The efficacy of a Homoeopathic complex (Aconitum napellus 30CH, Arnica montana 30CH and China officinalis 30CH) on the transport of broiler chickens to the abattoir, in terms of mortality rate, damage and weight loss.

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I, Alan Rowan Eatwell, declare that this dissertation represents my own work, both in conception and execution

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DEDICATION

This dissertation is dedicated to my father and Barbara for all their patience and support.

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ABSTRACT

The purpose of this placebo-controlled study was to evaluate the effect of a Homoeopathic complex (Aconitum napelus 30CH, Arnica montana 30CH and China officinalis 30CH) on broiler chickens being transported to the abattoir.

The area of research focussed on mortality rate, catching damage and weight loss. The mortality rate figures consisted of both catching mortality and dead on arrival. The catching damage data collected for this study consisted of the number of fresh bruises to wings, legs, breast and back as well as fresh scratches. Weight loss was determined by weighing a randomly chosen module of twelve crates (each crate holding twenty-six birds) from each treated house, prior to, and again after transportation and lairage.

Two neighbouring chicken-houses (each containing approximately 30 000 Cobb-500 broiler chickens) were chosen for this study. One house's water supply was treated with one litre of the homoeopathic complex, while the other house was treated with an equivalent amount of placebo. This was undertaken the day prior to transportation of the chickens to the abattoir.

The following day, a module containing twelve crates of chickens was chosen at random from both treated houses during capture. Each crate was weighed prior to transportation, and then weighed again after transportation to the abattoir and lairage.

Catching damage (or morbidity) data was collected at the abattoir by quality assurance spotters, who identified carcass defects on the processing lines after

slaughter, defeathering, and evisceration before chilling. They carried out six two-minute spot checks for each house

From the results of this study, it can be concluded that the administration of the homoeopathic complex (Aconitum napellus 30CH, Arnica montana 30CH and China officinalis 30CH) did not significantly influence the total mortality rates. There was a mixed result with respect to catching damage but a significant reduction in weight loss for the chickens treated with the homoeopathic complex compared to the placebo treated chickens.

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DEFINITION OF TERMS

Adrenomedullary System — **The inner, part of the adrenal gland that secretes Catecholamines (epinephrine and norepinephrine) In response to sympathetic stimulation (Solomon *et al* 1990)**

Ascites — **Effusion and accumulation of serous fluid in the abdominal cavity (Dorlands 1989)**

Basopenia — **Abnormal decrease of basophil cells in the Blood (Wordsworth 1988)**

Basophilia — **Abnormal increase of basophilic leukocytes in the blood (Dorlands pocket medical dictionary 1989)**

Broiler — **A chicken raised for slaughter for a period on average of 37 days with a body mass of approximately 1.8 kg (Thomson 2002)**

Corticosteroid — **Any of the steroids elaborated by the adrenal cortex (excluding the sex hormones); divided into two major groups: *glucocorticoids*, chiefly involved in carbohydrate, protein and fat metabolism, and *mineralocorticoids*, involved in the regulation of electrolyte and water balance (Dorlands 1989)**

Eosinophil — **A granular leukocyte having a nucleus with two lobes connected by a thread of chromatin, and cytoplasm containing coarse, round granules of uniform size (Dorlands 1989)**

Heterophil — **The most common leukocyte in the peripheral blood of some avian species. They tend to be round cells with a**

	colourless cytoplasm containing eosinophilic rod-shaped granules. Mature heterophils have a lobed nucleus with a coarse, clumped chromatin that stains purple (Maxwell 1993)
Heterophilia	**Abnormal increase of heterophilic leukocytes in the blood**
Heteropenia	**Abnormal decrease of heterophilic leukocytes in the blood**
Hyperthermia	**Greatly increased body temperature (Dorlands 1989)**
Hypothermia	**Low body temperature (Dorlands 1989)**
Hypoglycaemia	**Deficiency of glucose concentration in the blood, which may lead to nervousness, hypothermia, headache, confusion, and sometimes convulsions and coma (Dorlands 1989)**
Lairage	**The storage of broilers in crates upon arrival at the abattoir before slaughter (Hunter *et.al.* 1998)**
Leukocyte	**White cell; a colourless blood corpuscle capable of ameboid movement, whose chief function is to protect the body against micro-organisms causing disease and which may be classified in two main groups: granular and nongranular (Dorlands 1989)**
Lymphocyte	**A mononuclear, non-granular leukocyte having a deeply staining nucleus containing dense chromatin and a pale-blue-staining cytoplasm. Chiefly a product of lymphoid tissue, it participates in immunity. (Maxwell 1993)**
Morbidity (Catching Damage)	**Consists of the number of fresh bruises to wings, legs, breast and back as well as fresh scratches**
Mortality	**The death of the broilers**

Mycoplasmal Infection	**Infection caused by a genus of highly pleomorphic, gram-negative, aerobic to facultatively anaerobic micro-organisms that lack cell walls (Family Mycoplasmataceae) (Dorlands 1989)**
Placebo	**A pharmacologically inactive substance which is administered as a drug in the treatment of psychological illness or in the course of drug trials (Wordsworth 1988)**
Potency	**The degree of succussion and serial dilution of a homoeopathic medicine**
Pressor	**Tending to increase blood pressure (Dorlands 1989)**
Pulmonary Hypertension	**Abnormally increased pressure in the pulmonary Circulation (Dorlands 1989)**
Right Ventricular Failure	**Failure of adequate output by the right ventricle of the heart, marked by venous engorgement, hepatic enlargement and pitting oedema. (Dorlands 1989)**
Succussion	**The method of adding kinetic energy to a dilution through shaking**
Sudden Death Syndrome	**Death of an apparently healthy chicken which appears to be caused by cardiac arrest (Thomson 2003)**
Triglyceride	**A compound consisting of three molecules of fatty acid esterified to glycerol ; a neutral fat that is the usual storage form of lipids in animals (Dorlands 1989)**
Weight Loss	**The difference in mass of the broilers between the weight measured after crating and after transportation and lairage**

CHAPTER 1

INTRODUCTION

The aim of this placebo-controlled study is to evaluate the efficacy of a Homoeopathic complex (Aconitum napelus 30CH, Arnica montana 30CH and China officinalis 30CH) on the transport of broiler chickens to the abattoir, in terms of mortality rate, damage (viz. scratching and bruising) and weight loss.

When broiler chickens are transported from the farm to the abattoir, they are exposed to numerous stressors, which can cause bruising, broken bones and even death. These stressors include overcrowding, handling, food restriction and dehydration. Road transportation stressors include increased thermal load, noise and vibration.

Research should be carried out to decrease the effects of the stressors on the broilers resulting in improved welfare of the birds as well as lower damage and mortality rates. The objective of this study is to improve the quality of life of the chickens during transport to the abattoir. Also by reducing injury and mortality, this study can be of economic advantage in the poultry industry.

According to an extensive literature review no previous Homoeopathic research has been carried out in this field.

CHAPTER 2

REVIEW OF THE RELATED LITERATURE

2.1 INTRODUCTION

The following discussion focuses on literature related to the undertaken research.

There has been a change in meat consumption from beef and pork to chicken. The reason behind this change appears to be a change in consumer preference to leaner meats with less fat and therefore better for a healthier diet. Chicken meat is also regarded as convenient to prepare as well as providing variety in a diet. From an economical viewpoint there has been a relatively low increase in the price of chicken meat over the last few years (Sumner 1998).

There has also been a change in the public perception of welfare in animal agriculture from the traditional view of caring for animals to a new impression of an exploitation of animals causing them to have miserable lives (Fraser 1997).

Also handling, crating and transportation can cause injuries, thereby reducing the birds' welfare as well as being of economic significance
(Kannan and Mench 1996:21).

2.2 THE BROILER INDUSTRY

The consumption of poultry has increased considerably world wide over the last few decades. In the U.S.A. broiler consumption has increased from 23.6 pounds (10.7kg)

per capita in 1960 to 72 pounds (32.7kg). Chicken consumption in the U.S.A. overtook pork in 1982 and beef in 1992 (Sumner 1998:466)

Other examples of change in chicken consumption are Israel with an increase per capita from 25.6 kg to 32 kg and Germany where consumption increased from 6.9 to 7.6 kg per capita (Schipper 1998).

Poultry consumption is also increasing on the African continent. In South Africa poultry consumption per capita has increased over the last three decades from 3 kg in 1966 up to 17 kg in 1996 (Malan 1997).

2.3 FACTORS AFFECTING POULTRY HUSBANDRY

2.3.1 POULTRY ANATOMY

It is important to take note of anatomical differences between poultry and other animals when considering poultry husbandry. The skin in poultry is much thinner compared to other animals as well as being movable and bruising easily. The skin is also poorly supplied with blood vessels except for the comb and wattle. Chickens do not have sweat glands and only cool down by rapid respiration (Mitchell 1997:271).

