

RECHERCHE INTERNET

REGLEMENTATION

DGCCRF - Règlement Bois

http://www.dgccrf.bercy.gouv.fr/securite/produits_alimentaires/materiaux_contact/bois.htm

Le règlement (CE) n°1935/2004 du 27 octobre 2004 précise que les matériaux et objets mis ou destinés à être mis au contact des denrées alimentaires doivent être inertes vis-à-vis des denrées alimentaires.

1. *Domaine d'application*
2. *Restriction d'emploi des matériaux*
3. *Définitions des critères d'aptitude au contact alimentaire*
4. *Limites d'acceptabilité*
5. *Analyses*
6. *Annexe*

SITES DEDIES

FOOD CONTACT MATERIALS (Auteur : R ; Veraart, scientist Keller&Heckman)

<http://www.foodcontactmaterials.com/>

Base de données (EFSA, SCF, FDA)

Moteur de recherche littérature scientifique

Fiche différents matériaux pour contact alimentaire et méthodes

Liste Projets européens sur le sujet (PCRD 3 à 7)

Législations Internationales (Canada, USA, Europe)

Number of hits found for words in title "wood": 6
<i>Author(s):</i> Barsberg, S.; Thygesen, L. G. <i>Title:</i> Spectroscopic properties of oxidation species generated in the lignin of wood fibers by a laccase catalyzed treatment: electronic hole state migration and stabilization in the lignin matrix. <i>Source:</i> Biochimica et Biophysica Acta, General Subjects, <i>Volume:</i> 1472, <i>Issue:</i> 3, <i>Page:</i> 625-642, <i>Year:</i> 1999
<i>Author(s):</i> Chalmers, Rachel M.; Ferguson, Christobel; Caccio, Simone; Gasser, Robin B.; Abs El-Osta, Youssef G.; Heijnen, Leo; Xiao, Lihua; Elwin, Kristin; Hadfield, Stephen; Sinclair, Martha; Stevens, Melita. <i>Title:</i> Vinyl flooring underlay panels with resistance to migration of contaminants for reduced discoloration of the floorings, comprising wood underlay panels coated with an effective amount of borax or ferric chloride. [Erratum to document cited in CA142:299686]. <i>Source:</i> International Journal for Parasitology, <i>Volume:</i> 35, <i>Issue:</i> 14, <i>Page:</i> 1615, <i>Year:</i> 2005
<i>Author(s):</i> Mauguier-Guyonnet, Françoise; Burget, Dominique; Fouassier, Jean-Pierre; Merlin, Andre. <i>Title:</i> Photocurable formulations for wood coating applications. <i>Source:</i> FATIPEC Congress, <i>Volume:</i> 27th, <i>Issue:</i> Vol. 2, <i>Page:</i> 579-592, <i>Year:</i> 2004
<i>Author(s):</i> Mestach, Dirk; Tweene, Derrick. <i>Title:</i> Green wood protection. <i>Source:</i> PPCJ, Polymers Paint Colour Journal, <i>Volume:</i> 194, <i>Issue:</i> 4477, <i>Page:</i> 18, 20, 21, <i>Year:</i> 2004
<i>Author(s):</i> Smith, Leonard A.; Cote, Wilfred A. <i>Title:</i> Resin penetration into wood cell walls. <i>Source:</i> Journal of Paint Technology, <i>Volume:</i> 44, <i>Issue:</i> 564, <i>Page:</i> 71, <i>Year:</i> 1972
<i>Author(s):</i> Anon. <i>Title:</i> Food additives. Glycerol ester of wood rosin. <i>Source:</i> Federal Register, <i>Volume:</i> 32, <i>Issue:</i> , <i>Page:</i> 10508-9, <i>Year:</i> 1967

CONTACT ALIMENTAIRE (LNE, Laboratoire National de Metrologie et d'Essais)
<http://www.contactalimentaire.com/index.php?id=382>
Site Internet de veille et d'assistance sur la sécurité sanitaire des matériaux et emballage au contact des aliments
Réglementation, Normalisation, Certification, Etudes et recherche,
Bibliothèque thématique avec informations sur documents réglementaires, travaux de recherche...

