|  |  |
| --- | --- |
| Logo AGES | |
| Dioxins and dioxin-like polychlorinated biphenyls | |
|  |  |
| 08.05.2024 22:07 Uhr | |

**Dioxins
and
dioxin-like
polychlorinated
biphenyls**

**Dioxins
and
dioxin-like
polychlorinated
biphenyls**

Last
change:
10.10.2023

**Profile**

**Description**

Dioxins
is
a
collective
term
for
similar
chlorinated
hydrocarbon
compounds
(congeners),
which
includes
75
polychlorinated
dibenzo-p-dioxins
(PCDDs)
and
135
polychlorinated
dibenzofurans
(PCDFs).

Polychlorinated
biphenyls
(PCBs)
are
a
group
of
substances
consisting
of
209
congeners
that
differ
in
the
number
and
position
of
chlorine
atoms
on
the
biphenyl
and
exhibit
different
toxic
properties.
12
congeners
have
a
similar
structure
to
dioxins
and
have
the
same
toxic
effects,
so
they
are
referred
to
as
dioxin-like
PCBs
(dl-PCBs).
The
remaining
compounds
have
different
properties
than
dioxins
and
are
called
non-dioxin-like
PCBs
(ndl-PCBs).

PCDDs,
PCDFs
and
PCBs
always
occur
in
a
mixture
of
different
compositions.

**Occurrence**

Dioxins
are
formed
as
by-products
in
combustion
processes
and
in
the
synthesis
of
chlorine-containing
compounds
and
are
not
produced
intentionally.
PCBs,
on
the
other
hand,
were
produced
as
technical
mixtures
until
the
1980s
and
had
many
industrial
uses.
They
were
used
as
non-flammable
liquids
in
transformers
and
capacitors
and
as
plasticizers
in
plastics
and
sealants.
Their
use
has
been
banned
since
2001.
But
PCBs
are
also
unintentionally
formed
and
released
during
combustion
and
synthesis
processes.

Dioxins
and
PCBs
are
difficult
to
degrade,
are
transported
long
distances
by
wind
and
rain,
and
remain
in
the
environment
for
many
years.
Due
to
their
high
fat
solubility,
they
accumulate
in
the
fatty
tissue
of
living
organisms
and
bioaccumulate
along
the
food
chain.
That
is,
when
farm
animals
ingest
feed
contaminated
with
dioxins,
dioxins
are
stored
and
accumulated
in
their
fatty
tissues.
Therefore,
they
are
mainly
found
in
food
of
animal
origin
such
as
milk,
eggs,
meat
and
fish
and
products
thereof.

**Health
risk**

In
humans,
acute
poisoning
can
lead
to
chloracne,
nausea
with
vomiting
and
irritation
of
the
upper
respiratory
tract,
peripheral
neuropathies
(diseases
of
the
peripheral
nervous
system),
disorders
of
lipid
metabolism,
and
liver
damage
(Nau
et
al.,
2003).
Such
poisonings
have
been
reported
in
chemical
accidents,
as
in
Seveso,
Italy,
in
1976,
or
in
occupational
exposures
in
chemical
factories.
The
occurrence
of
chloracne
in
adults
is
observed
from
a
single
dioxin
dose
of
1,000,000
pg
WHO-TEQ/kg
(for
explanation,
see
the
technical
information)
body
weight.

Lower
sperm
concentrations
in
males
have
been
identified
as
a
consequence
of
higher
exposure
already
in
the
womb
and
after
birth.
An
association
between
high
exposure
to
dioxins
in
fathers
and
a
shift
in
sex
ratio
in
offspring
with
a
lower
number
of
boys
relative
to
girls
was
observed.
Exposure
to
dioxins
in
childhood
resulted
in
lower
enamel
mineralization
and
enamel
defects.

Evidence
for
other
adverse
effects
in
humans
is
not
yet
fully
established.
But
there
is
evidence
that
there
may
be
a
link
to
type
2
diabetes
and
obesity,
increased
mortality
from
cardiovascular
disease,
effects
on
the
immune
system,
nervous
system,
and
female
reproductive
ability.

