



EBC/The Brewers of Europe Survey of Fusarium-Toxins in European Beers

Fourth Fusarium-toxin forum 10-11 January 2008

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Content of presentation

- Comparison results of surveys on fusarium toxins which were performed on European beers in 2006 and in 2007
- Reminder results research on fate T-2 and HT-2 from field to beer
- Conclusions



Sampling

- | | 2006 | 2007 |
|--------------------|------|------|
| • Number samples | 195 | 198 |
| • Number countries | 26 | 27 |
- The number of samples from each country was based on the respective volumes produced by each of the countries.
 - 10 of these beers were classified as “white beers”, 11 as “dark beers”, 28 as “special beers” and 149 as “lager beers”



Distribution of samples

Country	Sample
Austria	5
Belgium	10
Bulgaria	5
Czech Republic	13
Denmark	8
Estonia	2
Finland	5
France	10
Germany	20
Hungary	5
Ireland	7
Italy	5
Latvia	2

Country	Sample
Lithuania	2
Luxembourg	2
Netherlands	10
Norway	5
Poland	10
Portugal	5
Romania	5
Slovakia	5
Slovenia	2
Spain	15
Sweden	5
Switzerland	5
Turkey	10
United Kingdom	20



Fusarium toxins analysed

Analytes	LOD ($\mu\text{g/l}$)	LOQ ($\mu\text{g/l}$)
T2 Toxin	0.03	0.10
HT2 Toxin	0.05	0.10
T2-triol	2	4
Monoacetoxyscirpenol	1	2
Neosolaniol	1	2
Acetyldeoxynivalenol	5	10
Deoxynivalenol	2	4



Method of Analysis

- liq/liq extraction, SPE purification, concentration,
- LC/MSMS Thermo TSQ Quantum Triple quad 2005,
- COFRAC French validation

