

## SECTION 1: IDENTIFICATION

### 1.1. Product Identifier

**Product Form:** Mixture

**Product Name:** Astagraf XL® (tacrolimus extended-release capsules)

**Material Name:** Tacrolimus, FK506

**CAS No:** 104987-11-3

**Chemical Name of Active Ingredient:** [3S-[3R\*[E(1S\*,3S\*,4S\*)], 4S\*,5R\*,8S\*,9E,12R\*,14R\*,15S\*,16R\*,18S\*,19S\*,-26aR\*]]-5,6,8,11,12,13,14,15,16,17,18,19,24,25,26,26a-hexadecahydro-5,19-dihydroxy-3-[2-(4-hydroxy-3-methoxycyclohexyl)-1-methylethenyl]-14,16-dimethoxy-4,10,12,18-tetramethyl-8-(2-propenyl)-15,19-epoxy-3H-pyrido[2,1-c][1,4]oxaazacyclotricosine-1,7,20,21(4H,23H)-tetrone, monohydrate

**Chemical Formula of Active Ingredient:** C<sub>44</sub>H<sub>69</sub>NO<sub>12</sub>•H<sub>2</sub>O

### 1.2. Intended Use of the Product

**Use of the substance/mixture:** Pharmaceutical research, manufacturing, and clinical use. For professional use only.

### 1.3. Name, Address, and Telephone of the Responsible Party

#### Company

Astellas US LLC

1 Astellas Way

Northbrook, IL 60062

Tel.: 800-888-7704

[www.us.astellas.com](http://www.us.astellas.com)

### 1.4. Emergency Telephone Number

**Emergency Number** : 800-727-7003

Medical Communications

## SECTION 2: HAZARDS IDENTIFICATION

*This product is a drug, as defined by the US Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.) It is in solid, final form for direct administration to the patient. Therefore, it is exempt from the US 2012 Hazard Communication Standard, as defined in the 29 CFR 1910.1200(b)(5)(iii).*

## SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

*This product is a drug, as defined by the US Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.) It is in solid, final form for direct administration to the patient. Therefore, it is exempt from the US 2012 Hazard Communication Standard, as defined in the 29 CFR 1910.1200(b)(5)(iii).*

## SECTION 4: FIRST AID MEASURES

### 4.1. Description of First Aid Measures

**First-aid Measures General:** Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label if possible).

**First-aid Measures After Inhalation:** Remove to fresh air and keep at rest in a position comfortable for breathing. Obtain medical attention if breathing difficulty persists.

**First-aid Measures After Skin Contact:** Gently wash with plenty of soap and water. Obtain medical attention if irritation develops or persists.

**First-aid Measures After Eye Contact:** Rinse cautiously with water for at least 5 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if pain, blinking, or redness persist.

**First-aid Measures After Ingestion:** Do not induce vomiting. Rinse mouth. Immediately call a POISON CENTER or doctor/physician.

### 4.2. Most important symptoms and effects, both acute and delayed

**Symptoms/Injuries:** May be toxic if swallowed in large amounts. Suspected of damaging the unborn child. Causes damage to organs through prolonged or repeated exposure.

**Symptoms/Injuries After Inhalation:** Exposure to capsule contents: May cause respiratory irritation.

**Symptoms/Injuries After Skin Contact:** Exposure to capsule contents: May cause skin irritation.

**Symptoms/Injuries After Eye Contact:** Exposure to capsule contents: May cause eye irritation.

**Symptoms/Injuries After Ingestion:** Ingestion is likely to be harmful or have adverse effects.

**Chronic Symptoms:** Suspected of damaging the unborn child. Causes damage to organs through prolonged or repeated exposure (pancreas, thymus, lymph nodes, spleen, kidneys).

### 4.3. Indication of Any Immediate Medical Attention and Special Treatment Needed

If you feel unwell, seek medical advice (show the label where possible).

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## SECTION 5: FIRE-FIGHTING MEASURES

### 5.1. Extinguishing Media

**Suitable Extinguishing Media:** Water spray, fog, carbon dioxide (CO<sub>2</sub>), alcohol-resistant foam, or dry chemical.

