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### Hanta virus

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# **Rochester Institute of Technology**

A Thesis submitted to the Faculty of the  
College of Imaging Arts and Sciences in candidacy for the  
degree of Master of Fine Arts.

## **Hanta Virus**

by

Rhonna Kaye Brown

May 27, 1997

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## Introduction

Medical Illustration, to me, means communication. A medical illustrator is an interpreter between the medical/scientific community and the lay community. The ability to be able to understand and communicate with both sides is essential to success in this profession. Presenting highly scientific information in a way that the majority of people will be able to understand requires a special ability to translate, especially so that little of the information is lost and no one feels overwhelmed. This thesis represents two years of study in Fine Arts as applied to Medical Illustration. I chose this subject not only for its pertinence but also because it allowed me to illustrate both humans and animals. The media used, the poster and brochure, allow the information to reach more people. The poster can be displayed in a clinic or other likely places and the brochure can be taken home and read at leisure by anyone. They can be printed for non-english speaking people as well. This way the most people can be reached through a highly informative and very cost effective means. The black and yellow colors used throughout are meant to represent a caution sign. This is a warning to beware and to be careful around mice and especially wild animals. It is not meant cause fear or wide spread panic.

## What Hanta Virus Is

The Hanta virus is an enveloped retrovirus which causes a disease in humans known as Hanta Virus Pulmonary Syndrome (HPS). (Hjelle, 1995) This virus was first isolated due to an outbreak of HPS in the area where Arizona, New Mexico, Colorado, and Utah meet otherwise known as the Four Corners area. This particular strain of Hanta virus is called the Four Corners virus (FC). The FC virus lives in the digestive tract of deermice. The virus lives as a parasite in the deermouse, *Peromyscus maniculatus*, causing a chronic infection in its host without making the mouse sick. (Ing, 1994) It is not yet known how the mice get

infected, but it is believed that the virus is spread among mice by biting each other. The range of deermice extends from Mexico to Canada and the family range covers both of the Americas. (Eisenberg. 1987) There are other viruses that are closely related to FC and cause HPS that are found in rodents in the same family (*Muridae*) as the deermouse.(CDC, 293) Such rodents as the cotton rat, harvest mouse, and the white-footed mouse all carry viruses that can cause HPS. (Hjelle, 1995) It is possible that more species in this family carry some form of the virus and research is continuing in order to learn more.

### What Hanta Virus Does

Hanta virus is found in the rodent's saliva, feces, and urine.(Ing, 1994) FC is an aerosol and can be inhaled, if a person comes into contact with infected dust from mouse urine and feces. It can also be caught by being bitten. Once inside the body, the virus quickly takes effect and is believed to attack the alveolar cells of the lungs. Symptoms appear as a flu-like prodrome (Hjelle, 1995) and can include persistent fever, chills, headache, myalgia, nausea, vomiting, and non-productive cough. (CDC, 291) The prodrome is followed by dyspnea, cough, thrombocytopenia, severe hemodynamic instability and neutrophilia as well as an interstitial infiltrate of the lungs that resembles a wide variety of other diseases. (Hjelle, 1995) As the alveolar cells are attacked and die, they leave holes in the lining of the lung tissue. The blood vessels are exposed and tear easily. There is also an inflammatory response and the lungs fill up with fluid and blood from the leaking capillaries. After the virus has run its course and the infection subsides, the lungs begin to heal. Scarring then occurs and can be extensive. If the damage to alveolar cell lining of the lung is too much, thick scar tissue will develop limiting the amount of gas exchange possible. Some alveoli collapse while others expand as their walls thicken with scar tissue. If the damage is too extensive, death will occur.



## How One Contracts Hanta Virus

The virus is most commonly contracted via dust breathed in. Sweeping and vacuuming are the two methods which typically cause dust to stir up. To avoid breathing in dust, use a filtering mask. When handling mice or their remains, be sure to wear gloves. (Ing, 1994) Use a household cleanser(Ing, 1994) to thoroughly wet the area to be cleaned before removing any remains or droppings. This will help prevent dust from wafting into the air. Hanta virus cannot be treated or cured. There is no treatment protocol, however if detected soon enough, it can be managed.(Hjelle, 1995)

## The Illustrations

The poster gives general information about the virus and shows the disease through illustrations. The brochure gives more specific information about the disease and how to prevent it as well as contains all the illustrations from the poster. People can see the poster and be informed and can also take home a brochure to remind them of the poster and get more information.