The skeleton in poultry differs from other animals. The bones are harder and able to withstand greater pressure. Some bones are filled with air in contrast to bone marrow in other animals. The pneumatic bones are directly and indirectly connected with the lungs and with air sacs which favour the spread of diseases (Mitchell 1997:271).

Feathers, which insulate and help control body temperature, are much reduced in modern fast-growing broilers causing insufficient control of body temperature. The

enlargement of the sternal bursa, which develops in the skin at about four weeks, creates breast blisters, which may become infected, necessitating trimming (Mitchell 1997).

The blood in birds differ from mammals in that red blood corpuscles contain a nucleus (Mitchell 1997:271).

2.3.2 GROWTH RATES

Another factor influencing the poultry industry is the vast improvement in growth rates in broilers over the last three decades. In 1963 it took seventy days to produce a two kilogram live chicken, whereas in 1993 it took only forty two days to achieve the same mass. The life of a broiler is short, an average of thirty-seven days. Feed efficiency has also improved dramatically, with feed conversion ratios of 2.61 between 1963 –1970 compared to only 1.87 between 1989-1993. However ascites, sudden death syndrome (SDS) and bone deformities coincide with this rapid growth rate and food utilisation improvement (Malan 1997:554).

This increase in broiler performance has however been accompanied by metabolic changes resulting in metabolic stress. This can be directly related to an insufficient oxygen supply during metabolism and a dysfunctional homeostasis (Malan 1997:555).

The mortality pattern has also changed significantly from a mortality incidence rate of less than 1% from 1963- 1973 rising to 9.4% from 1989-1993. This is mostly due to the incidence of metabolic disorders (such as Ascites and sudden death syndrome) increasing. Prior to 1973 most mortalities occurred before the age of twenty-one days. Over the past few decades, mortalities have shifted to older birds, mostly after

the age of twenty-one days. A higher incidence of metabolic disorders is seen during winter. Pulmonary Hypertension Syndrome (ascites) is one of the largest causes of broiler mortality and carcass condemnations world wide and in South Africa (Malan 1997:558).

Ascites is the result of hypoxemia (i.e. deficient oxygenation of the blood) induced pulmonary hypertension causing right ventricular failure. Exposure to cold is the main environmental trigger for ascites. High altitude is also a significant cause of ascites mortality due to the low oxygen concentration at elevated altitude. Other factors causing ascites include ammonia, poor ventilation, overcrowding, rapid growth rates etc. (Malan 1997:558).

In mature poultry, bones are hard and able to withstand great pressure. This is not necessarily true for broilers since they are not yet mature when slaughtered. This would explain a higher incidence of leg deformities in modern broilers. This would imply that broilers would be more likely to damage during handling while being captured prior to transport to the abattoir (Mitchell 1997:368).

2.3.3 STRESS

According to Webster's Collegiate Dictionary (1981), "stress" can be defined as "physical, chemical or emotional factors that cause bodily or mental tension" and may be factors in disease causation".

Animal husbandry-related stressors include food restriction, crowding, handling, lairage, heat, noise and transportation. Stressors, such as these, may impede the production of antibodies and effective cell-mediated immunity, increasing the susceptibility to viral diseases, tumours and mycoplasmal infections in chickens.

According to Gross (1989) chemical inhibition of adrenal steroidogenesis enhanced resistance to viral and respiratory infections in chickens.

Stressors may be classified as chronic or acute. An example of an acute stressor is handling of an untrained chicken for a short period of time. Prolonged confinement in overcrowded conditions would be an example of a chronic stressor.

2.3.4 STRESS RESPONSE IN POULTRY

The stress response acts as a physiological mechanism of mediation linking a stressor to a target organ, which may have a positive or negative effect. Whether stress is damaging or not depends on the relationship between firstly, individual characteristics and properties of stressors, stress and physiological systems and secondly, the nervous system, peripheral organ systems and the neuroendocrine systems (Bohus *et al* 1987).

Two distinctive pathways involving interlocking physiological reactions are affected once a stressor has been perceived. The first pathway involves the sympathetic adrenomedullary (SA) system responsible for the “fight or flight” mechanism, which may have a dramatic physiological impact but is of short duration. This neurogenic pathway includes the postganglionic neurones and adrenal medullary tissue, which are both linked to the release of cathecholamines (adrenaline and noradrenaline) which act to accelerate the heart rate (Maxwell 1993).

The pressor response produced by cathecholamines may stimulate the arterial barorecptors and increase vagal tone enough to overpower the direct effect and cause cardiac deceleration (Nash *et al* 1976).

The second pathway involves the hypothalamic-pituitary-adrenalcortical axis which occurs when the biological system fails to cope with the stressors and behavioural activity is suppressed which is associated with Selye's adaptive stage of the "general adaptation syndrome"(Zulkifli and Siegel 1995:64). This neurogenic pathway is responsible for the release of glucocorticoids in the form of corticosterone. If the animal fails to respond because of adrenal insufficiency, it becomes exhausted and dies (Freeman 1985:45).

Glucocorticoids have an anti-inflammatory action and, as such, are useful against bacterial diseases where the major pathology involves local or generalised inflammation. Viral infections, on the other hand, cause direct invasion of tissue and inflammation is required to localise the infection (Zulkifli and Siegel 1995:66).

Leucocytes are blood cell types particularly involved in the stress response and constitute the immune system. There are three different types of leucocytes, namely granulocytes, lymphocytes and monocytes. Granulocytse are further subdivided into three cell lines: basophils, eosinophils and heterophils (equivalent to mammalian neutrophils) (Maxwell 1993:35).

Heterophils are responsible for defence against bacteria, have a defensive role against parasites (e.g. worms and protozoa). Avian basophils on the other hand, are less well understood but appear to be a mediator in the early inflammatory response. Lymphocytes aid in recognising and destroying different pathogens and are essential in the defence against intracellular parasites such as viruses and certain bacteria (Maxwell 1993:35).

Stress may cause involution (structural deformation) of lymphoid tissue, thereby reducing the number of lymphocytes with an increase in heterophylic granulocytes (Siegel 1983), which may increase resistance to bacterial but not viral infections. Heterophils, the poultry equivalent of the mammalian neutrophil, is responsible for the defence against parasites such as worms and protozoa (Maxwell 1993:35).

Plasma corticosteroid concentrations are inconsistent and are regarded as inadequate as a biological index of stress. Gross and Siegel (1993:972) have suggested that heterophil to lymphocyte ratios are a more reliable indicator of the magnitude of the perceived stress in chickens. During conditions of extreme stress to some birds a heteropenia exists and the heterophil to lymphocyte ratio cannot therefore be used as an accurate measurement of stress (Maxwell 1993:41). For this reason plasma heterophil and lymphocyte levels will not be used as a measure of stress in this study.

During leukocyte response in birds exposed to stress a two-phase cellular reaction occurs. In mild to moderate stress there is a heterophilia and a corresponding raised heterophil to lymphocyte ratio. During the second phase, under extreme stress, a basophilia occurs which may be associated with potentially life-threatening situations. In other animal orders stress causes a basopenia so the observations above may be unique to birds (Maxwell1993: 41).

2.3.5 POULTRY STRESSORS

2.3.5.1 HANDLING

Handling, during capture prior to transport to the abattoir, is a major stressor. According to Broom and Knowles (1989) handling was the most traumatic part of

transporting laying hens. Broilers are generally only handled three times in their lifetime: Firstly as chicks when they are placed in a shed, secondly after five to seven weeks, when they are removed and placed on a truck for transport, and thirdly at the abattoir, where they are handled for the last time.

The handling process at the farm basically consists of three components:

- Collection (including catching)
- Portage (carrying the birds from the collection point to the place of loading onto the transport vehicle)
- Loading onto the transporting truck.

Handling also includes placing birds in crates, which are required to keep the large number of birds usually involved under control. It also makes the process of both transportation and subsequent unloading both easier and safer for the birds, as they are less likely to be injured by collision (Scott 1993:46).

Bird welfare is often compromised during the handling process causing fear, frustration, pain and discomfort. Commercial broilers are generally caught by the legs or wings, carried by the legs in groups of two or three and crated for varying time periods prior to road transport. Manual handling alone causes stress to broilers regardless of the roughness of handling. Herding or conveying would cause less stress (Scott 1993:47).

Severe wing flapping during handling may cause bruising and red wing tips resulting in downgrading of broiler carcasses and causing substantial economic losses to the industry due to necessary trimming (Kannan and Mench 1996:22). Birds should not

be allowed to drop any great distance as this cause the fowls to flap their wings as they fall making them susceptible to wing damage (Duncan 1989:104).

Handling can also trigger physiological stress responses in birds. Inverted handling, as used by commercial handlers, under experimental conditions resulted in higher corticosterone levels than upright handling. Crating however appears to override both the handling effect and food deprivation effect either because of stressor activity or because it is the most powerful stressor amongst the three.
(Kannan and Mench 1996:29).

