

Package ‘ERBioR’

September 9, 2026

Type Package

Title Reproducible Occupational Biological Risk Assessment with the ERBio Method

Version 0.9.0

Description A source-traceable computational implementation of the ERBio method for occupational biological risk assessment. It provides deterministic risk calculation, versioned questionnaires, a scientifically audited regulatory biological-agent registry, workplace-level assessment, preventive planning outputs, bilingual Spanish-English functionality and reproducible reports. The software preserves a single language-neutral calculation core and keeps method-faithful components distinct from explicit computational extensions. The underlying ERBio method was developed by Aguilar-Elena and is described in Aguilar-Elena (2015) <[doi:10.5281/zenodo.22107465](https://doi.org/10.5281/zenodo.22107465)>.

License GPL (>= 3)

Encoding UTF-8

Depends R (>= 4.1.0)

Imports utils

Suggests testthat (>= 3.0.0), shiny, DT, readxl, openxlsx

Config/testthat/edition 3

NeedsCompilation no

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Repository CRAN

Date/Publication 2026-09-09 14:50:26 UTC

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ERBioR-package	<i>ERBioR: Reproducible Occupational Biological Risk Assessment</i>
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Description

A source-traceable computational implementation of the ERBio method for occupational biological-risk assessment.

Details

ERBioR separates four layers: the original ERBio deterministic method, versioned questionnaire instruments, regulatory biological-agent data, and technical enrichment. Explicit computational extensions are labelled as such and are not silently treated as source rules.

The underlying ERBio method is described by Aguilar-Elena (2015), [doi:10.5281/zenodo.22107465](https://doi.org/10.5281/zenodo.22107465).

References

Aguilar-Elena, R. (2015). *Riesgos biológicos laborales: ERBio, un nuevo método de evaluación teórica*. Doctoral thesis, Universidad Pública de Navarra. [doi:10.5281/zenodo.22107465](https://doi.org/10.5281/zenodo.22107465).

Orden TES/1287/2021, de 22 de noviembre, BOE-A-2021-19371, por la que se sustituye el anexo II del Real Decreto 664/1997.

Directive 2000/54/EC of the European Parliament and of the Council, as updated for Annex III by Commission Directive (EU) 2019/1833 and Commission Directive (EU) 2020/739 for SARS-CoV-2.

See Also

[erbio_assess](#), [erbio_assess_questionnaire](#), [erbio_reference_level_from_agent](#), [erbio_assess_workplace](#)

Description

Utilities supporting the Spanish-English presentation layer introduced in ERBioR 0.9, including language selection, approved scientific translations, preventive-action text, questionnaire internationalisation and the bundled Shiny application. Scientific calculations remain language-neutral.

Usage

```
erbio_set_language(language = c("es", "en"))

erbio_get_language()

erbio_load_translation_registry(path = NULL)

erbio_validate_translation_registry(path = NULL)

erbio_load_preventive_action_registry(path = NULL)

erbio_validate_preventive_action_registry(path = NULL)

erbio_load_ui_dictionary(path = NULL)

erbio_translate_ui(key, language = erbio_get_language(), path = NULL)

erbio_get_questionnaire_i18n(
  questionnaire_id,
  language = erbio_get_language(),
  version = NULL,
  path = NULL
)

erbio_bilingual_invariance_check(
  questionnaire_id,
  responses,
  version = NULL,
  scoring = "default",
  path = NULL
)

erbio_preventive_action(
  item_id,
  language = erbio_get_language(),
  path = NULL
)
```

```
erbio_run_app(launch.browser = TRUE, ...)
```

```
erbio_shiny_build_id()
```

Arguments

language	Presentation language. Supported values are "es" for Spanish and "en" for English.
path	Optional directory or file override. If omitted, installed ERBioR package data are used.
key	Stable key identifying an entry in the ERBioR user-interface dictionary.
questionnaire_id	Stable ERBio questionnaire identifier.
version	Optional questionnaire source-version identifier.
responses	Questionnaire response vector used to compare scientific results across presentation languages.
scoring	Questionnaire scoring semantics. The default preserves the scoring defined for the corresponding ERBioR instrument.
item_id	Stable ERBioR questionnaire item identifier.
launch.browser	Logical value passed to the Shiny application launcher indicating whether a browser should be opened.
...	Additional arguments passed to the Shiny application launcher.

