Radiographic Diagnosis

A proliferative and destructive bone lesion exists in the left humerus. The appearance of this lesion suggest a primary bone tumor or an osteomyelitis. A biopsy of the bone lesion is recommended.

Comment

An area of new bone growth, which has almost completely encircled the cortex, exists on the proximal humerus. An area of cortical destruction is present on the posterior aspect of the humerus. There are also several "pin point" lytic areas in the new bone. The location of the lesion is near the metaphysis which is a site of predilection for primary bone tumors. However, the age of the animal and appearance of the lesion are somewhat unusual and the possibility of osteomyelitis, perhaps fungal in origin, should be investigated.

Follow Up

A bone biopsy revealed the presence of *Aspergillus sp.* Thoracic radiographs revealed nodular densities throughout the lung fields. The dog was euthanized and at necropsy a diagnosis of disseminated Aspergillosis was confirmed.

Nitrite

What is Nitrate?

Sodium nitrate is a naturally-occurring substance in vegetables, water, soil, and even the air. Originally discovered as an impurity in salt, small amounts have been used for thousands of years to cure meats.[1]

What is Nitrite?

Sodium nitrite, also used to cure processed meats, is a derivative of sodium nitrate. When nitrate is used to cure meats, it converts to nitrite. Nitrite is the active ingredient. Both nitrate and nitrite usage are allowed under the Meat Inspection Act.

What Does Nitrite Do?

Nitrite is essential in cured meats because it performs several vital functions:

- it prevents botulism.[2,3] Nitrite provides a safeguard against mishandling by manufacturers, distributors, retailers or consumers (i.e., failure to refrigerate properly because of mechanical malfunction, negligence or ignorance). A recent USDA study concluded that 63% of the 2,500 households surveyed ran a *"high risk"* of food-borne illness because of a lack of awareness of basic safe food handling practices.[4]
- it gives cured meats their special flavor and appearance; without it, we could not have bacon, sausages, hams and other meat products as we now know them.
- it retards oxidation which otherwise causes an undesirable (warmed over) flavor.

Nitrite is the only substance that will do all these things. No substitute has been found even though more than 700 substances have been tested as possible replacements.

Why the Controversy?

Nitrite can combine with secondary amines to form compounds called nitrosamines. When fed in large quantities, nitrosamines can cause certain types of cancer in laboratory animals. The meat industry became concerned in 1970 because secondary amines can be found occasionally in small quantities in meats.

The American Meat Institute brought this *potential* problem to the attention of USDA and the FDA, and the three organizations have engaged in extensive, joint nitrite research since then. In fact, AMI and its member companies have spent millions of dollars on efforts to explore the matter fully.

Results of difficult, time-consuming analyses have shown that virtually all cured meat products are free of nitrosamines. However, minute amounts of a nitrosamine called nitrosopyrrolidine have been discovered in some bacon as a result of severe frying.

Expert Panel Formed

In September, 1973, the Secretary of Agriculture appointed a six-member Expert Panel on Nitrates, Nitrites and Nitrosamines to advise the Department on the safety and continued use of these substances. After

Courtesy of Robert E. Rust, ISU Meat Specialist, and American Meat Institute, Washington, D.C.

several meetings and the careful consideration of much data, the Panel, in September, 1974, agreed on some broad recommendations:[5]

1. that nitrate use should be prohibited in all cured meat products except for fermented sausage and dry-cured products because nitrite alone is adequate.
2. that the level of nitrite salt permitted to be added for curing meat and poultry be limited to 156 parts per million (ppm) in all processed products except bacon and dry-cured products. (The Panel felt that botulism is a real threat and that the continued use of nitrite is warranted. Action on bacon, fermented sausage and dry-cured products was deferred at that time pending more research).
3. that the current permitted 200 ppm residual nitrite level be reduced in various product categories to reflect what is achievable with current technology.

