# LEVEL OF GAMMA RADIATION IN SOME MEAT PRODUCTS MARKETED IN UPPER EGYPT

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## Background

Gamma radiation is electromagnetic radiation similar to light but of much higher energy. The wavelength of gamma rays is much shorter than that of visible light. Gamma rays are emitted inradioactive decay along with alpha or beta radiations (FAO, 1994). Radioactive contamination arises from both natural and artificial sources, the latter having assumed greater importance since the Second War World (Gracey *et al*., 1999). Radionuclides are readily transferred to the human population through domestic grazing meat producing animals, which are effective collectors of contamination from various vegetative sources (Gilbert *et al*., 1989, McGee *et al*., 1993), from the atmosphere (MAFF, 1994), from soil (Andersson *et al*., 2001) or from nuclear accident (Jones, 1989 and Prohl *et al*., 1989). After Chernobyl nuclear accident, the contamination of beef by radionuclides was found up to 120 Bq/Kg in 1987 (Hrusovsky *et al*., 1989). Also, it was found that the radionuclides in all examined imported lamb meat and 17 % of roast beef samples were 82 and 4 Bq/Kg,respectively (Marouf *et al*. 1991).

## Objectives

The purpose of this study was to determine the level of gamma rays in some selected imported as well as locally produced meat products marketed in Upper Egypt.

## Materials and methods

A total of 105 locally produced and imported meat products were collected to detect the levels of gamma radiation. Preparation and digestion of samples were applied according to the technique recommended by Gajan and Larry (1972). All prepared samples were first screened with a Geiger Muller apparatus for primitive evaluation of gamma radiation. Scaler ratemeter type 6-90 was used for the measurement of the levels of gamma radiation in each sample as count per minute (cpm). At the same time, the radiation of the background (air) was measured and subtracted from the sample reading, where the excess was converted to Becquerel unit per kilogram (Bq/Kg) (WHO, 1994).

## Results and discussion

Radionuclides, which undergo significant gastrointestinal absorption by man and animals, are those of greatest concern in food chain transference. These radioactive contaminants are also readily transferred to animal products, such as milk and meat, which are then consumed by man (FAO, 1994). It was observed that the differences between the highest levels of gamma radiation in the background were lower than the maximum permissible limits recommended by Council Regulation ECC No. 1707/86. These limits were, in terms of maximum permitted levels of caesium-134 and caesium-137, 370 Bq/Kg for milk and infant feeds, and 600 Bq/Kg for other food (MAFF, 1994). It was observed that the imported canned luncheon meat from Palestine was had the most radiation (299.50 Bq/Kg), the canned beef imported from France (238.67 Bq/Kg) being the second. Lower results were recorded by many investigators, such as Hrusovsty *et al*. (1989) who found caesium radionuclides in canned meat products were up to 70 Bq/Kg, Battiston *et al*. (1991) who reported that the concentration of total caesium in muscle reached a maximum value of 156 Bq/Kg, as well as Marouf *et al*. (1991) who recorded that all imported lamb meat samples were contaminated with caesium-137 at the level of 82 Bq/Kg. The canned luncheon imported from Palestine had gamma radiation levels close to the minimum permissible limits (300 Bq/Kg) reported by FAO (1994)

## Conclusions

Although most of the locally produced meat products in Egypt are manufactured from imported meat, the examined imported canned beef and canned luncheon had higher gamma radiation levels in comparison to those measured in the locally produced canned beef and canned frankfurters. Such observations may be attributed to different sources of contamination by gamma radiation, or other isotopes emitting gamma.

## References

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**Table 1.** Mean values of gamma levels (cpm) in locally produced canned meat and some meat products samples in comparison to background (air)

| Type of sample | N | Mean gamma in samples | Mean gamma in background |
|---|---|---|---|
| Canned beef | 20 | 179.50 | 177.50 |
| Canned frankfurter | 5 | 179.83 | 175.16 |
| Beef burger | 5 | 169.83 | 175.16 |
| Beef kofta | 5 | 170.33 | 175.16 |
| Beef luncheon | 5 | 176.83 | 174.83 |
| Beef sausage | 5 | 167.17 | 175.16 |
| Minced beef meat | 5 | 163.33 | 175.16 |

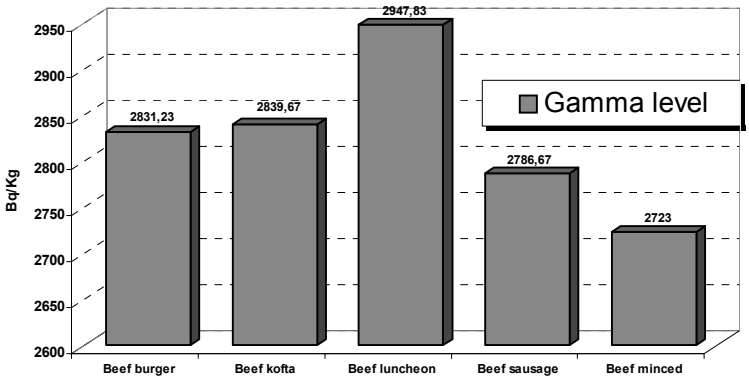


**Figure 1.** The level of gamma radiation in some local meat products.

**Table 2.** Differences between Highest levels of gamma (cpm) in locally produced canned meat and some meat products samples in comparison to background (air)

| Type of sample | Highest level of gamma in sample (cpm) | Highest level of gamma in BG (cpm) | Difference (±) (cpm) | Difference (Bq/Kg) |
|---|---|---|---|---|
| Canned beef | 208.65 | 200.15 | + 8.50 | 141.67 |
| Canned frankfurter | 202.06 | 193.00 | + 9.06 | 151 |
| Beef burger | 183.73 | 193.00 | - 9.27 | 0 |
| Beef kofta | 183.93 | 193.00 | - 9.07 | 0 |
| Beef luncheon | 196.27 | 192.30 | + 3.97 | 66.17 |
| Beef sausage | 179.80 | 193.00 | - 13.20 | 0 |
| Minced beef meat | 173.27 | 193.00 | - 19.73 | 0 |