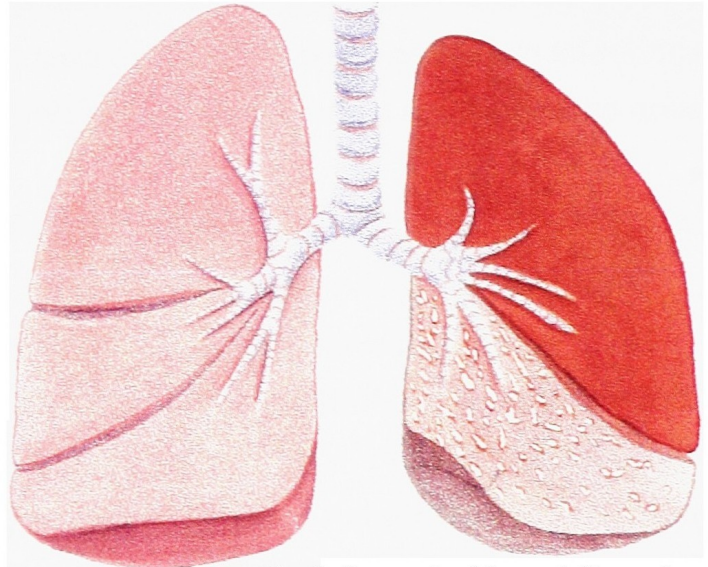
The illustrations were a combination of traditional illustrations and computer generated illustrations. The traditional art was painted in watercolor on hotpress watercolor board and is shown in



*Fig. 1 Deermouse*

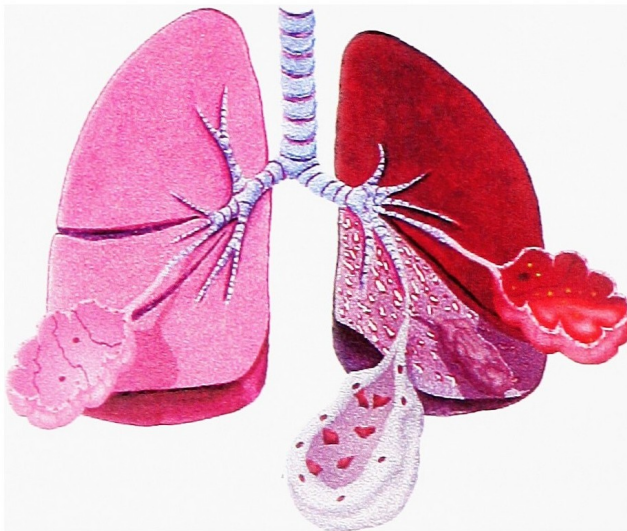
figures 1 and 2. To paint the mouse (Fig. 1), flat washes were used to build up volume and shape. Then, using a size 00000 brush and dry-brush technique, a layer of "fur" was painted evenly over the mouse. With a flat wash brush and

plain water the “fur” was smoothed out and blended by laying washes of water over it. After that dried, more washes were layered on in the shadow areas to really build volume. More “fur” was dry-brushed in opaque watercolors over these washes to finish the mouse and give it a life-like look. The eye was dry brushed in opaque black with a white highlight masked out. The lungs (Fig. 2) were painted in the same manner as the mouse. The bodies were flat washes with the bronchi masked out. Later these were dry brushed in as well as the capsules and fissures. The lung painting was deliberately left flat and unfinished. It is the backdrop for some of the computer work.



*Fig. 2 Lungs, healthy and diseased*

The computer work was done in Adobe Illustrator™ and Adobe Photoshop™. For the lung illustration, the watercolor lungs (Fig. 2) were scanned in and used as a background. Sketches of alveoli were scanned in at 150 dpi and Illustrator™ was used to make paths of the shapes, as at the time this was the most efficient use of the available technology. These paths were imported into Photoshop™ and saved as working paths. These paths were then filled with



*Fig. 3 Computer enhanced lungs with alveoli*

color from the painting and manipulated to create the alveoli coming out of the lungs. The airbrush tool was used to paint the alveoli and give them a “3-D” feeling. Some of the paths of the cells were stroked to make cell borders and a soft-edged, adjusted paintbrush gave them nuclei. The outer paths were filled with shadow



colors and moved into position for the cast shadows. The excess parts of the shadows were erased to meet the edges of the lung tissue. All of the individual elements were done on separate layers and then flattened into one final layer (Fig. 3). A copy was enlarged for the poster and another was reduced for the brochure maintaining 150 dpi.



