

Welfare and hygienic issues of broiler meat processing in
traditional broiler market



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Abstract

This study is based on the different factors that are indicator for animal welfare and hygienic issue of a broiler shop in Bhairab upazilla in Kishoregonj district. About 23 local broiler shop was visited for the purpose of this study. The study reveals that the rule and regulation of animal welfare were not fully followed for example the stocking density in shop. In 39.13 % broiler shop, they do not provide recommended space per bird. In 82.61 % broiler shop, we found signs of thermal discomfort such as reduced walking, long time standing etc., although there was cooling system for lessening the high temperature. On the other hand, in 26.09% broiler shop, they are transferring the bird from vehicle to shop by holding two wing and two feet. Slaughter knife of 78.26% broiler shop was sharp which causes a smooth severance and desirable bleeding. About 86.96% broiler shop, they do not dispose the dead birds properly. In 73.91% broiler shop, they use antibiotics as a growth promoter which is threaten for consumer. But the hygienic condition was not poor for example, 86.96% broiler shop uses clean water as drinking water of birds. Hygienic issue in broiler meat processing is also a vital thing for the protection of human health. It has a zoonotic significance.

Keywords: Indicator, animal welfare, hygienic issue, zoonotic significance, condition of litter.

Chapter 1

Introduction

Bangladesh is a developing country and has a vast population with limited area. For this huge population, broiler meat nowadays is the main source of protein. There many factors that affect the quantity of broiler meat production and human health. Among them, hygienic maintenance in broiler chicken rearing and broiler meat processing. But most of the people do not know about the hygienic way to process broiler meat in traditional broiler market. In this study, we covered about the hygienic condition of local broiler shop and also animal welfare from transportation to slaughter of broiler chicken. As Bangladesh is a hot and humid country, there are huge diseases creating harmful microorganism. Besides, genetically metabolic rate of broiler is high. These factors cause extra stress in birds and as a result meat production is decreased for poor welfare. So, we can say that good animal welfare maintenance is very important especially in our country.

According to OIE standard in chapter 7.10, Broiler means a bird of the species *Gallus gallus* kept for commercial meat production. As broiler is a high yielding meat strain of chicken and its increased growth rate create extra pressure on the body. So, welfare issue is very important for good meat production and its demand increased day by day. Antibiotics free meat production is the both welfare issue for broiler and human health issue.

For ensuring the animal welfare, a recognized organization should observe whether in all broiler shop animal husbandry issue such as proper feeding, watering, resting, proper treatment in case of diseases condition, thermal discomfort etc. They also observe the broiler meat processing is in hygienic way or not. According to a study, organic agricultural methods offer higher levels of animal wellbeing than traditional methods (Tuytens, Heyndrickx *et al.*, 2008).

The rules state that birds need ample room to engage in routine habits like preening, eating, drinking, and dust bathing. The number of birds per unit space is called stocking density (e.g., number of birds per sq. m floor space).

Hygienic issue in broiler meat processing is also a vital thing for the protection of human health. It has a zoonotic significance. When broiler chicken is transported from farm to broiler shop, they are contaminated with microorganisms that picked up with feces and dust. Most of the outbreak such as food borne diseases (e.g. salmonellosis) are associated with unhygienic processing. For worldwide consumption and economic gain, broiler meat

production increased exponentially (WÜSTER, OTSUKA *et al.*, 1992).

As most of the people in Bangladesh is Muslim, they are very conscious about halal and healthy meat. The consumer of broiler meat buy the broiler meat from local broiler market, so the hygienic condition should be maintained in theses local market. Besides, Welfare issue is also an inevitable part in the broiler meat traditional market. Providing a natural setting where animals can engage in all of their natural behaviors is a definition of animal wellbeing (Haque, Sarker *et al.*, 2020).The term "welfare" refers to the condition of a human or an animal's healthy, happy, and secure existence (Wehmeier *et al.*, 2005). Over the past 200 years, animalwelfare laws and regulations have developed, and mistreating animals is now referred to as cruelty (Rollin *et al.*, 1999).

Objectives of this study:

1. To assess the welfare status during broiler processing in traditional live bird markets.
2. To evaluate the hygienic status of broiler meat processing.

