells (5×10^4) were incubated ($1\frac{1}{2}$–48 h) with no added hormone or in the presence of 1.6 nM oFSH or 50 μM forskolin. Progesterone values are means ± SEM ($n = 3$). Progesterone values of all stimulated cultures in A and at 24 h–48 h in B are significantly higher compared to non stimulated cells ($p < 0.001$).

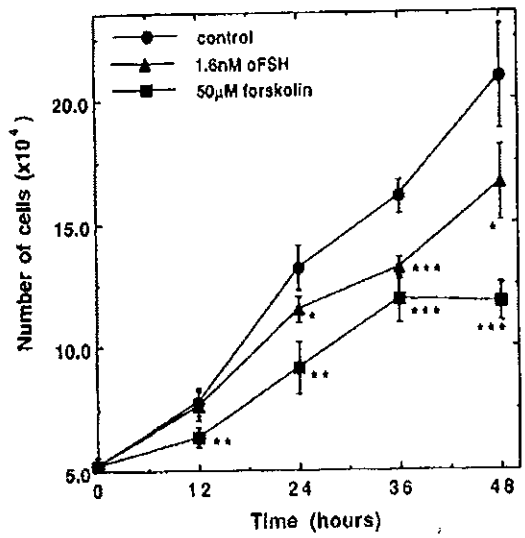

Fig. 6. GFSHR-17 growth in the presence of oFSH and forskolin. Cells (10^5) were incubated with no added hormone or in the presence of 1.6 nM oFSH or 50 μM forskolin. The number of cells at 12, 24, 36 and 48 h after onset of stimulation was counted twice on quintuplicate plates. Data are means ± SEM ($n = 5$). * $p < 0.01$; ** $p < 0.05$; *** $p < 0.001$ compared to control at the same time point.

Discussion

In this work, we succeeded in establishing oncogene-transformed granulosa cell lines that express constitutively FSH receptors. This could be achieved only if the cells, which had lost the expression of the native receptors (see below), were transfected with a plasmid DNA coding for the receptor molecule which was expressed under control of the SV40 early promoter. The loss of expression of the native FSH receptor was demonstrated in our early studies by lack of response to gonadotropins in established cell lines transfected with SV40 DNA and the Ha-*ras* oncogene alone (Amsterdam et al., 1988a; Suh and Amsterdam, 1990). In fact, no permanent steroidogenic cell line derived from granulosa cells expressing the FSH receptors had been characterized until the present work.

The introduction of the plasmid coding for the FSHR receptor into a steroidogenic cell allows us to examine characteristics of the newly synthesized receptor molecules and their ability to transduce signals which lead to stimulation of steroidogenesis. We found that the transfection of the cells with SV40 DNA and the Ha-*ras* oncogene did not interfere with the signal transduction mechanism leading to enhancement of steroidogenesis by FSH (Figs. 2, 3, 5). Moreover, the specific response to oFSH, bFSH and rFSH demonstrate a characteristic pattern which was similar to primary granulosa expressing the native receptors (Fig. 3). The extremely low basal levels of progesterone production in GFSHR-17 compared to primary granu-

losa cells is probably due to almost complete loss of the steroidogenic enzymes upon transformation. These enzymes are dramatically upregulated upon stimulation (see also Hanukoglu et al., 1990; Suh et al., 1992). Thus, the magnitude of stimulation of steroidogenesis in the newly established cells is even higher than in primary cells.

The synergistic effect of a glucocorticoid hormone, dexamethasone, on progesterone production induced by FSH, characterized in primary cultures (Adashi et al., 1981), was completely preserved in our cell line (Fig. 2). This synergistic effect, which is also characteristic of forskolin-stimulated transfected cells bearing or lacking the FSH receptor (Plehn-Dujowich et al., 1991) may be accomplished by the modulation of the glucocorticoid receptor function by protein kinase A (Rangarajan et al., 1992).

From Scatchard analysis of ^{125}I-FSH binding to the new lines (Fig. 4), we calculated that the high affinity binding sites for FSH have a K_d value of 100–115 pM. This value falls in the range of K_d values calculated for the native receptor molecules in rat granulosa cells obtained from different stages of follicular development (32–180 pM, Nimrod et al., 1976). A similar range of K_d was also found for ovarian and testicular tissue in other mammals using FSH from different sources (Combarnous et al., 1978; Zhang et al., 1991; Xiao et al., 1992; Yarney et al., 1990). In contrast to the affinity, we found that FSH receptor density on the transformed cells was 15–20 times higher than on primary granulosa cells (800–1500/cell Nimrod et al., 1976). Nevertheless, the steroidogenic response to FSH was about 50% lower than to forskolin, known to elevate intracellular cAMP levels in these and other cells (Seamon and Daly, 1986). This suggests that the cellular response to gonadotropic hormone may not be mediated exclusively via activation of adenylate cyclase and that the receptor molecule might be coupled to additional G inhibitory proteins interacting with other signalling pathways in the cells such as protein kinase C mediated processes. Indeed, the phorbol ester 12-*O*-tetradecanoylphorbol 13-acetate (TPA) which activate PKC was recently found to decrease the cAMP response to FSH in nontransformed granulosa cells (Nikula et al., 1990). Thus the oncogene transformed cell system can lend itself to a more detailed analysis of alternative pathways associated with FSH stimulation.