However as Kannan and Mench (1996:30) comment "although the inverted handling methods used in the study were intended to mimic commercial handling, there is no question that commercial handling and catching methods are far rougher and could lead to much more pronounced stress responses".

Handling is suggested to be a cause of a great deal of injury. In the United Kingdom, for example, typically 5% of broilers are downgraded due to injury which include bruising, broken bones and dislocations. Most of the damage resulting in downgrading occurs within a twelve hour period prior to slaughter Down grading effects the price that birds are sold at, thereby affecting the profit margin of the poultry producers. This is further affected by condemned birds. (Kettlewell and Turner 1985).

Bruising is a common cause for down grading broiler carcasses. According to May and Noles (1965) bruising followed by breast blisters were the most common causes of downgrading broiler carcasses. In Australia, 3.5% to 8% of daily production are downgraded in a study of four abattoirs, most commonly due to bruising. Carcass

scratches are another important reason for downgrading as they are unsightly and must be removed from carcasses for aesthetic reasons.
(McEwen and Barbut 1992:1107).

2.3.5.2 FOOD RESTRICTION

Broilers are fasted for six to nine hours prior to processing so as to reduce faecal contamination of carcasses, reducing problems caused by heat stress and combats respiratory alkalosis related mortalities. On the other hand, food deprivation is also considered to be a stressor (Kannan and Mench 1996:22) However, plasma corticosterone levels are not significantly affected by food removal.
(Maxwell 1993:37).

2.3.5.3 CROWDING

Over-crowding on the farm is also considered as a stressor. This can result in broilers pecking at, or scratching neighbouring birds thereby causing bruising and scratching resulting in down grading (Frankenhuis *et al* 1991).

A skin condition known as scabby hips is characterised by inflammation of the caudal parts of the back as well as the skin of the hips of broilers. Severe dermatitis and scab formation can occur, resulting in downgrading and carcass condemnation. Frankenhuis *et al* (1991) found that scabby hips are most likely caused by scratching of the skin by other birds claws. Furthermore the incidence of scabby hips can be decreased by reducing stocking density or increasing feeding space.

The ambient temperature determines the number of broilers placed in a crate during transportation. This varies between twenty-two and twenty-five birds, the higher

number used in cooler weather. Too many birds may cause heat stress which can result in life threatening increase in body temperature (Tomson 2001).

2.3.5.4 ROAD TRANSPORTATION

During road transportation to a centralised processing plant for slaughter, broilers may be exposed to a number of concurrent stressors. Thermal load during transit has been put forward as a major cause of mortality, injury and reduced welfare. Other causes may also be important sources of physiological stress, amongst these being vibration and noise during transport (Carlisle *et al* 1998:48)

Creatine kinase is an enzyme that catalyses the phosphorylation of creatine to creatine phosphate, which prevents the rapid depletion of adenosine triphosphate (ATP) in muscle by supplying a readily available high energy phosphate to regenerate ATP from adenosine diphosphate (ADP). Creatine phosphate is formed when the muscle is relaxed and ATP demands are not so high. Creatine kinase is a muscle-specific enzyme used clinically in the detection of acute or chronic diseases of muscle. An increase in Creatine kinase is observed in muscle disease or hyperthermia (Murray *et al* 1993:659).

Plasma activity of the intracellular muscle enzyme creatine kinase was elevated 2.2 fold in a group of broilers exposed to vibration at 5 Hz for 3 hours with a peak level activity reached at eight hours after exposure, followed by recovery to normal levels at twenty-four hours.

In birds exposed to 5Hz and 10Hz, plasma glucose concentration decreased by 12% and 17% respectively during exposure as compared to a control group. This relative

reduction persisted at eight hours post exposure only in birds exposed to 5 Hz vibration (Carlisle *et al* 1998:48).

Decreased blood glucose may demonstrate a depletion of energy reserves, especially liver glycogen stores, due to a combination of vibration effects and food withdrawal. Together with reduction in glycogen content of oxidative leg muscles, this may contribute to hypoglycaemia and result in muscular fatigue (Carlisle *et al* 1998).

Triglycerides (also known as triacylglycerols) are non-polar, water-insoluble fatty acid triesters of glycerol. They function as energy reservoirs in animals and are the major storage lipids in fat deposits (Voet *et al* 1999:222).

Plasma triglyceride increased by 16% during exposure to 5 Hz vibration and by 34% during exposure to 10 Hz vibration. Plasma cortisone levels increased during vibration by three fold in the 5 Hz group and 73% in the 10 Hz group during the three hour exposure period with a decrease to sub-basal levels at eight hours following exposure with recovery to basal levels at twenty-four hours (Carlisle *et al* 1998:49).

Road transportation ‘s effect on broiler chickens caused raised heterophil vs. lymphocyte ratios as well as raised plasma creatine kinase values indicating physiological stress in these birds (Mitchell *et al* 1992).

The results of the above effects are muscle damage, hypoglycaemia and activation of the pituitary-adrenocortical axis. Due to transport stress, plasma glucose falls before compensation by glycogen mobilisation and gluconeogenesis during initial rest in lairage, followed by increasing hypoglycaemia as glycogen reserves are exhausted (Carlisle *et al* 1998).

2.3.5.5 LAIRAGE

An additional source of stress is the holding of birds in modules on stationary vehicles upon arrival at the abattoir and in lairage prior to shackling. Lairage time may be equal to, or exceed, the transport time from the farm to the abattoir. Passive ventilation of modules containing broilers during lairage may be very low with the birds exposed to high thermal loads, causing increased thermoregulatory demands.

This may be further aggravated by external climactic conditions, thermal environment within the lairage and positioning and spatial arrangement of modules within the building. The temperature in a crate may be raised by approximately 10° C over a two hour period and may induce a proportional hyperthermia (Hunter *et al* 1998:54).

Due to transport stress, plasma glucose falls before compensation by glycogen mobilisation and gluconeogenesis during initial rest in lairage, followed by increasing hypoglycaemia as glycogen reserves are exhausted (Hunter *et al* 1998:54).

Decreasing triglyceride and non-esterified fatty acids levels throughout lairage also indicates the mobilisation and utilisation of lipid reserves, triggered by food withdrawal at the farm prior to the transport. This situation is aggravated by transportation stress and continued by fasting during lairage. Plasma cytokinase is unaltered by subsequent lairage, indicating that little or no muscle damage occurs during lairage (Hunter *et al* 1998:54).

Hunter *et al* also (1998:54) proposed that lairage time should be less than two hours, lairage and crate temperatures should be carefully monitored and automated ventilation used so as to improve the birds welfare as well as productivity.

2.3.5.6 AMBIENT TEMPERATURE

Experimental conditions simulating the heat stress that broilers may be exposed to during road transportation, where crate temperatures can contribute to life threatening increases in body temperature, were carried out. This resulted in a significant increase in basophils in about 25% of the surviving birds (Mitchell *et al* 1993). Often this basophiplia was accompanied by a significant heteropenia and lymphocytosis.

Leucocytes from these heat stressed birds showed evidence of basophil degranulation, significant increases in heterophil lobulation and cytoplasmic lipid droplets in monocytes. The red cells and thrombocytes are also structurally altered, the cells being significantly longer and thinner than before heat treatment. This change in cellular profile is probably due to the effects of dehydration
(Maxwell 1993:40).

The effect of exposure to high temperatures (44.4 °C and 47.8°C) causes an initial decrease in heterophils and an increase in lymphocytes after exposure for 15 to 30 minutes. Two hours later this situation was reversed (Maxwell 1993:38). Nathan *et al* (1976) found that heat exposure of adult cockerels to 42°C for one to two hours caused a significant decrease in leucocytes and an increase in plasma corticosterone levels.

Corticosterone is a glucocorticoid which is released during the adaption stage via the hypothalamic –pituitary –adrenal cortical axis. Glucocorticoids are steroids produced by the cortex (outer layer) of the adrenal glands. They affect carbohydrate, protein

and fat metabolism as well as being involved in other vital functions, including inflammatory reactions and the capacity to cope with stress (Voet *et al* 1999:229).
If the chicken suffers from adrenal insufficiency, it will fail to adapt and enter the stage of exhaustion and deteriorate and die (Freeman 1985:45).

During plucking of chickens at the slaughterhouse there is a relatively high incidence of skin tearing. Skin tearing is usually followed by muscle damage. Pitcovski *et al* (1994:737) states that muscle shredding is the main factor contributing to economic losses according to comments from various slaughter firms.

Ambient temperature is a crucial factor affecting the rate of skin tears and muscle damage at abattoirs. The higher the ambient temperature broilers are grown at is correlated to an increased rate of skin tears and muscle damage at slaughter. It has been proposed that temperature may cause alterations in the biochemical structure of the skin (Pitcovski *et al* 1994:736).

