



THE ISOLATION OF *SALMONELLA* ON FRESH MEAT AND BOWEL AND ITS DECONTAMINATION BY USING GAMMA IRRADIATION

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Key words : *Salmonella*, decontamination, gamma irradiation.

Salmonella is one of the most important food born pathogen around the world. The contamination of food especially those of animal origin with *Salmonella* is significant health problems and important cause of human suffering globally. The reported incidence of *Salmonella* infections in many countries has increased substantially. The economic impact of loss of productivity and cost of medical treatment is considerable.

Many species and strains of *Salmonella* which are pathogenic to human, need to be isolated and identified accurately. The procedures for isolation and identification of *Salmonella* generally established after have been collaborated testing and many have international recognition. The isolation and identification of *Salmonella* in food, usually rely on preenrichment, selective enrichment in selective and differential media, biochemical tests, and serological confirmation.

Irradiation can be an effective step in Hazard Analysis Critical Control Point (HACCP) program to kill bacteria pathogen associated with meats and poultry. Food irradiation is now recognized as another method of food preservation and ensuring its wholesomeness by sterilization or cold pasteurization, and its has diverse application. The safety of food is increased by virtue of destruction of microbial pathogens, many of which can be eliminated totally from fresh product by irradiation at 1.5 kGy. However, irradiation needs to be applied at a specific time in order to minimize losses due to susceptibility to microbial attack during storage (Monika and Fung, 1995). Specifically, Thayer (1995) also reported that the population of most common enteric pathogens associated with meat products can be significantly decreased or eliminated by low dose (<3.0 kGy) treatment with irradiation.

In Indonesia, approval for irradiation for frozen shrimp and frog leg has been given at the level up to 7 kGy, no approval given for other food of animal origin such as chicken, beef and pork meat as of this writing. More studies need to be conducted to support the decision to approve the use of irradiation for such meats.

This paper discusses the experiments conducted in order to isolate *Salmonella* on chicken, beef, pork meat and bowel and to determine its decontamination dose by using gamma irradiation. As occurred in many other countries, in Indonesia chicken, beef, pork meats and bowel are reported to be the major food vehicle associate with *Salmonella* infections. The results of this experiments are expected to contribute significantly to the approval of irradiation for decontaminated of microbial pathogen on fresh meat.

Salmonella were isolated from chicken, beef and pork meat and bowel obtained from traditional markets and supermarkets in Jakarta and surroundings areas. The isolates found were tested using microbiological and biochemical methods

followed by serological test to determine their serotypes. Isolates were inoculated into chicken, beef, pork meat and bowel (which have been irradiated at 10 kGy) and irradiated at 0,1,2,3,4,5,6,7 kGy with dose rate of 6 kGy/h in ice condition (0°C) and with dose rate 7.6 kGy/h in dry ice condition (-79°C). The source of gamma irradiation used was ⁶⁰Co in Latex Irradiator, at CRDIRT, NNAE.

There were 9 serotypes of *Salmonella* found in the chicken meat and bowel samples, namely *S. agona*, *S. hadar*, *S. kentucky*, *S. typhimurium*, *S. schwarzengrund*, *S. ouakam*, *S. blockley*, and *S. enteritidis*, respectively. The D₁₀ values of *Salmonella* in chicken meat were varied from 0.515 to 1.038 kGy at 0°C and 0.781 to 1.919 kGy at -79°C (see table 1). The strain of *Salmonella* isolated from beef samples were *S. ouakam*, and *S. javiana*, and the D₁₀ values were 0.475 and 0.575 respectively at 0°C and 1.400 and 0.950 kGy, respectively at -79°C (see table 2). While the strains of *Salmonella* isolated from pork meat was *S. agona* and *S. anatum* was found on the intestine. It was found that the D₁₀ value of *S. agona* was 0.600 kGy at 0°C and 0.750 kGy at -79°C. The D₁₀ of *S. anatum* was 0.450 kGy at 0°C and 0.550 kGy at -79°C, respectively (see table 3).

The results of these experiment as described above revealed that *Salmonella* were found in all kinds of meat samples. The sanitation of the places (farm, slaughter house, slaughter equipment, market, etc.) where the meats were obtained was significantly influence the level of *Salmonella* contamination. In general, the level of *Salmonella* contamination from traditional market was higher than on the meats sample obtained from supermarket. The number of *Salmonella* serotype found in chicken meat was higher than in beef, pork and bowel. Even *S. typhimurium* which is the most consistent pathogenic bacteria was found in chicken meat. The result of these experiment also revealed that low dose irradiation (below 3 kGy) provides effective measure to eliminate *Salmonella* from the meats sample. The irradiation sensitivity of *Salmonella* was also influenced by the kind of meat and meat temperature when irradiation was conducted. The D₁₀ value for *S. agona* and *S. anatum* irradiated on chicken meat was higher than when irradiated in pork meat, both at 0°C and -79°C. All serotypes were more sensitive when irradiated 0°C compare when irradiated at -79°C.

References

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Table 1. D₁₀ value of *Salmonella* in chicken meat and bowel

Serotypes	Substrate	D ₁₀ (kGy)	
		Radiation Temperature	
		0°C	-79°C
1. <i>S. kentucky</i> (74)	meat	0.515	0.898
2. <i>S. anatum</i> (5)	meat	0.759	1.416
3. <i>S. schwarzengrund</i> (4)	meat	0.688	1.310
4. <i>S. agona</i> (3)	meat	0.850	1.919
5. <i>S. hadar</i> (2)	meat	0.950	0.781
6. <i>S. typhimurium</i> (1)	meat	1.038	1.327
7. <i>S. blockley</i> (3)	intestine	0.800	0.600
8. <i>S. ouakam</i> (2)	liver	0.825	0.750
9. <i>S. enteridis</i> (1)	heart	0.925	0.975

Table 2. The D₁₀ value of *Salmonella* in beef

Serotype	Substrate	D ₁₀ (kGy)	
		Radiation temperature	
		0°C	-79°C
1. <i>S. oukam</i> (1/9)	meat	0.475	1.400
2. <i>S. javiana</i> (1/2)	meat	0.575	0.950

Table 3. The D₁₀ value of *Salmonella* in pork meat and bowel

Serotype	Substrate	D ₁₀ (kGy)	
		Radiation Temperature	
		0°	-79°C
1. <i>S. agona</i> (6)	meat	0.600	0.750
2. <i>S. anatum</i> (1)	instentine	0.450	0.550