Chapter 2

Materials and method

Study area and period

For the study purposes, Local broiler shop in Bhairab upazilla of Kishoregonj district was selected. As there are enough broiler shop for knowing the condition of animal welfare issue & hygienic issue of broiler meat processing.

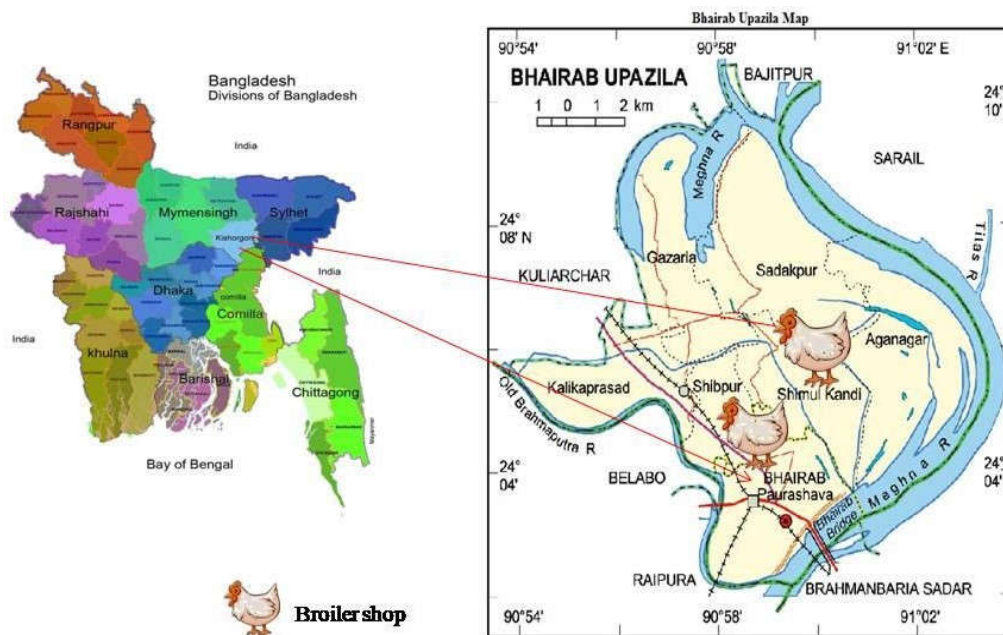


Figure 1: Location of study broiler shop

Data collection and data analysis

Data was collected directly from individual broiler shop in five different local market by using preformed questionnaire from 17-04-23 to 05-07-23. In the questionnaire, all information related to study was maintained such as animal welfare issue e.g., stress due to stocking density during transportation, pre slaughter treatment, ventilation system for removing ammonium gas, cooling system for heat loss, cannibalism, presence of thermal discomfort and hygienic issue e.g., condition of litter, feeder and drinker condition, water quality, frequency of changing of scalding water, disposal of dead bird etc. In the questionnaire, both open ended

and close ended was used. The broiler shops are used for data collection mainly from municipality. In total, 23 broiler shop were used for data collection. The collected data were imported into Microsoft excel and results are expressed percentage. Despite the need to separate welfare evaluation from moral and ethical judgments and the acknowledged challenges of accurately assessing the welfare of animals in transit (Broom *et al.*, 1993). The majority of scientific studies of how animals react to transportation support the idea that it is harmful in some way, probably because one or more of the "five freedoms" are violated (Savory *et al.*, 1995).

Chapter 3

Results and discussion

In this study, data about Welfare and hygienic issue was collected from total 23 local broiler shops.

Table 1: Frequency of welfare violation events during transportation

Variable	Categories	Number (N=23)	Percentage (%)
Space in vehicle (sq. ft/bird)	>0.5	3	13.00
	<0.5	18	78.26
	Equal to 0.5	2	8.69

The Table 1 is showed that space in vehicle during transportation per bird. About 13% broiler shop uses less than 0.5 sq. ft/bird that provide very comfort to the bird during transportation. 78.26% broiler shop provide less than 0.5 sq. ft/bird space that is stressful to the birds during transportation. The birds may be exposed to a variety of potential stressors during transit, including the thermal demands of the transport microenvironment, acceleration, vibration, motion, impacts, fasting, withdrawal of water, social disruption and noise (Nicol, Scott *et al.*, 1990; Mitchell, Kettlewell *et al.*, 1993). The adverse effects of these factors and their combinations may range from mild discomfort and aversion to death.