In Bombay, India an experimental remedial treatment was used to control high mortality rates in broilers during summer in tropical countries. This was carried out by administering a mixture of ammonium chloride, ascorbic acid and alpha-methyl-p-tyrosine to a group of broilers for seven weeks. The result was that the mortality rate was significantly reduced. Also the performance of broilers was elevated with respect to utilisation of feed and body weights. (Rajmane and Ranade1992: 343)

The explanation put forward was that the ammonium chloride increased the blood pH. The ascorbic acid may have altered plasma corticosterone levels and helped in maintaining the potassium concentration. Alpha-methyl-p-tyrosine probably blocks synthesis of cathecolamine as well maintaining higher levels of ascorbic acid (Rajmane and Ranade1992: 344).

2.3.5.7 NOISE

Noise is also a powerful stressor to birds. The only leukocyte to show a significant increase in number, following exposure to a continuous noise level of 80 or 95 decibels, was the monocyte (McFarlane *et al* 1989). A rapid heterophil to lymphocyte ratio response was produced by chickens after three hours on a road transporter (Mitchell *et al* 1992).

Gross (1990:759) exposed chickens to noise produced by banging a metal pail for thirty seconds. This resulted in the heterophil/lymphocyte ratios beginning to rise eighteen hours later, reaching a maximum level in twenty hours and returning to pre-stress levels after thirty hours. The increased heterophil/lymphocyte ratio is a good measure of the chicken's perception of stress in its environment (Maxwell 1993:35).

2.3.5.8 VIBRATION DURING TRANSPORTATION

Carlisle *et al* (1998:48) carried out a study to discover the physiological effects on broilers exposed to the vibrations during road transportation. Three groups of broilers were fasted for three hours then exposed to typical frequencies found on commercial transporters viz. 2hz, 5hz and 10hz for three hours. Plasma concentration levels of the intracellular muscle enzyme creatine kinase (CK), glucose and triglyceride (TG) and corticosterone were measured as physiological indicators.

In all of the groups peak CK activity occurred at eight hours after start of treatment (viz. five hours recovery) with return to basal values at twenty-four hours (twenty – one hours of recovery). The 5hz group showed the maximum elevation of 2.2 fold. Broilers exposed to 5hz and 10hz had plasma glucose decrease by 12% and 17% respectively (Carlisle *et al* 1998:48).

Plasma TG increased during exposure by 16% in the 5hz group and 34% in the 10hz group. This rise was sustained in the 10hz group at eight hours but in the 5hz group showed a further 46% increase over the same time period. Plasma TG recovered to higher levels at twenty-four hours than those found before exposure to vibration, except for the 2hz group (Carlisle *et al* 1998:49).

Plasma corticosterone concentration increased during the three hour treatment period three fold in the 5hz group and by 73% in the 10hz group. There was a decrease to sub-basal levels at eight hours then recovered to basal levels at twenty-four hours (Carlisle *et al* 1998:49).

These results point to initiation of physiological stress following exposure to vibration resulting in muscular damage, hypoglycaemia and stimulation of the pituitary-adrenocortical axis. Lower blood glucose levels may indicate depletion of energy reserves especially liver glycogen stores. Raised plasma corticosterone especially at higher frequencies may show the degree of stress caused by vibration (Carlisle *et al* 1998:49).

2.4 MECHANICAL HANDLING

Mechanical handling could be a possible solution to reduce physical contact with humans thereby reducing the intensity of the induced physiological stress responses. The fear levels of mechanically caught birds are reduced and heart rates return to normal levels quicker than those caught manually (Duncan *et al* 1986:112).

Various techniques have been tried for mechanical handling but problems with poor design and damage to birds have meant that it has been difficult to use these

machines commercially. Some systems simply scoop up the birds and transport them to crates. Birds may also be harvested by rubber paddle devices which rotate about a horizontal axis (similar to a grain combine harvester) or a vertical axis, where plucking fingers draw birds into the machine (Scott 1993:48). Another method is to collect birds by vacuum sending them directly to the truck.

Mechanical conveyer systems during the portage component of handling allow birds to be transported with minimal manual handling. However the birds should not be allowed to fall any great distance as this causes birds to flap their wings as they fall making them more susceptible to wing damage (Scott 1993:52).

However, mechanical devices are expensive, requiring high capital investment and may exceed existing labour costs. New technology may also not easily applied to existing systems and not readily transportable (Scott 1993:53).

2.5 MORTALITY

Bird deaths occur during the catching process (known as “catching mortality”). Deaths also happen during transportation to the abattoir as well as during lairage at the abattoir itself, prior to slaughter (known as “dead on arrival”). According to Swarbrick (1986) some 80% of deaths on arrival at the processing plant were due to transport stress and injury. Dead on arrival figures range from less than 0.2% to over 1% on particular loads.

2.6 ALLOPATHIC MEDICATION

In treating avian hysteria in a flock there are tranquilizers, eg. Metoserpate hydrochlorate that are practical to use for chickens by adding a small dose to the water supply (North1984: 668).

Heat stress in broilers is treated conventionally by adding multivitamin packs to the water supply for two days which can be used up to the day of slaughter
(Thomson 2002).

Coccidosis is a disease caused by a group of parasitic protozoan organisms of the class “Coccidia”. It is one of the most devastating of poultry diseases. It causes the destruction of the lining of the intestinal tract thereby preventing the absorption of food material from the intestines (North 1984:657).

Low levels of coccidiostat antibiotics are added to the food formula, which indirectly act as growth promoters by reducing clostridial levels in the intestine, thereby increasing food absorption. This treatment is stopped three to five days before slaughter. (North 1984:475).

Other therapies such as sulphonamides, amoxycyllin, penicillin and fluoroquinolones are given under veterinary prescription to treat E. coli infections or respiratory diseases (Thomson 2002).

At present no allopathic medicine is used to treat broilers prior to transportation so as to decrease bruising and mortality rates.

2.7 THE HOMOEOPATHIC TREATMENT OF BROILERS

There is a decreasing public acceptance of the use of drugs and other chemical compounds in feed or water. There is also consumer resistance to eating chickens that have received drugs in which there may be drug residues. It is often prohibitive to use chemotherapy due to long withdrawal periods. The cost of developing new drugs is very high. There is also a risk to the consumer if drug resistant bacteria are transferred via the food chain to man (Vielitz1997: 562).

For the above-mentioned reasons, there is a need to scientifically search for feasible alternative treatment modalities to supplement or replace the use of allopathic drugs. Homoeopathy has increasingly been considered as an alternative treatment modality for animal health problems (Searcy et al 1995).

Homoeopathy is defined as “a therapeutic method which clinically applies the law of similars and which uses medicinal substances in weak or infinitesimal doses” (Jouanny 1991:11). The “law of similars” is the fundamental principle underlying homoeopathic treatment and expresses the parallel action between the toxicological action of a substance and its therapeutic action (Jouanny 1991:15).

The law of similars states that any substance which can produce a totality of symptoms in a healthy individual, can cure that totality of symptoms in a sick individual (Vithoulkas 1981:98).

The law of similars may be divided into three parts. Part one: All pharmacologically active substances, when administered to healthy people, cause a set of symptoms characteristic of the substance used. Part two: all sick people exhibit a set of symptoms characteristic of their disease. Part three: The ill patient may be cured by

prescribing (in weak or infinitesimal doses) the substance whose experimental symptoms produced in healthy people are similar to those produced by the ill patient (Jouanny 1991:13).

The advantage of homoeopathic medication is that the active drugs are highly diluted. For example, a homoeopathic potency of 30 CH means a dilution of 1×10^{-60}. The number of atoms in a mole of substance, or Avogadros number, is 6.0225×10^{-23}. That means at a homoeopathic potency of 30 CH there will not be a single molecule of the original base substance left in the remedy, therefore there is no risk of drug residues in the meat nor a necessity for a drug withdrawal period.

J. Pollock (1998) carried out a study to treat stress in chickens using a homoeopathic complex consisting of Arnica montana 9Ch and Aconitum napellus 9CH. This complex was administered during the first three days after hatching of the chicks. Weight gain increased significantly but there was no significant change in mortality rate or food conversion ratio.

The potency used in Pollock's study was probably too low. In acute and severe stress the action of a 9CH potency will be depleted too quickly before the remedy will have significant effect on the stress (Jouanny 1991:93). Vithoulkas (1980: 214) recommends that potencies of 30CH or 200CH be used for oversensitive patients.

The time when the Homoeopathic complex was administered during Pollock's study may have affected the results. It should probably have been administered closer to the time of slaughter.

The potency range of homoeopathic medicines may be classified as low, medium and high. What these are regarded as varies between Homoeopaths. Jouanny

regarded 4 or 5CH as low potencies, used to treat on the level of local symptoms. 7 or 9CH he regarded as medium potencies used to treat on the level of general symptoms and modalities. (The term “modalities” refers to the qualification of a symptom in terms of its aggravation or improvement by external factors e.g. heat or cold, rest or motion, time of day, weather etc. [Jouanny 1991:19].) Jouanny considered high potencies to be 15CH or 30CH or higher, to be used to treat on the level of nervous symptoms or general behaviour (Jouanny1991: 93).

