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**CONTAMINANTS IN DUCK AND OTHER SPECIALITY EGGS**

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## Introduction

Regulatory limits for dioxins have existed for hen eggs within the European Union since 2002, and the limit was extended in 2006 to include dioxin-like PCBs, and in 2011 to include non-dioxin-like PCBs1. Proposals exist to extend these limits to other types of eggs. A limited amount of data exists for dioxins and PCBs in duck and gull eggs, but there is very little information on eggs from other species. Whilst there is a considerable amount of data from chicken eggs, including differences between those from birds reared in different ways for example indoor birds compared to those with access to the outdoors2,3, there is very little information on emerging contaminants in hen eggs and even less on these contaminants in eggs from other species.

A range of regulated and emerging organic environmental contaminants were measured in duck and other non-hen eggs that are available for sale in the UK. Just over a hundred samples were analysed. These included 70 duck and 10 quail eggs, and also eggs of other species such as goose, turkey, guinea fowl, ostrich, rhea, peafowl, pheasant, emu and gull. The EU regulatory limits for dioxins and PCBs in eggs apply only to hen eggs and egg products but the European Commission has suggested that they might be extended to other types of egg.

This study was carried out to provide an initial indication as to whether these contaminants in eggs might present a risk to consumers and also to inform the UK position in discussion relating to extension of European regulations.

## Materials and methods

Just over a hundred egg samples were collected from different locations across the UK with outlets including supermarkets, farm shops and specialist food stores. The majority of these were duck eggs (n=70), but they also included eggs of other species as shown in the table below.

All egg samples were analysed for PCDD/Fs, PCBs, PBDEs, and a sub-set was also analysed for brominated dioxins and biphenyls (PBDD/Fs, PBBs), and mixed halogenated dioxins and biphenyls (PXDD/Fs and PXBs). The sub-set was also analysed for PCNs which are a candidate for listing on the Stockholm Convention.

## Results and discussion

19 samples, including 3 duck, 4 goose, 3 ostrich, 3 rhea, 2 gull and one each of emu, peafowl, turkey and pheasant, contained PCDD/F toxic equivalent (TEQ) levels that were above the regulated limit for hen eggs (2.5 pg TEQ/g fat). Twelve samples also were higher than the limit of 5.0 pg TEQ/g fat for the sum of dioxins plus dioxin-like PCB. With the exception of the gull eggs, the contribution from dioxin-like PCBs was typically between 20 and 30%. The 2 gull eggs also contained indicator PCB levels that were above 400 ng/g fat (the limit for hen eggs is 40). PCDD/Fs, PCBs, PCNs and PBDEs occurred in all egg samples, levels being lowest in quail eggs. PBDE levels ranged from 0.3 - 227 µg/kg fat (0.05 - 22.7 µg/kg whole) for the sum of the measured PBDE congeners with the highest levels by far, being observed in samples of gull eggs. The corresponding PBDE range for duck eggs was 0.4 - 12 µg/kg fat (0.07 -1.5 µg/kg whole).

Of the emerging contaminants, PCNs occurred in all of the measured samples (range1.6 – 20 ng/kg whole weight) with the highest levels occurring in duck, goose and gull eggs. In general, most PCN occurrence levels were higher than those reported in recent literature for hen eggs. The mean value for the TEQ arising from the measured PXDD/F and PXB congeners (0.25 pg TEQ/g) was comparable to recently reported data (0.175 pg TEQ/g) for eggs including hen, duck and gull. Considering the very few congeners measured when compared to the vast number of congeners with halogens substituted in the 2,3,7 and 8 positions, this will represent only a small fraction of the total amount present. Most samples (>90%) showed the presence of brominated dioxins, with a greater frequency of PBDF occurrence as observed in other studies. The TEQ levels for PBDD/Fs were generally lower than the corresponding

chlorinated dioxin TEQ, although a small proportion (10-15%) of samples showed comparable TEQ values.
A preliminary examination was made to see whether or not contaminant load related to either the weight of egg in relation to the weight of the adult bird, the number of eggs laid in a year, the fat content of the eggs etc. No obvious pattern was seen, except that the contaminant load and relative contribution from the different classes of contaminant was notably different for the gull eggs. A more detailed analysis of the data will follow.
In general, contaminants in these species tended to be higher than those seen in chicken eggs.

**Conclusions**
The contaminant pattern in gull eggs was notably different to that from other species, likely due to the fish based diet of that species. Gull eggs contained relatively high levels of all contaminants, especially PCBs and PBDEs. It is also interesting to note that gulls have been reported to scavenge on landfill sites. Where total TEQ was high, the main contribution tended to be from dioxins (with the exception of gull eggs where PCBs dominated – see above). Brominated and mixed halogenated dioxins made a number of significant contributions to total TEQ for a number of samples including goose and peafowl in addition to gull eggs. Considering the small number of mixed halogenated congeners measured this is likely to be a substantial underestimate of the total amount.
This study highlights the ubiquity of these contaminants in duck and other non-hen eggs, and provides the first such broad dataset of its kind for this range of contaminants for these foods. The data allows the definition of a baseline level for the emerging contaminants and provides a basis for the estimation of risk to consumers of these foods.
Given that around 20% of the samples exceeded the regulated limits for hen eggs, if those limits were applied to all other species it would have a major impact on the industry.

**Acknowledgements**
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**References**
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| Species | No. of egg samples |
|---|---|
| Duck | 70 |
| Quail | 10 |
| Goose | 6 |
| Ostrich | 3 |
| Turkey | 3 |
| Rhea | 3 |
| Guinea fowl | 2 |
| Pheasant | 2 |
| Peafowl | 2 |
| Gull | 2 |
| Emu | 1 |