



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

Fourth Fusarium-toxin forum 15 - 16 January 2007

Stéphane Dupire



Sampling

- 195 samples of beer collected in early 2006 from 26 European countries were analysed.
- 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 148 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	4
Ireland	7
Italy	5
Latvia	2

Country	Sample
Lithuania	2
Luxembourg	2
Netherlands	10
Norway	5
Poland	10
Portugal	5
Romania	5
Slovakia	5
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



Analysis Method of Analysis

- See presentation of Dr. Boivin:
- liq/liq extraction, SPE purification, concentration,
- LC/MSMS Thermo TSQ Quantum Triple quad 2005,
- COFRAC French validation

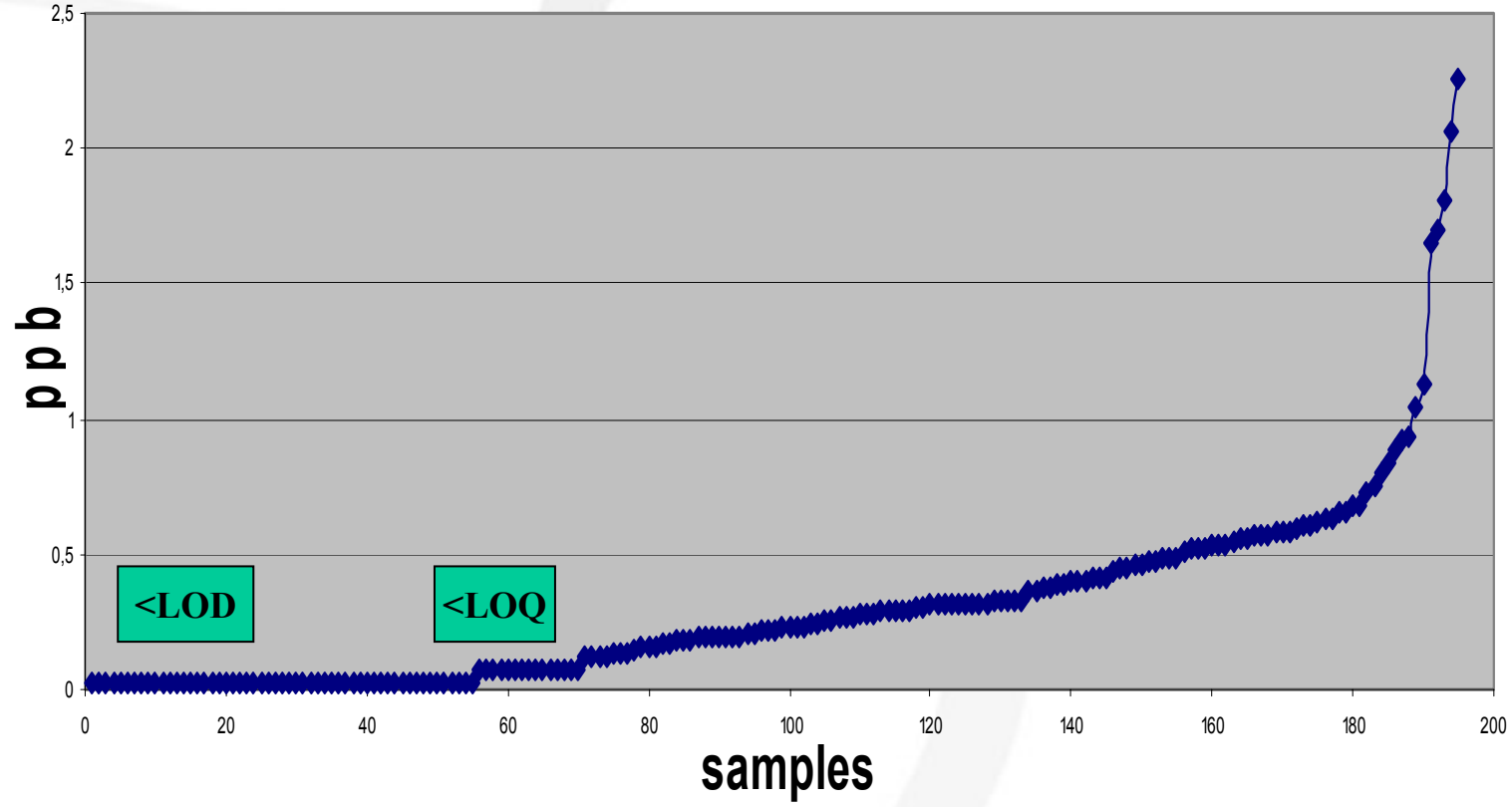


Results: HT2 $\mu\text{g/l}$

HT2	n	mean	max
white	10	0,25	0,88
dark	11	0,30	0,73
special	28	0,29	2,26
lager	146	0,31	2,06
total	195	0,30	2,26



