The Lead Content of Game

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The results of investigations into the occurrence in Game of lead, principally derived from lead shot, are tabulated and discussed. Distinction is made between soluble and particulate contamination.

E. C. Wood and E. P. Underwood[1] have reported high localised lead contamination in game birds. This laboratory has recently completed the examination of readily available brands of preserved grouse, partridge and pheasant. The method of examination followed broadly that suggested by Wood and Underwood but has been extended to include the soluble lead content of the edible portion.

Duplicate samples of each manufacturer's product were examined. The aspic or jelly liquor was drained from the carcase and the flesh dissected from the bones. The flesh was carefully pulled apart and searched for lead shot; the number and weight of lead shot found are shown in the table. The removal of the bulk of this shot, before processing, would have been impossible due to the location and depth of penetration of the shot. The edible flesh of each carcass was halved, each half comminuted with water, and the fine particulate lead separated from the resultant slurry by repeated addition of water, sedimentation and decantation. The combined washings including flesh were bulked to 2 litres. Each aliquot was dry ashed in platinum and the lead determined spectrophotometrically.[2]

The accompanying table (page 20) lists the amounts of particulate lead found in the residue (column 7), the lead content of the washings of the residue (column 8), and the dissolved lead in the liquor after settlement of the diluted slurry (column 9). The lead contents of the aspic or jelly filler are shown in column 12.

DISCUSSION

by E. C. WOOD

By kind permission of the authors, it was possible to view the above paper before publication. These results confirm the findings of Underwood and Wood,[1] but many more samples have been examined and the investigation has been carried out in greater detail. Attention may be usefully drawn to some of the implications of the present work.

(1) By halving the carcasses and examining the halves separately, the large sampling error attached to this kind of analysis has been demonstrated. For example, one half of the last sample gave a residue containing nearly 14 times

as much lead as the other half, even though 100 g of each half was taken for analysis; and although the differences between duplicate analyses of the slurry were less in general than with the residues, as is to be expected, they were nevertheless substantial. The lead content of the aspic or jelly was always negligible.

(2) The number of whole shot found and picked out varied greatly from carcass to carcass. While most contained no whole shot or only one, there were 19 in the last sample but one. This also had the highest content of "particulate and soluble" lead; but the sample with the next highest lead content of this kind (the second in the table) contained only two whole shot. Presumably the lead content of a carcass will depend not only on whether it is penetrated by many shot, but also on the extent to which they hit against bone and are broken up into fragments. Carcasses containing no shot and very little lead may be from birds that were hit only in the head.

(3) There is no definition of "meat" in the Lead in Food Regulations, 1961, but assuming that the foods analysed fall within the category of "canned meat," the legal maximum lead content is 5 p.p.m. There is nothing in the Regulations to suggest that whole lead shot are to be excluded when calculating the lead content of game; but even if Public Analysts are expected to exercise their common-sense and ignore whole shot, two of the samples examined by Hubbard infringe the law, and to no small extent.

(4) The lead contents in the table are calculated on the whole weight of edible matter, that is, including the jelly, which generally approximates to the weight of the carcass and often exceeds it. If the lead content of the carcass itself is calculated, excluding the jelly, two more samples infringe the Regulations and one approaches infringement (4·2 p.p.m.). This suggests that game carcasses sold by retail dealers uncooked will frequently contain more than 5 p.p.m. of "soluble and particulate" lead. It is probable, however—and fortunate—that no Public Analyst has ever had such a sample officially submitted to him and has had to consider in consequence how to word his certificate in respect of a whole pheasant found to contain, apart from whole shot, 6 p.p.m. or more of lead.

(5) A further point is that any manufacturer of products such as game spreads or pâtés runs the risk of offending against the Regulations by producing "meat pastes" that contain more than 5 p.p.m. of lead, unless he can devise a method of removing from the carcasses before processing not only whole shot—this is normal practice—but also particulate lead.

(6) Most people would probably agree that Hubbard's findings do not imply any appreciable hazard to health, both because of the infrequency with which game is eaten and also because particulate lead will doubtless be largely excreted without absorption. Nevertheless, it must be emphasised that Public Analysts, like all persons charged with the duty of enforcing the law, must consider the law as it stands, and cannot ignore or condone an offence merely because it appears to them that the law is wrong or not in accordance with

