



# Factors responsible for discoloration of bone-in broiler chicken thighs

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## Summary

Black bone discoloration is a syndrome causing darkening of bone-in broiler thighs. Bone darkening occurs in up to 30% bone-in broiler chicken thighs processed in Alberta (industry sources) and there is consumer bias against chicken dark meat in North America. The research is designed to study the possible factors causing the discoloration.

## Problem

Bone darkening is a dark internal discoloration of chicken meat that occurs adjacent to the bone-in chicken thighs. It occurs due to migration of hemoglobin from femur (thigh bone) to the surrounding tissues. Hemoglobin is normally oxidized to methemoglobin after freezing and thawing of bone-in thighs or is denatured on cooking, resulting in greater discoloration. Leg bones contain high blood level supply, therefore are most susceptible to darkening. Consumer acceptance of chicken meat depends on product appearance; for this reason, discoloration due to blood spots is seen as a low quality product. Moreover, myoglobin, the main pigment of well-bled meat, can also be oxidized during freezing and cooking influencing the meat color.

## Objectives:

- ✓ Investigate the factors related to bone darkening;
- ✓ Study the effect of cooking and freezing on broiler thighs;
- ✓ Compare the effect of diet on bone growth and meat characteristics.

## Our Approach

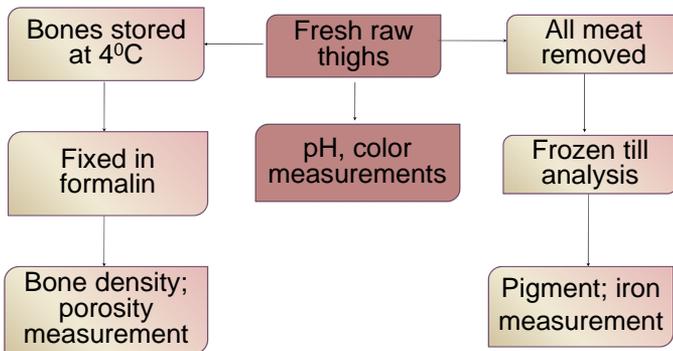


Figure 1. Experimental treatment for fresh raw thighs.

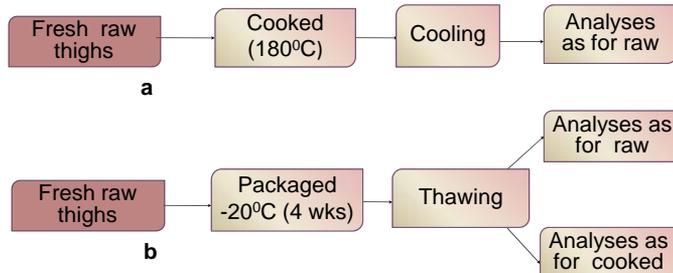


Figure 2. Experimental treatment for **a)** fresh cooked **b)** frozen thighs (frozen raw and frozen cooked).

## Project design

Part I  
Analysis on chicken bone-in thighs in broilers bought from market

Part II  
Broilers raised at Poultry Research Centre (PRC) on 3 different diets:  
✓ Vitamin D;  
✓ 25-hydroxy vitamin D;  
✓ Diluted vitamin D.

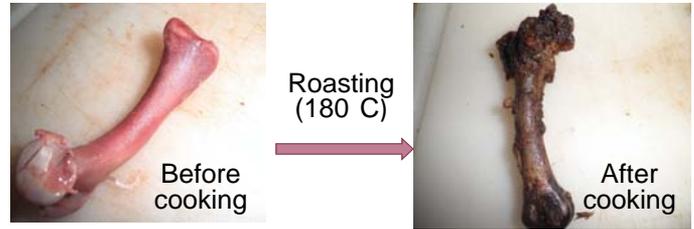


Figure 3. The uncooked raw (left) and cooked (right) thigh (femur bone).

## Observations

1. Cooking and freezing increased the release of iron from hemoglobin and myoglobin molecules in broiler thigh meat.
2. Cooking, in general, decreased the concentration of total heme pigments.
3. Upon cooking and freezing the concentration of metmyoglobin increased.

## Conclusion

The research will help us understand the possible causes related to the problem. Cooking and freezing methods can be manipulated to decrease the rate of bone darkening. Diet specifications can be made leading to increased bone growth and thus reducing the incidence. Consumer confidence can be increased in dark meat resulting in more profits to industry. Processing, storage and preparation techniques might then be used to further reduce the incidence.

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