The Secretary of Agriculture accepted the recommendations and, in November, 1975, after additional research on bacon was completed, announced a proposed change in its regulations. AMI submitted comments to USDA expressing general support for the proposed changes. The proposed regulations included setting lower levels of nitrite and maximum permitted levels of ascorbate (Vitamin C) for processing of bacon to block the formation of nitrosopyrrolidine during frying.

American Meat Institute Action

Recognizing the problem back in April, 1975, before the USDA proposal, AMI urged its members to adjust their processing of bacon by eliminating nitrate altogether, reducing nitrite by about 40% to 120 ppm, and increasing to the legal maximum (550 ppm) the amount of ascorbate (Vitamin C). These recommendations have been voluntarily adopted by most meat processors and AMI estimates that 95% of all U.S. bacon is now produced in this manner.

Results of Research

All available information indicates that these minute amounts of nitrosopyrrolidine are not harmful to humans in the amounts present in the diet and in the environment. Furthermore, there are valid questions about the reliability of tests which indicate levels below 10 parts per billion.

The hypothesis of nitrite combining with secondary amines to produce nitrosamines in the stomach is still being debated. But current evidence indicates the possibility is remote because of the extremely low amounts of nitrite and secondary amines present in our foods.

More than 80% of the nitrite entering the human stomach originates in saliva, and less than 20% comes from cured meat and poultry products.[10,11] The former occurs from the consumption of nitrate, principally from vegetables, and its subsequent excretion in saliva where it is converted by bacteria to nitrite. Dr. Steven R. Tannenbaum of the Massachusetts Institute of Technology has said: "It would be essentially impossible for man to completely avoid nitrate in a normal diet, whether it consisted of processed or unprocessed foods, and the amount of nitrate consumed would almost certainly be higher in a vegetarian diet."[12]

AMI is continuing its search for additional so-called blocking agents which will act to prevent the formation of nitrosamines in bacon, such as ascorbate is already doing.

Expert Panel's Conclusions

The Carter Administration took office in January, 1977. Following the appointment of a new Assistant Secretary of Agriculture for Food and Consumer Services, Carol Tucker Foreman, the Expert Panel was enlarged to broaden the scope of its interests and expertise.

In September, 1977, the Panel drafted a proposed final report recommending nitrite levels for red meat products that are essentially the same as those urged by the American Meat Institute.

It concluded that: "As an anti-clostridial (anti-botulism) agent, nitrite has been the most acceptable ingredient yet found and is responsible for the excellent safety record of commercially produced meats. . . ."[13]

The Panel approved a table of nitrite, nitrate and ascorbate amounts for various classes of products, and asked the Department to propose ranges above and below the targets. For bacon, the target level for ingoing nitrite is 120 ppm and for Vitamin C of 550 ppm. The Panel also recommended that, if carcinogenic nitrosamines are found in any

product cured with nitrate or nitrite, the Secretary of Agriculture must seek to eliminate the nitrosamines as *rapidly as possible within three years.*

Regrettably, the Department has so far failed to even make public the final report of the Expert Panel, not to issue final regulations incorporating the Panel's recommendations—which AMI largely endorses.

Recent Developments

Rather than accepting the recommendations of its own Expert Panel, USDA in October, 1977, requested the meat industry to provide information demonstrating whether the use of nitrite in the production of bacon results in the formation of carcinogenic nitrosamines. USDA gave the industry 90 days to provide this information for bacon but set longer timetables—from six months to two years—for sausages, lunch meats and other cured meats, depending on the type of product.

Because of the difficulty in amassing more data on bacon in such a short period of time, USDA has recently added an additional 60 days to the deadline. At a November 9th meeting with the meat industry, the Department acknowledged that all previous data had been submitted with the understanding that the "nondetectable level" for nitrosamines is 10 ppb, since most laboratories do not have a capability for confirming below that level. However, USDA now says it can confirm the presence of these substances down to the level of 5 ppb and, accordingly, considers anything below that to be "undetectable."

In November, 1977, the Community Nutrition Institute petitioned USDA to ban nitrite from all uses in the processing of meat food products intended for human consumption. In view of the excellent progress made by the meat industry in nearly eliminating the formation of nitrosamines (and keeping them well below any level that could be harmful to humans), the meat industry was bewildered by this development. The American Meat Institute views the action as totally unsupported by scientific evidence.

What if Nitrites Were Banned From Cured Meats?

Domestic production of cured meats is more than 9 billion pounds per year. Consumption is even higher because the U.S. is an importer of cured meats. The retail value of cured meats (most of which contain nitrite) sold in this country each year exceeds $12 billion.

If nitrite were no longer allowed in bacon, hog producers would have an annual income loss of at least $500 million. There would be fewer hog farmers and less employment in farming; less employment in meat packing, distribution and retail establishments; loss of export markets for pork; financial losses from the closing of facilities; less choice for consumers at the meat counter; and the loss of cash and future markets.

Much greater losses would occur *if nitrite were to be banned in all cured meats.* It would all but destroy the U.S. hog industry since nearly 70% of our pork ends up in processed meat products—mostly cured meats. Only about 30% is sold fresh.

A severe decline in hog farming would seriously affect the entire chain of production, including grain farmers, equipment manufacturers, food processors, distributors and retailers. Hogs consume over one-third of the corn we feed to livestock each year. Cash receipts of farmers from the sale of hogs approach $7.5 billion annually. The retail value of pork production sold is estimated to be $15 billion annually—a huge market. Cattle markets would also be seriously affected since about 10% of beef goes into cured meats.

Summary

A potential public health problem has been thoroughly investigated, found to be scientifically inconsequential, and yet has created a high degree of undue public concern.

The botulism threat is a serious one and clearly warrants the continued use of nitrite in cured meats at the reduced levels recommended by USDA's Expert Panel.

While possible nitrosamine formation in bacon cannot be totally ignored, the preponderance of evidence suggests that the meat industry has been successful in substantially blocking such formation and that the minute traces found in some severely fried bacon samples pose no health hazards to humans. Accordingly, it would be extremely unwise for USDA to act prematurely to ban

Continued on page 34

Class of 1978

NEILL and Mary **LUND** are the proud parents of a baby girl, Heather Marie, born 28 November 1977.

Class of 1979

Tom Sanderson married Cinda Nelson on 4 June 1977.

Robert Durrie married Lauren Schaefer on 11 June 1977.

Robert James married **Meg Glattly** on 18 June 1977.

Bruce Hoppe married Elizabeth Wachal (R. Ph., Wis. '76) on 25 June 1977.

Jeff and Carol **Dick** are the parents of a baby boy, Jeremy Robert, born 11 July 1977.

Tim Bertram is engaged to Julie Hagel.

Nick and Leslie **Striegel** are the parents of a baby boy, Andrew Nicholas, born 18 November 1977.

Jay Stewart married Joan Wilson on 17 December 1977.

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Nitrites, *cont'd. from page 29*

nitrite in bacon or other meat products in the belief that it was reacting to a real threat to health. The resulting economic upheaval would be extremely costly to many thousands of Americans—farmers, workers, and consumers—and would have an undesirable impact on many foreign nations. Because of the unfounded fears that have been expressed, the futures market, the stock market, bankers, and others are becoming nervous about the situation, a development that will not be helpful to our economy and prospects for future production.

Research should and will continue into methods that will eliminate any detectable traces of nitrosamines in bacon or any other meat products. AMI supports these efforts and will do all it can to ensure the continued production of safe, healthful and high quality products.

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Class of 1980

STEVE SPEAS married Barbra Krabbe on 19 Nov. 1977.

STAN and Pat **OURADA** are the proud parents of a baby boy, Jason Dean, born 7 Dec. 1977.

Class of 1981

TIM and Kris **WEISENSEL** are the proud parents of a baby girl, Sarah Magdelen, born 20 Oct. 1977.

DEB CONANT is engaged to marry John Lueth on 24 June 1978.

JILL STROHBEHN is engaged to marry Paul Engelstad on 24 June 1978.

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The ISU Veterinarian wishes to thank Fort Dodge Laboratories for their contribution of $25 to our organization.

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