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## Hazard Alert



## Hazard Evaluation System and Information Service

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# Ribavirin

(Virazole<sup>R</sup>; 1-beta-D-ribofuranosyl-1,2,4-triazole-3-carboxamide)

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**Health Hazard Summary:** Ribavirin is an anti-viral drug used by many hospitals in the treatment of respiratory syncytial virus infection. It is considered by some physicians to be an effective and sometimes life-saving drug, but studies have also indicated that the drug may pose a reproductive risk to health care workers. Ribavirin causes birth defects in test animals given small doses of the drug. It is not known whether or not ribavirin has similar effects in humans. However, based on the animal studies and on measurements of the exposure of health care workers, pregnant health care workers should avoid exposure to ribavirin aerosol.

## HOW YOU CAN BE EXPOSED TO RIBAVIRIN AEROSOL

Ribavirin is an odorless, white powder used in hospitals as an anti-viral drug to treat respiratory syncytial virus (RSV) infection. RSV commonly causes respiratory infection in infants and children, especially in the winter and early spring, and it occasionally causes illness in adults. Newborns, infants, and pre-school children can develop severe pneumonia and bronchiolitis from RSV infection. Premature infants, children with congenital heart disease or chronic lung conditions, and immuno-compromised persons of any age are at high risk of serious and even life-threatening RSV infection. Some physicians consider ribavirin to be an effective and sometimes life-saving drug in cases of severe RSV infection.

A solution of ribavirin is administered as an aerosol for many hours at a time over several days. When delivered through a mist tent or an oxygen hood, aerosol may escape into patient-care areas. The mist remains in the air until it settles on nearby surfaces, is removed by the hospital ventilation system, or is inhaled by a health care worker or a visitor.

When ribavirin settles on surfaces, contamination is often heaviest on surfaces near the aerosol delivery unit, including linens, walls, and nearby equipment. Large deposits sometimes form around the joints of hoses that carry the aerosol to the patient. Because equipment and supplies are moved through the hospital, employees may come in contact with concentrated ribavirin until these items are cleaned.

## HOW RIBAVIRIN ENTERS THE BODY

Ribavirin enters your body when you breathe it as a fine aerosol in the air. Ribavirin can condense on surfaces such as sheets, tables, and equipment. You can swallow ribavirin if the mist or dust contaminates your food or hands. Skin absorption has not been studied, but is likely to be insignificant

## HOW RIBAVIRIN AFFECTS THE BODY

Ribavirin absorbed into the body is cleared from plasma in a few hours, but may remain in red blood cells for several weeks. Traces of ribavirin were found in the blood of one health care worker seven days after caring for a patient who was getting the aerosol treatment.

**Reproduction:** Studies in animals show that ribavirin causes birth defects when females are exposed even to low doses during pregnancy. It is not known whether ribavirin can cause similar harm in humans. Environmental monitoring of health care workers who are exposed to ribavirin aerosol during oxygen tent or mask administration has shown that their exposures are often greater than levels that are recommended to protect against harm to the fetus.

**Respiratory Tract:** Ribavirin aerosol has been reported to cause throat irritation and cough. If you have asthma, ribavirin aerosol could irritate your lungs and cause shortness of breath and

wheezing.

**Eyes:** If you wear contact lenses, ribavirin mist may irritate your eyes.

**Cancer:** Ribavirin is mutagenic in some experimental test systems. Ribavirin has not been completely tested to determine whether it causes cancer in animals or humans.

## **HOW YOU CAN BE PROTECTED FROM RIBAVIRIN EXPOSURE**

**Administration Techniques:** During ribavirin delivery by oxygen tent, the largest releases may occur when the tent is opened or moved aside to care for the patient. A few minutes before the tent is to be moved, turn off the aerosol generator. Shutting off the aerosol flow prior to providing patient care can significantly reduce the amount of ribavirin released into patient-care areas. A simple shutoff valve which greatly facilitates the temporary shutoff of aerosol flow is available from the manufacturer. Whenever possible, aerosol flow should be shut off for five minutes prior to patient care.

When ribavirin is given for many hours, the solution in the aerosol generator slowly becomes more concentrated and the aerosol contains larger amounts of the drug. Prepare new solutions as often as recommended by the manufacturer in the package insert.

**Personnel Policies:** If you are pregnant or planning to become pregnant within six weeks, you should take precautions to minimize your exposure to ribavirin aerosol. Health care workers with respiratory problems should also minimize their exposure to ribavirin aerosol. Alternative work assignments should be available for you.

**Scavenging Systems:** The best way to reduce exposure to ribavirin aerosol is to minimize the release of the aerosol at the source. Special aerosol delivery systems, which replace conventional oxygen hoods and tents, use vacuum pumps to scavenge and remove excess aerosol before it escapes into work areas. One system is available from the manufacturer of ribavirin, and others are under development. Although these systems have not been widely tested, preliminary data indicates that they significantly reduce environmental exposure to ribavirin.

With intubated patients, excess ribavirin can be scavenged by placing filters in the expiratory loop of the ventilator, allowing very little ribavirin aerosol to be released into the room.

**Patient Isolation:** Patients receiving ribavirin aerosol should be placed in a single room or grouped in common rooms. Static or negative pressure rooms should be used, and the doors should remain closed. These precautions should minimize the risk of spread of infection as well as minimizing worker exposure to ribavirin aerosol. Warning signs should be posted where ribavirin is used to inform workers and visitors of the hazard.

Meals should be served using disposable trays, utensils, and plates.

Only necessary supplies should be stored in the patient's room, and they should be kept as far as possible from the bedside to prevent contamination.

**Personal Protective Equipment:** Gowns, gloves, hair covers, and shoe covers should be worn to prevent contact with ribavirin aerosol. Handwashing is essential after ungloving.

Surgical masks and common dust masks do not adequately protect against inhalation of ribavirin. When engineering controls cannot sufficiently reduce exposure, a respirator should be worn and a respiratory protection program should be developed, as outlined in Cal/OSHA regulations (General Industry Safety Order 5144, Title 8, California Administrative Code). An industrial hygienist or other knowledgeable person should be consulted, to ensure that the equipment is appropriate and is used correctly.

To prevent eye irritation, goggles should be available for individuals wearing contact lenses.

**Proper Waste Disposal:** Contaminated waste should be disposed into the chemotherapy waste stream.

**Housekeeping:** All housekeeping staff should wear protective equipment described above when cleaning rooms. All equipment should be thoroughly cleaned with soap and water or contained for disposal before removal from the room. Linens should be handled with a minimum of shaking, to reduce the release of ribavirin into the room.

**Environmental Monitoring:** Although legal limits for ribavirin exposure have not been established, exposure should not be greater than levels that are recommended to protect against harm to the fetus. Environmental monitoring can be done by an industrial hygienist to determine how much ribavirin you may be exposed to during a work shift. Blood or urine testing for ribavirin is not recommended.

**YOUR RIGHT TO KNOW:** Under the Hazard Communication Standard (General Industry Safety Order 5194, Title 8, California Administrative Code), your employer must tell you if you are working with ribavirin or other hazardous materials, must make the Material Safety Data Sheets (MSDSs) for those materials available to you, and must train you in how to use the materials safely. If you think you may be exposed to ribavirin, ask to see the MSDS. The current MSDS for ribavirin recommends that pregnant women avoid exposure to the drug. This Hazard Alert is an aid for worker training programs, and does not take the place of a Material Safety Data Sheet or the required training by your employer.