Depending on the level of stress placed on the birds by all transportation procedures and the microenvironment present in the container and the vehicle, these stresses may jeopardize their welfare, health, and productivity. The primary elements affecting the welfare of birds and the quality of their carcasses while being transported from a farm to a slaughterhouse are: Feed withdrawal time before and during transit.

- Catching and transporting broilers in crates.
- The macro- and microenvironment around broilers placed onto a vehicle.
- Crate loading

Ideal broiler transportation cage measurements (in centimeters) are 95.5 x 57 x 32.5 for

a capacity of 18 to 20 chicks weighing 8.5 kg. density and lairage time prior to slaughter (Chikwa, Atkare *et al.*, 2019).

Table 2: Frequency of welfare violation events before slaughter at shop

Variable	Categories	Number (N=23)	Percentage (%)
Pre slaughter treatment	Resting	23	100.00
	Feeding	23	100.00
	Watering	23	100.00
	Fasting	2	8.60

The Table 2 is illustrated about the pre slaughter treatment at broiler shop. Maximum broiler shops adopted resting, feeding, watering. But very few broiler shops do fast pre slaughter (8.6%).

Table 3: Ventilation condition

Variable	Categories	Number(N=23)	Percentage (%)
Ventilation	Very good	3	13
	Good	9	39.13
	Fair	10	43.47
	Poor	1	4.35
	Very poor	0	0.00

The table 3 is showed that Ventilation condition in broiler shop. The survey show that 43.47 % shop's ventilation are fair in condition. In very few broilers shop, ventilation condition is poor. In 39.13% broiler shop, ventilation condition is in good condition.

Table 4: Condition of litter at broiler shop

Variable	Categories	Number (N=23)	Percentage (%)
Condition of litter	Wet	6	26.09
	Optimum	13	56.52
	Dusty	4	17.39

The Table 4 shows that in maximum broiler shops the litter is in optimum condition.4% of broiler shop's litter condition is dusty that is risk factor for brooder pneumonia.6% litter condition is wet that is risk factor for foot dermatitis of birds.

Table 5: Cooling system for removing heat stress during summer days

Variable	Categories	Number (N=23)	Percentage (%)
Cooling system	Ceiling fan	23	100.00
	Standing fan	9	39.13
	Exhaust fan	3	13.04

The Table 5 is shown that cooling system in the broiler shop for lessening the excess temperature and ammonium gas. For cooling system, ceiling fan, standing fan and exhaust fan are used. In all broiler shop, Ceiling fan are used. Only in 3 broiler shops, they used exhaust fan for cooling. About 39.13% broiler shops are using standing fan while 100% boiler shop are using ceiling fan.

Table 6: Abnormal condition due to wet litter

Variable	Categories	Number(N=23)	Percentage (%)
Abnormal condition	Foot pad dermatitis	14	60.87
	Hock burn	6	26.09
	None of them	6	26.09

The Table 6 is shown that abnormal condition of birds due to wet litter. The most likely cause of foot pad dermatitis (FPD) is wet litter, followed by biotin deficiency. According to experimental data, biotin shortage leads to FPD, and commercial rations do not provide enough biotin to stop these lesions from developing. In 60.87% broiler shop, there were found foot pad dermatitis in the birds. It can be due to wet litter condition or very poor ventilation. In 26.09% broiler shop, hock burn was also found. They are indicator for poor welfare in shop, also poor hygienic condition.