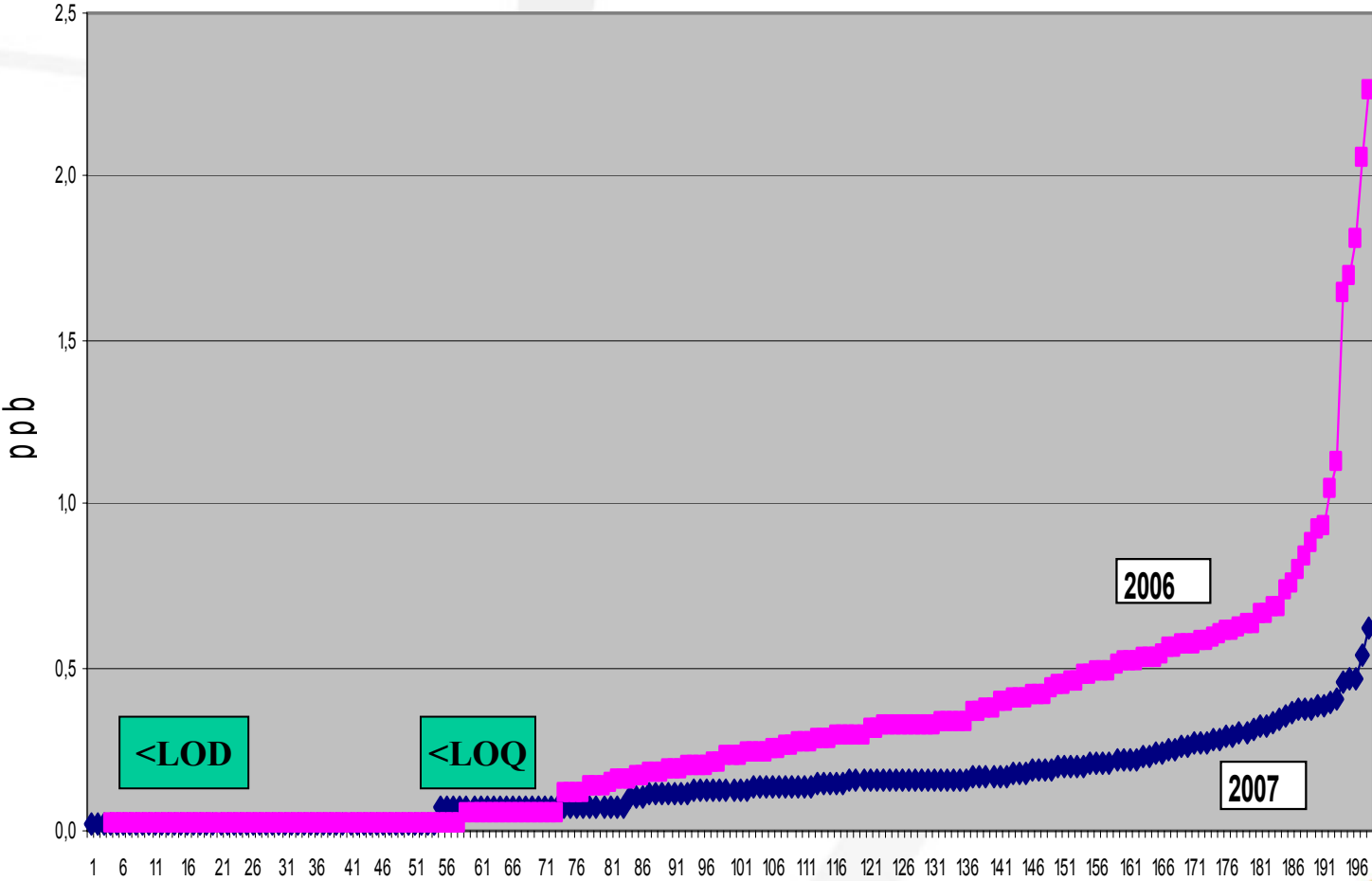


Results: HT2 $\mu\text{g/l}$

HT2	n		mean		max	
	2007	2006	2007	2006	2007	2006
white	10	10	0,18	0,25	0,45	0,88
dark	11	11	0,15	0,30	0,39	0,73
special	28	28	0,17	0,29	0,62	2,26
lager	149	146	0,13	0,31	0,54	2,06
total	195	198	0,14	0,30	0,62	2,26