**Unsuitable Extinguishing Media:** Do not use a heavy water stream. Use of heavy stream of water may spread fire.

### 5.2. Special Hazards Arising From the Substance or Mixture

**Fire Hazard:** Not considered flammable but may burn at high temperatures.

**Explosion Hazard:** Product is not explosive.

**Reactivity:** Hazardous reactions will not occur under normal conditions.

### 5.3. Advice for Firefighters

**Precautionary Measures Fire:** Exercise caution when fighting any chemical fire.

**Firefighting Instructions:** Use water spray or fog for cooling exposed containers.

**Protection During Firefighting:** Do not enter fire area without proper protective equipment, including respiratory protection.

**Other Information:** Refer to Section 9 for flammability properties.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

### 6.1. Personal Precautions, Protective Equipment and Emergency Procedures

**General Measures:** Use only as directed.

#### 6.1.1. For Non-emergency Personnel

**Protective Equipment:** Use appropriate personal protection equipment (PPE).

**Emergency Procedures:** Evacuate unnecessary personnel.

#### 6.1.2. For Emergency Responders

**Protective Equipment:** Equip cleanup crew with proper protection.

**Emergency Procedures:** Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit.

### 6.2. Environmental Precautions

Prevent entry to sewers and public waters. Notify authorities if product enters sewers or public waters.

### 6.3. Methods and Material for Containment and Cleaning Up

**For Containment:** Contain and collect as any solid.

**Methods for Cleaning Up:** Clean up spills immediately and dispose of waste safely. Sweep spilled substance into containers; if appropriate, moisten first to prevent dusting. Contact competent authorities after a spill.

### 6.4. Reference to Other Sections

See Heading 8. Exposure controls and personal protection. For further information, refer to Section 13.

## SECTION 7: HANDLING AND STORAGE

### 7.1. Precautions for Safe Handling

**Additional Hazards When Processed:** Avoid breaking or crushing capsules.

**Hygiene Measures:** Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

### 7.2. Conditions for Safe Storage, Including Any Incompatibilities

**Technical Measures:** Comply with applicable regulations.

**Storage Conditions:** Store in a dry, cool and well-ventilated place. Keep container closed when not in use. Keep/Store away from direct sunlight, extremely high or low temperatures and incompatible materials.

**Incompatible Products:** Strong acids, strong bases, strong oxidizers.

**Storage Temperature:** 15 - 30 °C (59 °F - 86 °F)

### 7.3. Specific End Use(s)

Pharmaceutical research, manufacturing, and clinical use. For professional use only.

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1. Control Parameters

For substances listed in section 3 that are not listed here, there are no established exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), NIOSH (REL), or OSHA (PEL).

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<b>Internally derived by drug substance OEL:</b>	Internal TWA (mg/m <sup>3</sup> )	0.2 µg/m <sup>3</sup> 8 hour TWA
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### 8.2. Exposure Controls

**Appropriate Engineering Controls** : Ensure adequate ventilation, especially in confined areas. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure all national/local regulations are observed.

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<b>Personal Protective Equipment</b>	: Not generally required. The use of personal protective equipment may be necessary as conditions warrant.
<b>Materials for Protective Clothing</b>	: Chemically resistant materials and fabrics.
<b>Hand Protection</b>	: Wear chemically resistant protective gloves.
<b>Eye Protection</b>	: Chemical goggles or safety glasses.
<b>Skin and Body Protection</b>	: Wear suitable protective clothing.
<b>Respiratory Protection</b>	: None required under normal product handling conditions. Use NIOSH-approved dust mask if dust has the potential to become airborne.
<b>Environmental Exposure Controls</b>	: Do not allow the product to be released into the environment.
<b>Consumer Exposure Controls</b>	: Do not eat, drink or smoke during use.