The steroidogenic response to FSH in the newly established cell lines was found to have an ED_{50} of 200 pM, which is comparable to the K_d value calculated for FSH-binding to GFSHR-17 cells. A similar ED_{50} value was found for oFSH stimulated steroidogenesis in primary rat granulosa cells (380 pM, Adashi and Resnick, 1984). This further supports the view that coupling between FSH stimulation and steroidogenesis remains intact in the oncogene transformed cells.

The kinetics of the steroidogenic response to FSH is different in the oncogene transformed cells compared to primary granulosa cells. While in primary cells, stimulation of progesterone was evident already after 3 and 6 h (Adashi and Resnick, 1984; Suh and Amsterdam, 1990), in the transformed cells it was not evident before 12 h (Fig. 5). These differences are probably due to de novo synthesis of the steroidogenic enzymes whose levels in nonstimulated cells were low, as can be judged from the immunostaining of adrenodoxin (Fig. 1) and from our previous studies in recently established lines established by cotransfection with SV40 DNA, Ha-*ras* oncogene and LHR expression plasmid (Suh et al., 1992). A substantial appearance of adrenodoxin 24 and 48 h after stimulation confirms the de novo synthesis of this electron carrier protein. This induction of adrenodoxin synthesis is most likely accompanied by de novo synthesis of adrenodoxin reductase and the cytochrome P450 side chain enzyme as was demonstrated previously in SV40 and Ha-*ras*-transformed cells stimulated by substances which elevate intracellular cAMP levels (Hanukoglu et al., 1990).

The lag period in the steroidogenic response is also characteristic of forskolin stimulation in SV40 and Ha-*ras*-transfected cells (Suh and Amsterdam, 1990), as well as of hCG stimulation in the LH/hCG responsive cell lines (Suh et al., 1992). Staining of all stimulated cells for adrenodoxin in FSH responsive cell lines is also a good indication of the homogeneity of the cell lines (Fig. 1).

An inverse relationship between growth, and differentiation stimulated by FSH or forskolin, was evident in the FSH responsive cell line (Figs. 5 and 6). This is not surprising in view of similar relationships in SV40-Ha-*ras*-transformed cells lacking or expressing LH receptors (Amsterdam et al., 1988a; Suh and Amsterdam, 1990; Suh et al., 1992). However, in this study cells were derived from preovulatory follicles that show a high degree of maturation. It is still unknown, whether transfection of cells obtained from earlier stages of follicular development, would yield cell lines in which FSH would be able to stimulate cell growth, as is believed to occur in undifferentiated normal granulosa cells of preantral follicles (for review see Richards and Hedin, 1988).

Comparing the signal transduction mechanisms associated with FSH and LH stimulation revealed interesting differences: (i) FSH receptors appear earlier in follicular development than do LH receptors and in fact FSH, in synergism with oestradiol, serves as the major physiological trigger for the expression of LH receptors (for review see Richards and Hedin, 1988). (ii) While stimulation of FSH receptors is associated with both growth and differentiation of granulosa cells, depending on the maturity of the cells, LH action always involves enhanced steroidogenesis associated

with depression of growth. (iii) While the LH response includes opening of calcium channels (Davis et al., 1987; Gudermann et al 1992) FSH does not seem to elicit such a phenomenon (Shibata et al., 1992), although modulation of calcium fluxes in FSH stimulated Sertoli cells was recently suggested (Grasso and Reichert, 1990; Grasso et al., 1991). Unfortunately, the cellular function of the two related gonadotropin receptors is complicated to compare, especially in early stages of follicular development, mainly because the receptors for these hormones appear at different stages of granulosa cell maturation. Recently, the cellular response to the two related gonadotropins (FSH and LH) was compared in human granulosa cells and it was found that cAMP can mediate divergent gonadotropic effects on growth and differentiation of these cells (Yong et al., 1992). Since we have established lines expressing either LH (Suh et al., 1992) or FSH receptors (the present work) which are derived from cells at an identical stage of maturation, that express exclusively either LH or FSH receptors, we can now compare the LH and FSH signalling in homologous cell systems. Cotransfection of granulosa cells obtained from selected stages of maturation with plasmids expressing both LH and FSH receptors or a chimeric receptor is also not beyond reach.

Upon completion of this work it was reported that the human FSHR gene was successfully introduced into mouse adrenal tumor Y-1 cell lines whose parental adrenal cells do not express the gonadotropin receptor (Kelton et al., 1992). In contrast, the newly established cell lines, characterized in this work, display a more physiological model since they were derived from primary granulosa steroidogenic cells which naturally express the FSHR.