Distribution of HT2

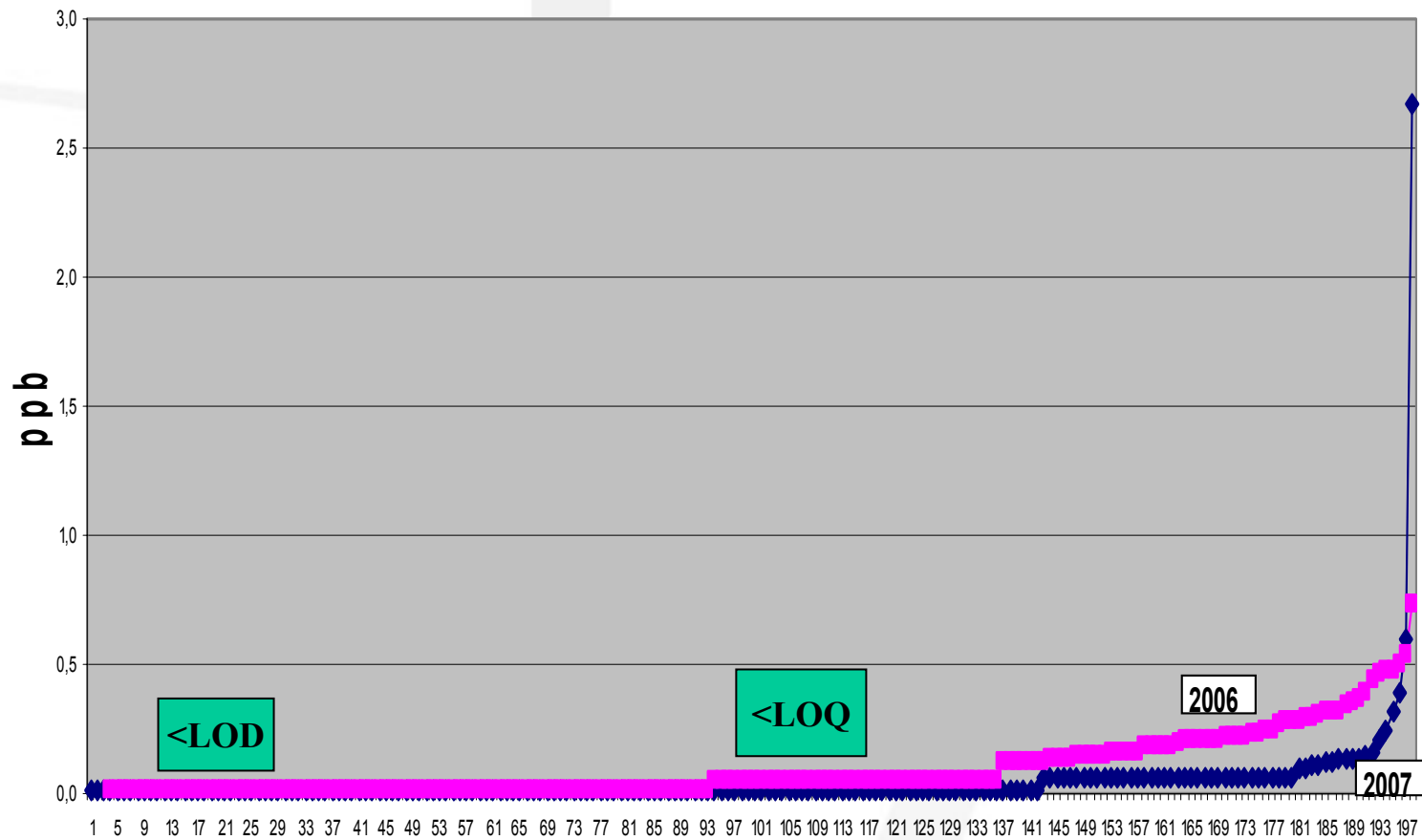


Results: T2 µg/l

HT2	n		mean		max	
	2007	2006	2007	2006	2007	2006
white	10	10	0,286	0,085	2,67	0,47
dark	11	11	0,072	0,060	0,32	0,20
special	28	28	0,045	0,073	0,60	0,36
lager	149	146	0,038	0,107	0,39	0,73
total	195	198	0,053	0,098	2,67	0,73