Documents concernant le bois et le contact alimentaire	
<u>Note d'information n° 2006-58</u> du 1er mars 2006 relative aux matériaux au contact des denrées alimentaires – cas du bois	
<u>Avis du Conseil supérieur d'hygiène publique de France</u> relatif à l'emploi de chlorure de didécyle méthyl benzyl ammonium afin de traiter des palettes en bois destinées à contenir des fruits et des légumes Séance du 11 avril 2000	
<u>Avis rendu au titre du Conseil supérieur d'hygiène publique</u> (section de l'alimentation et de la nutrition) relatif à l'emploi du alpha-ter-butyl-alpha-(para-chlorophénéthyl)-1H-1,2,4-triazole-1-éthanol ou tébuconazole dans le traitement du bois destiné à l'emballage des fruits et légumes Séance du 14 septembre 1999	
<u>Avis du Conseil supérieur d'hygiène publique de France</u> relatifs à l'emploi de préparations fongicides destinées à être appliquées sur le bois destiné à l'emballage de denrées alimentaires Séances du 9 juin 1992 et du 8 septembre 1992	
<u>QE E-0941/00</u> Interdiction de l'utilisation de tungstates pour le traitement du bois (1)	
<u>QE E-0942/00</u> Utilisation de tungstates pour le traitement du bois (2)	
<u>QE E-0943/00</u> Utilisation de tungstates pour le traitement du bois (3)	
<u>Décision de la Commission du 12 mars 2001</u> relative à des mesures d'urgence provisoires concernant le matériel d'emballage en bois constitué en totalité ou en partie de bois de conifères non transformé originaire du Canada, de Chine, du Japon et des Etats-Unis d'Amérique (2001/219/CE)	

Travaux de recherche concernant le contact alimentaire (aucun spécifique bois)	
<u>Mise au point de dosage de substances contenues dans les matériaux et susceptibles de migrer dans les aliments</u>	08/2005
<u>Evaluation par spectrométrie de masse (Py-MAB-TOF-MS) de la contamination microbiologique des matériaux et emballages destinés au contact des aliment</u>	
<u>Traditional United Europe food (Improving quality and fostering innovation of European traditional food production systems)</u>	
<u>Innovative non-thermal processing technologies to improve the quality and safety of ready-to-eat (RTE) meals</u>	
<u>Etudes et recherches en cours au LNE</u> <ul style="list-style-type: none"> - Développement d'un outil d'aide à la décision pour la maîtrise du risque de contamination chimique associé à l'utilisation des matériaux plastiques au contact des aliments (ACTIA 2005). - Innovative non-thermal processing technologies to improve the quality and safety of ready-to-eat (RTE) meals - High Q RTE (STREP, PCRD6). - Traditional United Europe food (Improving quality and fostering innovation of European traditional food production systems) - TrueFood (IP, PCRD6). - Evaluation par spectrométrie de masse (Py-MAB-TOF-MS) de la 	

contamination microbiologique des matériaux et emballages destinés au contact des aliments. - Mise au point de dosage de substances contenues dans les matériaux et susceptibles de migrer dans les aliments.	
<u>Développement d'un outil d'aide à la décision pour la maîtrise du risque de contamination chimique associé à l'utilisation des matériaux plastiques au contact des aliments.</u>	
<u>Décision du Conseil du 30 septembre 2002 arrêtant un programme spécifique de recherche, de développement technologique et de démonstration : «Intégrer et renforcer l'Espace européen de la recherche» (2002-2006) (2002/834/CE)</u>	2004

Les PEUPLIERS de FRANCE

<http://www.peupliersdefrance.org/indexindust.htm>

synthèse internet sur la réglementation contact alimentaire des emballages bois (2005)

EMBALLAGE DIGEST

<http://www.emballagedigest.fr/blog.php?2009/01/20/8411-fiches-techniques-pour-evaluation-des-materiaux-demballages-en-contact-alimentaire>

Appel d'offre pour élaboration de fiches techniques matériaux & contact alimentaire

UNIVERS DE L'EMBALLAGE

<http://www.univers-emballage.fr/1-11328-Contact-alimentaire.php>

Résumé sur la réglementation concernant le contact alimentaire

Présentation de divers produits bois emballage (type, utilisation)

FOOD STANDARD AGENCY

<http://www.food.gov.uk/science/research/researchinfo/contaminantsresearch/contactmaterials/a03prog/a03projlist/a03024proj/A03024/25>

A03024/25: Collation and review of information on the use of unusual and non-traditional types of wood used as food contact materials Wednesday 18 June 2003

This research project aims to gather information on the use of unusual and non-traditional types of wood as food contact materials and investigate which chemicals could migrate into food from these.