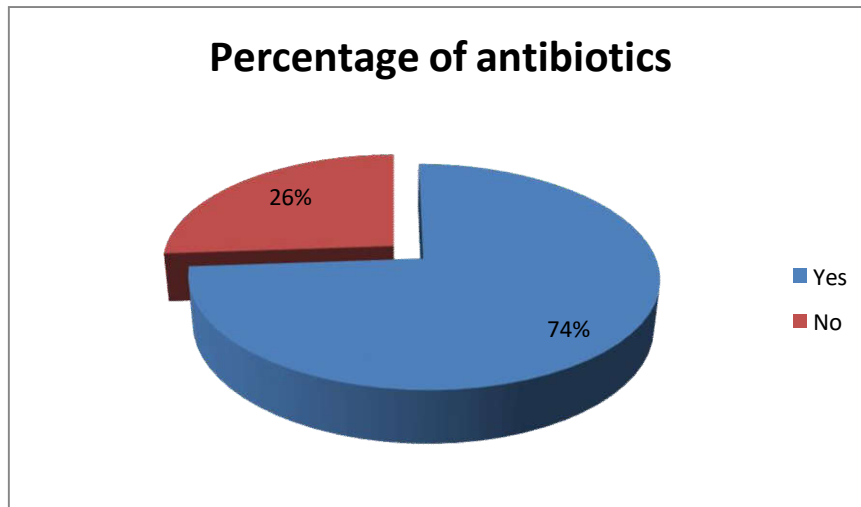


Figure 2: Pie chart showing percentage of using antibiotics in broiler shop

The pie chart is presented about the uses of antibiotics with water for reducing the risk of disease. About 73.91% broiler shop are using antibiotics. It is good for broiler temporary but it has harmful effect on human health. Antibiotics are used in the poultry business to promote meat production through better feed conversion, accelerated growth, and illness control (Mehdi, Létourneau-Montminy *et al.*, 2018). In chicken production, antibiotics can be

successfully utilized at sub-therapeutic levels to increase growth and by affecting broiler chicken's immune system, antibiotics improve the health of birds (Lee *et al.*, 2012). Besides developing resistance to antibiotics, the excessive use of these drugs has led to the presence of drug remnants in animal-derived products (Gonzalez Ronquillo, Angeles Hernandez *et al.*, 2017). Numerous types of antibiotics, including penicillin, tetracycline, macrolide, aminoglycoside, and amphenicol, have been identified in various food products. The presence of residues in livestock production can potentially have negative effects on human well-being. This is exemplified by tetracyclines, which can disrupt the proper development of teeth in young children (Kummerer *et al.*, 2009).

Table 7: Frequency of cannibalism at broiler shop

Variable	Categories	Number(N=23)	Percentage (%)
Cannibalism	Yes	5	21.74
	No	18	78.26

The table 7 is showed that presence of cannibalism in broiler shop. Although the occurrence of cannibalism is very rare in broiler. But above table is showed that in 21.74% broiler shop, there was cannibalism.

Table 8: Catching way of bird during slaughtering

Variable	Categories	Number of shops practiced these way (N=23)	Percentage (%)
Catching way	By one foot	4	17.39
	By two feet	11	47.83
	One wing	6	26.09
	Two wings	0	0
	2 feet and 2 wings	6	26.09

Table 8 illustrated about the catching way of birds during transferring to shop. From the standpoint of animal welfare, fractures that take place on the farm or during transportation lead to extended periods of distress, making them more critically evaluated in broiler welfare risk assessments. This is in spite of the fact that a higher number of fractures might occur at the slaughterhouse. It is recommended that the monitoring of wing fractures at slaughterhouses can be incorporated as an indicator of the well-being of broiler chickens (Kittelsen, Granquist *et al.*, 2015). About 47.83% of visited broiler shop catch the bird with two feet, although it will not cause any fractures of birds. In 26.09% broiler shop, hold only one wing for transferring the birds to the broiler shop.

Table 9: Stocking density in shop

Variable	Categories	Number of shop (N=23)	Percentage (%)
Stocking density (sq.ft/ bird)	More than 1	3	13.04
	Less than 1	11	47.83
	Equal to 1	9	39.00

The above table is showed that about floor space in the local broiler shop. It is very that in 39% broiler shop, the floor spaces are equal to requirement of a broiler. The ideal floor space requirement per broiler chicken is 1-2 sq. ft (0.09-0.18 sq. m). The anticipation was that elevated stocking densities would result in heightened glucocorticoid levels, particularly due to their conjunction with larger group sizes as observed in this study. This was considered an indicator of amplified stress (Buijs, Keeling *et al.*, 2009).

