# The Replacement Has a Toxicology

**Bisphenol substitution after Europe's 2026 transition: why removing BPA does not complete a food-contact safety case**

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## Abstract

The European Union's main transition for bisphenol A (BPA) in food-contact articles ended on 20 July 2026, while narrowly defined derogations and later deadlines remain. The immediate industrial question is no longer simply whether a can coating, closure or processing component contains BPA. It is whether the replacement chemistry is demonstrably appropriate for its intended food, process and shelf life. Regulation (EU) 2024/3190, as amended in February 2026, distinguishes BPA from other hazardous bisphenols and contains limited exceptions and transition provisions. This article examines substitution risk, non-intentionally added substances, migration, analytical uncertainty and the difficult interface between chemical hazard classification and finished-article performance. It compares European obligations with the distinct approaches of Great Britain, Northern Ireland and the United States. A proposed replacement-qualification protocol integrates supplier identity, targeted and non-targeted analytics, use-specific migration and change control. The protocol is a research and quality-management proposition, not an authorised certification system. The central conclusion is that removal of a regulated starting substance does not establish the safety of its replacement.

***Keywords:*** *bisphenol A; food-contact coatings; substitution; NIAS; migration; endocrine disruption; regulatory divergence; analytical chemistry*

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Meta description: Europe's BPA transition raises a second safety question: how to qualify replacement coatings through chemistry, migration testing and jurisdiction-specific evidence.

Internal tags: BPA; Food Contact Materials; NIAS; Chemical Substitution; Migration; EU Food Law; Packaging Innovation; Emerging Research

## 1 | The regulatory event is a substitution event

Commission Regulation (EU) 2024/3190 entered into force on 20 January 2025 and established restrictions on BPA and certain other hazardous bisphenols and derivatives in specified food-contact material groups. Its main transitional deadline for first placing non-compliant single-use and repeat-use final articles on the Union market was 20 July 2026. Commission Regulation (EU) 2026/250 subsequently clarified important provisions, including the distinction between first placing on the market, filling and sealing, and continued availability of certain repeat-use articles. As of 7 November 2026, it is therefore incorrect either to describe the rule as a merely future prohibition or to suggest that every food-contact article containing BPA must already have disappeared from commerce. [1,2]

This regulatory change is relevant to metal cans, jar closures, coatings, plastics, adhesives, printing inks, silicones, rubber and ion-exchange resins within the scope of the instrument. It is not a universal ban on every conceivable bisphenol molecule: the operative definitions, harmonised hazard classifications, specific derogations and restrictions must be read carefully. A generic “bisphenol-free” procurement instruction may be more restrictive than the law, yet still be analytically underspecified.

## 2 | What the law actually distinguishes

The consolidated regulation prohibits BPA use in the manufacture of covered food-contact materials and placing on the Union market of materials manufactured using BPA, subject to its defined exceptions and transitional provisions. It also addresses other bisphenols and derivatives with specified harmonised classifications for carcinogenicity, mutagenicity, reproductive toxicity or endocrine disruption. This is a hazard-informed legal architecture, not a declaration that all alternative polymer chemistries are safe. [1]

A limited derogation applies, under conditions, to certain large-capacity liquid-epoxy-resin applications and polysulfone filtration membrane assemblies. The derogation does not authorise unrestricted BPA migration. The exact conditions, including non-detectability where stipulated and cleaning or flushing, are application-specific. The legal meaning of “non-detectable” depends on the prescribed analytical framework; it should never be casually equated with absolute molecular absence. [1]

## 3 | The 2026 calendar cannot be reduced to one date

For most non-compliant single-use final articles, first placing on the market was permitted only until 20 July 2026. Certain articles intended to preserve fruit or vegetables (subject to the instrument’s exclusions), fishery products, and articles with BPA-based coating solely on the exterior metal surface have an extended first-placement deadline of 20 January 2028. Lawfully first-placed single-use articles can be filled and sealed for twelve months after the applicable deadline, and the resulting packaged food can be marketed until stocks are exhausted. [1,2]

For repeat-use final articles, separate rules apply. Professional food-production equipment within the relevant exception may first be placed on the market until 20 January 2028; defined periods also govern continued marketing of repeat-use articles previously placed on the market. Operators must document which physical article, date and legal category they rely upon. An inventory spreadsheet without article identity or proof of first placement is not a robust transition file.

