THE IMPORTANCE OF URINE ODOR CONTROL IN THE CAVIARY

By David Hardesty

All warm-blooded animals need food to survive and grow. Not all of this food will be digested. A goodly portion passes through the digestive tract undigested. That which is digested is broken down into simple organic molecules which will be used as "fuel" for the various processes within the body. The result of the "burning" of these simple "fuels" is the release of energy and the production of waste products of these reactions. These waste products include water, carbon dioxide, and urea. Urea is the chief byproduct of the metabolism of protein, and is manufactured almost exclusively by the liver, which dumps the urea into the bloodstream for eventual removal by the kidneys.

Urea is toxic to mammals and is constantly being filtered out of the bloodstream by the kidneys. This is why kidney failure is inevitably fatal. Once outside the body of the mammal as a component of urine, urea is used by certain bacteria as a source of energy. The byproduct of these bacteria using urea as fuel is ammonia, the all too familiar odor associated with the accumulation of urine.

All too often, the cavy breeder, ever zealous to protect his animals from disease, will overlook the potentially toxic effect of airborne ammonia. Animals may appear outwardly free from disease and yet be suffering the toxic effects of ammonia.

Factors which directly determine the amount of ammonia in the atmosphere include temperature, the relative humidity, cage population density and the frequency of cage cleaning. Higher temperature and relative humidity mean higher airborne ammonia levels. Too many animals per square foot of cage space means higher airborne ammonia levels. The type of cage can also directly influence atmospheric ammonia. Wooden cages soak up urine and form ideal environments for bacteria to form ammonia. The water from the urine will also slightly increase the relative humidity inside the cage. Cages which do not allow proper circulation of air will lend themselves to increased levels of atmospheric ammonia. Inadequate ventilation of the room or building housing the animals will also contribute to the buildup. No one needs to be told that summer is a bad time for excessive urine odors. But winter can also be a bad time with windows closed to prevent the escape of heat, but more importantly, the input of fresh air to dilute the concentration of ammonia in the air.

Ammonia is highly soluble in water and dissolves readily in the water which moistens the skin lining the nasal passages and trachea. Dahlman (1963), experimenting with the affects of atmospheric ammonia on rabbits, found that over 70% of the irritant was absorbed in the nasal passages. He further examined the effect of ammonia on the skin lining the nasal passages. Normally this skin has millions of tiny, microscopic protrusions called cilia. The job of these hairline cilia is to move the mucus, which normally is found adhering to the inner lining of the respiratory tract, up and out of the respiratory tract. This is accomplished by a rapid, beating motion of these cilia. Thus the mucus, produced by what are called goblet cells (also found in the lining of the respiratory passages), acts as a sticky "flypaper" to trap airborne dust, bacteria, and other contaminants, and carry them out of the respiratory system. Dahlman found that exposing the lining of the trachea and nasal passages to ammonia, caused a severe depression of the normal beating motion of the cilia. At higher levels he found an actual destruction of the surface layers of the skin lining the nasal passages. Gamble and Clough (1976) found that exposing these tissues to high concentrations of ammonia (200 parts per million) for a period of eight days was sufficient to cause the total disappearance of both the cilia and the goblet cells. Also observed was a virtual tripling of the skin thickness in the nasal passages, and trachea, with a resulting constriction of the effective diameter of nasal passages.

What is the significance of these observations? Because the cavy is constantly being threatened by infection by a host of airborne organisms, the upper respiratory tract serves as a first line of defense against these invaders. The complete disruption of the normal process of flushing out these invaders, via the cilia and mucus, by the irritating action of atmospheric ammonia renders the cavy much more susceptible to disease. Donnelly and Heird(1974) reported that in reportedly "healthy" control animals, inflammation of the trachea increased turbulent airflow and increased the deposition of airborne particles in the trachea (Gwen,1969) Because of the thickening of the lining of the trachea and nasal passages, the animals were forced to breathe harder, just to get the same amount of air, and thereby compound the problem.

Research has indicated another subtler side affect or ammonia exposure from urine odor. Jesel and Aron (1974) found that, without going into detail, exposing female cavies to the odor of urine caused a significant disruption of the normal estrous cycle. They found that the period of what was termed "vaginal closure", or sexual non-receptivity, was significantly reduced. They could provide no correlation between vaginal closure and a determination of exactly what point the cavy was in the cycle, internally. They found that only female urine exerted this affect, and only when collected from females which were in a period of vaginal opening. Urine collected during other times did not have any significant affect. What is important to note is that only the odor was in contact with the affected females. The total significance of this discovery will need additional research.

I have some personal experiences to relate which may have some bearing. For three years I raised my animals in a specially outfitted construction trailer because I lived in an apartment. The trailer was completely outfitted to maintain a constant temperature, humidity, and light exposure. During the winter and summer, especially the summer, I would have a moderate to bad problem with urine odor. During the fall and spring the problem would not be nearly as bad because I could open vents and mix fresh, outside air without completely throwing my room temperature out of proper ranges. What I did notice in the three years the animals were kept in the trailer was a pronounced drop in reproductive rates during the winter, and the summer; worse during the summer. I eventually moved the animals out of the trailer and into the attached garage of a 2 bedroom house which I had bought. All attempts to keep the garage cool, using an air conditioned, had to be abandoned due to a lack of sufficient insulation in the garage. Every attempt was made during the hot summer months to mix copious amounts of fresh air into the garage without causing drafts, to keep the temperature down at a bearable level during the day. The number of litters born of my sows during that first summer were higher than the combined total of the entire prior year. In theory, I had been providing what could be considered a more ideal environment in the trailer than in the garage and yet the sows, in spite of the summer heat and humidity, had litters as never before. These same sows as six months prior, which appeared healthy as horses and just simply were not having babies. Obviously something to do with the urine odor was affecting their reproduction. Possibly the research of Jesel and Aron is a verification of this fact.

If the cavy fancier is truly striving to provide the best of all possible worlds in care for his caries, control of atmospheric ammonia must rank very high on the list of "do's". If the cavy fancier is striving to breed a "perfect" specimen to put across the judges table, he must give every animal the optimum chance at survival. Protection from the ravages of ammonia toxicity must be given just as much importance as protection from bacterial disease. Ample cage space, frequent cage cleaning, and adequate ventilation must be provided to guard against the ravages of atmospheric ammonia. The control of this problem lies squarely in the lap of the fancier. How well do you guard against it?

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