Study Duration : September 1999 to January 2002

Contractor : Leatherhead Food International (formally Leatherhead Food Research Association) and TRADA Technology Ltd

Background

Wood, such as oak and pine, has traditionally been used as a material intended to come into contact with foodstuffs, for example for their storage, transportation and in culinary and kitchen activities. However, the uses of unusual and non-traditional woods for food contact have become more common, it being suggested that decorative and aesthetic properties of these products have added to their popularity. Currently there appears to be little available compiled information regarding the identities and levels of substances present in unusual and non-traditional types of wood. Neither is there much drawn together on substances that are added to these woods in the form of coatings, surface additives or preservatives, which have the potential to migrate into foodstuffs.

The current project has been carried-out to review and collate information on the chemical properties and present day uses of wood, in particular unusual/non-traditional or exotic woods for food contact applications in the UK. From this knowledge of the extent to which wood is used in contact with food, it was proposed to assess the potential for migration of the chemical constituents, of such wooden items, and substances added to these items as coatings, surface additives or preservatives.

Research Approach

To meet the above needs the project has;

- Reviewed published literature on wood species.
- Conducted a market survey of the uses, and reasons for use, of wood for food contact in the

- industrial/retail sector and domestically.
- Carried out analytical testing on woods, identified in the market survey to be used in the manufacture of food contact materials and articles – and including those identified in the literature as having natural toxic properties, together with relevant commercial coatings and finishing products.

The first part of the study consisted of an intelligence-gathering exercise on the species of wood used in direct contact with food. It addressed, in particular those items derived from non-traditional or exotic type woods. Leatherhead Food Research Association (LFRA) and TRADA, another research organisation, obtained information, from databases and published research papers, articles and other technical information.

A market survey was conducted to identify the use of wood (including unusual woods) for food contact in the industrial/retail sector. Two questionnaires were designed to establish the type of material or article; the species of the wood; any coatings/treatments that may have been applied to the finished products, and the nature of contact with foodstuffs. They were used in surveys that also investigated the factors that may influence decisions to use wooden food contact materials, and to obtain information on the use of unusual wooden food contact material/articles within the home environment. Four focus-group meetings were held at different regional locations in England and Wales. Quantitative data was obtained via a questionnaire, which was completed by the meetings' participants. This questionnaire was also widely distributed to consumer organisations.

Analytical screening of different wood types used in the manufacture of food contact articles was carried out. This included samples of uncoated wood (identified in the literature as having natural toxic properties) available to the woodcraft industry for manufacture into items that may be used in contact with food. It also included samples from retail outlets of coated, finished wooden food contact articles.

Results and findings

Many scientific studies have been undertaken to identify and characterise constituent natural substances of wood. Some species of woods are known to contain 'naturally occurring toxic substances'. Some poisonous effects from direct ingestion of these woods have been reported in animals and humans. However, currently there is very little published information available on levels, and the potential for transfer and migration of chemical substances, including natural toxicants, from finished wood products to contact food.

Wood products are used in domestic situations in direct contact with food for culinary and kitchen activities. They do not appear to be extensively used for commercial food preparation environments.

The use of 'exotic' and non-traditional woods (from areas such as 'cottage' and 'craft' industries and as gifts from overseas) for food contact appears to have increased recently. Physical and aesthetic characteristics influence the choice of wood species used for such articles rather than issues of food safety and quality. In many cases, the end-user is not aware of the species of wood used.

A wide range of timber from different wood species is used to manufacture decorative and functional objects such as kitchen utensils and bowls. Coatings and finishing products, of various formulations, are often applied to the finished wooden articles. Four examples of these products were analytically investigated by solvent dilution. This identified aromatic hydrocarbons (as xylene isomers) in two of these products. The extent to which these coating and finishing substances are used with wooden food contact materials and articles is unknown, however.

As part of this project analytical screening has identified a number of volatile and solvent-extractable compounds from woods typically used in food contact situations within the UK. The literature survey identified natural toxicants present in woods, such as taxine in yew, prunasin in cherry wood, and naphthoquinones in American black walnut. The analytical methods used would be expected to identify such toxicants, but none were detected.