Details

The bilingual layer changes presentation text only. Questionnaire identifiers, item identifiers, scoring rules, probability and risk calculations remain language-neutral.

The translation and preventive-action registries are versioned package data. Their validation functions report structural and approval-state checks without changing the underlying ERBio scientific logic.

`erbio_bilingual_invariance_check()` is intended to verify that equivalent Spanish and English presentations yield the same scientific result.

`erbio_run_app()` launches the Shiny application bundled with ERBioR.

Value

`erbio_set_language()` sets the active presentation language.

`erbio_get_language()` returns the active language.

Registry loading functions return data frames. Registry validation functions return structured validation results.

`erbio_translate_ui()` returns translated interface text.

`erbio_get_questionnaire_i18n()` returns a questionnaire with the selected presentation language.

erbio_bilingual_invariance_check() returns the result of the cross-language scientific invariance check.

erbio_preventive_action() returns the approved preventive-action information associated with an ERBioR item.

erbio_run_app() launches the bundled Shiny application.

erbio_shiny_build_id() returns the identifier of the bundled Shiny build.

References

Aguilar-Elena, R. (2015). *Riesgos biológicos laborales: ERBio, un nuevo método de evaluación teórica*. doi:10.5281/zenodo.22107465.

Examples

```
old_lang <- erbio_get_language()
erbio_set_language("en")
erbio_get_language()
erbio_set_language(old_lang)

dict <- erbio_load_ui_dictionary()
head(dict)

tr <- erbio_load_translation_registry()
head(tr)
```

erbio_agent_lookup	<i>Biological-Agent Registry and ERBio Reference Levels</i>
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Description

Query the regulatory biological-agent registry, inspect source rules and derive ERBio reference levels without silently treating unlisted agents as group 1.

Usage

```
erbio_load_agent_registry(path = NULL)
erbio_load_basebio_index(path = NULL)
erbio_agent_rules(rule_id = NULL, path = NULL)
erbio_validate_agent_registry(path = NULL)
erbio_agent_lookup(query, type = NULL, exact = TRUE, path = NULL)
erbio_reference_level_from_agent(agent, path = NULL, allow_partial = FALSE)
erbio_unclassified_human_virus(agent_name)
erbio_reference_level_from_agents(agents,
  policy = c("report_all", "explicit_max_group"), path = NULL)
erbio_assess_agent_questionnaire(agent, questionnaire_id, responses, exposure,
  version = NULL, scoring = NULL, path = NULL,
  compliance_boundary_policy = c("prose_2015", "table45_intervals", "strict"),
  full_compliance_rule = c("flag_only", "thesis_override"))
```

Arguments

<code>path</code>	Optional data-directory override.
<code>rule_id</code>	Optional machine-readable source-rule identifier.
<code>query</code>	Agent name, alias or stable identifier to search.
<code>type</code>	Optional agent type filter.
<code>exact</code>	Whether the lookup must be exact.
<code>agent</code>	Single biological-agent name or identifier.
<code>allow_partial</code>	Allow non-exact matching when resolving one agent.
<code>agent_name</code>	Name of an unclassified human virus.
<code>agents</code>	Character vector of biological agents.
<code>policy</code>	Multi-agent policy. "report_all" preserves discordant groups; "explicit_max_group" is an explicit conservative extension.
<code>questionnaire_id</code>	Questionnaire identifier used for the integrated assessment.
<code>responses</code>	Questionnaire responses.
<code>exposure</code>	ERBio exposure category.
<code>version</code>	Optional questionnaire version.
<code>scoring</code>	Optional scoring override.
<code>compliance_boundary_policy</code>	Compliance-boundary policy.
<code>full_compliance_rule</code>	Complete-compliance policy.