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

### 9.1. Information on Basic Physical and Chemical Properties

<b>Physical State</b>	: Solid
<b>Appearance</b>	: <b>0.5 mg:</b> hard gelatin capsule with a light yellow cap and orange body branded with red "647" on the capsule body and "0.5 mg" on the capsule cap. <b>1 mg:</b> hard gelatin capsule with a white cap and orange body branded with red "677" on the capsule body and "1 mg" on the capsule cap. <b>5 mg:</b> hard gelatin capsule with a grayish-red cap and orange body branded with red "687" on the capsule body and "5 mg" on the capsule cap.
<b>Odor</b>	: No data available
<b>Odor Threshold</b>	: No data available
<b>pH</b>	: No data available
<b>Evaporation Rate</b>	: No data available
<b>Melting Point</b>	: No data available
<b>Freezing Point</b>	: No data available
<b>Boiling Point</b>	: No data available
<b>Flash Point</b>	: No data available
<b>Auto-ignition Temperature</b>	: No data available
<b>Decomposition Temperature</b>	: No data available
<b>Flammability (solid, gas)</b>	: No data available
<b>Vapor Pressure</b>	: No data available
<b>Relative Vapor Density at 20 °C</b>	: No data available
<b>Relative Density</b>	: No data available
<b>Solubility</b>	: Insoluble in water, freely soluble in ethanol, and very soluble in methanol, and chloroform.
<b>Partition Coefficient: N-Octanol/Water</b>	: No data available
<b>Viscosity</b>	: No data available
<b>Molecular Weight Of Active Ingredient</b>	: 822.03 g/mol

**9.2. Other Information** No additional information available.

## SECTION 10: STABILITY AND REACTIVITY

- 10.1. Reactivity:** Hazardous reactions will not occur under normal conditions.
- 10.2. Chemical Stability:** Stable under recommended handling and storage conditions (see section 7).
- 10.3. Possibility of Hazardous Reactions:** Hazardous polymerization will not occur.
- 10.4. Conditions to Avoid:** Direct sunlight. Extremely high or low temperatures. Ignition sources. Incompatible materials.
- 10.5. Incompatible Materials:** Strong acids, strong bases and strong oxidants.
- 10.6. Hazardous Decomposition Products:** Carbon oxides (CO, CO<sub>2</sub>). Nitrogen oxides. Thermal decomposition generates toxic vapors.

## SECTION 11: TOXICOLOGICAL INFORMATION

### 11.1. Information On Toxicological Effects

**Acute Toxicity:** Not classified

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Tacrolimus (109581-93-3)	
LD50 Oral Rat	134 - 194 mg/kg
LD50 I.V. Rat	23.6 - 57 mg/kg
Magnesium stearate (557-04-0)	
LD50 Oral Rat	> 2000 mg/kg
Cellulose hydroxypropyl methyl ether (9004-65-3)	
LD50 Oral Rat	>= 4000 mg/kg

**Skin Corrosion/Irritation:** Not classified

**Serious Eye Damage/Irritation:** Not classified

**Respiratory or Skin Sensitization:** Not classified

**Germ Cell Mutagenicity:** Not classified

Tacrolimus (109581-93-3)	
Additional information	No evidence of genotoxicity was seen in bacterial (Salmonella and E. coli) or mammalian (Chinese hamster lung-derived cells) in vitro assays of mutagenicity, the in vitro CHO/HGPRT assay of mutagenicity, or in vivo clastogenicity assays performed in mice; tacrolimus did not cause unscheduled DNA synthesis in rodent hepatocytes.

**Carcinogenicity:** Not classified

Tacrolimus (109581-93-3)	
Additional information	<p>Carcinogenicity studies were carried out in male and female rats and mice. In the 80-week mouse study and in the 104-week rat study no relationship of tumor incidence to tacrolimus dosage was found. The highest doses used in the mouse and rat studies were 0.8 – 2.5 times (mice) and 3.5 – 7.1 times (rats) the recommended clinical dose range of 0.1 – 0.2 mg/kg/day when corrected for body surface area.</p> <p>In a 104 week dermal carcinogenicity study, topical application of 0.1% tacrolimus increased the incidence of pleomorphic and undifferentiated lymphoma.</p>