It is hoped that this novel cell system can provide a valuable tool for the investigation of the regulation of the FSHR and the signal transduction mechanisms leading to growth and differentiation evoked by such a stimulus. Since FSH also affects the expression of cellular oncogenes such as c-*fos*, c-*jun*, *Jun* B and c-*myc* (Hall et al., 1991; Pennybacker and Herman, 1991), it is hoped that this system will lend itself to a detailed analysis of the role of such oncogenes and other transcription factors in modulation of the expression and the function of the FSH receptors.

Acknowledgement

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(+)
T7
Nhe I
Pme I
Afl II
Hind III
Asp718 I
Kpn I
BamH I
BstX I
EcoR I
EcoR V
BstX I
Not I
Xho I
Xba I
Apa I
Pme I
(-)
T7
Nhe I
Pme I
Apa I
Xba I
Xho I
Not I
BstX I
EcoR V
EcoR I
BstX I
BamH I
Asp718 I
Kpn I
Hind III
Afl II
Pme I
PCMV
BGH pA
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SV40 ori
Neomycin
SV40 pA
ColE1
Ampicillin
pcDNA3.1 (+/-)
5.4 kb
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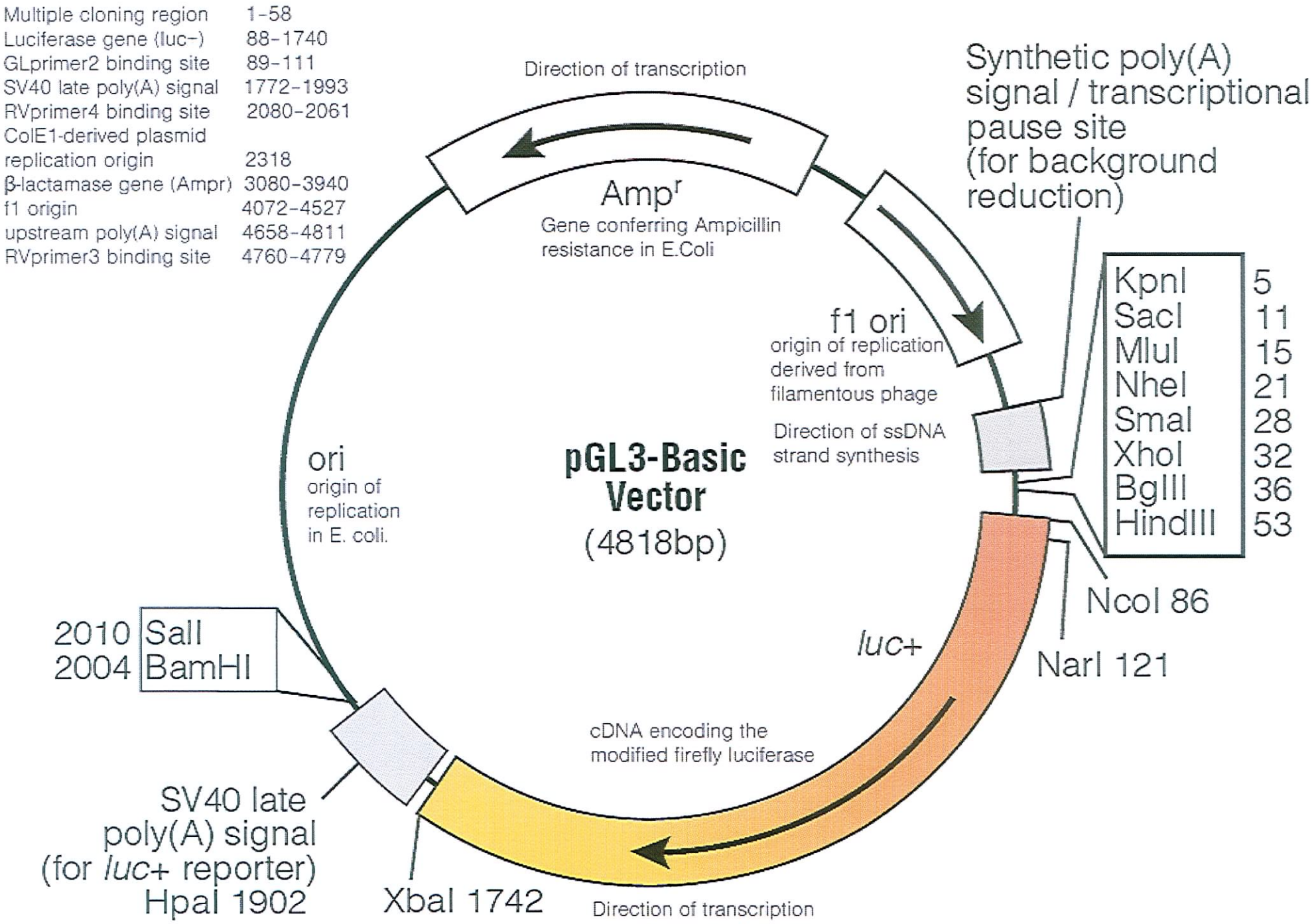
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GLprimer2 binding site 89-111
SV40 late poly(A) signal 1772-1993
RVprimer4 binding site 2080-2061
ColE1-derived plasmid replication origin 2318
β-lactamase gene (Ampr) 3080-3940
f1 origin 4072-4527
upstream poly(A) signal 4658-4811
RVprimer3 binding site 4760-4779
Direction of transcription
Ampr
Gene conferring Ampicillin resistance in E.Coli
Synthetic poly(A) signal / transcriptional pause site (for background reduction)
f1 ori
origin of replication derived from filamentous phage
Direction of ssDNA strand synthesis
KpnI 5
SacI 11
MluI 15
NheI 21
SmaI 28
XhoI 32
BglII 36
HindIII 53
NcoI 86
NarI 121
luc+
cDNA encoding the modified firefly luciferase
pGL3-Basic Vector
(4818bp)
ori
origin of replication in E. coli.
2010 SalI
2004 BamHI
SV40 late poly(A) signal (for luc+ reporter)
HpaI 1902
XbaI 1742
Direction of transcription