HT2 Distribution

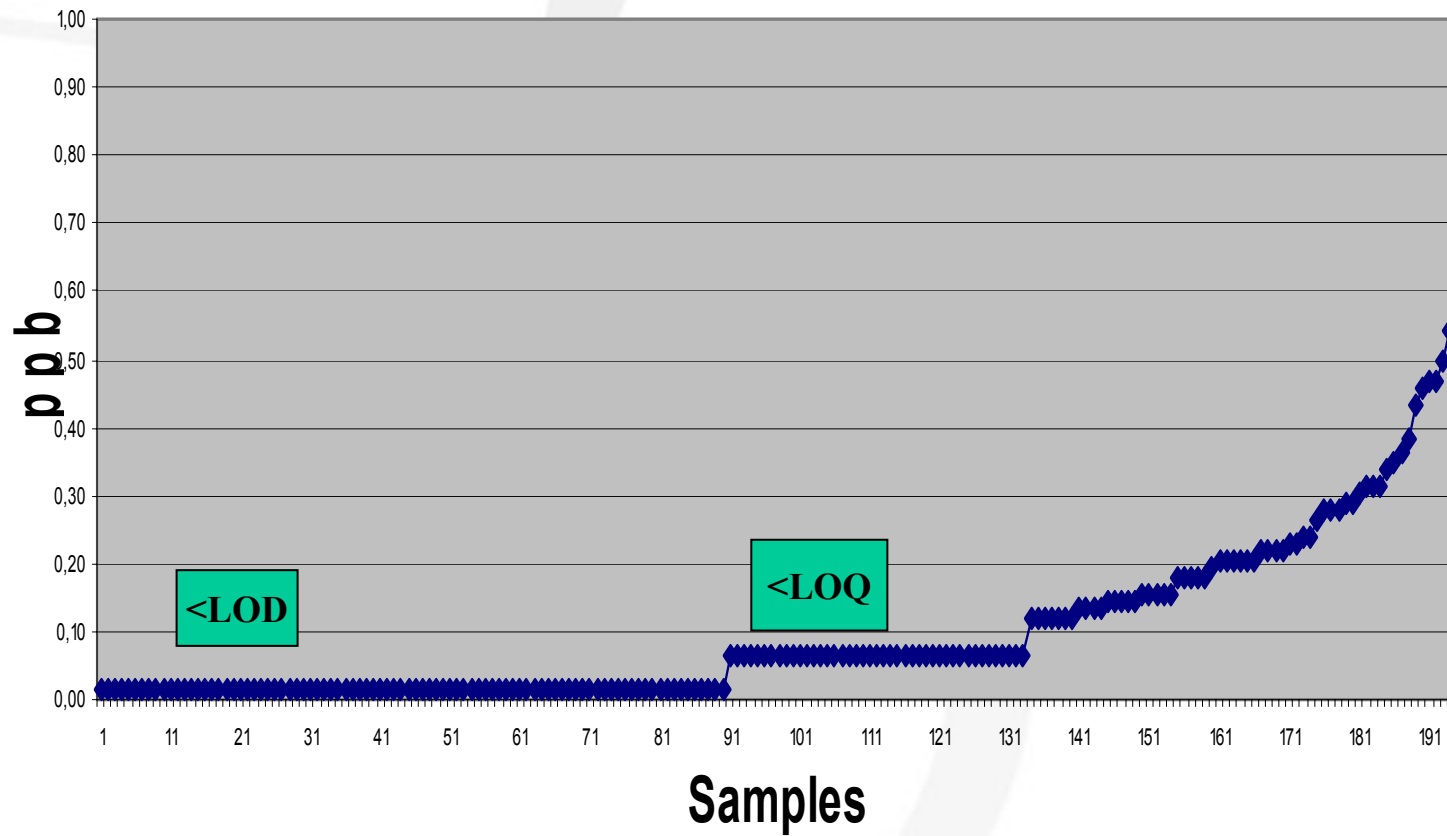


Results: T2 $\mu\text{g/l}$

T2	n	mean	max
white	10	0,085	0,47
dark	11	0,060	0,2
special	28	0,073	0,36
lager	146	0,107	0,73
total	195	0,098	0,73