Dissemination information

Final report is available from the FSA Library and Information centre. To obtain a copy, please contact the Enquiry Desk, Dr. Elsie Widdowson Library and Information Services, Food Standards Agency (020 7276 8181/8182 or at library&info@foodstandards.gsi.gov.uk).

See Also

- [A03 Research Programme \(A03\)](#)
- [Food Working Party on Contact Materials](#)

DOCUMENTS TECHNIQUES

FDA (US Food and Drug Administration)

Analysis and Evaluation of Preventive Control Measures for the Control and
education/Elimination of Microbial Hazards on Fresh and Fresh-Cut Produce (2001)
<http://www.fda.gov/Food/ScienceResearch/ResearchAreas/SafePracticesforFoodProcesses/ucm090977.htm>

SYPAL - édition spéciale Contact Alimentaire (2007)

Bois et denrées alimentaires enfin réconciliés...surpris ? *Etude du Danish Technological Institute*. Prospectus rapportant les résultats d'un rapport d'une étude scandinave.

ETUDES PREALABLES SIEL (GROW)

Rapport final et certains rapports intermédiaires du projet ACTIA 99.31 et ACTIA 04.6.

Sciences et techniques de l'ingénieur

Matériaux au contact des aliments - Législation et réglementation (2006) - N651

(Auteur : A ; KOZLOWSKI)

Contact alimentaire Principaux matériaux autorisés (2005)

(Auteur : A ; KOZLOWSKI)

Matériaux au contact des denrées - Législation et réglementation (2005) - F1 306

(Auteur : A ; KOZLOWSKI)

Alimentarité des matériaux - Réglementation (2004)

(Auteur : A ; KOZLOWSKI)

Contraintes, Europe, Amérique

Contact alimentaire : évaluation de conformité. Partie 1&2 - AF 6 930 et AF 6 931

(Auteurs : O ; Vitrac, C. Joly)

Contamination, Migration, méthode de conformité

Papiers et cartons au contact des denrées alimentaires

(Auteurs : B. Garcia Cerrillos, Noel Mangin)

Emballages en bois

(Auteurs : P. Ferro, P. Chanrion)

Normalisation en construction mécanique (1998)

(Auteur : A ; Chevalier)

Palettes, caisses, conteneurs, bacs : bois (2002)

(Auteur : P. Ferro)

Chariots de manutention manuels (2002)

(Auteur : G. Schemm)

Emballage et environnement (1998)

(Auteur : JP Pothet)

BASE DE DONNEES SCIENTIFIQUE:
WOOD AND "FOOD CONTACT"
Sept 2009

Résultats de la recherche bibliographiques concernant le bois et le contact alimentaire sur un ensemble de base de données scientifiques recouvrant la plupart des ressources bibliographiques à l'échelle mondiale. Les articles sont regroupés selon l'origine de la base de données. Les résumés et les liens Internet sont associés lorsque disponibles.

RECHERCHE SCIENCE DIRECT

WOOD AND FOOD CONTACT (title, abstract, keywords)
18 articles par ordre de relevance (avec abstract)
Le 14/08/09

Loretta M. Friedrich, Renee Goodrich-Schneider, Mickey E. Parish, Michelle D. Danyluk, Mitigation of *Alicyclobacillus* spp. spores on food contact surfaces with aqueous chlorine dioxide and hypochlorite, *Food Microbiology*, In Press, Corrected Proof, Available online 3 July 2009, ISSN 0740-0020, DOI: 10.1016/j.fm.2009.06.011.

(<http://www.sciencedirect.com/science/article/B6WFP-4WNRK1H-1/2/c9ac8b47d393277d6f80bc78947bfde3>)

Abstract:

The prevalence of Alicyclobacillus spp. and other spore-forming spoilage organisms in food handling and processing environments presents a sanitation challenge to manufacturers of products such as juices and beverages. The objectives of this study were to determine the efficacy of chlorine dioxide and sodium hypochlorite in killing Alicyclobacillus spores in situ and to evaluate the efficacy of various chlorine dioxide and hypochlorite sanitizing regimes on Alicyclobacillus spp. spores on stainless steel, wood, and rubber conveyor material. Five or two log CFU/ml spore concentrations were left in aqueous solution or inoculated onto stainless steel, rubber, or wood coupons and challenged with sanitizer for varied time intervals. After treatment, the coupons were placed in sterile sample bags, massaged with neutralizing buffer, and enumerated on Ali agar. Surfaces were also examined before and after treatment by scanning electron microscopy to confirm destruction or removal of the spores. For both five and two log CFU/ml spore concentrations, treatments of 50 and 100 ppm of chlorine dioxide and 1000 and 2000 ppm of hypochlorite, respectively, were the most effective. Of the range of chlorine dioxide concentrations and contact time regimes evaluated for all surfaces, the most effective concentration/time regime applied was 100 ppm for 10 min. Reductions ranged from 0 to 4.5 log CFU/coupon. Chlorine dioxide was least effective when applied to wood. Hypochlorite was not efficient at eliminating Alicyclobacillus spores from any of the food contact surfaces at any time and concentration combinations tested. Chlorine dioxide is an alternative treatment to kill spores of Alicyclobacillus spp. in the processing environment.

Keywords: *Alicyclobacillus*; Chlorine dioxide; Hypochlorite; Food contact surface; Sanitizer

Sylvie Lortal, Annalisa Di Blasi, Marie-Noelle Madec, Concetta Pediliggieri, Laura Tuminello, Gaelle Tanguy, Jacques Fauquant, Yohan Lecuona, Patrizia Campo, Stefania Carpino, Giuseppe Licitra, Tina wooden vat biofilm: A safe and highly efficient lactic acid bacteria delivering system in PDO Ragusano cheese making, *International Journal of Food Microbiology*, Volume 132, Issue 1, 1 June 2009, Pages 1-8, ISSN 0168-1605, DOI: 10.1016/j.ijfoodmicro.2009.02.026.

(<http://www.sciencedirect.com/science/article/B6T7K-4VT14C2-2/2/1f35487ad2403133e207fb6160ea84d0>)

Abstract:

In the Sicilian PDO Ragusano cheese making, raw milk is placed in a wooden vat called a Tina. As no starter is added, lactic acid is produced by milk flora and flora released from the Tina biofilm. The aim of this work was to assess the safety and efficiency of this natural inoculation system. From 15 Tinas' biofilms, bacteria total counts varied from 103 to 106 CFU/cm², with the predominance of thermophilic lactic acid bacteria. Low counts of yeasts and moulds were found in a few Tinas. Salmonella, Listeria monocytogenes, Escherichia coli O157:H7 were totally absent, as assessed by conventional plating and the Bax detection system after enrichment, highlighting the safety of the system. From four Tinas out of the 15, micropieces of wood were observed by confocal and scanning electron microscopy. The biofilm entrapped in a matrix covered almost entirely the surface of the wood. Polysaccharides were detected in the four Tinas. In three of the latter, cocci were predominant in the ecosystem whereas in the other one, cocci, bacilli, yeasts and moulds were observed. Fifty litres of microfiltered milk (< 10 CFU/mL) were poured in the four Tinas for 10 min of contact. Enumeration of lactic acid bacteria, yeasts and enterococci were performed in the milk after contact. Depending on the Tina, from 5 to 104 to 106 CFU/mL of Streptococcus thermophilus were released into the

milk, and from 104 to 105 CFU/mL of thermophilic lactobacilli. Spontaneous acidification after contact confirmed the high efficiency of biofilm lactic acid bacteria delivery.

Keywords: Wooden vat; Cheese; Biofilm; Ragusano cheese; Lactic acid bacteria; Food safety

E.L. Bradley, U. Honkalampi-Hamalainen, A. Weber, M.A. Andersson, F. Bertaud, L. Castle, O. Dahlman, P. Hakulinen, D. Hoornstra, J.-C. Lhuguenot, J. Maki-Paakkanen, M. Salkinoja-Salonen, D.R. Speck, I. Severin, A. Stamatii, L. Turco, F. Zucco, A. von Wright, The BIOSAFEPAPER project for in vitro toxicity assessments: Preparation, detailed chemical characterisation and testing of extracts from paper and board samples, Food and Chemical Toxicology, Volume 46, Issue 7, July 2008, Pages 2498-2509, ISSN 0278-6915, DOI: 10.1016/j.fct.2008.04.017.