Details

The legal group is taken from the Spanish regulatory layer. In the v0.7 audited data layer, the primary row source is Order TES/1287/2021 (BOE-A-2021-19371), which replaced Annex II of Real Decreto 664/1997. The consolidated real decree is retained as a secondary convenience reference. BASEBiO is retained as a technical enrichment layer and does not override the legal group. Agents not present in the classified list are not implicitly assigned to group 1. Independent row-by-row EUR-Lex concordance is not claimed until the dedicated EU audit is completed.

Value

Registry functions return data frames or QA lists. Reference-level functions return structured agent-reference objects or multi-agent result lists. `erbio_assess_agent_questionnaire()` returns an integrated agent and questionnaire assessment.

References

Orden TES/1287/2021, de 22 de noviembre, BOE-A-2021-19371, Annex II replacement.
 Real Decreto 664/1997, de 12 de mayo, consolidated reference.
 Commission Directive (EU) 2019/1833, Annex III update, and Commission Directive (EU) 2020/739 for SARS-CoV-2.
 INSST BASEBiO biological-agent database.

Examples

```
erbio_agent_lookup("Bacillus anthracis")
erbio_reference_level_from_agent("Mycobacterium tuberculosis")
erbio_reference_level_from_agents(
  c("Bacillus anthracis", "Coxiella burnetii")
)
```

erbio_assess

Core ERBio Calculation Functions

Description

Functions implementing the deterministic ERBio calculation layer: exposure, control compliance, probability, risk score (GRB), risk class and source-aware assessment aggregation.

Usage

```
erbio_probability_matrix()
erbio_risk_matrix()
erbio_risk_actions()
erbio_exposure_from_cadence(cadence)
erbio_exposure_level(exposure = NULL, time_percent = NULL,
  boundary_policy = c("strict", "upper_category", "lower_category"))
erbio_compliance_binary(responses)
erbio_compliance_audit_0_4(scores)
erbio_compliance_class(percent,
  boundary_policy = c("prose_2015", "table45_intervals", "strict"))
erbio_probability(compliance_class, exposure)
erbio_risk_score(probability, reference_level)
erbio_risk_class(score)
erbio_action(risk_class)
erbio_failed_controls(responses, item_text = NULL,
  scoring = c("binary", "audit_0_4"))
erbio_assess(reference_level, exposure, compliance_percent = NULL,
  responses = NULL, scoring = c("binary", "audit_0_4"), item_text = NULL,
  compliance_boundary_policy = c("prose_2015", "table45_intervals", "strict"),
  full_compliance_rule = c("flag_only", "thesis_override"))
erbio_assess_set(assessments,
  aggregation_rule = c("unresolved", "max_risk_extension"))
```

Arguments

cadence	Exposure cadence expressed using an ERBio cadence label.
exposure	Exposure category.
time_percent	Optional percentage of working time used to derive an exposure category.
boundary_policy	Explicit policy for source-boundary ambiguities.

responses	Questionnaire/control responses. Binary scoring accepts affirmative, negative and not-applicable responses.
scores	Audit scores on the source-preserved 0–4 scale.
percent	Compliance percentage.
compliance_class	ERBio compliance class.
probability	Probability level from 1 to 4.
reference_level	ERBio reference level from 1 to 4.
score	GRB risk score.
risk_class	ERBio risk class.
item_text	Optional item labels associated with responses.
scoring	Scoring semantics.
compliance_percent	Optional precomputed compliance percentage.
compliance_boundary_policy	Policy used to classify compliance at ambiguous boundaries.
full_compliance_rule	How the source statement concerning complete compliance is handled. The default flags rather than silently overrides the matrix.
assessments	A list of ERBio assessment objects.
aggregation_rule	Aggregation policy. The default preserves unresolved discordance; "max_risk_extension" is an explicit computational extension rather than a source rule.

Details

ERBioR preserves documented ambiguities rather than silently resolving them. In particular, the default aggregation policy does not invent a global risk class when questionnaire-level classes disagree.

Value

Matrix/reference functions return data frames or lookup values. Scoring functions return numeric or structured results. `erbio_assess()` returns an `erbio_assessment` object. `erbio_assess_set()` returns a structured list that preserves source-defined and unresolved aggregation status.