T2 Distribution

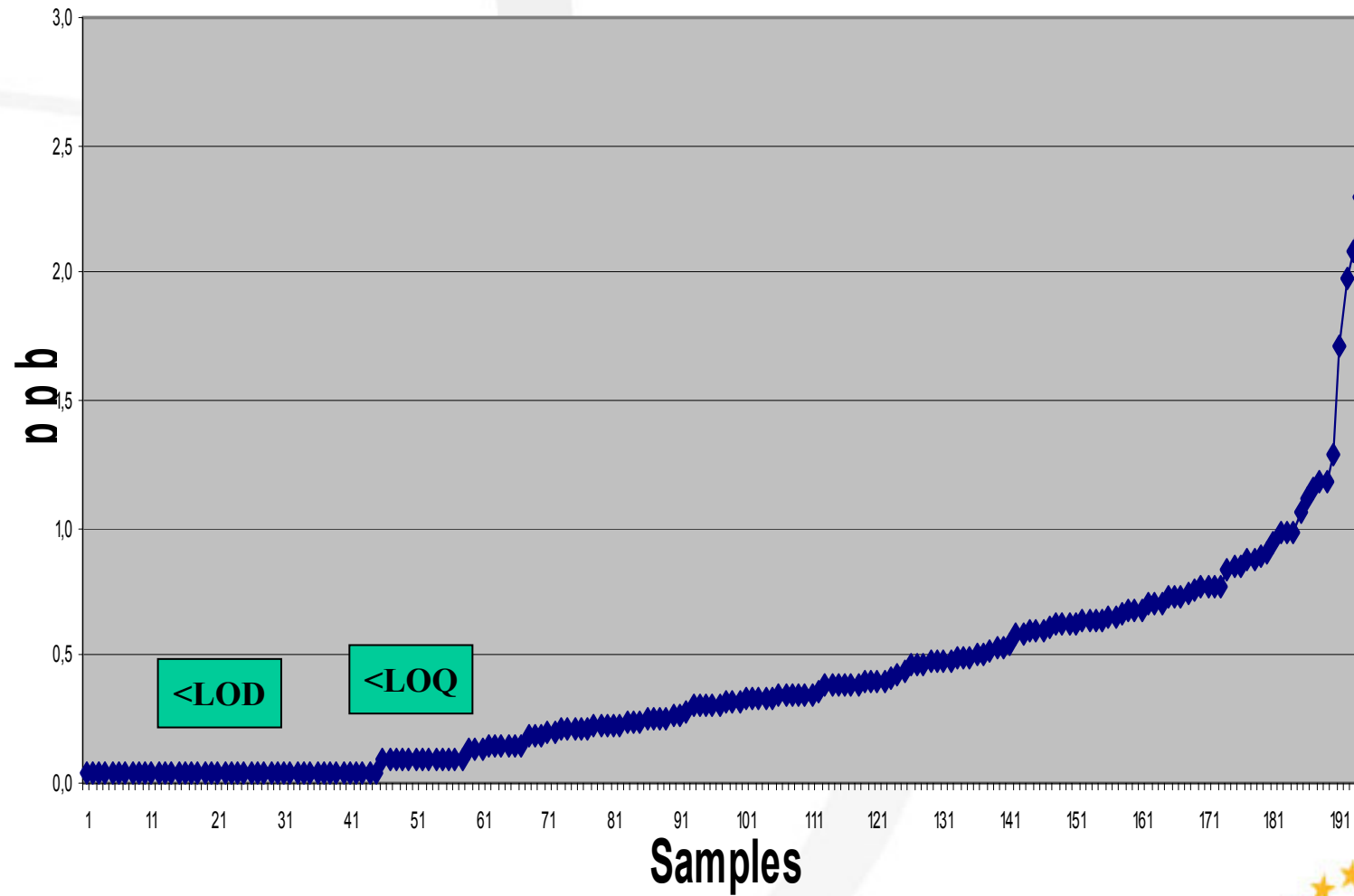


Results: T2 + HT2 $\mu\text{g/l}$

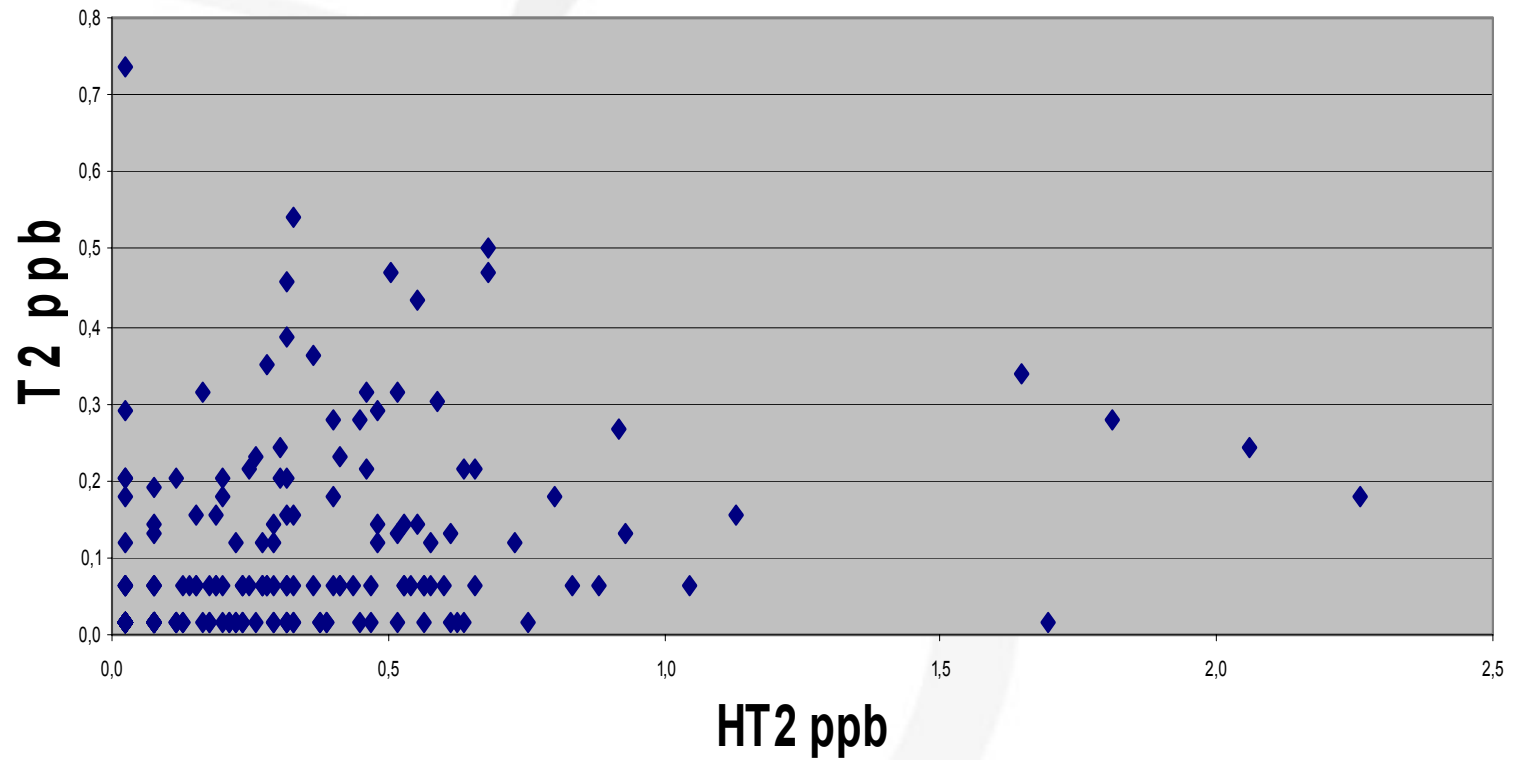
T2+HT2	n	mean	max
white	10	0,33	1,18
dark	11	0,36	0,85
special	28	0,37	2,44
lager	146	0,42	2,3
total	195	0,40	2,44