Table 10: Abnormal condition of birds due to presence of thermal discomfort

Variable	Categories	Number of shop(N=23)	Percentage (%)
Condition of birds	Reduced walking	19	82.61
	Standing	19	82.61
	Panting	18	78.26

The Table 9 is showed that percentage of abnormal condition due to presence of thermal discomfort in broiler shop. Abnormal condition such as reduced walking, standing, panting are the signs of thermal discomfort. Over the last decade, there has been a substantial rise in broiler production within tropical and subtropical regions, and this growth is anticipated to continue in the coming years. However, a significant hurdle to achieving efficient production in these climates is the decline in performance caused by elevated temperatures. The challenges linked to high temperatures during warm weather conditions largely revolve around the vulnerability of rapidly-growing commercial broiler breeds to heat stress during the later stages of growth (Ojano-Dirain, Waldroup *et al.*, 2002)

Table 11: Sharpness of knife used for slaughtering

Variable	Categories	Number of shop(N=23)	Percentage (%)
Condition of knife	Sharp	18	78.26
	Blunt	5	21.74

The above table is showed that about 78.26% broiler shop uses sharp knife for slaughtering the birds that indicate most of the broiler shop are aware of about the rule of slaughtering. In 5 broiler shop, we found that the slaughter knife was less sharp and we advised them to use the sharp knife and the importance of sharpness of knife for painless death. Using a correctly sized sharp knife is of utmost importance during the halal and kosher slaughter of animals without stunning. This ensures a swift and clean severance of the neck, contributing to improved bleeding and reducing pain and stress in the animals through a quicker induction of unconsciousness. This efficient bleeding process enhances meat quality and ensures higher standards of food safety. The utilization of a well-suited, sharp knife in terms of blade length serves to minimize the pain experienced during the process of neck severance in slaughter. This, in turn, aids in achieving a favorable bleeding outcome. Unfortunately, the significance of knife sharpness in relation to animal welfare has not been appropriately acknowledged and is often overlooked by those engaged in slaughterhouse operations. The execution of a precise, unblemished, and efficient neck incision through the use of an exceptionally sharp knife contributes to a reduction in the experience of pain (Kumar, Abubakar *et al.*, 2023).

Table 12: Time of post slaughter processing

Variable	Categories	Number of shop (N=23)	Percentage (%)
Time of processing	Before complete death	1	4.35
	After complete death	22	95.65

The table no 13 is showed that in 22 broiler shops, the post slaughter processing was started after the complete death of birds. Only in one shop, we found them to start the post slaughter processing before the complete death of a bird.

Table 13: Percentage of shop found any injury in the carcass of bird due to faulty and quick catching

Variable	Categories	Number of shop(N=23)	Percentage (%)
Presence of injury	Yes	8	34.78
	No	15	65.22

Above table are presented that there were 15 broiler shops in which no injury was found and in 34.78% broiler shops, there was injury like bruises, wing fracture due quick catching. A comprehensive analysis was conducted to identify and assess the various factors contributing to both mortality rates and instances of bruising that occur between the stages of catching and slaughter in broiler flocks (Nijdam, Arens , 2004).

Table 14: Hygienic condition of feeder and drinker

Variable	Categories	Number of shop (N=23)	Percentage (%)
Condition of feeder & drinker	clean	19	82.34
	Dirty	4	17.39

The above table is showed that hygienic condition of feeder and drinker in the broiler shop. In 82.34% shop, feeder was enough clean and the drinker was free from dirty.

Table 15: Condition of drinking water

Variable	Categories	Number of shop(N=23)	Percentage (%)
Water quality	Good & clean	20	86.96
	Dirty	3	13.04

The above table is showed that water quality of broiler shop used for drinking water of birds. In 20 broiler shops, they used clean water for the drinking of broilers. We know that in the poultry sector, ensuring the utilization of water with suitable physical, chemical, and microbiological characteristics is of paramount significance. The quality of drinking water assumes a critical role in facilitating the spread of certain bacterial, viral, and protozoan diseases, which are prevalent within poultry populations. Consequently, the implementation of measures to prevent waterborne diseases in broiler production involves safeguarding the water supply sources, employing water disinfection techniques, and conducting thorough quality assessments encompassing microbiological, chemical, and physical attributes.