## 4 | Why replacement chemistry creates a new evidence problem

BPA-based epoxy coatings were not used solely because they were cheap. They provide a combination of adhesion, corrosion resistance, flexibility and processing compatibility in demanding environments. Replacing them can change polymer backbone chemistry, curing agents, catalysts, cross-link density, coating thickness and interaction with the food matrix. The absence of BPA is a meaningful compositional attribute, but not a complete description of the replacement material.

Alternative technologies may include polyester, acrylic, oleoresinous and other proprietary systems, each with different performance envelopes. No category is intrinsically safe for every food or process. Migration can arise from intentionally used substances, residual monomers, oligomers, reaction products, impurities and degradation products. A manufacturer should demand a chemically informative specification rather than accepting a trade name or “BPA-NI” claim as a toxicological conclusion. [3–5]

## 5 | A familiar substitution trap: regrettable replacement

Substitution can fail when the replacement shares relevant hazard characteristics with the substance removed, or introduces different hazards that were not evaluated in the original decision. Bisphenol S and bisphenol F are often discussed in this context, but their regulatory status and toxicological evidence must be assessed individually; neither should be described as automatically prohibited everywhere or automatically interchangeable with BPA. The applicable EU restriction for other bisphenols turns on the regulation’s defined scope and qualifying harmonised classifications. [1]

A second substitution trap is functional. A coating that passes a narrow laboratory migration test might corrode in a salty or acidic product after retorting, allowing metal dissolution, flavour deterioration or loss of container integrity. Chemical migration, package integrity and microbiological preservation are complementary endpoints. Passing one does not establish the others.

## 6 | NIAS: the unknowns are part of the specification

Non-intentionally added substances (NIAS) may include impurities, reaction intermediates, oligomers and breakdown products. Regulation (EU) No 10/2011 establishes a framework for plastic food-contact materials, including risk assessment of relevant NIAS. Regulation (EC) No 1935/2004 imposes the general safety obligation across covered food-contact materials, and Regulation (EC) No 2023/2006 establishes good manufacturing practice requirements. Not every coating has the same specific EU harmonised measure as plastic; national rules and evidence obligations may remain relevant. [3–5]

A sensible analytical plan combines targeted assays for known residuals with suspect and non-target high-resolution mass spectrometry where justified. Screening peaks are not automatically toxicological hazards, and a lack of identified peaks does not prove zero exposure. Identification confidence, extraction artefacts, detection limits, simulant selection and uncertainty must be documented. Toxicological prioritisation should use estimated exposure, structural alerts and available substance-specific evidence, with appropriate expert review.

## 7 | The food matrix changes the question

Acidic juices, protein-containing beverages, oil-rich sauces, saline foods and thermally processed products challenge packaging differently. Acidity may influence corrosion and metal dissolution; fat can affect partitioning of organic migrants; heat and time alter diffusion and polymer ageing. A qualification test must reflect foreseeable contact duration, temperature, food composition and surface-area-to-volume ratio. Migration data for ambient water cannot automatically justify a hot-filled acidic beverage or a retorted sauce. [3,4]

For a hypothetical pH 3.8 beverage stored for twelve months, relevant endpoints could include specific migration of known substances, NIAS screening, oxygen transmission, colour and flavour stability, coating adhesion, corrosion and closure compatibility. A test showing no detectable BPA is necessary for a claim about BPA absence only to the extent supported by its method and sampling plan; it says little about these other endpoints.