Impairments
of
the
immune
system,
nervous
system,
hormonal
balance,
and
reproductive
functions
have
been
observed
as
chronic
effects
of
dioxins
in
animal
studies.
Various
cancers
have
been
observed
in
animals
exposed
to
dioxins
over
a
prolonged
period
of
time.
Genotoxicity
studies
have
shown
that
dioxins
have
no
mutagenic
potential.
Due
to
this
fact,
dioxins
and
dioxin-like
PCBs
are
assigned
to
the
group
of
tumor
promoters,
i.e.
they
accelerate
the
development
of
tumors
from
pre-damaged
cells,
but
are
not
themselves
able
to
trigger
tumor
development
through
DNA
damage.
In
rodents,
tumors
occurred
in
various
organs,
such
as
skin,
ovaries
and
liver.
Reduced
sperm
production,
delayed
onset
of
puberty,
and
changes
in
bones
were
noted.

**Situation
in
Austria**

[Maximum
levels
for
dioxins
and
dl-PCBs](https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:364:0005:0024:DE:PDF)
are
set
for
various
food
groups
in
the
European
Union
in
Regulation
(EC)
No.
1881/2006
setting
maximum
levels
for
certain
contaminants
in
foodstuffs.
In
addition
to
the
maximum
levels,
[action
levels](https://eur-lex.europa.eu/eli/reco/2014/663/oj?locale=de)
are
set
for
[certain
foods](https://eur-lex.europa.eu/eli/reco/2014/663/oj?locale=de)
according
to
Commission
Recommendation
2013/711/EU
on
the
reduction
of
the
presence
of
dioxins,
furans
and
PCBs
in
feed
and
food,
as
amended
by
Commission
Recommendation
2014/663/EU.
Action
levels
are
concentrations
of
dioxins
and
dl-PCBs
that
indicate
elevated
levels
of
contamination
in
food.
These
action
levels
are
slightly
below
the
maximum
levels
and
are
intended
to
encourage
food
producers
to
identify
and
remove
any
sources
of
contamination.

As
part
of
an
annual
priority
action,
continuous
monitoring
of
background
levels
of
dioxins
and
dl-PCB
in
foodstuffs
is
carried
out
in
Austria.
The
aim
of
this
Europe-wide
monitoring
is
to
obtain
reliable
data
on
the
contamination
of
food
with
these
substances
and
subsequently
to
take
the
necessary
measures
to
reduce
the
levels
of
dioxins
in
food
to
the
lowest
achievable
level.

The
focus
is
on
animal-based,
high-fat
foods
such
as
milk,
eggs,
meat
and
fish
and
products
made
from
them,
but
also
on
baby
food
and
occasionally
on
plant-based
foods.
The
focus
actions
on
dioxin
control
in
food
clearly
show
that
Austrian
foodstuffs
are
only
slightly
contaminated
with
regard
to
dioxins
and
dl-PCB,
i.e.
the
levels
are
well
below
the
applicable
limits.

The
average
intake
levels
for
dioxins
and
dl-PCB
in
Austria
were
estimated
to
be
0.77
pg
WHO-TEQ/kg
body
weight
and
day
for
children,
0.75
pg
WHO-TEQ/kg
body
weight
and
day
for
women
and
0.61
pg
WHO-TEQ/kg
body
weight
and
day
for
men.
Milk
and
dairy
products
were
the
main
contributors
to
total
intake,
followed
by
fish
and
fish
products
for
children
and
women,
and
meat,
poultry,
game,
and
offal
for
men.

**Monitoring
2012-2020**

Between
2012
and
2020,
251
samples
of
food
produced
in
Austria
were
taken
from
direct
marketers
and
at
the
slaughterhouse
and
analyzed
for
dioxins
and
PCBs.
Samples
of
animal
foods
included
meat
and
meat
products,
sheep
liver,
muscle
meat
from
fish,
milk
and
milk
products
such
as
yogurt,
cream,
cheese
and
butter,
chicken
eggs
and
fats
from
beef
and
pork,
and
honey.
From
the
group
of
plant
foods,
vegetable
oils
and
fats,
oilseeds,
nuts,
vegetables
and
herbs
were
examined.

Of
the
251
samples,
the
action
levels
and
maximum
levels
for
dioxins
and
dl-PCB
were
met
in
248
samples
(>98%).
In
one
sample
of
pork
bacon
with
a
concentration
for
the
sum
of
dioxins
of
1.87
pg
WHO-TEQ/g
fat,
the
maximum
level
for
dioxins
of
1.0
pg
WHO-TEQ/g
fat
was
exceeded
and
therefore
subsequently
also
the
maximum
level
for
the
sum
of
dioxins
and
dl-PCB
of
1.25
pg
WHO-TEQ/g
fat.
The
action
level
for
dl-PCB
in
beef
of
1.75
pg
WHO-TEQ/g
fat
was
exceeded
in
one
sample
of
veal
and
one
sample
of
beef.