Distribution of T2

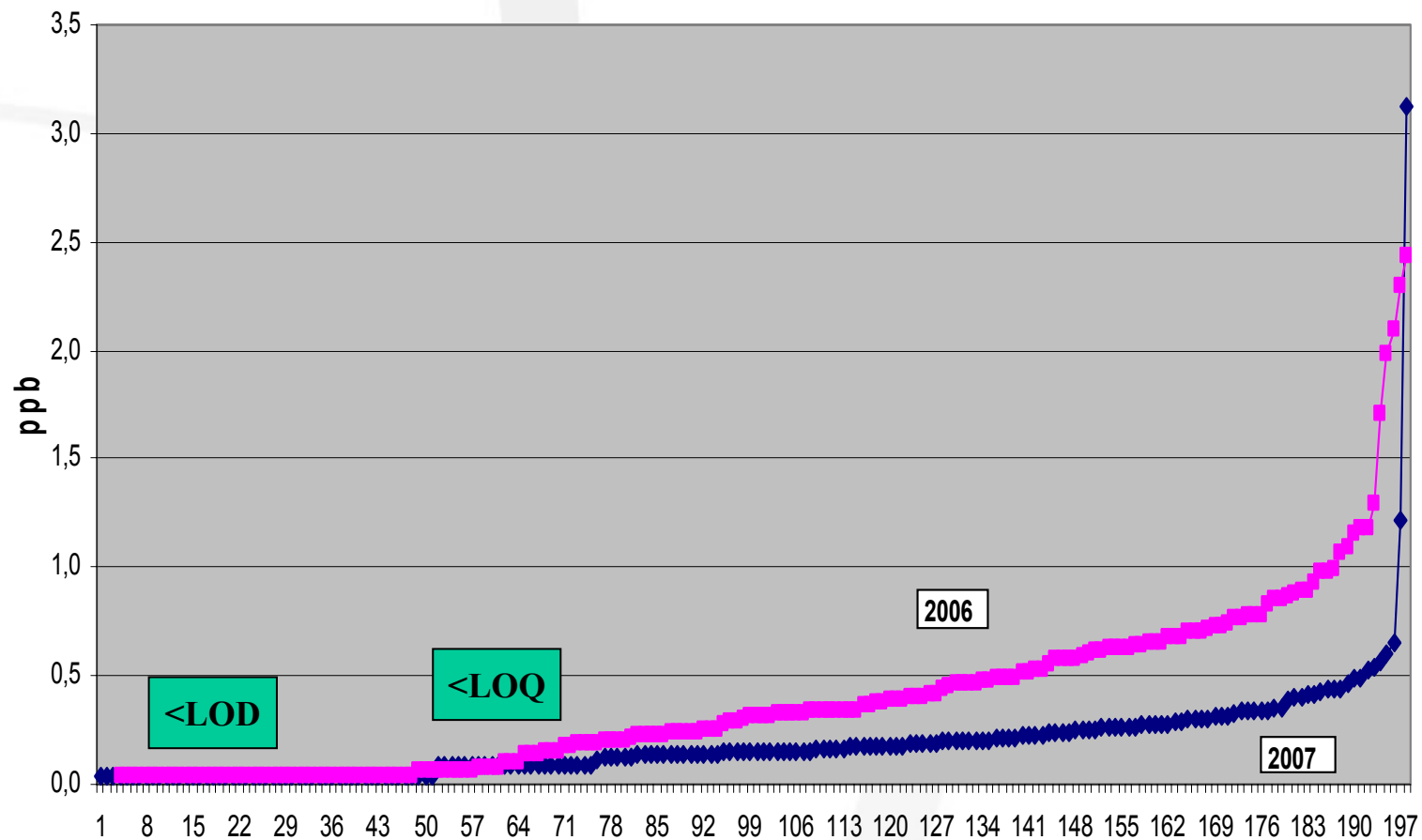


Results: T2 + HT2 $\mu\text{g/l}$

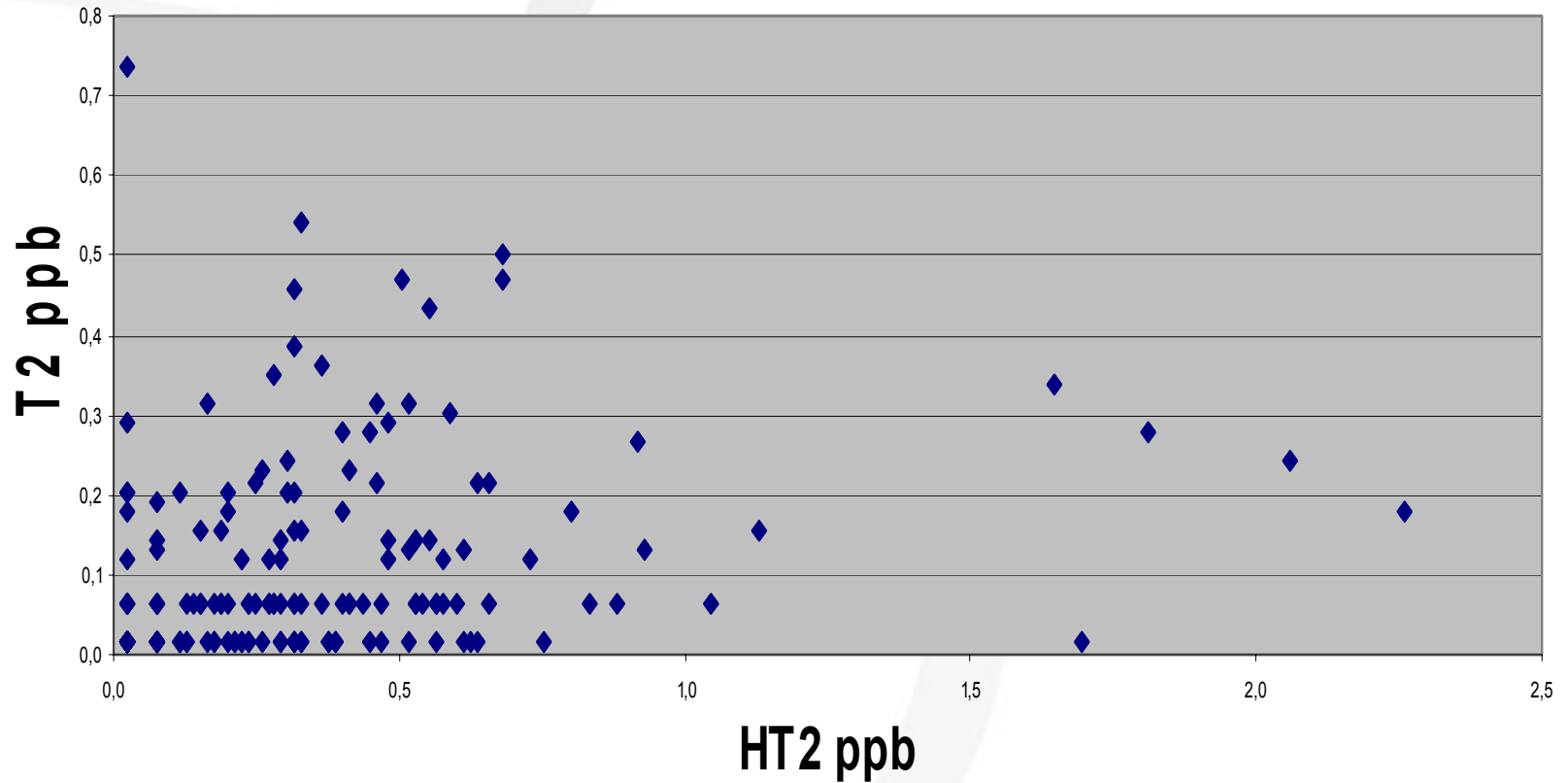
HT2	n		mean		max	
	2007	2006	2007	2006	2007	2006
white	10	10	0,461	0,33	3,12	1,18
dark	11	11	0,225	0,36	0,56	0,85
special	28	28	0,218	0,37	1,22	2,44
lager	149	146	0,168	0,42	0,65	2,30
total	195	198	0,193	0,40	3,12	2,44