Vithoulkas (1980:217) had a different view of potencies. He regarded 30CH as a lowish potency, 200Ch as a medium potency and 1M or higher as a high potencies. In the case of acute ailments, where the defence mechanism of the patient is strong, Vithoulkas recommended not to give potencies lower than 200CH. However he also recommended prescribing only one remedy at a time (Vithoulkas:1980: 217).

For the above reasons it has been decided to use 30CH potencies for this study, as a complex of remedies is being used rather than a single remedy. The remedies for this study have been chosen according to the Homoeopathic law of Similars viz. that a substance, capable of producing symptoms in a healthy organism, acts as a curative agent in a diseased organism showing the same symptoms (Hahnnemann 1983).

There appears to be no legislation relevant to the use of homoeopathic medication in poultry.

2.7.1 DESCRIPTION OF THE HOMOEOPATHIC COMPLEX SELECTED FOR THIS STUDY

When two or more remedies are given simultaneously, this is known as polypharmacy. This may be given as a combined formula, known as a complex, or in alternation.

The Homoeopathic remedies used in the complex selected for this study were Aconitum napellus 30CH, Arnica montana 30CH and China officinalis 30CH. It was administered to the broilers in the water supply the day prior to the capture and transportation of the chickens to the abattoir.

The three remedies used in the homoeopathic complex for this study were selected to help reduce the effects of stress on poultry, decrease bruising, lowering mortality rates and decrease weight loss during transportation to the abattoir.

Aconitum napellus

This is a remedy primarily used for acute conditions caused by shock or exposure to sudden changes in temperature. It is indicated for sudden illness following exposure to sudden and extreme cold (for example, chilly dry wind or cold water) or to extreme heat (for example, heat stroke or very hot summer). Broiler chickens are exposed to sudden changes in temperature during capture, crating and transportation to the abattoir, as well as during lairage at the abattoir. Characteristic symptoms indicating the use of this remedy includes sudden hyperthermia, which often begins with shivering bouts. Also there are signs of extreme restlessness and anxiety. There is an intense thirst for large quantities of cold water. There is a general fear, especially of death (Jouanny 1984:11-12 / Morrison 1993: 3-7).

Arnica montana

This remedy was selected for the trial as it is indicated for all cases of trauma, muscular strain and injuries resulting in extravasation of blood into tissue, which the broiler chickens experience during capture and transportation. It is therefore useful for treatment of bruising, contusion and sprains. It is useful where there is aggravation by the slightest touch, jolt, movement or damp cold. The pain after trauma is of a sore or bruised quality. It is useful for myalgias especially after over-exertion (Jouanny 1984:44-46).

China officinalis

This remedy is classically given for complaints following the loss of body fluids (e.g. haemorrhage or diarrhoea), making it a useful remedy for ailments after dehydration. There is an aversion to touch especially light touch and a general aggravation from draughts. This remedy has typically two phases: the first phase is very short, characterised by excitement similar to alcoholic intoxication; the second phase is characterised by asthenia with apathy and a slow but progressive decrease in vitality (Jouanny 1984:112-114).

2.8 CONCLUSION

In the author's opinion, there is a strong financial incentive for poultry farmers to reduce injuries to the broilers, lower the mortality rates as well as decrease weight loss during capture and transportation of poultry to the abattoir.

Due to the decreasing public acceptance of the use of allopathic drugs and other chemical compounds in feed or water for chickens, it is necessary for the industry to limit drug use. There is a consumer resistance to eating chickens that have received drugs in which there may be drug residues (Vielitz1997: 562).

Homoeopathic treatment provides a viable alternative to conventional drug treatment as the active drugs are highly diluted resulting in no drug residue accumulating in the broilers. Decreasing the effects of the stressors on the broilers will, in the author's view, result in improved welfare of the birds.

CHAPTER 3

MATERIALS AND METHOD

3.1 DESIGN OF THE EXPERIMENT

3.1.1 DESIGN OF THE STUDY

The aim of the study was to determine the effect of a homoeopathic complex (Aconitum napellus 30CH, Arnica montana 30CH and China officinalis 30CH) on broiler chickens during their capture at the farm and transportation to the abattoir in terms of mortality rate, damage and weight loss. The study was carried out at farm site twenty-nine belonging to Rainbow Chickens near Hammarsdale, Kwazulu Natal and continued at Rainbow's abattoir in Hammarsdale.

This was carried out as a blind placebo-controlled trial conducted on two neighbouring houses on the same farm. There were approximately 30 000 Cobb-500 broiler chickens in each house. The houses were both closed environment houses, with forced ventilation, with a stocking density of approximately twenty-one birds per square metre.

The trial was conducted on the day prior to the capture of the broilers (viz. at house age thirty-six days) as well as on the day of capture and transportation of the broilers to the abattoir.

3.1.2 DESCRIPTION OF THE HOMOEOPATHIC TREATMENT

The homoeopathic treatment consists of a complex made up of Aconitum napellus 30CH, Arnica montana 30CH and China officinalis 30CH in 0.2% ethanol. It was administered to the broilers the day prior to capture and transport to the abattoir for slaughter.

The placebo consists of 0.2% ethanol in distilled water.

3.2 THE BROILER CHICKENS

59 160 Cobb-500 broiler chickens were used in this study. House one contained 29 496 Cobb 500 chickens while House two contained 29 664 chickens. The birds all originated from identical stock, namely laying site L8, hatchery H2 from parent stock thirty-four weeks old. On the day of treatment the broilers were thirty-six days old.

3.3 THE FACILITIES

The trial was carried out on houses one and two at farm site twenty-nine belonging to Rainbow Chickens near Hammarsdale, Kwazulu Natal and continued at the Rainbow Chickens abattoir in Hammarsdale.

3.4 ETHICAL CONSIDERATIONS

This study was passed as ethically sound by the University of Durban Westville's Animal Ethics Committee(Appendix A). Rainbow Chickens also follow the Code of Practice for Keeping Poultry as approved by the South African Poultry Association

(1995). D.K.Thomson, the laboratory manager of Rainbow Chickens at Hammarsdale, also passed the study as being ethically sound.

3.5 THE CONTROLLED VARIABLES

3.5.1 TEMPERATURE CONTROLS

The broiler houses are closed environment houses with forced ventilation. The internal environment within the house is maintained at a constant temperature of around 25° C. There is no temperature control of the modules on the open trucks transporting the chickens. When the modules containing the chickens are unloaded at the abattoir, they are stacked two modules high in a row in front of large fans to assist in cooling the chickens during storage in lairage while awaiting slaughter.

3.5.2 WATERING AND FEEDING

Drinking water was supplied to each house from a thousand litre water header tank. Water was supplied on demand from nipple drinkers on closed line water pipes running the length of the house. The water lines were lifted just prior to the catching process, so as to prevent dehydration during catching and transportation.

Feed was also supplied on demand from automatic feeders. The feed was supplied by Meadow Feed Mills from Pietermaritzburg. The feed lines were lifted six hours before catching started. This fasting was necessary so as to reduce faecal contamination of carcasses during processing at the abattoir as well as reducing problems caused by heat stress and combating respiratory alkalosis related mortalities.

3.5.3 CONVENTIONAL MEDICATION

Low levels of the coccidiostat antibiotic Monesin were added to the food formula supplied by Meadow Feedmills to control the protozoan parasite eimeria sp. (which causes coccidiosis) in the intestine, resulting in increased food absorption. Zinc bacitracin was included in the feed as a growth promoter, by controlling clostridial infection in the gut. This treatment was stopped three days before slaughter. No additional medication was dispensed to the broilers.

3.5.4 IMMUNISATION

Day old chicks were vaccinated against Newcastle disease and Infectious Bronchitis with the IB/ND live vaccine, applied as an aerosol. The Newcastle vaccine was repeated at sixteen days as a booster, also as an aerosol.

3.6 THE INDEPENDENT VARIABLES

3.6.1 THE PREPARATION OF THE HOMOEOPATHIC REMEDY

The Homoeopathic remedies were prepared according to method forty-four of the German Homoeopathic Pharmacopoeia up to the potency below that which is needed for the experiment (viz. 29CH). The remedies were supplied by Pharma Natura, Homoeopharmaceutical company based in Pretoria. The potencies were made up in 20% ethanol.

Prior to the day of treatment the remedy complex was prepared under the supervision of the Natal Technikon Homoeopathic laboratory technician, Jonathan

Invernezzi. 10 ml of each of Aconitum napellus 29Ch, Arnica Montana 29Ch and China officinalis 29CH were added together to form a 29CH remedy complex.

10 ml of the 29CH remedy complex was then added to 990 ml of distilled water and succussed 100 times by hand against a thick book to prepare the final treatment complex for the experimental group, namely a 30CH potency.

A placebo was prepared by adding 2.08 ml of 96% ethanol to 998 ml of distilled water without succussion (Mostert 1998).

