Procedures on Working with 5-Bromo-2-Deoxyuridine (BrdU) and BrdU-Treated Animals	
Uses:	BrdU is used in the detection of proliferating cells in living tissues, as a tumor cells sensitizing agent for x-ray cancer treatment and as a topical antiviral agent.
Mechanism of Action:	BrdU substitutes for thymidine during DNA replication and can be incorporated into the newly synthesized DNA of replicating cells.
Routes of Exposure:	Occupational exposure to BrdU may occur through inhalation and dermal contact with this compound at workplaces where BrdU is produced or used. Unintentional ingestion or accidental injection can occur while working with BrdU.
Toxicity Values:	Mouse oral LD50: 9100mg/kg, Rat oral LD50: 8400mg/kg, Mouse dermal LD50: 3500mg/kg, Rat dermal LD50:3900mg/kg
Adverse Health Effects:	Cytotoxic Effects: Exposure via aerosol inhalation, ingestion, skin absorption, or accidental injection may produce serious subacute and chronic effects including: skin lesions, anemia, leukocytopenia, thrombocytopenia and inhibition of cell growth (Naguchi et al., 1971, Matsuoka et al., 1990). BrDu is a probable combustible compound. When heated to decomposition, the compound emits very toxic fumes of carbon monoxide, carbon dioxide, nitrogen oxides, and hydrogen bromide gas.
Irritant:	Unknown
Sensitizer:	Unknown
Carcinogen:	Unknown
Mutagen:	Potential for producing birth defects and other heritable genetics mutations is strongly suspected (Rocchi 2005).
Teratogen:	Strong teratogen: exposure may induce abnormalities in micronucleus and sperm nuclei (Bruce and Heddle 1979). Strong teratogenic effects in mice, rats and other mammalian species (National Institutes of Health 1988, Ashman and Davidson 1981) have also been noted.
Physical Properties:	Odourless white powder
Elimination:	Unknown. BrdU is degraded at a fairly rapid rate in mice and rats upon injection, in at least two metabolic pathways; one is hydrolysis at the glycosyl bond to yield bromouracil and 2- deoxyribose which is presumably then further metabolized. The other is debromination which is evidenced by liberation of bromide ion. The further fate of the remainder of the molecule has not been investigated [Kriss JP, Revesz L; Cancer Res 22: 254-65 (1962) as cited in NIH Division of Occupational Health and Safety; Safety Data Sheet for 5-Bromo-2'- deoxyuridineMost of the portion which is not so degraded is incorporated into DNA of various tissues, particularly the colon, stomach, bone marrow, and spleen. The label of intraperitoneally injected deuterated BrdU in pregnant mice is also found in the liver of both mothers and embryos (NIH Division of Occupational Health and Safety; Safety Data Sheet for 5-Bromo-2'-deoxyuridine).
Note:	Prior to Working with BrdU or BrdU-Treated Animals, the Principal Investigator (PI) and Area Manager must ensure all employees who intend to work with BrdU or BrdU-treated animals: a. Have been trained and are familiar with the contents of this procedure b. If female, complete a Pregnancy - Workplace Screening Tool for Pregnant Workers form (can be downloaded from www.ehs.utoronto.ca) and submit the form to Office of Environmental Health & Safety (Fax number 416-971-1361) for evaluation and to determine if any follow-up by medical provider or accommodation is required.
BrdU PREPARATION	
Engineering Controls:	BrdU solutions must be prepared in a certified chemical fume hood. Personal protective equipment (PPE) must be worn. All work surfaces must be covered with absorbent, plastic- backed, disposable bench paper. If it is not possible to weigh BrdU in a certified chemical fume hood, then: - Tare an empty container with its cap; - In a certified chemical fume hood, transfer an approximate quantity of BrdU into the container; - Cap and weigh the container; - In a certified chemical fume hood, add an appropriate amount of solvent to achieve the desired concentration.
Administrative Controls:	BrdU and BrdU-solutions must be stored in labeled, tightly capped containers. The container must be properly labeled with the identity of the hazardous contents (i.e., BrdU) and the appropriate hazard warning (i.e., Teratogen, Mutagen & Cytotoxic). The primary container for BrdU must be placed in a sealed, leak proof, unbreakable secondary container, which must also be labeled as described above. BrdU as received from the manufacturer/vendor in its original undiluted or powder form must be stored separately from other chemicals in a labeled, sealed, leak proof secondary container. The storage area must be posted with an appropriate hazard label.
Personal Protective Equipment:	Two pairs of chemical-resistant gloves (e.g., nitrile), disposable lab coat, wrist-guards or gloves taped to sleeves and mucous membrane protection (e.g. safety glasses and face shield must be worn before commencing this step.
Waste Disposal:	If non-disposable glassware is used, it must be single rinsed in a bleach solution prior to washing. The rinsate must be collected and disposed of as chemical waste. BrdU solutions must be collected and disposed of as chemical waste. Refer to the Laboratory Hazardous Waste Management and Disposal Manual for specific instructions or contact EHS Environmental Protection Services for further information. When all work with BrdU is complete, carefully remove all bench paper and dispose of as chemical waste. Wipe all surfaces with a bleach solution.
