The Concept of Original Purity

Mineral Water Workshop,

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ORIGINAL PURITY

PURITY

•THE CONDITION OR QUALITY OF BEING PURE

• FREEDOM FROM ANYTHING THAT DEBASES, CONTAMINATES, etc..

Thesaurus

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DEFINITION OF NATURAL MINERAL WATER

- EU Directive 2009_54 EC, Annex I:

Natural mineral water can be clearly distinguished from ordinary drinking water;

(a) by its nature, which is characterised by its mineral content, trace elements or other constituents and, where appropriate, by certain effects

(b) by its original purity

both characteristics having been preserved intact because of the underground origin of such water, which has been protected from all risk of pollution

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DEFINITION

• This definition comes from Directive 80_777 *EEC on the approximation of laws of the Member States relating to the exploitation and marketing of natural mineral waters*, issued the 15 of July 1980.

• Understanding of the Original Purity concept is that mineral waters shall be free of pollution.

• The ground origin of the mineral water shall offer sufficient protection to all risk of pollution, therefore no need to establish limits for pollutants.

HOWEVER.....

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AND ANALYTICAL TECHNIQUES DEVELOPED…

• Since the publication of the Directive 80_777 EEC the analytical tools available to measure pollutants have improved significantly

• Developments in analytical technologies in last decades allow to detect substances in water (naturally present or anthropogenic) at levels as low as nanograms per litre of water while in the 80's the limits of detection were milligrams per litre (1.000.000 times more).

1980 1990 2000 2010

Limits of detection of analytical equipments

mg	µg	ng
0.001g	0.000001 g	0.000000001 g
10^{-3} g	10^{-6} g	10^{-9} g

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AND ANALYTICAL TECHNIQUES DEVELOPED…

• The use of sophisticated analytical equipment permitted to uncover that some organic substances considered as pollutants so far, can be naturally present in ground water at ppb / sub-ppb level:

• Benzene, methane, ethane, present in ground CO_2

• PAHs: Naphthalene, Chrysene, Phenanthrene from oil, coal, tar, burning of organic matter (forest fires)

• Chloroform

• Chlorinated phenols

} interaction between chlorides and organic matter

• Acetic acids from natural oxidation of organic matter

• .....

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PARAMETERS MUST BE SET……

• No criteria were given in the Directives either on how to measure the original purity or which molecules should be used as parameters, because it was taken for granted that the ground origin of the water offered enough protection against contamination.

• Some Member States have started to apply their own criteria to evaluate the original purity , based in existing guidelines or regulations (WHO, EU Drinking Water Directive 98/83 EC, Codex Standard 108)

• These criteria are generally based on the presence of pollutants that are quite common in the environment:

- Pesticides
- Polyciclic aromatic hydrocarbons (PAHs)
- Volatile organic compounds
- Trihalomethanes (THMs)

• but also on Codex parameters (mineral oil, surfactants, Pesticide, PCB)

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PARAMETERS MUST BE SET. HOWEVER…..

- There is not a common reference within the EU

- Some Member States use the drinking water Directive 98/83 EC as reference

- Some countries set quantification limits for the chosen parameters while other apply the detection limit

- Germany set orientation values to be checked at the moment of recognition of a new mineral water source

- Values used differ from country to country

- France has notified new provisions adding up to the existing discrepancies at EU level

↳ risk of barrier to trade

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DISCREPANCIES AT NATIONAL LEVEL….