3.6.2 SELECTION OF THE HOUSES USED IN THE STUDY

Two neighbouring houses (one and two) on site twenty-nine belonging to Rainbow Chicken Farms near Hammarsdale in Natal were chosen for this study. One house was used as an experimental house with the other house acting as a control.

The reason for neighbouring houses being chosen is that the birds came from identical stock (Viz. laying site L8, hatchery H2). These broilers would have experienced similar growing environments with reference to feed, temperature, disease, handling, mortality etc.

3.6.3 THE ADMINISTRATION OF THE HOMOEOPATHIC REMEDY

The day prior to the transportation of the chickens to the central abattoir (viz. After 36 days of the chicken's life cycle), the water supply from the thousand litre water header tank was cut off to the nipple drinkers of the whole house. one litre of the Homoeopathic complex or the equivalent amount of placebo was then added to the header tanks. The treated water supply was turned off for a period of thirty minutes

so as to increase thirst throughout the whole flock. This would result in all the birds in the house receiving the treated water within one hour of the water supply being continued to the house.

The experimental house's water supply was treated by impregnating the water header tank with the Homoeopathic complex chosen for this study. The control houses water supply was treated with an equivalent amount of placebo. Farmer Bert Potgieter selected which house to treat with either the placebo or the homoeopathic complex.

3.7 MEASUREMENTS AND OBSERVATIONS

3.7.1 WEIGHT LOSS

On the following day the two treated houses were caught an hour apart. A module from each of the two houses was chosen at random and placed aside after capture. A module contains twelve crates with each crate holding twenty-six birds. Each crate in the chosen modules was sequentially numbered and marked (viz. 1- 12).

A battery-powered Avery Berkel platform scale balance (model L120) was used to weigh the crates. The scale weighs a maximum mass of 150 kg with an accuracy of 0.05kg. A 20.00kg weight was used as a quality control measure to ensure the accuracy of the weighing process.

Each crate was weighed on the Avery Berkel platform scale, just after capture, prior to transportation to the abattoir. The two modules were clearly marked prior to loading onto the transportation vehicle. The modules containing the weighed crates were set aside once the transportation had reached the abattoir. The crates were

weighed again after transportation and lairage, prior to slaughter, four hours after initial weighing. The difference in weight between the mass at the farm and the mass after transportation and lairage, gave a relative weight loss.

3.7.2 MORTALITY RATES

3.7.2.1 CATCHING MORTALITY

This is the number of birds that die after handling by the catching crew at the house during capture, prior to transportation to the abattoir.

3.7.2.2 DEAD ON ARRIVAL

This is the number of birds found dead at the abattoir after transportation and lairage, prior to slaughter.

3.7.3 CATCHING DAMAGE (MORBIDITY)

The two treated houses (viz. one experimental and one treatment house) were sent through the abattoir at the same time. In the abattoir two lines run through in parallel. House one was allocated to processing line two while house two was allocated to processing line one.

Trained Rainbow Farms quality assurance spotters at the abattoir identified carcass defects after slaughter, defeathering, and evisceration before chilling.

The quality assurance spotters carried out two-minute spot checks on a line. At a line speed of 141 and 140 birds per minute for lines one and two respectively this means

that the quality assurance spotters sample 282 birds on line one and 280 birds on line two for damage over the two-minute spot check periods.

The quality assurance spotters alternated between the two parallel processing lines taking a total of six spot checks on each line examining some 1 692 carcasses from line one and 1 680 carcasses from line two. At the above mentioned line speeds it took some four hours to process a house of 30 000 birds.

The data that was collected for use in this study was that of catching damage. This consisted of the number of fresh bruises to wings, legs, breast and back as well as fresh scratches.

3.8 EVALUATION OF THE DATA

3.8.1 METHODS OF DATA ANALYSIS

Since the sample size per group was small i.e. n<24 (12 per group for weight loss), non-parametric tests were used.

A Mann-Whitney U-test was used to perform inter-group comparisons with respect to mortality, weight loss and catching damage (fresh bruises to wings, legs, breast and back as well as fresh scratches).

The Kruskal-Wallis H-test was used to perform comparisons between the number of fresh bruises to wings, legs, breast and back within both the treatment as well as the placebo group.

Statistical analysis was carried out using the SPSS computer package. The level of significance (α**)** for all tests was fixed at 5% or 0.05. P-values were used for decision making.

GROUPS ANALYSED

Group 1 constitutes the homoeopathic treated group /experimental (House one)

Group 2 constitutes the placebo treated group /control (House two)

3.8.1.1 THE MANN-WHITNEY U-TEST

Comparison between Group one and Group two:

The Mann-Whitney test was used to compare group one and two. These two groups were regarded as being independent of one another (viz. unpaired). The aim of carrying out this test was to find out whether there was any significant difference between the two groups at the level of significance $\alpha = 0.05$.

Hypothesis testing

The null hypothesis H_0 stated that there was no difference between the two groups with respect to the variable of interest. The alternative hypothesis H_1 stated that there was a significant difference between the two groups.

$H_0 : \mu 1 = \mu 2$

$H_1 : \mu 1 \neq \mu 2$

$\alpha = 0.05$ = level of significance of the test.

Decision Rule

For a two-tailed test:

Reject H_0 if $P < \alpha = 0.05$

Accept H_0 if $P \geq \alpha = 0.05$

P was the observed significance level of the test.

3.8.1.2 THE KRUSKAL-WALLIS TEST

Comparison within Groups

The Kruskal-Wallis non-parametric test was used to determine whether there was any significant difference between the fresh bruises to wings, legs, breast and back within both the homoeopathic treated group, as well as the placebo group. The level of significance for the test was $\alpha = 0.05$.

Hypothesis Testing

The null hypothesis H_0 stated that there was no significant difference between the fresh bruises to wings, legs, breast and back within a group. The alternative hypothesis H_1 stated that there was a significant difference between the fresh bruises to wings, legs, breast and back within a group.

H_0 : There was no difference between the number of bruises.

H_1 : There was a difference between the number of bruises.

$\alpha = 0.05$ = level of significance of the test.

Decision Rule

For a one-tailed test:

Reject H_0 if $P < \alpha = 0.05$

Accept H_0 if $P \geq \alpha = 0.05$

P was the observed significance level of the test.

CHAPTER 4

RESULTS

4.1 INTRODUCTION

This chapter contains the results acquired after statistically analysing the data collected from the measurement criteria:

- Mortality (Catching mortality and dead on arrival)
- Weight loss
- Catching damage (with respect to fresh bruises to wings, legs, breast and back as well as fresh scratches)

The results were statistically analysed using the SPSS computer package.

4.2 TABLE 4.1 : Comparison between Group 1 (Homoeopathic) and Group 2 (Placebo) using the Mann-Whitney U-test for Catching Damage

$\alpha = 0.05$ = level of significance

$P < \alpha$: homoeopathic and placebo groups are different

$P \geq \alpha$: homoeopathic and placebo groups are not different

Criteria	Probability Value (P-value)	Conclusion
Fresh Bruises Back	**.169**	**No Difference**
Fresh Bruises Breast	**.026**	**Different**
Fresh Bruises Legs	**.055**	**No Difference**
Fresh Bruises Wings	**.035**	**Different**
Fresh Scratches	**.107**	**No Difference**

4.3 TABLE 4.2 : Comparison between Group 1 (Homoeopathic) and Group 2 (Placebo) using the Mann-Whitney U-test for Weight Loss

$\alpha = 0.05$ = level of significance

$P < \alpha$: homoeopathic and placebo groups are different

$P \geq \alpha$: homoeopathic and placebo groups are not different

Criteria	**Probability Value (P-value)**	**Conclusion**
Weight Loss	**0.039**	**Different**

4.4 TABLE 4.3 : Comparison within Group 1 (Homoeopathic) between fresh bruises to back, breast, legs and wings using the Kruskal-Wallis test

$\alpha = 0.05$ = level of significance

$P < \alpha$: homoeopathic and placebo groups are different

$P \geq \alpha$: homoeopathic and placebo groups are not different

Criteria	**Probability Value (P-value)**	**Conclusion**
Fresh Bruises to back, breast, legs and wings	**.198**	**No Difference**

4.5 TABLE 4.4 : Comparison within Group 1 (Placebo) between fresh bruises to back, breast, legs and wings using the Kruskal-Wallis test

α = 0.05 = level of significance

P < α: homoeopathic and placebo groups are different

P $\geq$ α: homoeopathic and placebo groups are not different

Criteria	**Probability Value (P-value)**	**Conclusion**
Fresh Bruises to back, breast, legs and wings	**.007**	**Different**

TABLE 4.5 Comparison of mortalities between Group 1 (Homoeopathic) and Group 2 (Placebo)

	HOUSE 1	HOUSE 2
CATCHING MORTALITY	27	64
DEAD ON ARRIVAL	90	41
TOTAL MORTALITY	117	105

FIGURE 4.1 Comparison of mortalities between Group 1 (Homoeopathic) and Group 2 (Placebo)

