

# Eye Infection

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## Introduction

Eye injury, inflammation, or infections may involve the orbit and/or the eyelids. Conjunctivitis is an inflammation of the conjunctiva, which is the mucosal lining of the eye's surface. Conjunctival inflammation typically results from infection, allergy, or irritation. Infectious conjunctivitis is most commonly viral or bacterial and is contagious, while numerous allergens can cause allergic conjunctivitis. Symptoms of conjunctival inflammation include congestion of surface blood vessels leading to the appearance of redness, discharge, discomfort and burning and/or itching. Diagnosis of conjunctivitis and differentiation between bacterial, viral, and noninfectious conjunctivitis are usually clinical. While the clinical course of conjunctivitis is usually benign and self-limited, infectious conjunctivitis requires treatment with topical antibiotics to prevent the infection from progressing.

Eyelid infections such as blepharitis and hordeolum (stye) localize to the eyelid margins. These are treated with topical or systemic antibiotics, and warm wet compresses.<sup>[1]</sup> There have been cases of eye infections reported in space, all of them being eyelid infections. Space flight may increase the risk of eye infections secondary to particulates being suspended in microgravity.<sup>[2]</sup> These may also result in corneal foreign bodies and abrasions, which are addressed under their corresponding medical condition pages.

## Clinical Priority and Clinical Priority Rationale by Design Reference Mission

*One of the inherent properties of space flight is a limitation in available mass, power, and volume within the space craft. These limitations mandate prioritization of what medical equipment and consumables are manifested for the flight, and which medical conditions would be addressed. Therefore, clinical priorities have been assigned to describe which medical conditions will be allocated resources for diagnosis and treatment. "Shall" conditions are those for which diagnostic and treatment capability must be provided, due to a high likelihood of their occurrence and severe consequence if the condition were to occur and no treatment was available. "Should" conditions are those for which diagnostic and treatment capability should be provided if mass/power/volume limitations allow.*

Conditions were designated as “Not Addressed” if no specific diagnostic and/or treatment capability are expected to be manifested, either due to a very low likelihood of occurrence or other limitations (for example, in medical training, hardware, or consumables) that would preclude treatment. Design Reference Missions (DRMs) are proposed future missions designated by a set of assumptions that encompass parameters such as destination, length of mission, number of crewmembers, number of Extravehicular Activities (EVAs), and anticipated level of care. The clinical priorities for all medical conditions on the Exploration Medical Condition List (EMCL) can be found here ([https://humanresearchwiki.jsc.nasa.gov/index.php?title=Category:All\\_DRM](https://humanresearchwiki.jsc.nasa.gov/index.php?title=Category:All_DRM)). The EMCL document may be accessed here ([https://humanresearchwiki.jsc.nasa.gov/images/6/62/EMCL\\_RevC\\_2013.pdf](https://humanresearchwiki.jsc.nasa.gov/images/6/62/EMCL_RevC_2013.pdf)).

Design Reference Mission	Clinical Priority	Clinical Priority Rationale
<p>Lunar sortie mission</p> <p>Assumptions:</p> <ul style="list-style-type: none"> <li>■ 4 crewmembers (3 males, 1 female)</li> <li>■ 14 days total</li> <li>■ 4 EVAs/ crewmember</li> <li>■ <u>Level of Care 3</u></li> </ul>	<p>Shall</p>	<p>Untreated conjunctivitis has the potential to deteriorate to a severe ophthalmic infection that could result in permanent loss of vision. The crew may be at an increased risk due to particulates being suspended during transit in microgravity. Therefore, treatment capability shall be manifested.</p>
<p>Lunar outpost mission</p> <p>Assumptions:</p> <ul style="list-style-type: none"> <li>■ 4 crewmembers (3 males, 1 female)</li> <li>■ 180 days total</li> <li>■ 90 EVAs/ crewmember</li> <li>■ <u>Level of Care 4</u></li> </ul>	<p>Shall</p>	<p>Untreated conjunctivitis has the potential to deteriorate to a severe ophthalmic infection that could result in permanent loss of vision. The crew may be at an increased risk due to particulates being suspended during transit in microgravity. Therefore, treatment capability shall be manifested</p>
<p>Near-Earth Asteroid (NEA) mission</p> <p>Assumptions:</p> <ul style="list-style-type: none"> <li>■ 3 crewmembers (2 males, 1 female)</li> <li>■ 395 days total</li> <li>■ 30 EVAs/ crewmember</li> <li>■ <u>Level of Care 5</u></li> </ul>	<p>Shall</p>	<p>Untreated conjunctivitis has the potential to deteriorate to a severe ophthalmic infection that could result in permanent loss of vision. The crew may be at an increased risk due to particulates being suspended in microgravity. Therefore, treatment capability shall be manifested.</p>