Original purity for natural mineral waters (situation at national level)

Country	Regulatory measures	Criteria	Regulatory limit	Nature of limit	Requirements applicable to DW, Directive 98/83
Belgium	Royal Decree of 8.2.1999 - Annex I	Pesticide and similar products	Individual substance: 0.0001 mg/l	LOQ	No
			Total pesticide: 0.0005 mg/l		
		PAH: (fluoranthene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[ghi]perylene, benzo[a]pyrene, Indeno[1,2,3-cd]pyrene)	Total PAH: 0.0001 mg/l		
Bulgaria	Compliance with Directive 98/83, BG Regulation №9/2001				Yes
Finland	Compliance with Directive 98/83				Yes
France, NMW	Yes	THMs	Individual substance: 0.0001 mg/l	LOQ	
		Total pesticide and metabolites	0.0001 mg/l		
		Benzene, benzo[a]pyrene, dichloroethane and PAH	30% of limit set to DW		
France, Spring Water	Compliance with Directive 98/83				Yes with exception of pesticide level of 0.1 ug/l
Germany		PAH, fluoranthene excluded	0.02 ug/l	Orientation	No
		VOCs	5 ug/l		
		THMs	5 ug/l		
		Phenols	2 ug/l		
		Plant protection products, Pharmaceutical products	0.05 ug/l		
		Dissolved organic carbon	0.2-2 mg/l		
		Anionic detergents	50 ug/l		
		Hydrocarbons extractible with 1,1,2-trichlorotrifluoroethane	100 ug/l		
Greece	Compliance with Directive 98/83				Yes

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DISCREPANCIES AT NATIONAL LEVEL….

Country	Regulatory measures	Criteria	Regulatory limit	Nature of limit	Requirements applicable to DW, Directive 98/83
Hungary	No			LOQ	Yes
Italy	Decree 29/12/03	Surfactants	50 ug/l	LOQ	No
		Mineral oil	10 ug/l		
		Benzene	0.5 ug/l		
		Benzopyrene	0.003 ug/l		
		Benzofluoranthene	0.006 ug/l		
		Benzoterylene	0.006 ug/l		
		Dibenzoanthracene	0.006 ug/l		
		Indenopyrene	0.006 ug/l		
		Individual pesticide	0.05 ug/l		
		Aldrin, dieldrin, heptachlor, heptachlorepoxide	0.01 ug/l, individual		
		Biphenyls	0.05 ug/l		
		THMs	0.05 ug/l		
		Trichloro, Tetrachloroethylene, dichloroethane	0.1 ug/l		
		Cyanide	0.01 mg/l		
Romania	Decree HG1020/2005	Naturalphenols not reacting with chlorine	0.5 ug/l	LOQ	Yes, besides phenols at 0.5 ug/l
		Surfactants	0.2 mg/l		
		PAH , fluoranthene excepted	0.1 ug/l		
		Tetrachloroethene and trichloroethene	10 ug/l		
		THMs, total	0.1 mg/l		
		Individual pesticide	0.1 ug/l		
		Total pesticide and metabolites	0.5 ug/l		
Spain	Article 1.2.4, Annex I of Royal Decree 1074/2002	Residual Chlorine, Phenolic compounds, Surfactants, Chlorinated Diphenyls, Oils, Fats, Any other product that is an indicator of possible contamination not included in Annex IV, section B of this provision		LOD	No
UK	No			LOD	No

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EUROPEAN FEDERATION OF BOTTLED WATERS' ACTION

• A working group to produce an industry proposal of the *Original Purity* aiming at a harmonized interpretation or guideline that could be used at European level, was set up by the European Federation of Bottled waters. The working group consisted of experts from the industry and analytical laboratories , and it was led by the Chair of the Technical and Regulatory Group of the EFBW, Mrs Annick Moreau.

• The basics of the proposal are:

1) The criteria are applicable to the water at the spring, and not to the finished product.

2) The substances selected are molecules that can be analysed with ISO or EPA validated methods.

3) Other substances that can be detected in the environment were also considered. However, it was deemed that the ones proposed were fit to purpose.

4) Only anthropogenic substances are concerned.

5) The criteria are a warning. Any non-compliance shall trigger an investigation plan to understand the cause and set remediation.

6) All values are to be considered as *orientation* ones.

7) The criteria shall not be related to any safety concern. The values set are at the same level or below the limits in the European drinking water directive.