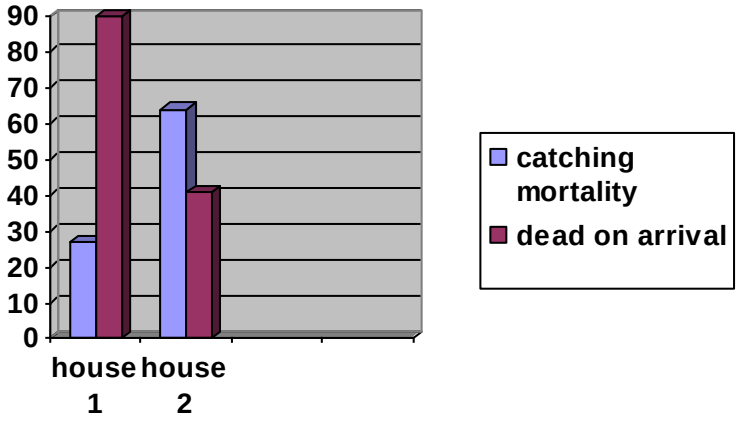


TABLE 4.6 HOUSE 1 – CATCHING DAMAGE

SPOT CHECK NO.	FRESH BRUISES				FRESH SCRATCHES
	BACK	BREAST	LEGS	WINGS	
1	7	3	4	8	14
2	3	3	4	7	13
3	6	3	4	5	11
4	5	7	6	5	12
5	4	0	4	6	14
6	2	4	1	3	10
TOTAL	27	20	23	34	74
AVERAGE	4.5	3.3	3.8	5.7	12.3

FIGURE 4.2 House 1 -Catching Damage

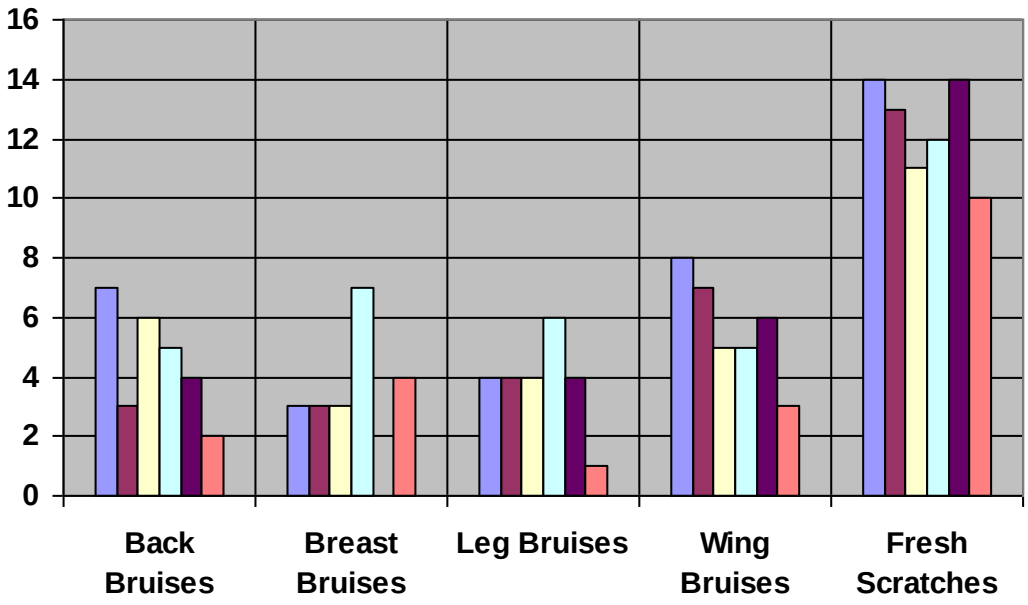


TABLE 4.7 HOUSE 2 – CATCHING DAMAGE

SPOT CHECK NO.	FRESH BRUISES				FRESH SCRATCHES
	BACK	BREAST	LEGS	WINGS	
1	3	7	2	7	12
2	5	8	3	6	15
3	5	12	1	13	20
4	9	8	4	9	19
5	8	7	3	8	15
6	9	3	0	8	11
TOTAL	39	45	13	51	92
AVERAGE	6.5	4.5	2.2	8.5	15.3

FIGURE 4.3 House 2 – Catching Damage

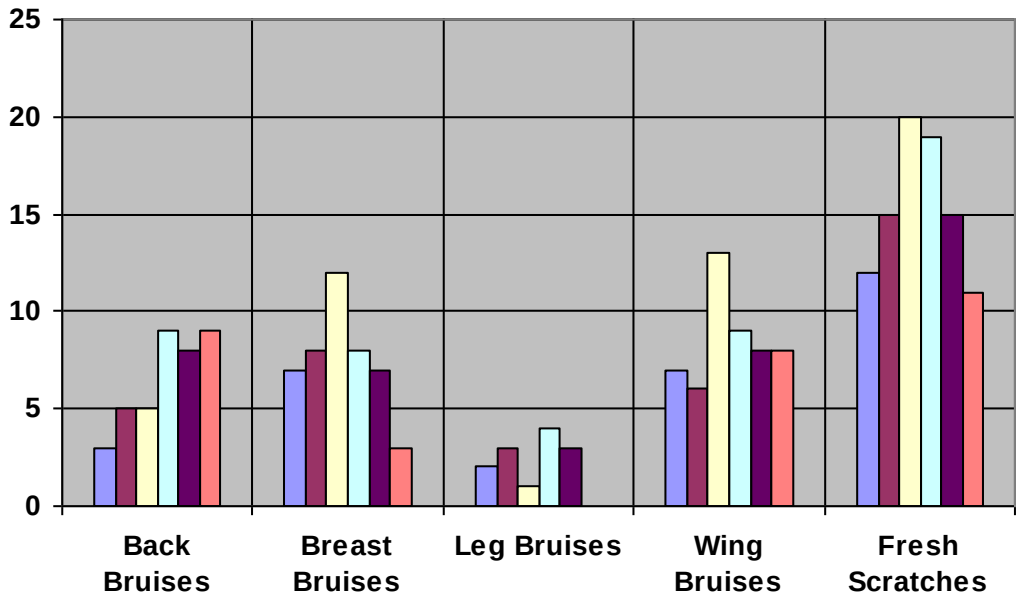


TABLE 4.8 HOUSE 1 WEIGHT LOSS

CRATE NUMBER	MASS BEFORE TRANSPORT AND LAIRAGE (KG)	MASS AFTER TRANSPORT AND LAIRAGE(KG)	DIFFERENCE IN MASS(KG)
1	56.80	56.10	0.70
2	58.10	57.55	0.55
3	59.25	58.55	0.70
4	58.65	57.75	0.90
5	59.45	59.10	0.30
6	58.00	57.65	0.35
7	56.90	56.45	0.45
8	59.10	58.70	0.40
9	61.35	60.15	1.20
10	60.85	60.50	0.35
11	60.10	59.75	0.35
12	58.60	58.30	0.30