(<http://www.sciencedirect.com/science/article/B6T6P-4SBHX7X-2/2/405fa2be92c195bdeac61b8ffe36e7a8>)

Abstract:

Nineteen food contact papers and boards and one non-food contact board were extracted following test protocols developed within European Union funded project BIOSAFEPAPER. The extraction media were either hot or cold water, 95% ethanol or Tenax, according to the end use of the sample. The extractable dry matter content of the samples varied from 1200 to 11,800 mg/kg (0.8-35.5 mg/dm²). According to GC-MS the main substances extracted into water were pulp-derived natural products such as fatty acids, resin acids, natural wood sterols and alkanols. Substances extracted into ethanol particularly, were diisopropyl naphthalenes, alkanes and phthalic acid esters. The non-food contact board showed the greatest number and highest concentrations of GC-MS detectable compounds. The extracts were subjected to a battery of in vitro toxicity tests measuring both acute and sublethal cytotoxicity and genotoxic effects. None of the water or Tenax extracts was positive in cytotoxicity or genotoxicity assays. The ethanol extract of the non-food contact board gave a positive response in the genotoxicity assays, and all four ethanol extracts gave positive response(s) in the cytotoxicity assays to some extent. These responses could not be pinpointed to any specific compound, although there appeared a correlation between the total amount of extractables and toxicity.

Keywords: BIOSAFEPAPER; Chemical analysis; Cytotoxicity; Genotoxicity; Global bioassay

E. Barthelemy, D. Lafon, J.M. Fremy, A. Feigenbaum, Les materiaux au contact des aliments : reglementation et evaluation des risques sanitaires pour les consommateurs, Archives des Maladies Professionnelles et de l'Environnement, Volume 68, Issue 3, July 2007, Pages 267-278, ISSN 1775-8785, DOI: 10.1016/S1775-8785(07)88941-7.

(<http://www.sciencedirect.com/science/article/B8JFG-4PYH5R1-9/2/b7681a310b1aa787757d1462f7da0e65>)

Abstract: Resume

L'objet de cet article est de presenter les obligations a observer et les precautions a prendre pour assurer la securite alimentaire des consommateurs en matiere de materiaux au contact des aliments : emballages et conditionnements, recipients et ustensiles de cuisine, machines et materiel utilises dans la production, moyens de stockage ou de transport de denrees ainsi que les tetines et sucettes.

Pour qu'un consommateur soit expose a une substance dangereuse reliee a un materiau ayant ete en contact avec l'aliment a une dose representant un risque pour sa sante, les conditions successives suivantes doivent etre remplies.

- une substance dangereuse doit etre presente (soit initialement soit de facon neoformee) dans un materiau ;
- cette substance doit migrer des materiaux vers les aliments.

- le consommateur doit ingerer une quantite suffisante de ces aliments contamines.

La maitrise du risque sanitaire peut etre realisee en agissant sur ces trois etapes. Pour y aider, il existe des reglementations francaises ou europeennes, dont les principales sont decrites dans cet article. Le principe de base est que les materiaux ne doivent pas ceder aux denrees alimentaires, dans les conditions normales ou previsibles de leur emploi, des constituants dans une quantite susceptible de presenter un danger pour la sante humaine ou animale ou d'entraîner une modification inacceptable de la composition des denrees alimentaires ou une alteration de leurs caracteres organoleptiques.

L'evaluation du risque lie aux materiaux au contact des aliments est rigoureusement encadree principalement pour les matieres plastiques. Cependant d'autres groupes de materiaux tels que les resines echangeuses d'ions, le bois, les papier-cartons ne font pas encore l'objet de mesures reglementaires specifiques et n'ont pas ete evaluees par les autorites sanitaires.

L'evaluation des risques porte majoritairement sur les substances qui interviennent dans la fabrication des materiaux. Pour les demandes d'autorisations d'emploi de nouvelles substances, le fabricant doit soumettre un dossier d'evaluation des risques aupres de l'Autorite competente, en France aupres de la Direction generale de la concurrence, de la consommation et de la repression des fraudes (DGCCRF). L'evaluation scientifique du dossier est realisee dans le cadre d'une expertise collective confiee au comite d'experts Materiaux au contact des denrees alimentaires de l'AFSSA ou de l'AESA selon le niveau de reglementation nationale ou europeenne. Pour sa part, l'AFSSA a mene un certain nombre de ces expertises dont plusieurs ont conduit a l'etablissement de lignes directrices parfois reprises dans des arretes