*Fig. 4 Graphic of spray bottle*

Each of the graphics as in Fig. 4 were originally pencil sketches scanned at 150 dpi into Illustrator™ where their shapes were created. Each sketch was traced using the pen tool to make a shape of the sketch. The shape was filled with solid black. A copy of this shape was scaled to fit on top of the black shape and filled with white. The edges of the white object were then manipulated to reveal the black underneath and give the appearance of the original sketch with its variance of line weight. These solid objects were then imported into Photoshop™ where the white areas were selected and filled with the appropriate colors. These were then copied and resized keeping the same dpi to fit either the poster or brochure.



*Fig. 5 Intestines*

The mouse intestines were done in a similar fashion as the lungs with the exception being that the finished layer with the completed mouse intestine and virus was reduced to fifty percent transparency and then layered onto the mouse to give it a ghosting effect.

Desktop publishing software, QuarkXPress™, was used to develop the final pieces. The “runaround” function allowed the text to flow around the illustrations giving the pieces a flowing feel.

In order for an illustration with a colored background to appear in QuarkXPress™ and be able to use the “runaround”



*Fig. 6 Intestines transposed onto mouse*

function, a clipping path was created in Photoshop that allowed the illustration to appear without the surrounding white space . The QuarkXpress <sup>TM</sup> document with the appropriate illustrations saved in a special graphics file were then saved to zip disks and taken to a printer.

The printers proved to be an education in and of themselves. The illustrations were too large and complex for them to handle. Resolutions had to be dropped to an incredibly low 80 dpi for the lungs and mouse and 100 dpi for the graphics. The clipping paths had to be redone by filling the white space around the illustrations with a matching background color and a more simple path drawn around the illustration in order for the printer to read it. Even with all the precautions taken and all the fine adjustments made, the final printout had some problems. Colors weren't quite right and because the poster and brochure were done on different printers they didn't match exactly. Overall, however, they were well done and turned out nicely.



# Hanta Virus Pulmonary Syndrome

The Hanta virus causes a disease in humans known as Hanta Virus Pulmonary Syndrome (HPS). This virus was first isolated due to an outbreak of HPS in the Four Corners area. This is the area where Arizona, New Mexico,



Fig. 1 mouse infected with viruses

Colorado, and Utah meet. The virus is now called the Four Corners virus (FC). The FC The virus lives in the mouse's digestive tract.

It is found in the rodent's saliva, feces, and urine. FC is an aerosol and can be breathed in, if a person comes into contact with

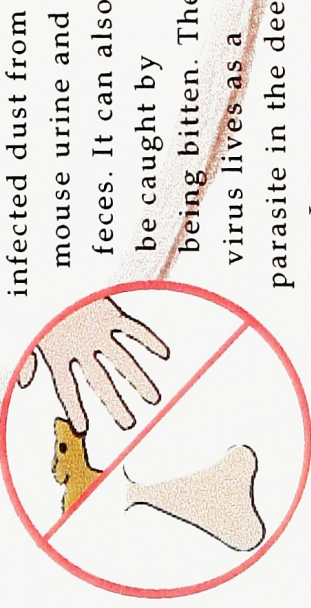


Fig. 2 ways to become infected with viruses

infected dust from mouse urine and feces. It can also be caught by being bitten. The virus lives as a parasite in the deer mouse. It causes a chronic infection in its host, but doesn't make the animal sick.

The deermouse range extends from Mexico to Canada and this disease is not limited to the Four Corners region

Once inhaled, the virus quickly takes effect. It is believed to attack the alveolar cells. As the alveolar cells die, they leave holes in the lining of the lung tissue. The blood vessels are exposed and tear easily. There is an inflammatory response and the lungs fill up with fluid

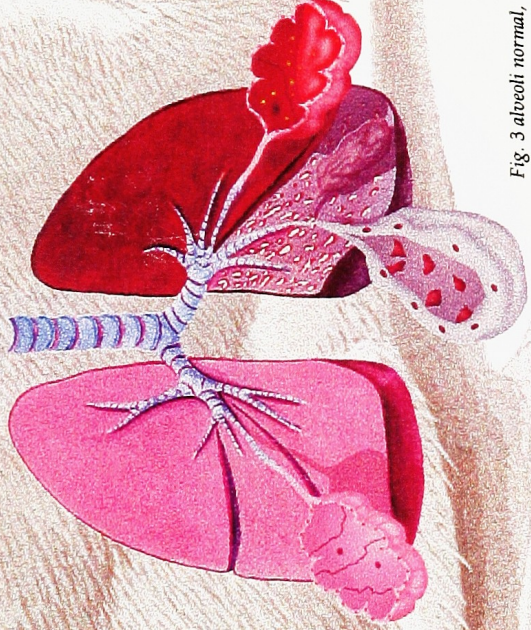


Fig. 3 alveoli normal, infected, and scarred

and blood from the leaking capillaries. After the immune system begins to get control over the virus, the lungs begin to heal. Scarring usually takes place. If the damage to alveolar cell was too much, thick scar tissue will develop limiting the amount of gas exchange possible. Some alveoli collapse while others expand as their walls thicken with scar tissue. If the damage is too extensive, death will occur.