Western

TOXIN USE RISK ASSESSMENT

Name of Toxin:	Follicle stimulating hormone (FSH)
Proposed Use Dose:	100 µg
Proposed Storage Dose:	100 µg
LD_{50} (species):	120000 µg

Calculation:

120000 µg/kg x 50 kg/person

Dose per person based on LD_{50} in µg = 6000000

LD_{50} per person with safety factor of 10 based on LD_{50} in µg = 600000

Comments/Recommendations:

Western

TOXIN USE RISK ASSESSMENT

Name of Toxin:	Luteinizing hormone (LH)
Proposed Use Dose:	100 µg
Proposed Storage Dose:	100 µg
LD_{50} (species):	25 µg

Calculation:

25 µg/kg x 50 kg/person

Dose per person based on LD_{50} in µg = 1250

LD_{50} per person with safety factor of 10 based on LD_{50} in µg = 125

Comments/Recommendations:

Canadian Centre for Occupational Health and Safety

CCOHS

RTECS Registry of Toxic Effects of Chemical Substances®

Data source: Accelrys, Inc.

Record Contents

Format: All Sections

- [x] Chemical Identification
- [x] Acute Toxicity Data
- [x] Other Multiple Dose Toxicity Data
- [x] Reproductive Data

REFRESH RECORD

RTECS Number	OK6367000
Chemical Name	Luteinizing hormone
CAS Registry Number	9002-67-9
Last Updated	200808
Data Items Cited	10
Compound Descriptor	Reproductive Effector Hormone

Synonyms/Trade Names

ICSH
Interstitial cell stimulating hormone
LH
Luteinizing gonadotropic hormone
Luteotropic hormone
Luteotropin
Luteoziman
Lutropin
Niaddk o-LH-24
NIH-LH-B 9
Pituitary luteinizing hormone
PLH

Type of Test	Route of Exposure	Species Observed	Dose Data	Toxic Effects	Reference
TDLo - Lowest published toxic dose	Parenteral	Rodent - rat	208.33 units/kg	Reproductive - Maternal Effects - oogenesis	REPRO* Reproduction : the official journal of the Society for the Study of Fertility (Bristol, UK : Published for the Society for Reproduction and Fertility by BioScientifica, <2004->) V.121-2001- Volume(issue)/page/year: 127,483,2004

Type of Test	Route of Exposure	Species Observed	Dose Data	Toxic Effects	Reference
TDLo - Lowest published toxic dose	Intramuscular	Rodent - rat	1740 ug/kg/2D (intermittent)	Reproductive - Maternal Effects - ovaries, fallopian tubes Biochemical - Enzyme inhibition, induction, or change in blood or tissue levels - cytochrome oxidases (including oxidative phosphorylation)	CBINA8 Chemico-Biological Interactions. (Elsevier Scientific Pub. Ireland Ltd., POB 85, Limerick, Ireland) V.1-1969- Volume(issue)/page/year: 63,15,1987

Type of Test	Route of Exposure	Species Observed	Dose Data	Sex/Duration	Toxic Effects	Reference
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	500 ug/kg	female 12 day(s) after conception	Reproductive - Maternal Effects - parturition	ENDOAO Endocrinology (Baltimore). (Williams & Wilkins Co., 428 E. Preston St., Baltimore, MD 21203) V.1- 1917- Volume(issue)/page/year: 86,874,1970
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	1375 ug/kg	female 12-22 day(s) after conception	Reproductive - Effects on Newborn - stillbirth	ENDOAO Endocrinology (Baltimore). (Williams & Wilkins Co., 428 E. Preston St., Baltimore, MD 21203) V.1- 1917- Volume(issue)/page/year: 86,874,1970
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	1 gm/kg	female 8 day(s) after conception	Reproductive - Maternal Effects - ovaries, fallopian tubes Reproductive - Fertility - abortion	PSEBAA Proceedings of the Society for Experimental Biology and Medicine. (Academic Press, Inc., 1 E. First St., Duluth, MN 55802) V.1-1903/04- Volume(issue)/page/year: 147,823,1974

TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	219 ug/kg	female 13-16 day(s) after conception	Reproductive - Maternal Effects - other effects	JRPFA4 Journal of Reproduction and Fertility. (Biochemical Soc. Book Depot, POB 32, Commerce Way, Colchester, Essex CO2 8HP, UK) V.1- 1960- Volume(issue)/page/year: 85,51,1989
TDLo - Lowest published toxic dose	Parenteral	Rodent - rat	12 gm/kg	male 6 day(s) pre-mating	Reproductive - Paternal Effects - prostate, seminal vesicle, Cowper's gland, accessory glands	ANREAK Anatomical Record. (Alan R. Liss, Inc., 41 E. 11th St., New York, NY 10003) V.1- 1906/08- Volume(issue)/page/year: 65,261,1936
TDLo - Lowest published toxic dose	Intravenous	Rodent - rabbit	25 ug/kg	female 11 day(s) after conception	Reproductive - Fertility - other measures of fertility	JRPFA4 Journal of Reproduction and Fertility. (Biochemical Soc. Book Depot, POB 32, Commerce Way, Colchester, Essex CO2 8HP, UK) V.1- 1960- Volume(issue)/page/year: 17,183,1968
TDLo - Lowest published toxic dose	Intravenous	Rodent - rabbit	25 ug/kg	female 9 day(s) after conception	Reproductive - Fertility - litter size (e.g. # fetuses per litter; measured before birth)	ENDOAO Endocrinology (Baltimore). (Williams & Wilkins Co., 428 E. Preston St., Baltimore, MD 21203) V.1- 1917- Volume(issue)/page/year: 77,337,1965

RTECS® is provided quarterly by Accelrys, Inc., and was last updated: **July, 2010**.

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Western

TOXIN USE RISK ASSESSMENT

Name of Toxin:	17beta-estradiol
Proposed Use Dose:	50000 µg
Proposed Storage Dose:	5000 µg
LD_{50} (species):	1 µg

Calculation:

1 µg/kg x 50 kg/person

Dose per person based on LD_{50} in µg = 50

~~LD_{50}~~ **per person with safety factor of 10 based on LD_{50} in µg =** *5*

TD_{LO}

Comments/Recommendations:

Proposed use and storage amounts are over the calculated LD_{50}.

* This was approved by Biohazards Subcommitted. TD_{LO} used (not LD_{50})

Canadian Centre for Occupational Health and Safety

CCOHS

RTECS Registry of Toxic Effects of Chemical Substances®

Data source: Accelrys, Inc.

Record Contents

Format: All Sections

- [x] Chemical Identification
- [x] Acute Toxicity Data
- [x] Other Multiple Dose Toxicity Data
- [x] Tumorigenic Data
- [x] Reproductive Data
- [x] Mutation Data
- [x] Reviews
- [x] Status in U.S.

REFRESH RECORD

RTECS Number	KG2975000
Chemical Name	Estradiol
CAS Registry Number	50-28-2
Last Updated	201007
Data Items Cited	411
Molecular Formula	C18-H24-O2
Molecular Weight	272.42
Wiswesser Line Notation	L E5 B666TTT&J E1 FQ OQ
Compound Descriptor	Tumorigen Drug Hormone Mutagen Natural Product Human Reproductive Effector

Synonyms/Trade Names

1,3,5-Estratriene-3,17-beta-diol
17-beta-Estra-1,3,5(10)-triene-3,17-diol
17-beta-Estradiol
17-beta-OH-estradiol
17-beta-OH-oestradiol
17-beta-Oestra-1,3,5(10)-triene-3,17-diol
17-beta-Oestradiol
3,17-Epidihydroxyestratriene
3,17-beta-Dihydroxy-1,3,5(10)-estratriene
3,17-beta-Dihydroxy-1,3,5(10)-oestratriene
3,17-beta-Dihydroxyestra-1,3,5(10)-triene

3,17-beta-Dihydroxyoestra-1,3,5-triene
3,17-beta-Estradiol
3,17-beta-Oestradiol
Altrad
Bardiol
D-3,17-beta-Estradiol
D-3,17-beta-Oestradiol
Dihydrofollicular hormone
Dihydrofolliculin
Dihydromenformon
Dihydrotheelin
Dihydroxyestrin
Dihydroxyoestrin
Dimenformon
Dimenformon prolongatum
Diogyn
Diogynets
E(sub 2)
Estra-1,3,5(10)-triene-3,17-beta-diol
Estraderm TTS
Estradiol-17-beta
Estraldine
Estrovite
Femestral
Femogen
Gynergon
Gynestrel
Gynoestryl
Lamdiol
Macrodiol
Macrol
Microdiol
NSC-9895
Nordicol
Oestergon
Oestra-1,3,5(10)-triene-3,17-beta-diol
Oestradiol
Oestradiol R
Oestradiol-17-beta
Oestroglandol
Oestrogynal
Ovahormon
Ovasterol
Ovastevol
Ovociclina
Ovocyclin
Ovocycline
Ovocylin
Primofol
Profoliol
Progynon
Progynon-DH
Syndiol
Theelin, dihydro-
alpha-Estradiol
alpha-Oestradiol
beta-Estradiol
beta-Oestradiol
cis-Estradiol
cis-Oestradiol
d-Estradiol
d-Oestradiol