References

Aguilar-Elena, R. (2015). *Riesgos biológicos laborales: ERBio, un nuevo método de evaluación teórica*. doi:[10.5281/zenodo.22107465](https://doi.org/10.5281/zenodo.22107465).

Examples

```

erbio_probability("Aceptable", "Frecuente")
erbio_risk_score(probability = 2, reference_level = 3)
erbio_risk_class(6)

a <- erbio_assess(
  reference_level = 3,
  exposure = "Muy frecuente",
  compliance_percent = 82.5
)
a

```

erbio_assess_workplace

Integral Workplace-Level ERBio Assessment

Description

Validate the required questionnaire set, evaluate one or more biological agents, preserve questionnaire and agent-level results, and build preventive planning candidates.

Usage

```

erbio_sector_questionnaires(path = NULL)
erbio_validate_workplace_questionnaires(questionnaire_responses, path = NULL,
  require_core = TRUE, require_sector = TRUE)
erbio_build_preventive_plan(questionnaire_scores, risk_results,
  priority_policy = c("context_only", "max_observed_extension"))
erbio_workplace_rules(rule_id = NULL, path = NULL)
erbio_assess_workplace(activity, agents, questionnaire_responses, exposure,
  versions = NULL, scoring = NULL, path = NULL, require_core = TRUE,
  require_sector = TRUE,
  questionnaire_aggregation_rule = c("unresolved", "max_risk_extension"),
  workplace_aggregation_rule = c("unresolved", "max_risk_extension"),
  preventive_priority_policy = c("context_only", "max_observed_extension"),
  compliance_boundary_policy = c("prose_2015", "table45_intervals", "strict"),
  full_compliance_rule = c("flag_only", "thesis_override"))

```

Arguments

path	Optional data-directory override.
questionnaire_responses	Named list of questionnaire response vectors.
require_core	Require audit, general and workers questionnaires.
require_sector	Require at least one sector-specific questionnaire.
questionnaire_scores	Questionnaire score objects used to derive failed controls.

risk_results	Risk-result data used as planning context.
priority_policy	Preventive-priority policy. The max-observed option is an explicit extension.
rule_id	Optional workplace source-rule identifier.
activity	Activity or workplace description.
agents	One or more biological agents.
exposure	One exposure category or a named vector aligned to agents.
versions	Optional named questionnaire-version overrides.
scoring	Optional named scoring overrides.
questionnaire_aggregation_rule	Questionnaire-level aggregation policy.
workplace_aggregation_rule	Workplace-level aggregation policy.
preventive_priority_policy	Policy used to contextualize planning candidates.
compliance_boundary_policy	Compliance-boundary policy.
full_compliance_rule	Complete-compliance policy.

Details

The default workplace policy preserves discordant questionnaire classes and multi-agent results rather than manufacturing a single global class. The highest observed risk class is reported separately as a descriptive field. Responsible person, target date and resources in the preventive plan are not inferred automatically.

Value

`erbio_assess_workplace()` returns an `erbio_workplace_assessment` containing agent summaries, questionnaire summaries, risk results, unresolved items, warnings, provenance and a duplicated preventive plan.

References

Aguilar-Elena, R. (2015). *Riesgos biológicos laborales: ERBio, un nuevo método de evaluación teórica*. doi:[10.5281/zenodo.22107465](https://doi.org/10.5281/zenodo.22107465).

Examples

```
responses <- list(
  audit = rep("Si", 32),
  general = rep("Si", 48),
  workers = rep("Si", 34),
  sec_wastewater = rep("Si", 12)
)
```

```
x <- erbio_assess_workplace(
  activity = "Tratamiento de aguas residuales",
  agents = "Mycobacterium tuberculosis",
  questionnaire_responses = responses,
  exposure = "Frecuente"
)
x
```

erbio_render_workplace_report

Render and Export Reproducible ERBio Workplace Reports

Description

Render a workplace assessment to Markdown or export the full reproducibility bundle to files.

