Acceptable, tolerable, non-tolerable

Risks at the workplace

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Different Exposure Situations

General Population:

(Pt)

Exposure duration, in total:	75 a
Annual Exposure :	52 w
Weekly Exposure :	7 d
Daily Exposure :	24 h
Exposure group:	everybody including hypersensitive persons

Workplace situation:

(Wt)

Exposure :	40 a
Annual Exposure :	44 w
Weekly Exposure :	5 d
Daily Exposure :	8 h
Exposure group :	healthy worker

Starting point of our Discussion

Report of the Federal Environmental Agencies in 1992:

➔ Risk from the 7 most important environmental carcinogens, in total:

Urban population :	**1 : 1,000/Pt**
Rural population:	**1 : 5,000/Pt**

The risks for the urban population was assessed as being to high.

Goal: adaptation to situation of the rural population

Intermediate step:	
Urban population :	**1 : 2,500/Pt**

Risk from X-ray examination

Kind of examination	Risiko
Hand	1 : 10 Millionen
Elbow, knee	1 : 1 Million
Lung, cervical spine, skull	**1 : 100,000**
Thoracic spine, hip, mammography	1 : 40,000
Lumbar spine, abdomen, CT- head	1 : 10,000
Stomach and small intestine (radiography), CT-spine	1 : 2,000
Large intestine and artery (radiography), CT-thorax	1 : 1,000

Additional mortality risk by one time X-ray examination
Source: Prof. Jung, Uni Hamburg

Radiation Safety Regulation

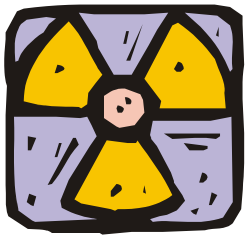
Accepted maximum annual radiation dose for employees:

⇨ **20 mS/a**

Accepted maximum lifetime radiation dose for employers:

⇨ **400 mS**

⇒ **additional risk cancer :** **2 : 100/Wt**



Natural Radiation Exposure

➔ radiation dose: 1 mS/a

additional risk cancer: **4 : 1,000/Pt**

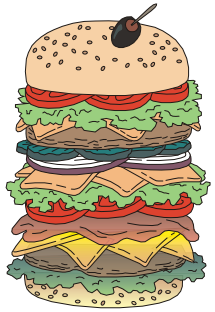
Lethal risks in different branches of economy

Forestry	**2.5 : 1,000 /Wt**
Agriculture	**3 : 1,000 /Wt**
Construction	**2 : 1,000 /Wt**
Mining	**3 : 1,000 /Wt**
Retail	**4 : 10,000 /Wt**