Type of Test	Route of Exposure	Species Observed	Dose Data	Toxic Effects	Reference
LD - Lethal dose	Subcutaneous	Rodent - rat	>300 mg/kg	Details of toxic effects not reported other than lethal dose value	IYKEDH Iyakuhin Kenkyu. Study of Medical Supplies. (Nippon Koteisho Kyokai, 12-15, 2-chome, Shibuya, Shibuya-ku, Tokyo 150, Japan) V.1- 1970- Volume(issue)/page/year: 26,740,1995
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	10 ug/kg	Related to Chronic Data - changes in uterine weight	TXAPA9 Toxicology and Applied Pharmacology. (Academic Press, Inc., 1 E. First St., Duluth, MN 55802) V.1- 1959- Volume(issue)/page/year: 133,313,1995
TDLo - Lowest published toxic dose	Intraperitoneal	Rodent - rat	150 ug/kg	Related to Chronic Data - changes in uterine weight	TXAPA9 Toxicology and Applied Pharmacology. (Academic Press, Inc., 1 E. First St., Duluth, MN 55802) V.1- 1959- Volume(issue)/page/year: 14,358,1969
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - mouse	1090 ng/kg	Vascular - other changes Endocrine - estrogenic	JRPFA4 Journal of Reproduction and Fertility. (Biochemical Soc. Book Depot, POB 32, Commerce Way, Colchester, Essex CO2 8HP, UK) V.1- 1960- Volume(issue)/page/year: 123,235,2002
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - mouse	400 mg/kg	Behavioral - fluid intake Biochemical - Metabolism (Intermediary) - other proteins Related to Chronic Data - changes in uterine weight	TOXID9 Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH 44311) V.1- 1981- Volume(issue)/page/year: 72,12,2003
TDLo - Lowest published toxic dose	Intraperitoneal	Rodent - rat	100 ug/kg	Reproductive - Maternal Effects - uterus, cervix, vagina Biochemical - Enzyme inhibition, induction, or change in blood or tissue levels - other oxidoreductases Related to Chronic Data - changes in uterine weight	BCPCA6 Biochemical Pharmacology. (Pergamon Press Inc., Maxwell House, Fairview Park, Elmsford, NY 10523) V.1- 1958- Volume(issue)/page/year: 39,485,1990
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	50 ug/kg	Reproductive - Maternal Effects - uterus, cervix, vagina Related to Chronic Data - changes in uterine weight	JOENAK Journal of Endocrinology. (Biochemical Soc. Book Depot, POB 32, Commerce Way, Colchester, Essex CO2 8HP, UK) V.1- 1939- Volume(issue)/page/year: 85,291,1980
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	5 ug/kg	Reproductive - Maternal Effects - oogenesis Reproductive - Maternal Effects - ovaries, fallopian tubes Biochemical - Metabolism (Intermediary) - other proteins	BIREBV Biology of Reproduction. (Soc. for the Study of Reproduction, 309 W. Clark St., Champaign, IL 61820) V.1- 1969- Volume(issue)/page/year: 65,1232,2001
TDLo - Lowest published toxic dose	Intraperitoneal	Non-mammalian species	2.5 mg/kg	Blood - changes in serum composition (e.g. TP, bilirubin, cholesterol)	TOXID9 Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH 44311) V.1- 1981- Volume(issue)/page/year: 72,192,2003
TDLo - Lowest published	Subcutaneous	Rodent - mouse	1 ug/kg	Reproductive - Maternal Effects - uterus, cervix, vagina	TOXID9 Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH

toxic dose					44311) V.1- 1981- Volume(issue)/page/year: 72,134,2003
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - mouse	10 ug/kg	Reproductive - Maternal Effects - ovaries, fallopian tubes	TOXID9 Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH 44311) V.1- 1981- Volume(issue)/page/year: 72,135,2003
TDLo - Lowest published toxic dose	Intraperitoneal	Rodent - mouse	1.5 ug/kg	Reproductive - Maternal Effects - uterus, cervix, vagina Biochemical - Metabolism (Intermediary) - effect on cyclic nucleotides Biochemical - Metabolism (Intermediary) - effect on inflammation or mediation of inflammation	TOSCF2 Toxicological Sciences (Oxford University Press, 6277 Sea Harbor Drive, Orlando, FL 32887) V. 41, Jan. 1998- Volume(issue)/page/year: 66,62,2002
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	10 ug/kg	Behavioral - changes in motor activity (specific assay) Behavioral - changes in psychophysiological tests	PSCHDL Psychopharmacology (Berlin). (Springer-Verlag New York, Inc., Service Center, 44 Hartz Way, Secaucus, NJ 07094) V.47- 1976- Volume(issue)/page/year: 173,139,2004
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - mouse	1 ug/kg	Related to Chronic Data - changes in uterine weight Biochemical - Metabolism (Intermediary) - other proteins	TOLED5 Toxicology Letters. (Elsevier Science Pub. B.V., POB 211, 1000 AE Amsterdam, Netherlands) V.1- 1977- Volume(issue)/page/year: 144,257,2003
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	25 ug/kg	Behavioral - changes in psychophysiological tests	NEROEW Neuropsychopharmacology. (Elsevier Science, 655 Avenue of the Americas, New York, NY 10010) V.1- 1987- Volume(issue)/page/year: 28,830,2003
TDLo - Lowest published toxic dose	Intraperitoneal	Rodent - rat	1 mg/kg	Sense Organs and Special Senses (Eye) - retinal changes (pigmentary depositions, retinitis, other) Biochemical - Metabolism (Intermediary) - other	EJPHAZ European Journal of Pharmacology. (Elsevier Science Pub. B.V., POB 211, 1000 AE Amsterdam, Netherlands) V.1- 1967- Volume(issue)/page/year: 498,111,2004
TDLo - Lowest published toxic dose	Implant	Rodent - rat	5 mg/kg	Liver - other changes Biochemical - Enzyme inhibition, induction, or change in blood or tissue levels - multiple enzyme effects	TXCYAC Toxicology. (Elsevier Scientific Pub. Ireland, Ltd., POB 85, Limerick, Ireland) V.1- 1973- Volume(issue)/page/year: 200,103,2004
TDLo - Lowest published toxic dose	Intraperitoneal	Rodent - mouse	50 ug/kg	Liver - other changes Endocrine - estrogenic Biochemical - Enzyme inhibition, induction, or change in blood or tissue levels - other oxidoreductases	TXAPA9 Toxicology and Applied Pharmacology. (Academic Press, Inc., 1 E. First St., Duluth, MN 55802) V.1- 1959- Volume(issue)/page/year: 201,137,2004
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - mouse	400 mg/kg	Related to Chronic Data - changes in uterine weight	TOXID9 Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH 44311) V.1- 1981- Volume(issue)/page/year: 72(Supp 1),12,2003
TDLo - Lowest published toxic	Implant	Rodent - rat	5 mg/kg	Liver - changes in liver weight Endocrine - changes in pituitary weight	TOXID9 Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH 44311) V.1- 1981-

dose					Volume(issue)/page/year: 66,184,2002
TDLo - Lowest published toxic dose	Implant	Rodent - rat	15 mg/kg	Reproductive - Tumorigenic effects - other reproductive system tumors Tumorigenic - increased incidence of tumors in susceptible strains	TOXID9 Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH 44311) V.1- 1981- Volume(issue)/page/year: 66,184,2002
TDLo - Lowest published toxic dose	Parenteral	Non-mammalian species	5 mg/kg	Liver - other changes	TOXID9 Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH 44311) V.1- 1981- Volume(issue)/page/year: 60,35,2001
TDLo - Lowest published toxic dose	Parenteral	Non-mammalian species	0.5 mg/kg	Blood - changes in serum composition (e.g. TP, bilirubin, cholesterol) Biochemical - Metabolism (Intermediary) - other	TOXID9 Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH 44311) V.1- 1981- Volume(issue)/page/year: 60,35,2001
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	25 mg/kg	Reproductive - Paternal Effects - prostate, seminal vesicle, Cowper's gland, accessory glands	BJMRDK Brazilian Journal of Medical and Biological Research. (Associacao Brasileira de Divulgacao Cientifica, Faculdade de Medicina de Ribeirao Preto, USP, 141000 Ribeirao Preto, SP, Brazil) V.14- 1981- Volume(issue)/page/year: 38,487,2005
TDLo - Lowest published toxic dose	Intraperitoneal	Rodent - mouse	1200 ng/kg	Related to Chronic Data - changes in uterine weight Liver - changes in liver weight	TOXID9 Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH 44311) V.1- 1981- Volume(issue)/page/year: 60,249,2001
TDLo - Lowest published toxic dose	Unreported	Rodent - mouse	2000 ng/kg	Reproductive - Maternal Effects - uterus, cervix, vagina	TOXID9 Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH 44311) V.1- 1981- Volume(issue)/page/year: 60,299,2001
TDLo - Lowest published toxic dose	Implant	Rodent - mouse	2 mg/kg	Biochemical - Metabolism (Intermediary) - effect on inflammation or mediation of inflammation	TOXID9 Toxicologist. (Soc. of Toxicology, Inc., 475 Wolf Ledge Parkway, Akron, OH 44311) V.1- 1981- Volume(issue)/page/year: 90,388,2006
TDLo - Lowest published toxic dose	Administration onto the skin	Human - woman	4 ug/kg/36H	Kidney/Ureter/Bladder - other changes in urine composition Biochemical - Metabolism (Intermediary) - effect on cyclic nucleotides	EJCPAS European Journal of Clinical Pharmacology. (Springer-Verlag New York, Inc., Service Center, 44 Hartz Way, Secaucus, NJ 07094) V.3- 1970- Volume(issue)/page/year: (),A56,1999
TDLo - Lowest published toxic dose	Intramuscular	Rodent - guinea pig	1 mg/kg	Lungs, Thorax, or Respiration - bronchiolar dilation	CYLPDN Zhongguo Yaoli Xuebao. Acta Pharmacologica Sinica. Chinese Journal of Pharmacology. (China International Book Trading Corp., POB 2820, Beijing, Peop. Rep. China) V.1- 1980- Volume(issue)/page/year: 23,243,2002
TDLo - Lowest	Subcutaneous	Rodent - mouse	60 mg/kg	Blood - change in clotting factors	EJPHAZ European Journal of Pharmacology. (Elsevier