Table 16: Percentage of broiler shop that change the scalding water

Variable	Categories	Number of shop (N=23)	Percentage (%)
Frequency of changing	0	6	26.09
	1	7	30.43
	2	6	26.09
	3	4	17.39

The above table is illustrated that the frequency of changing water using for scalding of carcass of birds. The highest changing frequency is 3 times a day which is maintained by 17.39 % broiler shop. On the other hand, 26 % broiler shop do not change scalding water as they do not use scalding water. In the commercial processing of broilers, the carcasses undergo a series of steps including scalding, defeathering, evisceration, and rinsing before being chilled and packaged (Lillard *et al.*, 1989). These processes generally result in a reduction of the microbial load on the carcasses. However, there is a possibility of cross-contamination occurring, which

could potentially lead to an elevated level of carcass contamination as the processing unfolds. (Thomas, McMeekin *et al.*, 1980)

In commercial poultry processing, carcasses are typically rinsed using either dipping or spray washing methods. Immersion systems usually employ a continuous flow of water to rinse the carcasses. However, in smaller poultry processing setups where water may become stagnant, there is a worry about the accumulation of microbial contamination. This situation is less than ideal because substances like fat, blood, and proteins present in the water could encourage the growth of microorganisms, potentially leading to hygiene issues. (Rodrigo, Adesiyun *et al.*, 2005).

Table 17: Percentage of shop that use disposal of dead bird

Variable	Categories	Number of shop (N=23)	Percentage (%)
Disposal	Yes	3	13.043
	No	20	86.96

Methods of disposing of carcasses of deceased birds on poultry farms include options such as incineration, burying them deeply in the ground, or discarding them as refuse. But in our study area, most of the broiler shop did not adopt any disposal system. Only 13.043% broiler shop disposes the dead birds in proper way. Others broiler shop do no dispose the dead birds, they dump the dead bird in the dustbin.

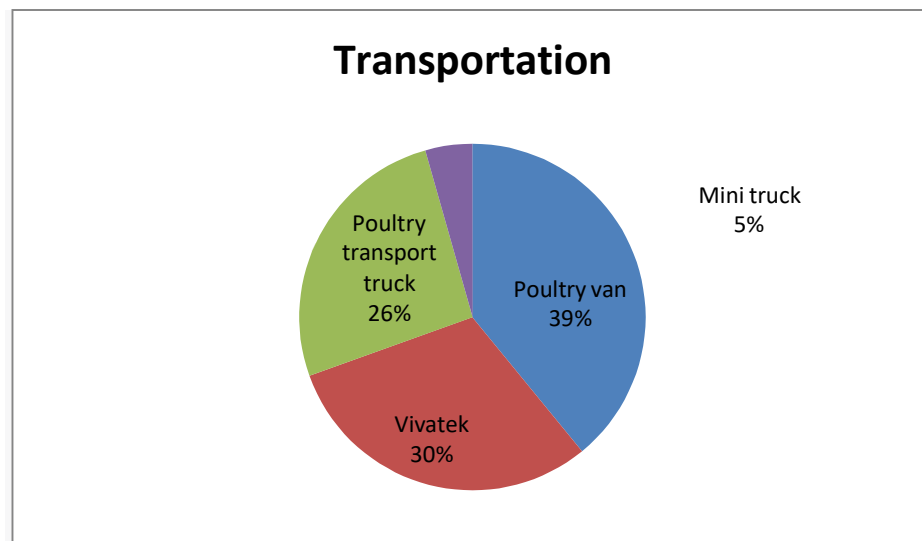


Figure 3: Pie chart showing the percentage of different transportation for broilers.

Chapter 4

Conclusion

Animal welfare and hygienic issue in the broiler meat processing is crucial issue, although our study shows that most of the people in the broiler shop are not aware of about this issue. For improvements the knowledge of about these issue in the local broiler shop, awareness program and training program should be organized by livestock department.

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Biography of author

I am Jesmin Akter, the youngest child of Giasuddin Ahmed and Mahmuda Akter. I am currently pursuing a Doctor of Veterinary Medicine (DVM) degree at Chattogram Veterinary and Animal Sciences University, enrolled in the Faculty of Veterinary Medicine. In 2015, I successfully completed the Secondary School Certificate Examination (SSC) from Shimulkandi high school, Bhairab, Kishoregonj. Subsequently, in 2017, I accomplished my Higher Secondary Certificate Examination (HSC) from Rafiqul Islam Mohila College.

At present, I am engaged in a yearlong internship program, during which I am dedicated to enhancing my practical skills and acquiring valuable hands-on knowledge in my field of study. My strong enthusiasm for this discipline drives me to develop essential skills from day one and accumulate practical insights that will prepare me for the demands of the contemporary scientific landscape