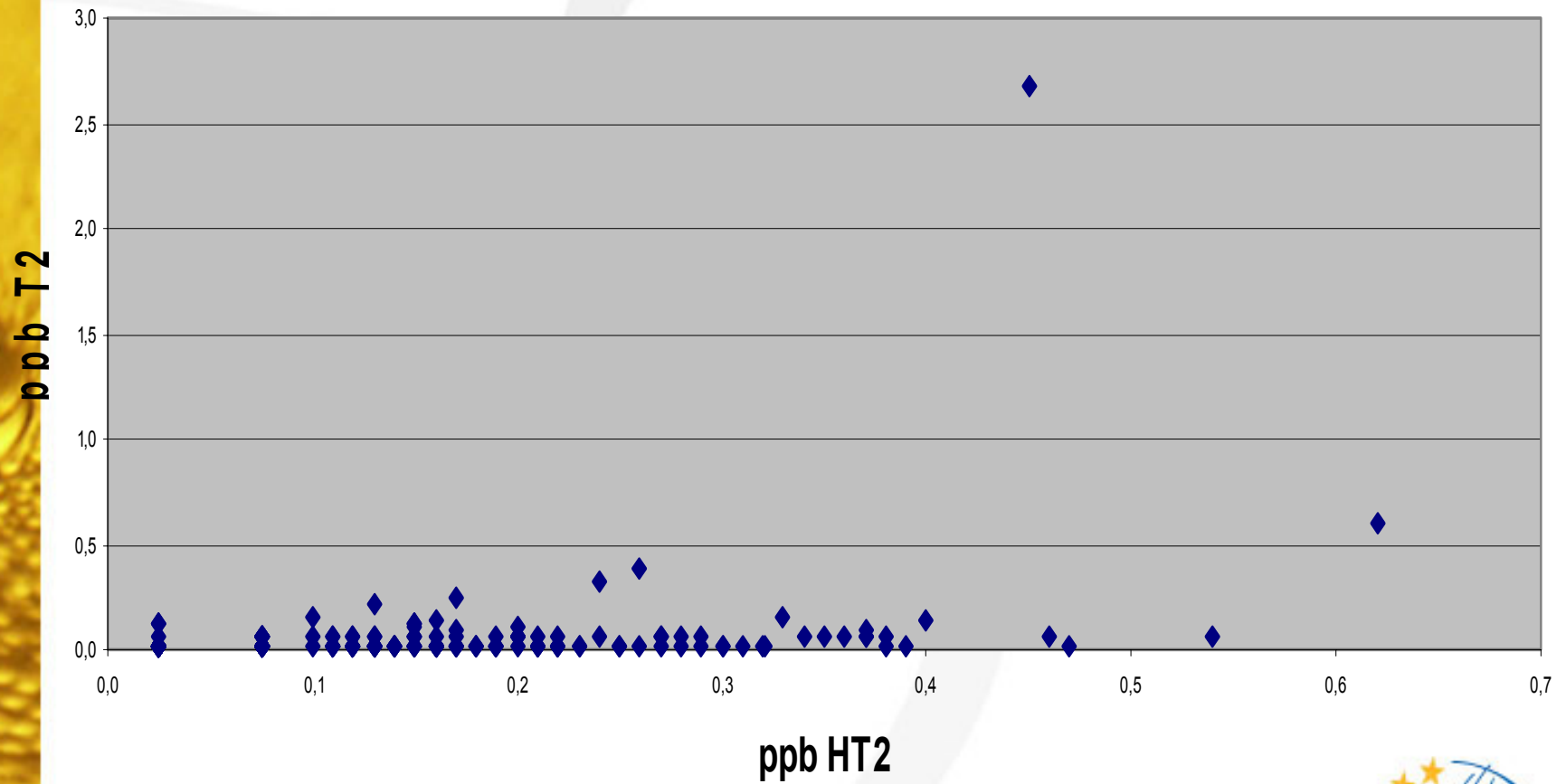
Distribution of HT2+T2



No relation between T2 and HT2 in 2006



No relation between T2 and HT2 in 2007

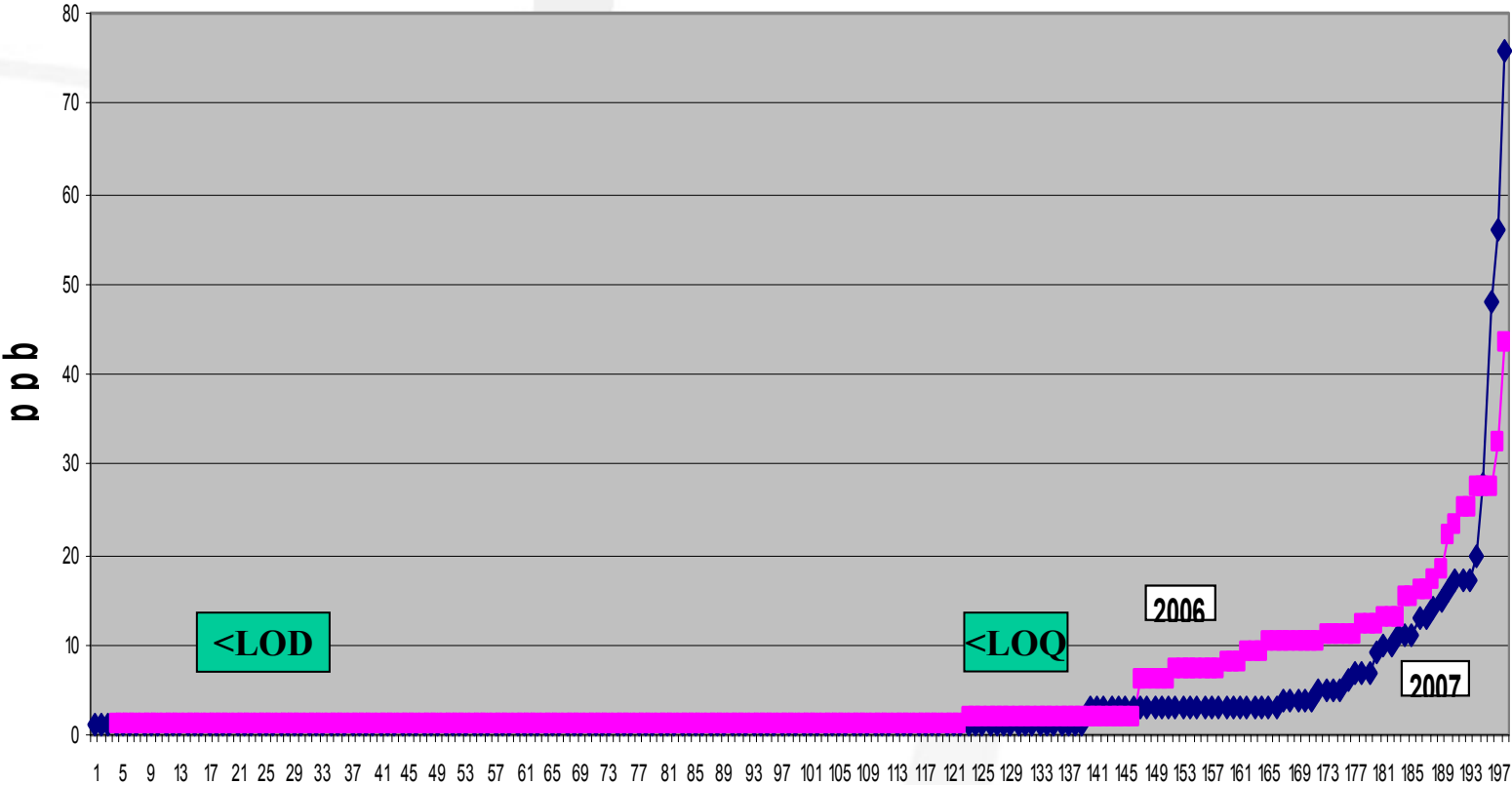


Results: DON $\mu\text{g/l}$

HT2	n		mean		max	
	2007	2006	2007	2006	2007	2006
white	10	10	5,9	5,5	17	12
dark	11	11	1,4	3,1	5	13
special	28	28	1,6	2,5	5	17
lager	149	146	3,9	5,0	76	43
total	195	198	3,5	4,5	76	43



Distribution of DON



Other fusarien toxins

	% samples detected		Level of detection	
	2007	2006	2007	2006
Acetyldeoxynivalenol	0	2	nd	<LOQ
Diacetoxyscirpenol	0	0	nd	nd
Fusarenon X	0	0	nd	nd
Monoacetoxyscirpenol	0	0	nd	nd
Neosolaniol	0	0	nd	nd
Nivalenol	0	13	nd	<LOQ
T2-triol	0	0	nd	nd



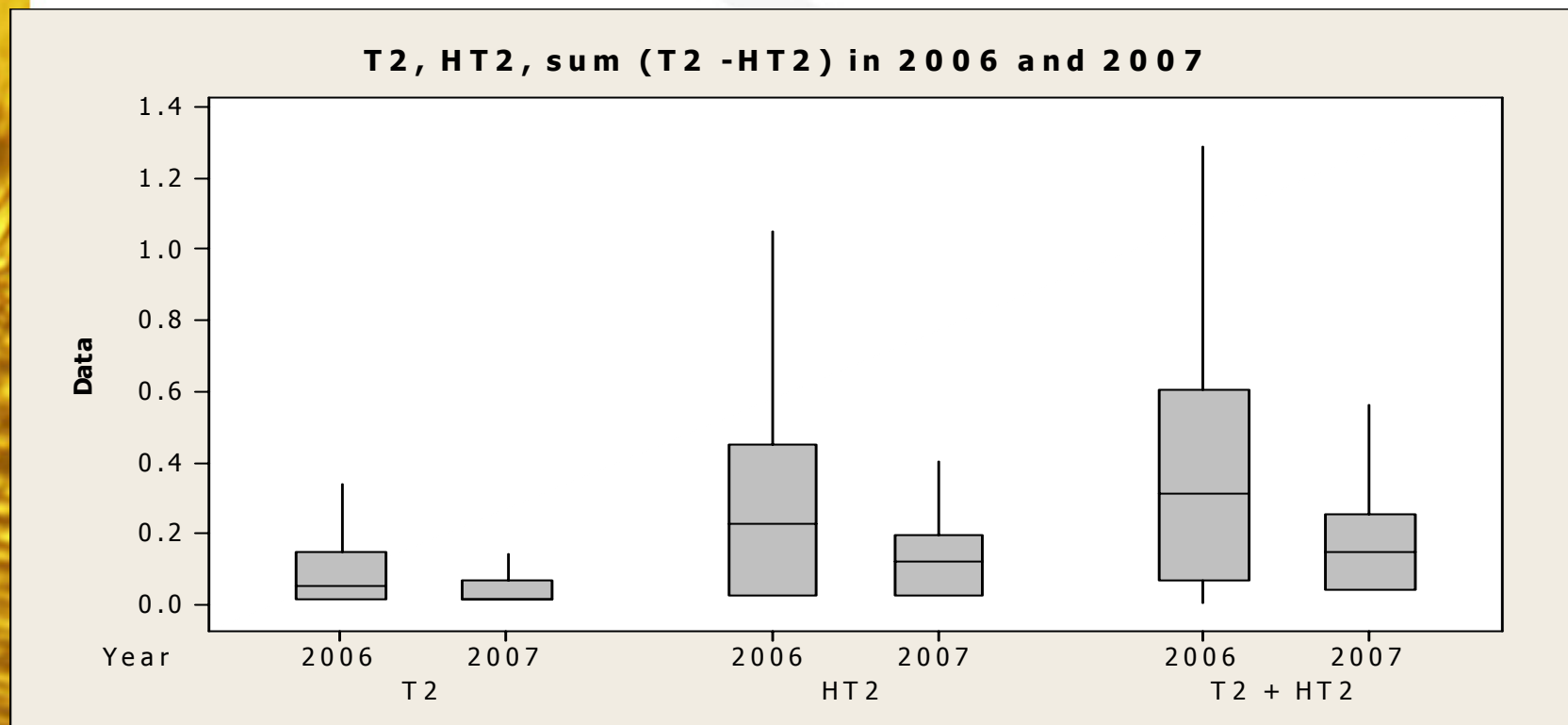
Geographical distribution

- The sampling does not allow to report any meaningful geographical distribution of detected mycotoxins.
- As T2/HT2 toxins and DON are related to field contaminations, the levels in beer of each country have to be linked with the barley crop locations and not with the beer brewing countries.



Summary of the survey

n=198 (195)	HT2		T2		T2 + HT2		DON	
	2007	2006	2007	2006	2007	2006	2007	2006
mean	0,14	0,31	0,053	0,10	0,19	0,40	3,5	4,5
max	0,62	2,26	2,67	0,73	3,12	2,44	76	43



Conclusions from 2007 survey

- With the low limits of detection which have been used, HT2 is detected in a majority of European beers, while DON is only detected in a minority.
- The levels of T2 and HT2 are not linked with the particular types of beers



Conclusions from 2007 survey

- 2007 shows a big decrease in levels found in beer (2 times less).
- As beer levels reflect malt levels which, in turn reflect barley/wheat levels, it is assumed that levels in the raw material for 2007 crop also reduced.
- Contaminations are weather dependent



REMINDER

Conclusions from EBC/The Brewers of Europe Research Fate of T-2 and HT-2 from field to beer

- During beer brewing most (65 to 100%) of the HT2/T2 present in malt still persists into the beer.
- There is little or no significant losses of HT2/T2 in brewing co-products (brewers' grains, brewers' hops, brewers' yeast)



General Conclusions

- As T2 and HT2 levels in beer are directly related to the levels in malt, the brewing industry has no other action point than a strong collaboration with the malting industry.
- We believe the final solution will take place in the fields.
- More research needed to know how to mitigate risk



Thank you for your attention