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1	2	3	4	5	6	Lead content of edible portion (i.e. excluding bones) 7		8		9	10	11		12		Total lead in edible sample 13		14
Declared ingredients	Container	Declared net wt. contents	Wt. of whole bird	†Wt. of Aspic/ Jelly	Wt. of flesh used	Residue		Slurry		Solution	Total flesh wt.	Flesh (total)		Aspic or jelly		Lead shot number found	Lead shot weight	Particulate and soluble
		g	g	g	g	µg	p.p.m.	µg	p.p.m.	p.p.m.	g	µg	p.p.m.	µg	p.p.m.		g	p.p.m.
Partridge in sherry wine jelly	C	426	232	194	93 93	84 27	0·9 0·3	N.D. 88	N.D. 0·9	0·1	186	287	1·5	21	0·11	0	—	0·8
Partridge in sherry wine jelly	C	426	221	205	80 80	1530 750	19·1 9·4	620 274	7·8 3·4	0·1	170	3364*	19·8	10	0·05		0·295	9·0
Grouse in port wine jelly	C	567	333	234	127 127	532 835	4·2 6·6	340 184	2·7 1·4	0·2	254	1891	7·5	23	0·10		0·208	3·9
Grouse in port wine jelly	C	567	300	267	120 120	454 244	3·8 2·0	204 170	1·7 1·4	0·7	240	1072	4·5	27	0·10	1	0·102	2·2
Pheasant in Burgundy wine jelly	C	1362	685	677	250 250	4 N.D.	<0·1 N.D.	66 194	0·3 0·8	0·1	540	285*	0·5	75	0·11	1	0·081	0·3
Pheasant in Burgundy wine jelly	C	1362	770	592	300 300	84 140	0·3 0·5	264 140	0·9 0·5	1·4‡	605	628	1·0	71	0·12	6	0·643	0·6
Partridge in Aspic	G	454	184	270	69 69	41 29	0·6 0·4	86 106	1·2 1·5	0·1	138	262	1·9	14	0·05	0	—	0·7
Partridge in Aspic	G	454	230	224	85 85	6 6	<0·1 <0·1	24 138	0·3 1·6	0·5	170	173	1·0	11	0·05	0	—	0·5
Grouse in Aspic	G	454	211	243	70 70	39 6	0·6 <0·1	26 26	0·4 0·4	0·6‡	158	110*	0·7	12	0·05	0	—	0·3
Grouse in Aspic	G	454	201	253	75 75	144 115	1·9 1·5	174 78	2·3 1·0	<0·1	154	525	3·4	15	0·06	1	0·125	1·3
Pheasant in Aspic	G	794	394	400	100 100	1680 1970	16·8 19·7	520 364	5·2 3·6	0·2	338	7660*	22·7	36	0·09	19	1·690	10·4
Pheasant in Aspic	G	794	340	454	100 100	47 640	0·5 6·4	114 500	1·1 5·0	0·2	290	1890*	6·5	23	0·05	1	0·102	2·6

N.D. = Not determined. * = Adjusted to total weight. † = Based on declared net weight. C = Canned. G = Glass. ‡ = Anomalous Results.

common-sense in some exceptional case. For one man's idea of what is common-sense or exceptional may differ from another's, and who is to say where the line shall be drawn? It seems clear therefore that the Lead in Food Regulations need amendment to provide for the presence in game of these relatively large traces of lead. It may be a long time, however, before such an amendment is made; in the meantime, it is to be hoped that Sampling Officers will not embarrass Public Analysts by submitting samples of game!

References

1. E. C. Wood and E. P. Underwood, *J. Ass. Publ. Analysts*, 1963, **1**, 91.
2. Analytical Methods Committee of the S.A.C., *Analyst*, 1959, **84**, 127.

Letter to the Editor

Permitted Food Colours

Sir,

I am naturally most interested in Mr. Spalding's comments[1] on some of the R_f figures quoted by Chaudrhi and me in our recent paper[2] published by your Journal. This has clarified a few more of the mysteries associated with the Solmedia set of colours and we are duly grateful. However, I cannot agree entirely with the implications of his last paragraph comparing the figures he has taken from my paper[3] for the overnight descending technique with his own figures for an ascending 12 cm run. While it is true that no distance of run was specified (in fact it was about 40 cm), and also that varying lengths of run will introduce differences, this is surely only one of the factors to be considered in comparing his figures with mine. In particular, R_f values are also affected by the chromatographic method (whether ascending, descending or radial technique) and, of course, the method of measuring the position of the spot, particulars of which were stated in our paper.[2] This comparison of figures merely on the length of run lends point to the statement we made on page 23 that R_f values are affected largely by varying details of technique, and should be used as evidential rather than absolute values.

I would add that using a 10- to 12-cm ascending run and using the leading edge of the spot for measurement, we have obtained good agreement with Mr. Spalding's figures.

References

1. Spalding, R. C., *J. Ass. Publ. Analysts*, 1964, **2**, 111.
2. Pearson, D. and Chaudhri, A. B., *ibid.*, 1964, **2**, 22.
3. Pearson, D., *ibid.*, 1964, **2**, 30.

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