

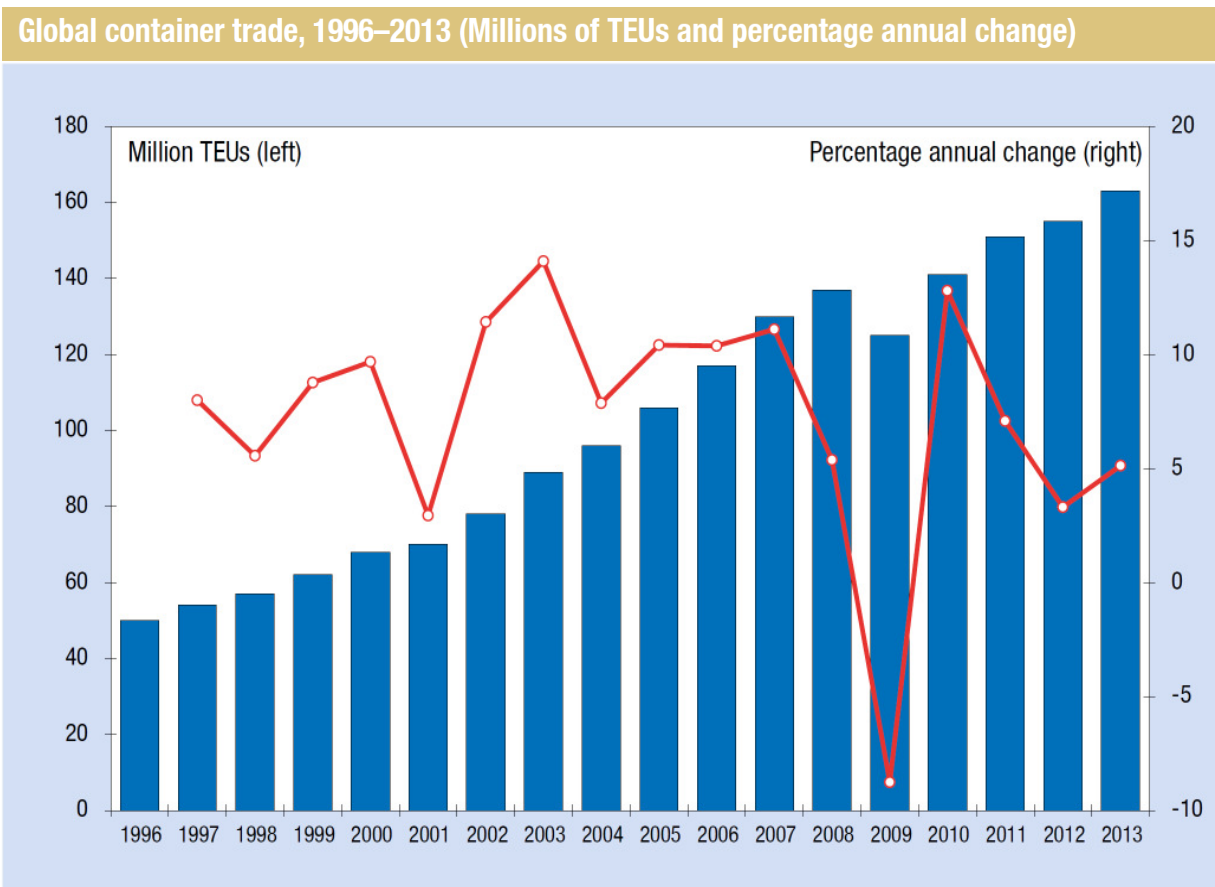
Container fumigation

Off-gassing from fumigated goods and products:
ongoing research project for future detailed
health risk analysis.