BrdU ADMINISTRATION	
Engineering Controls:	Administration of BrdU to rodents must be conducted in a certified chemical fume hood, certified class II type A2 biological safety cabinet at a minimum or at a certified down draft table.
Administrative Controls:	Animals must be chemically or physically restrained prior to starting the procedure. All work surfaces, except the down-draft table, must be covered with absorbent, plastic-backed, disposable bench paper.
Personal Protective Equipment:	Both the personnel administering the BrdU, and those in the immediate vicinity of the procedure must wear appropriate PPE. Two pairs of chemical-resistant gloves (e.g., nitrile), disposable lab coat or gown, wrist-guards or gloves taped to sleeves and mucous membrane protection (e.g., chemical goggles, face shield and surgical mask) must be worn before commencing this task.
Waste Disposal:	After the completion of each injection, immediately place the syringe-needle unit in a sharps disposal container.
Note:	Use only needle-locking syringes or disposable syringe-needle units (i.e., needle is integral to the syringe). Used disposable needles must not be bent, sheared, broken, recapped, removed from disposable syringes, or otherwise manipulated before disposal.

ANIMAL HOUSING	For First 24 hours After Administration
Engineering Controls:	For rodents, use disposable cages; cover the cages with filter bonnets If cages are not filtered, they should be ventilated (i.e. via certified chemical fume hood, certified class II type A2 biological safety cabinet at a minimum or ventilated rack) The room must be kept in negative pressure with an anteroom connecting to other building areas.
Administrative Controls:	Unless for specific research purpose, the first cage change should be conducted at least 150 hours after administration. The door(s) to a room containing BrdU-treated animals must be posted in such a manner that it is clear that the room contains BrdU-treated animals. The animal cages must also be properly labeled. For large animals (Non-Human Primates and Dogs): a. To minimize the creation of aerosols, line the cage drop pans with disposable, plastic-backed, absorbent pads. Adequately wet excreta with water.
Personal Protective Equipment:	If handling/working with BrdU-treated animals, changing cages, disposing cages or disposing cage waste: Wear disposable gown covering on top of gown, wrist-guards or glove taped to sleeves, head and foot covering, two pair chemical-resistant gloves (e.g., nitrile), N-95 disposable respirator, and chemical goggles must be worn during handling BrdU-treated animals.
Waste Disposal:	Carefully remove the pads and place in a hazardous waste container for disposal. If pan liners are not used, adequately wet the bedding with water to keep the dust down. Place bedding in a hazardous waste container, using care not to aerosolize dust from the bedding.
Note:	If entering room with BrdU-treated animals without handling BrdU-treated animals (cage closed): Wear gown, foot covering, chemical-resistant gloves (e.g., nitrile), safety glasses and mucous membrane protection (e.g. surgical mask) must be worn before entering room.
ANIMAL HOUSING	**After the first cage change:**
Engineering Controls:	Cage change/dumping should be performed using certified local exhaust ventilation (e.g., certified class II type A2 biosafety cabinet at a minimum or chemical fume hood). This local exhaust ventilation should be wiped down with a bleach solution, detergent and water after use.
Administrative Controls:	The animals may be transferred to clean, standard caging and the BrdU door signs and cage tags may be removed.
Personal Protective Equipment:	During handling animals, changing cages and disposing cage waste: Wear a disposable gown covering on top of gown, foot covering, wrist-guards or gloves taped to sleeves, double chemical resistant gloves (e.g., nitrile), safety glasses and mucous membrane protection (e.g. surgical mask).
Waste Disposal:	Disposable rodent cages must be carefully placed into hazardous waste containers, taking care to avoid creation of dusts. Dirty cages and racks should be covered with a full drape and moved to the cage wash for immediate cleaning.
Note:	If entering room with BrdU-treated animals without handling BrdU-treated animals (cage closed): Lab coat/gown and foot covering must be worn before entering room.
EMERGENCY RESPONSE	**In the event of an exposure:**
	1. Flush body area for a minimum of 15 minutes: a. Contaminated skin should be washed with copious amounts of soap and water b. Contaminated eyes and mucous membranes should be irrigated using normal saline or water 2. Notify the supervisor, if immediately available. Supervisor to fill out an incident/accident/occupational disease form and return the complete form to Health & Well-Being (Fax number: 416-971-3052). 3. Seek medical attention as soon as possible 4. If in doubt, call EHS Occupational Hygiene & Safety at 416-978-4467 to determine further steps.
EMERGENCY RESPONSE	**In the event of a spill:**
Small Spill	1. Only employees trained in the handling of BrdU should clean up spills 2. Wear appropriate PPE 3. If a spill occurs on linings and underpads, spray linings and underpads with a bleach solution. Allow to soak. 4. If a liquid spill occurs on an unlined surface, clean the area with plastic-backed pads to prevent BrdU contaminating gloves. The area should be soaked with a bleach solution, rinsed with water, then washed with detergent, rinsed with water and dried with pads 5. If a solid spill occurs on an unlined surface, cover the spill with disposable towel dampened with a bleach solution 6. Discard contaminated linings, underpads and materials in hazardous waste bags 7. If in doubt, call EHS Environmental Protection Services at 416-978-7000
Large Spill	1. Evacuate people from the immediate area 2. During business hours, call EHS Environmental Protection Services at 416-978-7000. 3. During off-hours, contact the Campus Police.