published toxic dose					Science Pub. B.V., POB 211, 1000 AE Amsterdam, Netherlands) V.1- 1967- Volume(issue)/page/year: 510,229,2005
TDLo - Lowest published toxic dose	Unreported	Rodent - mouse	400 ug/kg	Reproductive - Maternal Effects - uterus, cervix, vagina Biochemical - Metabolism (Intermediary) - other	TXCYAC Toxicology. (Elsevier Scientific Pub. Ireland, Ltd., POB 85, Limerick, Ireland) V.1- 1973- Volume(issue)/page/year: 213,236,2005
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	10 ug/kg	Endocrine - changes in luteinizing hormone Endocrine - changess in gonadotropins Related to Chronic Data - changes in uterine weight	REPRO* Reproduction : the official journal of the Society for the Study of Fertility (Bristol, UK : Published for the Society for Reproduction and Fertility by BioScientifica, <2004->) V.121- 2001- Volume(issue)/page/year: 125,597,2003
TDLo - Lowest published toxic dose	Parenteral	Amphibian - frog	60.6 ug/kg	Reproductive - Paternal Effects - spermatogenesis (incl. genetic material, sperm morphology, motility, and count)	REPRO* Reproduction : the official journal of the Society for the Study of Fertility (Bristol, UK : Published for the Society for Reproduction and Fertility by BioScientifica, <2004->) V.121- 2001- Volume(issue)/page/year: 126,83,2003
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	40 ug/kg	Reproductive - Maternal Effects - uterus, cervix, vagina Biochemical - Metabolism (Intermediary) - other proteins	JTEHF8 Journal of Toxicology and Environmental Health, Part A. (Taylor & Francis, 47 Runway Rd., Suite G, Levittown, PA 19057) V.53- 1998- Volume(issue)/page/year: 70,171,2007
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	40 mg/kg	Endocrine - other changes Endocrine - changes in pituitary weight Blood - changes in serum composition (e.g. TP, bilirubin, cholesterol)	ALCOH* Alcohol (Fayetteville, N.Y., New York Ny : Elsevier Science) V.1- 1984- Volume(issue)/page/year: 9,465,1992
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - mouse	7.2 mg/kg	Vascular - other changes Biochemical - Enzyme inhibition, induction, or change in blood or tissue levels - peptidases	CNREA8 Cancer Research. (Public Ledger Building, Suit 816, 6th & Chestnut Sts., Philadelphia, PA 19106) V.1- 1941- Volume(issue)/page/year: 66,4789,2006
TDLo - Lowest published toxic dose	Intraperitoneal	Rodent - mouse	0.2 mg/kg	Liver - other changes	TOLED5 Toxicology Letters. (Elsevier Science Pub. B.V., POB 211, 1000 AE Amsterdam, Netherlands) V.1- 1977- Volume(issue)/page/year: 177,20,2008
TDLo - Lowest published toxic dose	Implant	Rodent - mouse	2 mg/kg	Endocrine - changes in spleen weight Nutritional and Gross Metabolic - weight loss or decreased weight gain Biochemical - Metabolism (Intermediary) - other proteins	TOLED5 Toxicology Letters. (Elsevier Science Pub. B.V., POB 211, 1000 AE Amsterdam, Netherlands) V.1- 1977- Volume(issue)/page/year: 183,1,2008
TDLo - Lowest published toxic dose	Subcutaneous	Rodent - rat	12.5 ug/kg	Behavioral - changes in motor activity (specific assay)	PSCHDL Psychopharmacology (Berlin). (Springer-Verlag New York, Inc., Service Center, 44 Hartz Way, Secaucus, NJ 07094) V.47- 1976-

Western

TOXIN USE RISK ASSESSMENT

Name of Toxin:	Pregnant mare's serum gonadotropin (PMSG)
Proposed Use Dose:	10 µg
Proposed Storage Dose:	0 µg
LD_{50} (species):	120000 µg

Calculation:

120000 µg/kg x 50 kg/person

Dose per person based on LD_{50} in µg = 6000000

LD_{50} per person with safety factor of 10 based on LD_{50} in µg = 600000

Comments/Recommendations:

Western

TOXIN USE RISK ASSESSMENT

Name of Toxin:	Human chorionic gonadotropin (hCG)
Proposed Use Dose:	10 µg
Proposed Storage Dose:	0 µg
LD_{50} (species):	36 µg

Calculation:

36 µg/kg x 50 kg/person

Dose per person based on LD_{50} in µg = 1800

LD_{50} per person with safety factor of 10 based on LD_{50} in µg = 180

Comments/Recommendations: