The Relationship of Eggshell Structure to Eggshell Penetration by *Salmonella* Typhimurium in Table Eggs

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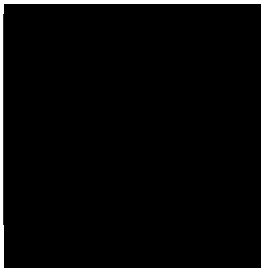
I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification. I certify that any help received in preparing this thesis and all sources used have been acknowledged in this thesis

Signature 

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Summary

This project sought to correlate external shell features with underlying shell structures and examine if these structures are indicative of increased incidence of eggshell penetration by *Salmonella* Typhimurium.

Eggs are an important nutrient and protein source in most cultures around the world, and the importance of food safety in intensive food production industries is likely to increase. Microbial infection of eggs is the source of approximately 49% of *Salmonella* food poisoning cases in Australia each year. The most significant source of these infections in Australia is *Salmonella* Typhimurium. Eggshell translucency is a phenomenon observed when an egg is candled over a light source; the underlying cause and incidence of eggshell translucency form the basis of our investigations of shell structures. In order to image eggshell structure, both Computed Tomography and Scanning Electron Microscopy were used to examine different structural components of the shell.

Shell structures were found to be different among shells, even consecutive shells from the same bird. There was a clear relationship between refrigerated storage and the appearance of translucency, and that there were significant differences in the type of mammillary bodies and pore formations between low and high translucency shells. There was no consistent relationship between translucency and eggshell penetration; however, there were some significant correlations. This experiment also identified a number of structural features that were potentially conducive to bacterial entry.

Although there was no clear relationship between higher incidence of eggshell translucency and increased rates of bacterial penetration, this project has confirmed a number of shell structures that are more commonly associated with bacterial penetration of intact table eggs.