Distribution of T2 + HT2



No correlation between T2 and HT2

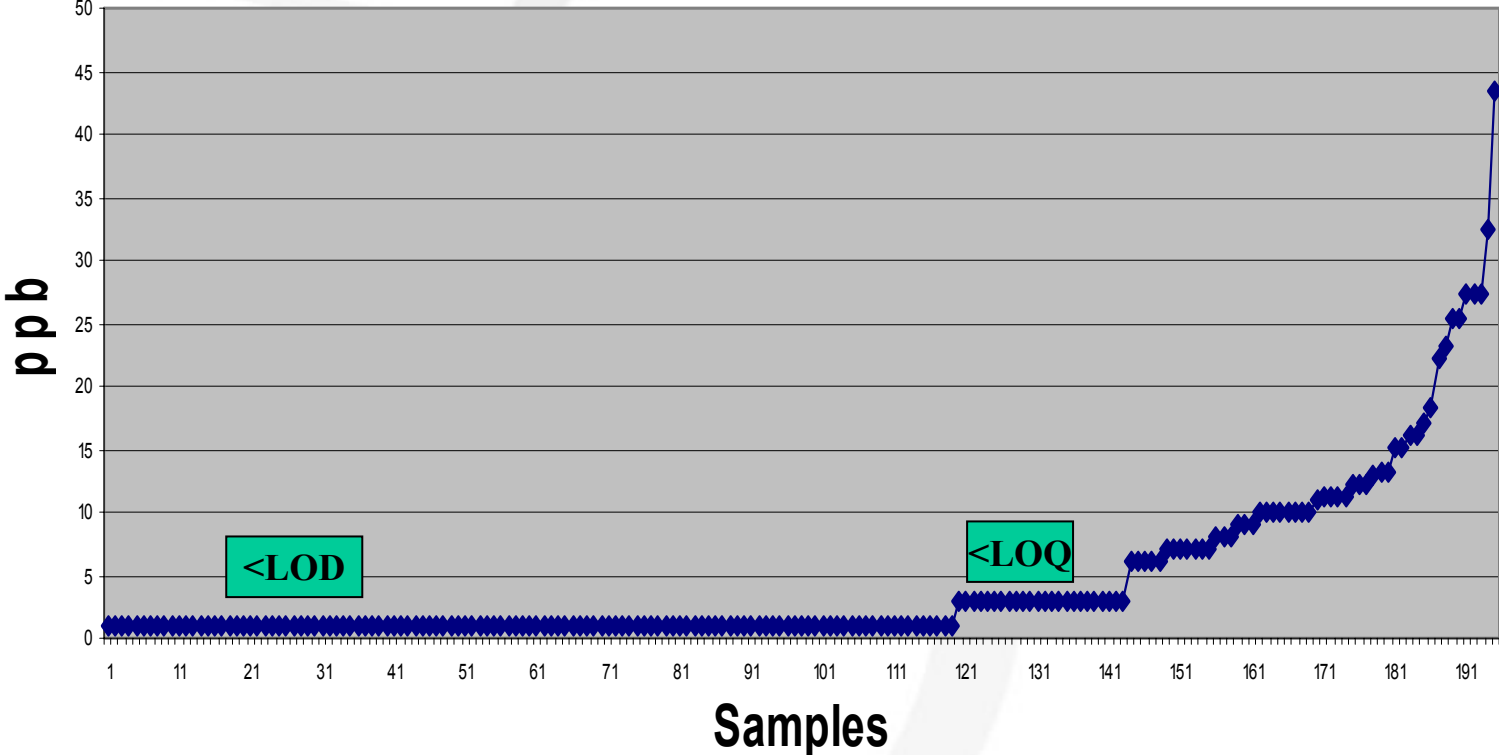


Results: DON $\mu\text{g / l}$

DON	n	mean	max
white	10	5,5	12
dark	11	3,1	13
special	28	2,5	17
lager	146	5.0	43
total	195	4.5	43



Distribution of Deoxynivalenol



Other fusarium toxins

- The mycotoxins: diacetoxyscirpenol monoacetoxyscirpenol, neosolaniol , T2-triol and fusarenon X were not detected in any of the beer samples
- Acetyldeoxynivalenol was detected in only 2% of samples, at levels below the limit of quantification and nivalenol was detected in 13% of samples, also at levels below the limit of quantification.



Geographical distribution

- The sampling does not allow to report any meaningful geographical distribution of detected mycotoxins. Some countries are represented by only 2 samples.
- 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=195	HT2	T2	T2 + HT2	DON
mean	0,31	0,10	0,40	4,5
max	2,26	0,73	2,44	43
perc 50	0,22	0,065	0,31	1
perc 60	0,29	0,065	0,39	1
perc 70	0,38	0,12	0,50	2
perc 80	0,51	0,18	0,65	8
perc 90	0,62	0,27	0,85	12
perc 95	0,84	0,34	1,06	17
perc 97,5	1,13	0,46	1,29	25
perc 99	1,81	0,5	2,09	27



Conclusions from this survey

- With the low limits of detection which have been used, T2, HT2 and DON are detected in the majority of European beers
- The levels of T2 and HT2 are not linked with the particular types of beers
- This survey will be repeated in 2007



Conclusions from the Brewers of Europe Studies

- In Europe, there is a sharp increase of barley contamination by HT2/T2 toxins from 2003 to 2006.
- This increase is due to barley contaminations by *Fusarium Langsethiae*.
- This increase will probably continue in the next years to unknown levels.



Conclusions from the Brewers of Europe Studies

- For these purposes, malting could be considered a cleaning process resulting in a decrease of HT2/T2 levels of 50 to 75%.
- The decrease during malting results from the washing out effect during steeping and from a lower resynthesis during germination and kilning.



Conclusions from the Brewers of Europe Studies

- During beer brewing most (65 to 100%) of the HT2/T2 present in malt will persist into the beer.
- There is little or no significant losses of HT2/T2 in brewing co-products (spent grains, spent hops, spent yeasts)



Conclusions from the Brewers of Europe Studies

- As T2 and HT2 levels in beer are directly related to their 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.



Conclusions from the Brewers of Europe Studies

- **It is, we believe, far too early to impose T2 and HT2 limits on barley, malt or beer.**



- Thank you for your attention