## 8 | Analytical design: absence claims require detection limits

A laboratory statement of “not detected” is meaningful only with an analyte definition, sampling plan, validated method, limit of detection or quantification, matrix and uncertainty. Testing the finished article differs from testing the coating resin; testing an extract differs from measuring migration into a food or appropriate simulant. Methods should be designed to answer the legal and toxicological question actually posed, not to produce the smallest possible number in an unrelated medium.

Change control is equally important. A supplier reformulation that modifies curing chemistry, pigment, primer or coating weight can invalidate earlier migration assumptions. The food manufacturer needs notice of material changes and a documented requalification trigger. Certificates of analysis, declarations of compliance and supporting test reports should have traceable versions and manufacturing-site applicability.

## 9 | European Union and Spain: direct rules, distributed responsibility

The Commission establishes the applicable harmonised framework; national competent authorities enforce it. In Spain, food-contact compliance is supervised within the competent official-control system, with AESAN playing a national coordination and information role. Regulation (EC) No 1935/2004 requires safe use under normal or foreseeable conditions and establishes traceability principles. Packaging suppliers, converters, food packers, importers and brand owners have distinct contractual roles but cannot outsource their own applicable legal obligations merely by obtaining a generic supplier certificate. [1,3]

The practical file should identify the article and intended food, coating chemistry at an appropriate confidential level, legal basis, applicable transition provision if any, declaration of compliance where required, supporting migration and NIAS work, GMP evidence, change-control agreement and market-specific labelling or claims review. This is a proposed dossier architecture, not a newly prescribed EU form with that title.

## 10 | Great Britain, Northern Ireland and the United States

Great Britain must be assessed under its applicable domestic food-contact legislation and subsequent amendments. A new EU restriction does not automatically become British law simply because it was adopted after EU exit. Northern Ireland has distinct EU-linked arrangements under the Windsor Framework; operators should verify the currently applicable territorial instruments and market-placement rules. Consequently, a statement that packaging is “UK compliant” without territorial and legal qualification is too imprecise for cross-border procurement.

In the United States, the FDA assesses food-contact substances through applicable statutory and regulatory routes, including food-contact notifications and existing authorisations where appropriate. The European BPA restriction is not itself an FDA approval or prohibition. US status depends on the specific substance, manufacturer or notifier where relevant, intended use, conditions of contact and applicable limitations. A single global certificate cannot substitute for this jurisdictional analysis. [6]

## 11 | The industrial decision is multi-objective

An alternative coating should be evaluated against four linked dimensions: legal eligibility, chemical safety, functional performance and supply-chain resilience. A nominally compliant replacement that reduces shelf life, requires more severe sterilisation or increases food waste may fail commercially and environmentally. Conversely, retaining a technically successful but legally non-compliant coating is not an acceptable quality trade-off. The correct engineering objective is robust compliance and performance across actual product conditions.

For ingredient and beverage developers, packaging qualification should be integrated with formulation development rather than deferred to procurement. Changes in pH, preservatives, flavour solvents, fat content, protein dispersion or heat treatment can alter packaging interactions. A food-safety challenge test for microbial control does not replace migration testing, and migration testing does not replace microbiological process validation.

## 12 | Research & Innovation Opportunity

### Unresolved problem and existing knowledge

Migration testing, chemical substitution assessment, GMP and supplier change control are established disciplines. The research gap is not the invention of a new “BPA-free” test. It is whether an integrated, food-matrix-specific substitution dossier can detect failures earlier and more reliably than conventional procurement checks that examine chemical compliance and packaging performance in separate departments. Existing literature and patents on BPA-free coatings mean that neither alternative resin families nor generic risk matrices can credibly be presented as new inventions.

### Hypothesis and not established fact

A Replacement-Chemistry Qualification Matrix connecting formulation identity, intentionally used substances, NIAS profiles, migration, corrosion, oxygen barrier, processing severity, supplier changes and jurisdictional status could reduce late-stage qualification failures. This is a testable quality-systems hypothesis, not an authorised method or evidence that any particular alternative coating is safer.