- The values given in the proposal are quantification limits (LOQ), not detection ones (LOD)

- The choice of LOQ is based on the fact whereby technological advances permit to further improve the sensitivity of the analytical equipments, while for proper identification molecules need to be quantified.

- Benzene requires a special consideration as it may be naturally present in sparkling waters at the spring. Therefore:

    - it is necessary to determine its origin (natural or anthropogenic) via hydrogeological studies

    - in case of natural origin, CO2 must be treated to ensure regulatory compliance

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EFBW's proposed interpretation of "Original Purity" at SPRING				
Parameters	**Proposition** Natural Mineral Water **Orientation** Parametric Quality Values (µg/l)*	Comments	Comparison: 98/83/EC Parametric Values	LOQ Specifications for the analysis of parameters***
PAH's total Benzo-a-pyrene	≤ 0.05 ≤ 0.01 µg/l (for individual substance) ≤ 0.01	The specified compounds are: Benzo (b) fluoranthene Benzo (k) fluoranthene Benzo (ghi) perylene Indeno (1,2,3-cd) pyrene	0.1 µg/l 0.01µg/l	25% of parametric value 25% of parametric value
VOCs: Benzene **(1)**	≤ 0.5	*Fr 0,3 / IT 0,5 /CZ 0,1*	1 µg/l	0.1 µg/l
Tetrachloroethylene	≤1		10 (T+T) µg/l	0.1 µg/l
Trichloroethylene	≤1		10 (T+T) µg/l	0.1 µg/l
1,2 dichloroethane	≤ 0.5		3 µg/l	0.1 µg/l
THM's (individually)	≤ 1.0	The specified compounds are: Chloroform, dibromochloromethane, bromodichloromethane. For bromoform see **	100 µg/l	0.1 µg/l (for individual substance)
Pesticides as individual **** Pesticides Total **** PCB's Total	≤ 0.1 ≤0.25 ≤ 0.1	In the case of Aldrin, dieldrin, heptachlor and heptachlor epoxide the parametric value is < 0.025 µg/l.	0,1 µg/l 0.5 µg/l	25% of parametric value (The performance characteristics apply to each individual pesticide and will depend on the pesticide concerned. The limit of detection may not be achievable for all pesticides.)

* Codex reference: "the following substances shall be below the limit of quantification"
** In case of ozone-enriched air (directive 2003/40/EC), Bromoform ≤ 1 µg/l
*** ISO methods with some exceptions (EPA methods)
**** and their relevant metabolites as defined in DG Sanco Guidance document 25 Feb 2003

(1) As Benzene may naturally occur in hight mineralised natural mineral waters and natural sparkling mineral waters at higher level than 0,5 µg/l, hydrogeological assessments are required case by case to clarify that this natural origin does not impair their original purity .

Nota : For plasctics materials intended to come into contact with foodstuffs, see directive 2002/72/EC

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PARALLEL ON-GOING CODEX WORK

• In parallel, on-going work at Codex level is taking place with the revision of analytical methods for substances listed in paragraph 3.2, especially points 3.2.17 to 3.2.20 of Codex Standard 108 for natural mineral water.

• The progress of this work is being monitored in case it may impact the original purity proposal.

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CONCLUSION

- The concept original purity was introduced in mineral water directive 80_777/EEC, very likely to highlight that mineral waters were free of pollution because of their ground origin.

- The developments in analytical chemistry since the publication of the Directive (1980) have permitted the detection of organic substances in natural mineral water at very low concentrations. These molecules are chiefly of natural origin.

- The absence of criteria at EU level to define the original purity has led Member States to apply individual, unharmonized positions.

- An industry position has been prepared by expert members of the European Federation of Bottled Waters, and will be promoted at EU level. The objective is to have the same criteria to evaluate the original purity throughout the Member States.

- Still on-going Codex work may have an impact and lead to future developments

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THANKS FOR YOUR ATTENTION