Usage

```
erbio_render_workplace_report(x, max_plan_rows = 100L)
erbio_write_workplace_report(x, file = "ERBioR_workplace_report.md",
  max_plan_rows = 100L)
erbio_export_workplace_bundle(x, dir, overwrite = FALSE,
  max_plan_rows = 100L)
```

Arguments

x	An erbio_workplace_assessment object.
max_plan_rows	Maximum number of preventive-plan rows printed in the Markdown report. Exported CSV data retain all rows.
file	Output Markdown file.
dir	Directory for the reproducibility bundle.
overwrite	Whether existing bundle files may be replaced.

Value

erbio_render_workplace_report() returns a character string; erbio_write_workplace_report() returns the normalized report path; erbio_export_workplace_bundle() returns a named character vector of written artifact paths.

Examples

```
responses <- list(
  audit = rep("Si", 32),
  general = rep("Si", 48),
  workers = rep("Si", 34),
  sec_wastewater = rep("Si", 12)
)
```

```
x <- erbio_assess_workplace(
  "Tratamiento de aguas residuales",
  "Mycobacterium tuberculosis",
  responses,
  "Frecuente"
)
substr(erbio_render_workplace_report(x), 1, 120)
```

erbio_score_questionnaire

ERBio Questionnaire Data and Assessment

Description

Access, validate, score and assess versioned ERBio questionnaires while preserving item identifiers, source provenance and validation status.

Usage

```
erbio_load_question_bank(path = NULL)
erbio_load_questionnaire_registry(path = NULL)
erbio_questionnaire_catalog(path = NULL)
erbio_get_questionnaire(questionnaire_id, version = NULL, path = NULL)
erbio_validate_question_bank(path = NULL)
erbio_score_questionnaire(questionnaire_id, responses, version = NULL,
  scoring = c("default", "binary", "audit_0_4"), path = NULL,
  language = erbio_get_language())
erbio_assess_questionnaire(questionnaire_id, responses, reference_level,
  exposure, version = NULL,
  scoring = c("default", "binary", "audit_0_4"), path = NULL,
  compliance_boundary_policy = c("prose_2015", "table45_intervals", "strict"),
  full_compliance_rule = c("flag_only", "thesis_override"))
erbio_questionnaire_rules(questionnaire_id = NULL)
```

Arguments

path	Optional directory or file override. If omitted, installed package data are used.
questionnaire_id	Stable ERBio questionnaire identifier such as "general" or "sec_wastewater".
version	Optional source-version identifier.
responses	Response vector. Named responses may use stable item IDs or final item numbers.
scoring	Requested scoring semantics. "default" uses the instrument metadata.
language	Presentation language, "es" or "en". This does not alter the scientific calculation.

reference_level	ERBio reference level.
exposure	ERBio exposure category.
compliance_boundary_policy	Policy used to classify compliance at source-boundary ambiguities.
full_compliance_rule	Policy for the complete-compliance source statement.

Details

Not-applicable items are excluded from the compliance denominator. Core and sector-specific questionnaires retain their documented validation status rather than being labelled uniformly.

Value

Load/catalog functions return data frames. Validation returns a structured QA list. `erbio_score_questionnaire()` returns an `erbio_questionnaire_score`; `erbio_assess_questionnaire()` returns an `erbio_questionnaire_assessment` including failed controls and source warnings.

References

Aguilar-Elena, R. (2015). *Riesgos biológicos laborales: ERBio, un nuevo método de evaluación teórica*. doi:10.5281/zenodo.22107465.

Examples

```
cat <- erbio_questionnaire_catalog()
head(cat)

general <- erbio_get_questionnaire("general")
nrow(general)

score <- erbio_score_questionnaire("general", rep("Si", 48))
score

assessment <- erbio_assess_questionnaire(
  "general", rep("Si", 48), reference_level = 3, exposure = "Frecuente"
)
assessment
```

erbio_version

ERBioR Version Information

Description

Return the ERBioR development version and frozen report-layer identifier.

Usage

```
erbio_version()  
erbio_report_patch_version()
```

Value

A length-one character string.

Examples

```
erbio_version()  
erbio_report_patch_version()
```

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