Common substances risks of every day life

Arsenic in drinking water (10 µg/l) **5 : 10,000/Pt**

Dioxin in food (2 pg Teq/kg) **3 : 10,000/Pt**

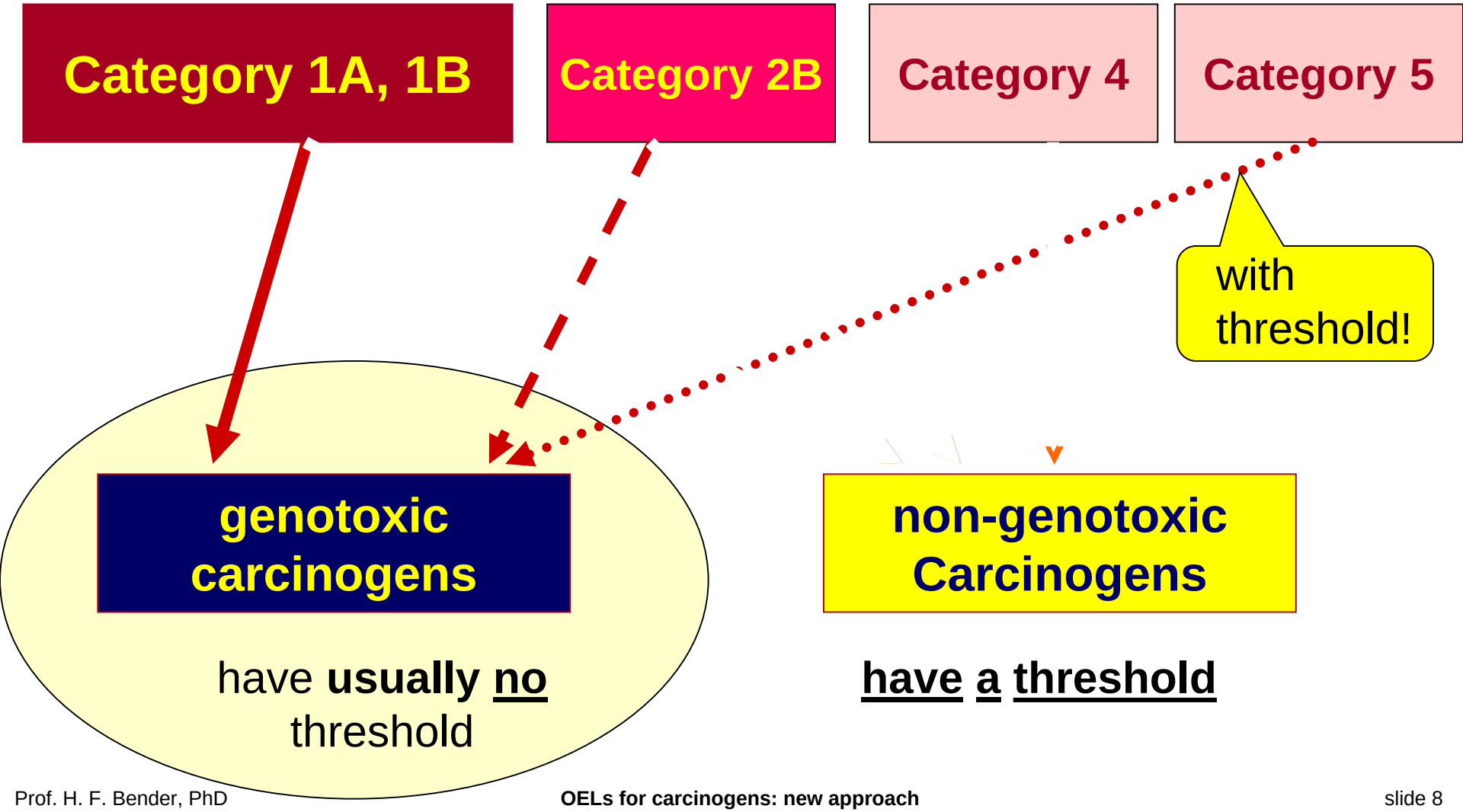


Diesel engine emissions (5 ng BaP/m^3) **2 : 10,000/Pt**

Cadmium in environmental dust **2 : 100,000/Pt**

Different kind of Carcinogens

A Carinogen Cat. 1A, 1B or 2 can be quite different!



General population

Accepted risks in different countries, e.g. NL (DECOS), USA (EPA)

1 : 1,000,000 Pt

Calculated for the workplace situations, based on the same exposure dose:

4 : 100,000 Wt

Risk Thresholds in Germany

Tolerable Risk: 4 : 1,000 Wt

Tolerable Risk:
Threshold, above which employees should not be exposed

Acceptable Risk (intermediate, until 2018: 4 : 10,000 Wt)

from 2019: 4 : 100,000 Wt

Acceptable risk:
Risk at the workplace without any additional safety measures required by the agencies

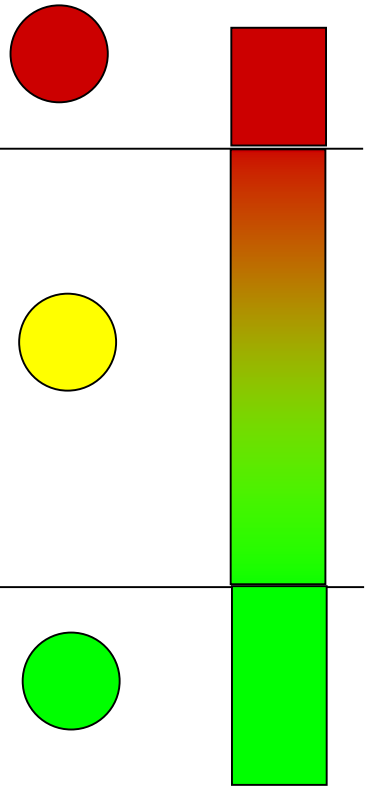
Safety measures concept

Division into 3 risk areas:

High risk: above tolerable limit

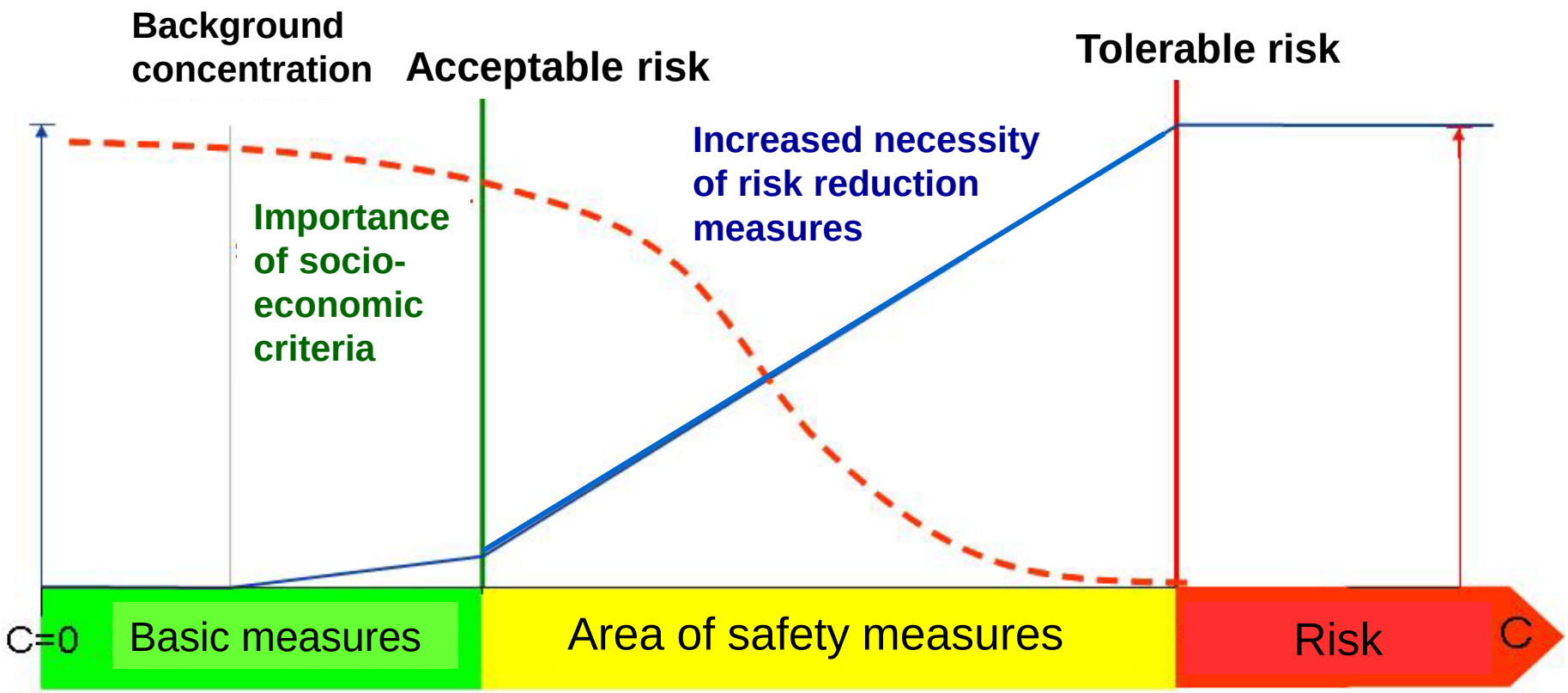
Medium risk: between acceptable and tolerable limit

Low risk: below acceptable limit



Safety measure concept

Priorisation of the different measure options in dependence of the risk



Consideration: state of technology

Procedure is needed, if state of the technology is

➔ belove tolerable concentration

or even

➔ belove acceptable concentration

General principle:

➔ prohibition of degradation

➔ former German TRK-values are not allowed to exceed

Comprehensive concept

Acceptable and tolerable concentration:

⇨ defined as TWA (time-weighted-average) for 8 h shift

Peak exposure:

⇨ Short time exposure limits (STEL) are established additionally, if needed

Different assessment duration:

⇨ For particles without acute (to chronic) health effects:

➔ assessment duration > shift are in discussion

Comprehensive concept

Consideration of background concentration (ubiquitary):

⇨ procedure, if background concentration is above acceptable concentration

↳ nitrosamines

Analytical limitations:

⇨ procedure, if detection limit is above acceptable concentration and can not be reached with reasonable effort

↳ fibres, nitrosamines

Endogenous carcinogen:

⇨ Consideration of endogenous produced carcinogens

↳ ethylenoxide

Risks at the workplace

Assessment of risks at the workplaces

- a task for real experts -

Thank you very much for your attention!