House 1: Total weight loss = 6.55kg

Average weight loss = 0.55kg

FIGURE 4.4 HOUSE 1 – WEIGHT LOSS

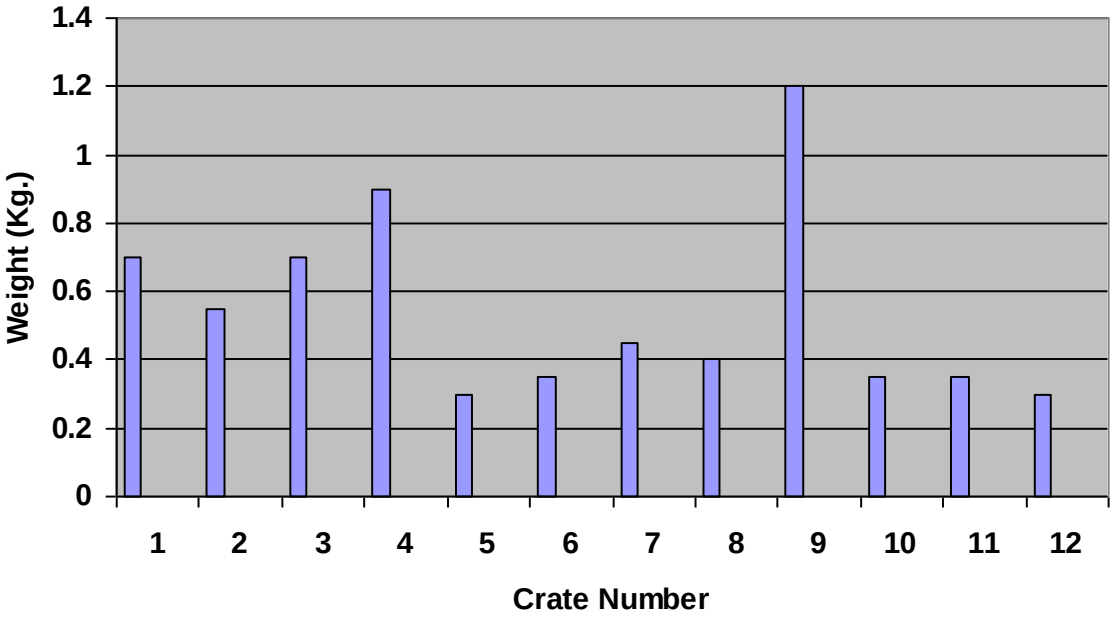


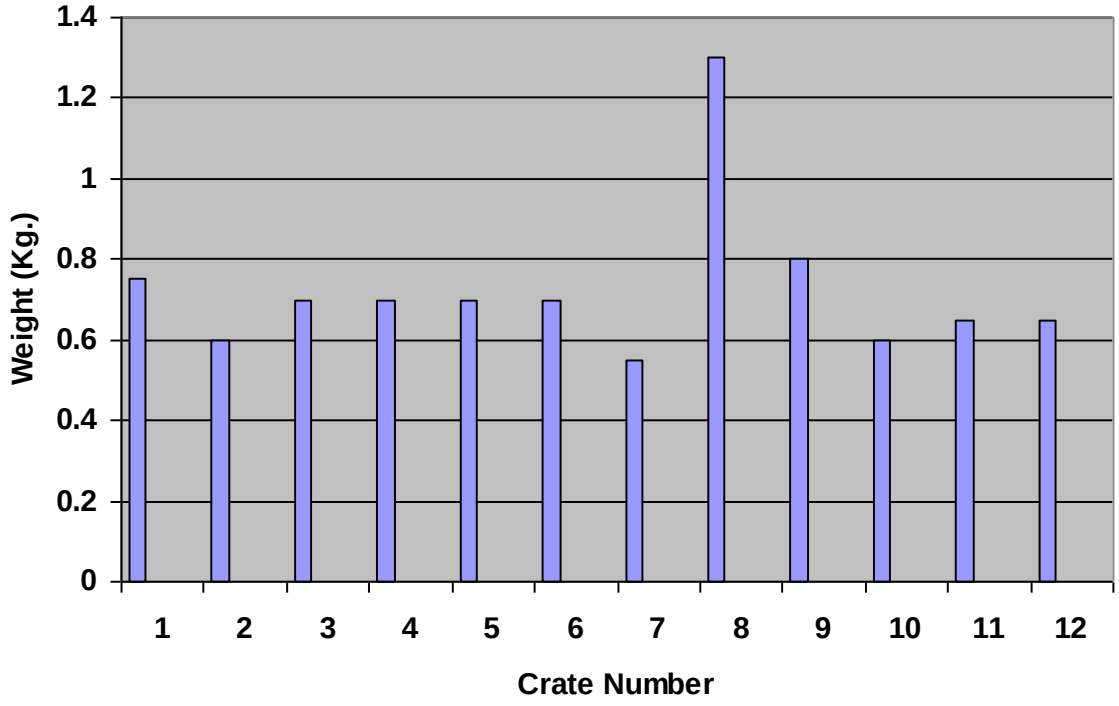
TABLE 4.9 HOUSE 2 WEIGHT LOSS

CRATE NUMBER	MASS BEFORE TRANSPORT AND LAIRAGE (KG)	MASS AFTER TRANSPORT AND LAIRAGE(KG)	DIFFERENCE IN MASS(KG)
1	59.30	58.55	0.75
2	58.75	58.15	0.60
3	57.90	57.20	0.70
4	59.70	59.00	0.70
5	60.25	59.55	0.70
6	58.65	57.95	0.70
7	59.90	59.35	0.55
8	54.60	53.30	1.30
9	59.85	59.05	0.80
10	59.10	58.50	0.60
11	57.95	57.30	0.65
12	58.65	58.00	0.65

House 2: Total weight loss = 8.70kg

Average weight loss = 0.87kg

FIGURE 4.5 HOUSE 2 - WEIGHT LOSS



CHAPTER FIVE DISCUSSION

5.1 THE EFFECT OF THE HOMOEOPATHIC COMPLEX ON MORTALITY RATES IN BROILER CHICKENS

The catching mortality was lower for the house treated with the homoeopathic complex compared to the house treated with the placebo (27 compared to 64). On the other hand, the dead on arrival figures for the placebo treated house was lower than the house treated with the homoeopathic complex (41 versus 90).

Overall the total mortality figures (combining the catching mortality and dead on arrival figures) was lower for the placebo treated house as compared to the house treated with the homoeopathic complex (105 compared to117).

The failure to decrease mortality rates in the homoeopathic treated group could be attributed to several factors. Firstly, it is impossible to control the handling of the broilers by catching team during capture at the farm. Secondly, it is not possible to control the conditions during lairage and handling at the abattoir.

5.2 THE EFFECT OF THE HOMOEOPATHIC COMPLEX ON CATCHING DAMAGE IN BROILER CHICKENS

There was a mixed outcome in this clinical trial with respect to catching damage in broilers. The Mann-Whitney U-test was used to statistically analyse the results using the level of significance $\alpha = 0.05$. According to these criteria, there was no statistically significant difference between homoeopathic and placebo treated groups with respect to fresh bruises to back and legs as well as fresh scratches.

On the other hand there was a statistically significant difference between homoeopathic and placebo treated groups with respect to fresh bruises to breast and wings. With both sets of data the homoeopathic treated group fared better than the placebo treated group.

Fresh bruises to the back for the homoeopathic treated group totalled 27 for the 6 spot checks (averaging 4.5 per spot check) compared to the placebo treated group which totalled 34 (averaging 7.5 per spot check). Fresh bruises to the wings for the homoeopathic treated group totalled 34 for the 6 spot checks (averaging 5.7 per spot check) compared to the placebo treated group which totalled 51 (averaging 8.5 per spot check).

Although not regarded as statistically significant, fresh bruises to back and fresh scratches for the homoeopathic treated group were lower than those found for the placebo treated group.

On the other hand, the number of fresh bruises to legs for the placebo treated group, although not regarded as statistically significant, were lower than those for the homoeopathic treated group.

5.3 THE EFFECT OF THE HOMOEOPATHIC COMPLEX ON WEIGHT LOSS IN BROILER CHICKENS

There was a statistically significant difference between homoeopathic and placebo treated groups with respect to weight loss. The Mann-Whitney U-test was used to statistically analyse the results using the level of significance $\alpha = 0.05$.

The total weight loss for the module selected from the homoeopathic treated house was 6.55 kg (averaging 0.55kg per crate). The total weight loss for the module selected from the placebo treated house was 8.7 kg (averaging 0.73 kg per crate).

This indicates that there was less weight loss during transportation and lairage for the house treated with the homoeopathic complex used in this study as compared to the house treated with the placebo.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

It can be concluded from the results of the study that the administration of the homoeopathic complex (Aconitum napellus 30CH, Arnica montana 30CH and China officinalis 30CH) did not significantly influence the total mortality rates (combining the catching mortality and dead-on-arrival figures).

There was a mixed outcome in this clinical trial with respect to catching damage in broilers. Overall, there was an improvement in most of the criteria for catching damage (except for that of fresh bruises to legs) for the homoeopathic treated group compared to the same criteria for the placebo group. Only the criteria of fresh bruises to breast and wings was regarded as statistically significant.

There was a significant reduction in weight loss during transportation and lairage for the house treated with the homoeopathic complex used in this study as compared to the house treated with the placebo.

6.2 RECOMMENDATIONS

There is a wide range of variations between houses. It would therefor be important to establish a base line of variation covering the parameters used in this study over a period of months, for a number of houses. This base line of variation would be used to more accurately determine the efficacy of homoeopathic treatment.

For the same reason of house-to-house variations, it is recommended to repeat the study as carried out in this thesis on at least three occasions, preferably using the

same houses. This would limit the number of possible variations.

It is recommended when repeating the trial exactly as put forward in this thesis, to have two or more students involved. The reason for this recommendation is the difficulty the author experienced with time constraints at the abattoir with weighing the crates at lairage, as well as being involved in monitoring the catching damage inside the abattoir.

It is recommended that the trial be repeated with the same remedies but in different potencies, either higher or lower. Another option would be to alter the time period of treatment. Instead of treating the water supply with the homoeopathic complex twenty-four hours before transportation, rather dose the water once a day for three to five days with the homoeopathic complex in the same or lower potency.

Entirely different remedies may also be used, for example, Bellis perennis which has a similar action to Arnica montana, namely recommended for trauma in general and in particular for trauma to the breast, coccyx and pelvis (Jouanny 1984:68). Ruta graveolens is indicated in trauma to ligaments, tendons and periosteum with a breaking, bruised sensation, aggravated by resting (Jouanny 1991:380). Rhus toxicodendron is a useful remedy in the early stages of acute sprain (Jouanny 1991:380).

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APPENDIX A

APPENDIX B