**Reproductive Toxicity:** Suspected of damaging the unborn child.

Tacrolimus (109581-93-3)	
Additional information	<p>Tacrolimus given orally at 1.0 mg/kg (0.8 times the maximum clinical dose based on body surface area) to rats, prior to and during mating was associated with a higher rate of pre-implantation loss and increased numbers of undelivered and nonviable pups. When given at 3.2 mg/kg (2.6 times the maximum clinical dose based on body surface area), tacrolimus was associated with maternal and paternal toxicity as well as reproductive toxicity including marked adverse effects on estrus cycles, parturition, pup viability, and pup malformations.</p> <p>In pregnant rabbits, tacrolimus at oral doses of 0.32 and 1.0 mg/kg (0.5 and 1.6 times the maximum clinical dose based on body surface area, respectively) was associated with maternal toxicity as well as an increased incidence of abortions. At the 1 mg/kg dose, fetal rabbits showed an increased incidence of malformations (ventricular hypoplasia, interventricular septal defect, bulbous aortic arch, stenosis of ductus arteriosus, interrupted ossification of vertebral arch, vertebral and rib malformations, omphalocele, and gallbladder agenesis) and developmental variations. In pregnant rats, tacrolimus at oral doses of 3.2 mg/kg (2.6 times the maximum clinical dose) was associated with maternal toxicity, an increase in late resorptions, decreased numbers of live births, and decreased pup weight and viability. Tacrolimus, given orally to pregnant rats after organogenesis and during lactation at 1.0 and 3.2 mg/kg (0.8 and 2.6 times the maximum recommended clinical dose, respectively) was associated with reduced pup weights and pup viability (3.2 mg/kg only); among the high dose pups that died early, an increased incidence of kidney hydronephrosis was observed.</p>

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**Specific Target Organ Toxicity (Single Exposure):** Not classified

**Specific Target Organ Toxicity (Repeated Exposure):** Causes damage to organs through prolonged or repeated exposure.

Tacrolimus (109581-93-3)	
Additional information	The primary target organs of tacrolimus toxicity in rats and baboons were the pancreas, thymus, lymph nodes and spleen; in rats, the kidneys were also affected. In 52-week repeated dose oral toxicity studies, the NOAEL for rats was 0.15 mg/kg/day while for baboons the NOAEL was 1.0 mg/kg/day

**Aspiration Hazard:** Not classified

**Symptoms/Injuries After Inhalation:** Exposure to capsule contents: May cause respiratory irritation.

**Symptoms/Injuries After Skin Contact:** Exposure to capsule contents: May cause skin irritation.

**Symptoms/Injuries After Eye Contact:** Exposure to capsule contents: May cause eye irritation.

**Symptoms/Injuries After Ingestion:** Ingestion is likely to be harmful or have adverse effects.

**Chronic Symptoms:** Suspected of damaging the unborn child. Causes damage to organs through prolonged or repeated exposure (pancreas, thymus, lymph nodes, spleen, kidneys).

## SECTION 12: ECOLOGICAL INFORMATION

### 12.1. Toxicity

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LC50 Fish 1	> 100% v/v saturated solution (4.8 mg test material) [Exposure time: 96 h - Species: Rainbow trout ( <i>Oncorhynchus mykiss</i> )]
EC50 Daphnia 1	> 64% v/v saturated solution (3.8 mg test material) [Exposure time: 48 h - Species: <i>Daphnia magna</i> ]
NOEC fish	100% v/v saturated solution
NOEC crustacea	5.6% v/v saturated solution

### 12.2. Persistence and Degradability

When released into the soil, this material is expected to readily biodegrade. When released into water, this material is expected to readily biodegrade. When released into the air, this material is not expected to precipitate to ground.

### 12.3. Bioaccumulative Potential

This material is not expected to significantly bioaccumulate.

### 12.4. Mobility in Soil

When released into the soil, this material is expected to leach into groundwater.

### 12.5. Other Adverse Effects

**Other Information** : Avoid release to the environment.

## SECTION 13: DISPOSAL CONSIDERATIONS

### 13.1. Waste treatment methods

**Waste Disposal Recommendations:** Dispose of contents and container according to local, regional, national, and international regulations.

**Ecology – Waste Materials:** Avoid release to the environment.

## SECTION 14: TRANSPORT INFORMATION

**14.1. In Accordance with DOT** Not regulated for transport.

**14.2. In Accordance with IMDG** Not regulated for transport.

**14.3. In Accordance with IATA** Not regulated for transport.

## SECTION 15: REGULATORY INFORMATION

**15.1 US Federal Regulations** Not applicable

**15.2 US State Regulations** Not applicable

## SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

**Revision Date** : 05/13/2015

**Other Information** : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

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*This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.*