The virus is most commonly contracted via dust breathed in.

Sweeping and vacuuming are the two methods typically that cause virus carrying dust to stir up. To avoid breathing in dust, use a filter-ing mask. When han-dling mice or their remains, be sure to wear gloves.



Fig. 4 vacuums and brooms stir up dust

Using a household cleanser to thoroughly wet the area to be cleaned before removing any remains or droppings will help prevent dust from forming. Hanta virus can not be treated or cured. There is no treatment

protocol, however if detected soon enough, it can be managed and overcome. There are other related viruses that

cause HPS in species closely related to the deermouse. More research must be done in order to find a cure for this deadly disease.

Fig. 5 use cleanser to wet area



# HANTA VIRUS

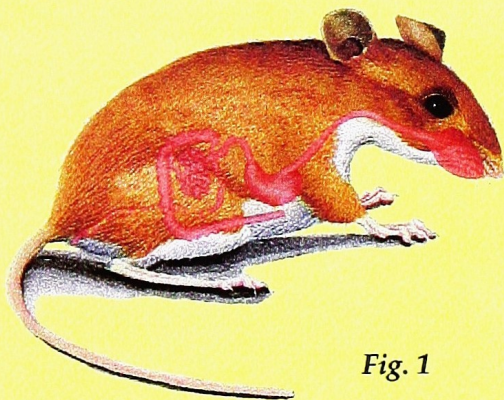


Fig. 1

Carried by deermice, the Hanta virus is a deadly new force on the medical frontier. It is contracted by breathing in the aerosol virus from rodent droppings or by being bitten by an infected mouse.



Fig. 2

In the lungs the virus attacks the delicate lining of the alveoli. As these cells are destroyed, holes are torn in the underlying capillaries. The blood vessels leak blood and fluid into the air spaces of the lungs. This makes the lung heavy and it resembles liver. The body tries to repair the damage by creating scar tissue. This causes some alveoli to expand and some to collapse, giving the lung a "honey-comb" look.

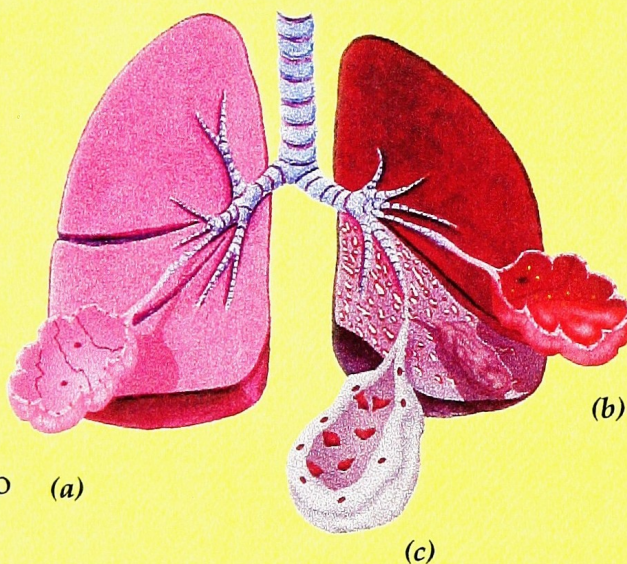


Fig. 3

Figure 1: Deermouse with virus in intestines.

Figure 2: Ways of contracting virus.

Figure 3: a) healthy lung and alveoli, b) lung in first stage of infection filling with blood, c) lung attempting repair with scar tissue and a few alveolar cells.

Figure 4: Sweeping and vacuuming stir up dust.

Figure 5: Wear gloves and wet area thoroughly.



Fig. 4

Vacuuming and sweeping stir up dust and allow the virus to be breathed in. The Center of Disease Control in Atlanta recommends wearing masks and gloves when working around mice and their remains. If mouse droppings or remains are to be removed, use a household cleaner to thoroughly wet the area. Always wear gloves while cleaning, and wash hands with soap and water.



Fig. 5



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