### Validation pathway

Select at least three commercially relevant coating systems and three contrasting foods: acidic aqueous beverage, fat-containing sauce and high-salt thermally processed product. Characterise coating composition under appropriate confidentiality agreements. Conduct legally relevant migration testing, targeted and non-target screening, corrosion and adhesion testing, accelerated screening complemented by real-time storage, and sensory assessment. Pre-register acceptance criteria and uncertainty rules. Compare conventional supplier qualification against the integrated matrix using blinded reviewers and independent laboratories. Record false acceptance, false rejection, review time, late-stage reformulation, batch variability and costs of failure.

### Legal, ethical and industrial constraints

The matrix cannot replace applicable declarations of compliance, statutory authorisations, competent-authority controls or toxicological assessment. Proprietary chemistry must be protected through controlled access, but confidential formulations cannot justify unreviewable safety assertions. If independently validated, the approach could assist can manufacturers, closure suppliers, beverage producers, private-label retailers and food-testing laboratories. Until then, its benefits remain hypothetical.

## 13 | Evidence hierarchy and critical conclusions

Established legal evidence: the EU BPA restriction is in force, its principal first-placement transition ended in July 2026, and exceptions and later deadlines remain. The February 2026 amendment matters to the exact calendar. Established scientific evidence: food-contact safety depends on chemical identity, migration and foreseeable conditions of use; replacement materials may introduce different migrants or performance constraints. [1–5]

Expert interpretation: “BPA-free” should be treated as a narrowly defined compositional claim, not a general safety certificate. Emerging research proposition: integrated substitution qualification may improve industrial decision quality, but comparative validation is required. No conclusion is drawn here that any named BPA alternative is categorically safe or unsafe across all food applications.

The policy achievement of removing a substance of concern will be durable only if the replacement is subjected to equally rigorous scrutiny. The most valuable innovation is not the speed with which an old label disappears, but the transparency with which the new material is characterised, tested and kept under control throughout its commercial life.

## Related Knowledge Areas

Food Safety; Regulatory Affairs; Processing Technologies; Functional Ingredients; Sustainability; Emerging Research.

## References and official sources

[1] European Commission. Commission Regulation (EU) 2024/3190, consolidated text (23 February 2026). https://eur-lex.europa.eu/eli/reg/2024/3190

[2] European Commission. Commission Regulation (EU) 2026/250 amending Regulation (EU) 2024/3190. https://eur-lex.europa.eu/eli/reg/2026/250/oj

[3] European Parliament and Council. Regulation (EC) No 1935/2004 on materials and articles intended to come into contact with food. https://eur-lex.europa.eu/eli/reg/2004/1935/oj

[4] European Commission. Regulation (EU) No 10/2011 on plastic food-contact materials and articles. https://eur-lex.europa.eu/eli/reg/2011/10/oj

[5] European Commission. Regulation (EC) No 2023/2006 on good manufacturing practice for food-contact materials. https://eur-lex.europa.eu/eli/reg/2006/2023/oj

[6] US Food and Drug Administration. Food Ingredients and Packaging: Food Contact Substances. https://www.fda.gov/food/food-ingredients-packaging/food-contact-substances-fcs

[7] European Food Safety Authority. Bisphenol A: re-evaluation of health risks in food. EFSA Journal. 2023;21(4):6857. DOI: 10.2903/j.efsa.2023.6857. https://doi.org/10.2903/j.efsa.2023.6857

[8] Food Packaging Forum. EU BPA ban reaches main transition deadline. 20 July 2026. https://foodpackagingforum.org/news/eu-bpa-ban-reaches-main-transition-deadline

[9] European Commission. Commission adopts ban of Bisphenol A in food contact materials. December 2024. https://food.ec.europa.eu/safety/chemical-safety/food-contact-materials_en

[10] European Chemicals Agency. Classification and Labelling Inventory and harmonised classifications. https://echa.europa.eu/information-on-chemicals/cl-inventory-database

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