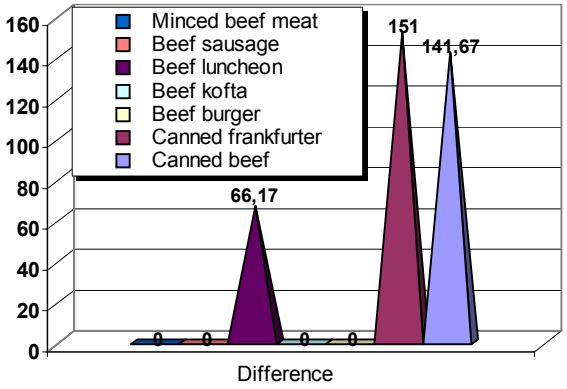


**Figure 2.** The difference in radiation between some local meat products with respect to the assay background.

**Table 3:** Mean gamma levels (cpm) in imported canned meat products samples in comparison to background (air)

| Type of sample | N | Origin | Mean gamma in samples | Mean gamma in background |
|---|---|---|---|---|
| Canned beef | 30 | Brazil | 189.50 | 184.67 |
| Canned beef | 10 | France | 178.67 | 174.33 |
| Canned luncheon | 10 | Palestine | 197.17 | 186.17 |
| Canned luncheon | 5 | Holland | 193.17 | 187.83 |

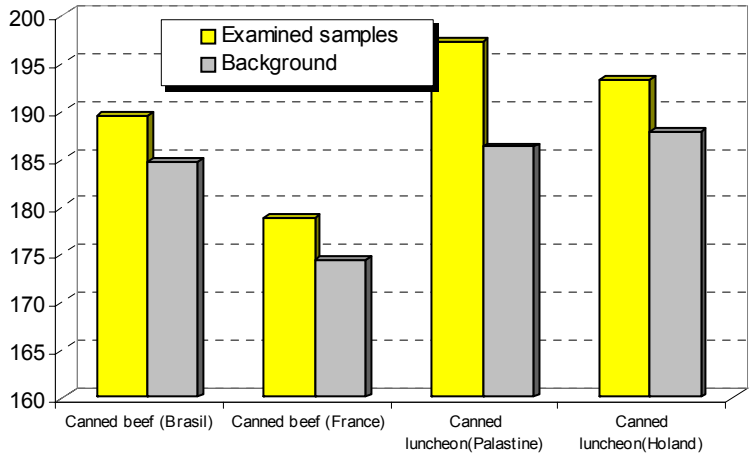


**Figure 3.** Mean levels of gamma (Bq/kg) in some imported canned meat in comparison to the background (air).

**Table 4:** Differences between the highest level of gamma radiation (cpm) in imported canned meat products samples in comparison to background (air).

| Type of sample | Origin | Highest level of gamma in sample (cpm) | Highest level of gamma in BG (cpm) | Difference (±) (cpm) | Difference (Bq/Kg) |
|---|---|---|---|---|---|
| Canned beef | Brazil | 201.60 | 192.45 | + 9.15 | 152.50 |
| Canned beef | France | 208.07 | 193.75 | + 14.32 | 238.67 |
| Canned luncheon | Palestine | 209.07 | 186.10 | + 17.97 | 299.50 |
| Canned luncheon | Holland | 197.20 | 187.85 | + 9.35 | 155.83 |

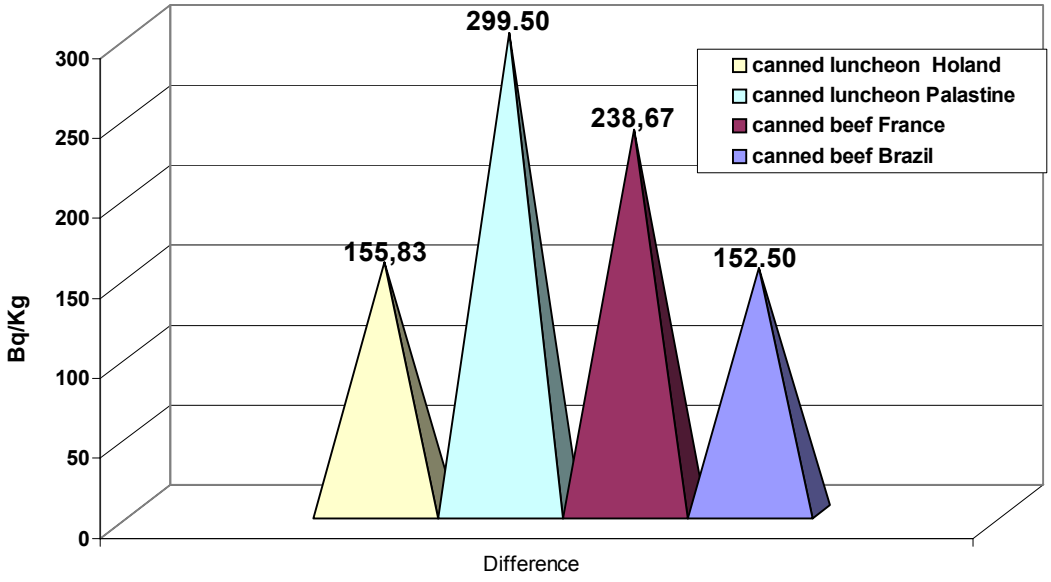


**Figure 4**. The difference between measured imported canned meat products and background measured in the assay