**Focus
actions
on
dioxins
&
PCBs**

Environmental
contaminants[in
food
-
Monitoring
2020](https://www.ages.at/mensch/schwerpunkte/schwerpunktaktionen/detail/umweltkontaminanten-in-lebensmitteln-monitoring-2020)

[Environmental
contaminants
in
food
-
Monitoring
2019](https://www.ages.at/mensch/schwerpunkte/schwerpunktaktionen/detail/umweltkontaminanten-in-lebensmitteln-monitoring-2019)

[Environmental
contaminants
in
food
-
Monitoring
2018](https://www.ages.at/mensch/schwerpunkte/schwerpunktaktionen/detail/umweltkontaminanten-in-lebensmitteln-monitoring-2018)

[Environmental
contaminants
in
food
-
Monitoring
2017](https://www.ages.at/mensch/schwerpunkte/schwerpunktaktionen/detail/umweltkontaminanten-in-lebensmitteln-monitoring-2017)

**Tips**

Particularly
sensitive
populations,
such
as
children
and
women
of
childbearing
age,
should
avoid
eating
game
meat
e.g.
wild
boar,
wild
fowl
e.g.
pheasant,
and
fish
e.g.
eel
and
bream.

**Specialized
information**

Dioxins
and
dl-PCBs
always
exist
as
mixtures
of
individual
compounds,
so-called
congeners.
These
are
similar
to
each
other
in
terms
of
their
function,
structure,
origin
or
other
properties,
but
are
not
necessarily
identical.
Each
congener
of
dioxins
and
dioxin-like
PCBs
is
toxic
to
a
different
degree.
In
order
to
sum
up
the
toxicity
of
these
different
compounds
and
to
facilitate
risk
assessments
and
control
measures,
the
World
Health
Organization
(WHO)
introduced
the
concept
of
Toxicity
Equivalence
Factors
(TEFs).
The
most
toxic
dioxin
2,3,7,8-tetrachlorodibenzodioxin
(2,3,7,8-TCDD),
known
as
the
Seveso
dioxin,
has
a
TEF
of
1,
while
a
less
toxic
one,
for
example,
has
0.5.
All
congeners
found
in
the
analysis
are
multiplied
by
their
respective
TEFs
and
then
added
together.
This
sum
is
called
the
toxicity
equivalent
(TEQ)
relative
to
the
most
toxic
dioxin.

In
November
2018,
the
European
Food
Safety
Authority
(EFSA)
derived
a
new
tolerable
weekly
intake
(TWI)
for
dioxins
and
dioxin-like
PCBs.
This
comprehensive
risk
assessment
is
based
on
current
scientific
studies
and
evidence.
In
doing
so,
the
TWI
was
lowered
from
14
pg
WHO-TEQ/kg
body
weight
per
week
to
2
pg
WHO-TEQ/kg
body
weight
per
week.
No
adverse
effects
on
humans
are
expected
at
a
lifetime
intake
of
dioxins
and
dioxin-like
PCBs
at
a
level
of
2
pg
WHO-TEQ/kg
body
weight
and
week.

**More
information
on
dioxins
and
dioxin-like
polychlorinated
biphenyls**

[Final
Report
Project
POPMON](https://www.ages.at/forschung/wissen-aktuell/detail/popmon)
-
Identification
of
relevant
persistent
organic
pollutants
and
potentially
contaminated
regions
as
a
basis
for
risk-based
food
monitoring
in
Austria.

[EFSA
2018
Risk
for
animal
and
human
health
related
to
the
presence
of
dioxins
and
dioxin-like
PCBs
in
feed
and
food.](https://www.efsa.europa.eu/en/efsajournal/pub/5333)

Mihats
D.,
Moche
W.,
Prean
M.,
Rauscher-Gabernig
E.,
2015:
[Dietary
exposure
to
non-dioxin-like
PCBs
of
different
population
groups
in
Austria](https://www.sciencedirect.com/science/article/abs/pii/S0045653515001083).
Chemosphere
126,
53-59.

Rauscher-Gabernig
E.,
Mischek
D.,
Moche
W.,
Prean
M.,
2013:
[Dietary
intake
of
dioxins,
furans
and
dioxinlike
PCBs
in
Austria](https://www.tandfonline.com/doi/abs/10.1080/19440049.2013.814169).
Food
Additives
&
Contaminants:
Part
A,
30:1770-1779.