

SUMMARY

Dietary polyamines putrescine (PUT), spermidine (SPD) and spermine (SPM) participate significantly in the cell growth, including tumour growth and in the tissues regeneration. Meat and liver represent an important polyamine source for humans.

Polyamines were determined in fresh meat and liver 24 hours after slaughter by a benzoylation / MECC method, while a dansylation / HPLC method was used for the determination of changes in polyamine contents during meat and liver storage and culinary processing.

SPM contents did not exceed 30 mg kg⁻¹ in fresh pork loin and leg (n=27) and bovine sirloin and rump (63 young bulls and 8 cows). Contents of SPD and PUT were in the most of samples below the limits of detection. No significant correlations at $P < 0.05$ between SPM contents in each muscle of young bulls and their age, live weight and type of efficiency were found. The difference in SPM contents in leg between the genders of pigs was significant ($P < 0.05$), likewise for SPM in both muscles of bulls and cows ($P < 0.05$). The significant inter-species difference ($P < 0.05$) in SPM content was found in loin only between gilts and cows.

Polyamine contents in livers ranged very widely. In fresh porcine livers were the most frequent SPD and SPM contents about 30 and 100 mg.kg⁻¹, respectively, while an inverse SPD / SPM ratio was found in bovine livers. The most frequent SPD and SPM contents in bovine livers were 100-150 and 40 mg kg⁻¹, respectively. PUT content in fresh livers was below the limit of detection. The inter-species differences of SPD and SPM contents in bovine and porcine livers were significant at $P < 0.001$. SPD and SPM contents in ovine livers were similar to those in porcine liver. Mean SPD and SPM contents in chicken livers were 57.3 and 117 mg kg⁻¹, respectively. PUT, SPD and SPM contents were below the limits of detection in bovine and porcine blood. Thus, blood does not represent a significant polyamine proportion in meat and livers. Significant negative correlations were found between SPD and SPM in livers of bulls ($P < 0.001$) and between SPD content and the age of bulls ($P < 0.01$). Mean SPD contents in liver were significantly different between the meat and dairy breeds (188 and 96.1 mg kg⁻¹, respectively) ($P < 0.05$) and between dairy and combined breeds (96.1 and 106 mg.kg⁻¹, respectively) ($P < 0.1$).

Raw pork loin and livers were chilled at 2 °C or frozen at -18 °C. Chilled meat and livers were stored in a protective atmosphere (OA; 70 % N₂ and 30 % O₂), vacuum packaged (VAK) or stored in a polyethylene bag (VOL) as an experimental control.

SPD and SPM contents in livers stored in the protective atmosphere and under vacuum significantly decreased ($P < 0.05$) to about 75 – 60 % of the initial values during 21 days, likewise SPD content in livers stored in the polyethylene bag during 9 days. Decrease of SPM content stored in the polyethylene bag was insignificant. SPM content in chilled loin in OA, VAK and VOL remained constant. SPD and SPM contents in frozen livers decreased significantly to about 70 % of the initial values during 168 days, while SPM in frozen pork loin mildly but insignificantly increased ($P < 0.05$). SPD content in frozen loin was below the limit of detection.

The influence of culinary processing on polyamine content changes in pork loin and livers was also surveyed. The most common culinary processing methods used in the Czech Republic were tested: boiling, stewing, roasting, baking and frying. SPM contents decreased significantly ($P < 0.05$) during thermal processing to 70 – 50 % of the initial values in unprocessed livers and pork. There were not significant differences among the individual culinary treatments, the greatest SPM losses were found during liver roasting and loin baking. In broth, contents of polyamines were below the detection limits.

The results may help mainly to dieticians and physicians for the controlled nutrition of patients, namely with tumour disorders or for wound healing.

Keywords: dietary polyamines; putrescine; spermidine; spermine; beef; pork; bovine liver; pork liver; storage; culinary processing