Dr. Jens Schubert

Introduction:

➤ International seaborne trade is steadily increasing



Source: Based on Drewry Shipping Consultants, *Container Market Review and Forecast 2008/2009*, and Clarkson Research Services, *Container Intelligence Monthly*, various issues.*

Development in international seaborne trade, selected years (Millions of tons loaded)

Year	Oil and gas	Main bulks ^a	Other dry cargo	Total (all cargoes)
1970	1 440	448	717	2 605
1980	1 871	608	1 225	3 704
1990	1 755	988	1 265	4 008
2000	2 163	1 295	2 526	5 984
2005	2 422	1 709	2 978	7 109
2006	2 698	1 814	3 188	7 700
2007	2 747	1 953	3 334	8 034
2008	2 742	2 065	3 422	8 229
2009	2 642	2 085	3 131	7 858
2010	2 772	2 335	3 302	8 409
2011	2 794	2 486	3 505	8 784
2012	2 836	2 665	3 664	9 165

Sources: Compiled by the UNCTAD secretariat on the basis of data supplied by reporting countries as well as data obtained from relevant government, port-industry and specialist sources. Data for 2006 onwards have been revised and updated to reflect improved reporting, including more recent figures and better information regarding the breakdown by cargo type. Figures for 2012 are estimated based on preliminary data or on the last year for which data were available.

^a Iron ore, grain, coal, bauxite/alumina and phosphate rock. Data from 2006 onwards are based on various issues of the *Dry Bulk Trade Outlook*, produced by Clarkson Research Services.*

*UNCTAD (United Nations Conference on Trade and Development), 2013. Review of maritime transport (RMT) 2013. http://unctad.org/en/publicationslibrary/rmt2013_en.pdf (accessed on 15 April 2014). UNCTAD secretariat, Geneva, Switzerland.

Introduction:

➤ Fumigation! Why?

- protection of vulnerable commodities (e.g. wood, shoes, food)
- prevent the introduction of harmful organisms (e.g. Asian long-horned beetle, pine shoot beetle)

➤ Guidelines and regulations

- a) International Standard for Phytosanitary Measures (ISPM No. 15, 2002) – two approved treatments for wood packaging material:
(1) Methyl bromide treatment (MB) or (2) Heat treatment (HT)*
- b) The Montreal Protocol on Substances that Deplete the Ozone Layer (1989) – phase out of methyl bromide by 2005 in developed countries and by 2015 in developing countries*
- c) EU-Commission Decision (2008/753/EC) – withdrawal of authorisations for plant protection products containing methyl bromide by 03/2010 at latest*

Objective:

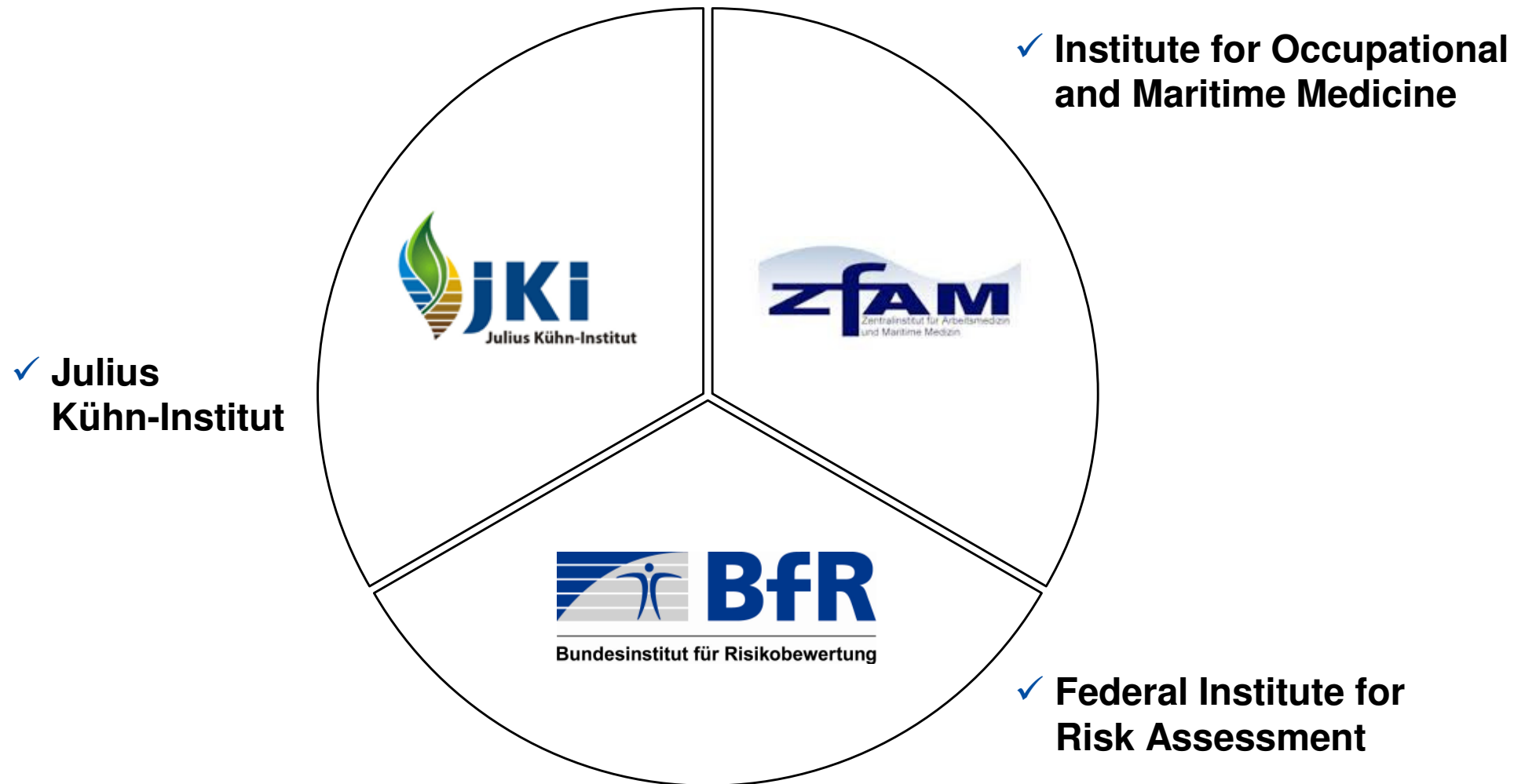
➤ Problem

- Fumigants: *methyl bromide, phosphine, sulfuryl fluoride, 1,2-dichloroethane, et al.*, —————> **Highly toxic!**
- Shipping containers: up to **70%** contaminated with fumigants or industrial chemicals (e.g. benzene, formaldehyde) above recommended exposure limits
- None or little data on the absorption and desorption of fumigants on consumer products available —————> **Health risk?**

➤ Issues

- Improvement of data situation regarding adsorption and desorption of fumigants on consumer products
- Determination of fumigant residues or reaction products on the surface of the fumigated commodities
- Determination of further effects

Project overview:



Results:

Cooperation BfR-ZfAM (Institute for Occupational and Maritime Medicine)	
Topic	experiments on adsorption and desorption
Equipment	fumigation chamber / sample chamber
Samples	sunflower seeds, wrapping paper, socks
Fumigants	phosphine, methyl bromide, 1,2-dichloroethane
Fumigation concentration	100 ppm
No. of experiments	3
Sampling	gas sample bags
Instrumentation	TD-2D-GC-MS/FPD
Further questions	surface analysis (ToF-SIMS)

Results:

slides removed – unpublished results

Results:

Cooperation BfR-JKI (Julius Kühn-Institut)	
Topic	experiments on adsorption and desorption
Equipment	fumigation chamber / desiccators
Samples	apples, soap, bay leaves
Fumigant	phosphine
Fumigation concentration	500, 1000, 2000, 3500 ppm
Desorption temperature	5, 15°C
No. of experiments	3
Sampling	syringe
Instrumentation	GC-MS

Results:

slides removed – unpublished results

Conclusion:

- **Desorption depends on:**
 - **Fumigant (fumigation concentration, temperature)**
 - **Matrix**
- **1,2-Dichloroethane desorbed over a very long period**
 - **Cross-contamination of non-fumigated goods possible**
- **“Residues” on surfaces of fumigated goods detectable**
- **Further research is required**

Thank you for your attention

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