2. Differences in the nature of chicken meat production and the implications for *Salmonella* and *Campylobacter*

2.1 General characteristics of chicken meat production and processing systems

One of the objectives of the request made by the CCFH to FAO and WHO was to investigate the feasibility of developing a Web-based decision tool that could assist managers in the evaluation of measures that could be most effective for risk reduction in their production and processing systems.

In order to meet this request, the Experts had to consider regional differences that could have critical impacts on the implementation of such a tool. Therefore, the first day of the Technical Meeting was dedicated to the discussion of these differences.

In spite of the extensive regional differences in broiler production, a substantial part of the chicken meat production at "industrial level" has some common aspects. For instance, the breeding stocks used all over the world are produced by a small number of companies, meaning that these sell to purchasers worldwide. This can lead to the widescale spread of *Salmonella* if the breeding stocks are infected. It is therefore especially important to control *Salmonella* in the breeder flocks, and as a consequence *Salmonella* control in primary breeder flocks is of a high standard (Allen, pers. comm.). Where the aim is to control specific serotypes, a zero-tolerance policy with respect to these organisms may give a false sense of security, because the predominant serotypes in poultry flocks are likely to change over time.

The trend seems to be towards production becoming more integrated in the future, and many small farms will be replaced by fewer, bigger farms, which will allow a greater integration. As an example, integrated poultry production is very widespread in the United States of America and in Russia, where the producers also control feed, rearing and processing. This high degree of integration can therefore lead to better control of *Salmonella* and *Campylobacter*. These control options can also be applied to less integrated systems; it is just more difficult, even though the principles for control should be the same.

Despite differences between countries, the characteristics of "industrial" broiler chicken meat production are broadly generic. This facilitates development of a modular risk assessment that focuses on shared food chain characteristics, but also provides for national inputs where there may be significant variation, such as in primary processing, distribution pathways, and handling of products by the consumer. For *Salmonella*, the peer reviewed literature indicates that the four most important control measures at primary production are: (1) the elimination of *Salmonella* in grandparent and parent flocks; (2) all-in all-out production at the broiler farm, to avoid any carry over during processing; (3) logistic slaughter planning scheduled to avoid pathogens being transferred from contaminated processing equipment to another flock; and, finally, (4) satisfactory cleaning of transport crates. For *Campylobacter* biosecurity at farm level, it is reported that prevention of the entry of *Campylobacter* is the most important control measure, but it is also important to prevent transfer of the organism from previous flocks. At present, the epidemiology is not completely clear, and there are also country differences to consider.

During processing, additional interventions can be applied. Application of GHP during processing helps to ensure that the contamination of broiler carcasses remains as low as possible. Essential practices include the removal of faecal matter, feathers, etc., from carcasses and equipment. Most important are procedures that keep the faecal spread to an absolute minimum.

Operations known to increase the contamination are scalding, plucking and evisceration. The feather plucker is the most important critical control point in the process in relation to contamination, but also evisceration can pose a big risk as a consequence of gut rupture. The problem in this step is that the carcasses are not entirely uniform in size and some may be damaged by the evisceration machinery. To reduce carcass contamination, decontamination measures can be applied. These can be physical or chemical, and aim to reduce the concentration. Contamination of carcasses with *Campylobacter* can be reduced by dipping or spraying of carcasses using chlorinated water, acidified sodium chlorite (ASC) or acetic or lactic acids. Trisodium phosphate (TSP) has also been widely used, but due to processing and environmental problems its use is now minimal. Regarding these decontamination measures, there are some regional differences to be considered, since chemical treatment is not accepted in the EU at the moment, but is widely used in other parts of the world, e.g. in the United States of America and New Zealand. Physical treatments that reduce *Campylobacter* counts on carcasses include freezing; crust freezing; heat treatment; steam-ultrasound; steam or hot water spray; forced air chilling; and irradiation.

The experts emphasized the differences between countries, and considered the fact that specific measures taken in one country might not work in another. In a Web-based risk assessment tool, countries would have to add national data in order to assess the relative risk for their country.

2.2 Regional perspectives: identification and consideration of critical differences

The regional differences were too comprehensive to be considered in the present report. However, this section provides an introduction to some of the critical differences among countries, for the industrial settings.

2.2.1 Primary production

The most prominent differences presented at the Technical Meeting were found in the primary production sector. The particular region has a great influence on this matter as well as variation in the size of broiler production. Thus differences in number of birds produced range from 9.02 billion in the United States of America to 75 million in Sweden. The climate in a region can have great effect on the type of housing chosen. The housing can be open or closed. Also the number of birds in the houses varies, since the heat generated by the chickens can be crucial. Also, other husbandry differences exist, and especially floor type and management can vary. A further account of these differences will not be given here since it is not the aim of this report, but the effect on hazard reduction will be reviewed in Chapter 4.

The amount and type of ventilation of the houses differs among the different regions and the different production types. The type and degree of ventilation used is very much dependent on the climate and the housing type, since hotter climates and closed houses requires more ventilation. As will be explained in Chapter 4, the ventilation can be an important source of *Campylobacter* introduction, and studies have been made in several Nordic countries on provision of fly-screens in the ventilation to prevent introduction of *Campylobacter* with flies.

Thinning may result in infection of the remaining birds with *Campylobacter* due to the temporary breakdown in biosecurity.

2.2.2 Slaughterhouse

Most processing procedures are similar in the different regions, but there are differences in processing practices, since the product wanted by the consumers can vary a lot between the different regions. In many places, marketing can be said to drive the production system. This can reflect differences in legislation. The EU has a top-down approach, whereas in the United States of America current practice is that the primary control is applied in the processing plant. As mentioned in the previous section, the decontamination step will also show some differences among the countries as a result of the local legislation. Thus demands under European Union legislation differ from that required by, for instance, the United States of America legislation.

2.2.3 Data for risk assessment

Besides the differences mentioned above, there are other challenges to be considered regarding the Web-based tool. One of the big difficulties is to get data representative for a country, due to different production systems within the country. For example, in Brazil, the big export companies are in the south, whereas the smaller companies in the north produce for the home market. There are challenges when comparing data within a country, but it is far more difficult to compare data between countries. Another big challenge is that different methods for analysis in monitoring and research give different results. Furthermore, the legislation and financial support for additional and systematic sampling will vary greatly within the different country. Standardized analysis for *Campylobacter* will pose a special problem in many countries.