## Initial Treatment Steps During Space Flight

*A link is provided to a prior version of the International Space Station (ISS) Medical Checklist, which outlines the initial diagnostic and treatment steps recommended during space flight for various conditions which may be encountered onboard the ISS. Further diagnostic and treatment procedures beyond the initial steps outlined in the Medical Checklist are then recommended by the ground-based Flight Surgeon, depending on the clinical scenario. Please note that this version does not represent current diagnostic or treatment capabilities available on the ISS. While more recent versions of this document are not accessible to the general public, the provided version of the checklist can still provide a general sense of how medical conditions are handled in the space flight environment. Medical Checklists will be developed for exploration missions at a later point in time.*

Please note this file is over 20 megabytes (MB) in size, and may take a few minutes to fully download.

ISS Medical Checklist ([http://www.nasa.gov/centers/johnson/pdf/163533main\\_ISS\\_Med\\_CL.pdf](http://www.nasa.gov/centers/johnson/pdf/163533main_ISS_Med_CL.pdf))

## Capabilities Needed for Diagnosis

*The following is a hypothetical list of capabilities that would be helpful in diagnosis. It does not necessarily represent the current capabilities available onboard current spacecraft or on the ISS, and may include capabilities that are not yet feasible in the space flight environment.*

- Slit lamp
- Cultures
- Fluorescein stain
- Gloves

## Capabilities Needed for Treatment

*The following is a hypothetical list of capabilities that would be helpful in treatment. It does not necessarily represent the current capabilities available onboard current spacecraft or on the ISS, and may include capabilities that are not yet feasible in the space flight environment.*

- Topical ophthalmic antibiotics
- Oral antibiotics
- Bandages or patches

## Associated Gap Reports

*The NASA Human Research Program (HRP) identifies gaps in knowledge about the health risks associated with human space travel and the ability to mitigate such risks. The overall objective is to identify gaps critical to human space missions and close them through research and development. The gap reports that are applicable to this medical condition are listed below. A link to all of the HRP gaps can be found here (<http://humanresearchroadmap.nasa.gov/Gaps/>).*

2.01 - We do not know the quantified health and mission outcomes due to medical events during exploration missions.

2.02 - We do not know how the inclusion of a physician crew medical officer quantitatively impacts clinical outcomes during exploration missions.

3.01 - We do not know the optimal training methods for in-flight medical conditions identified on the Exploration Medical Condition List taking into account the crew medical officer's clinical background. (Closed)

3.03 - We do not know which emerging technologies are suitable for in-flight screening, diagnosis, and treatment during exploration missions.

4.01 - We do not have the capability to provide a guided medical procedure system that integrates with the medical system during exploration missions.

4.14 - We do not have the capability to track medical inventory in a manner that integrates securely with the medical system during exploration missions.

4.15 - Lack of medication usage tracking system that includes automatic time stamping and crew identification

4.17 - We do not have the capability to package medications to preserve stability and shelf-life during exploration missions.

4.24 - Lack of knowledge regarding the treatment of conditions on the Space Medicine Exploration Medical Condition List in remote, resource poor environments (Closed)

5.01 - We do not have the capability to comprehensively manage medical data during exploration missions.

## Other Pertinent Documents

### List of Acronyms

<b>D</b>	
DRM	Design Reference Mission
<b>E</b>	
EMCL	Exploration Medical Condition List
EVA	Extravehicular Activity
<b>I</b>	
ISS	International Space Station
<b>M</b>	
MB	Megabyte
<b>N</b>	
NEA	Near Earth Asteroid

## References

1. Merck Manual. Conjunctivitis. Porter RS, editor. 2011. Whitehouse Station, N.J, Merck Sharp & Dohme Corp. p 580.
2. Marshburn TH. Acute Care. Barratt M, Pool S, editors. Principles of Clinical Medicine for Space Flight. New York: Springer; 2008. p. 111-112.

## Last Update

This topic was last updated on 8/12/2014 (Version 2).

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Category: Medical Conditions

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