

What do we know about the effects of new BFRs?

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Overview

- What do we know about the effects of some current BFRs?
 - PBDEs
 - HBCD
- What do we know about the effects of "newer" BFRs?

Polybrominated diphenyl ethers

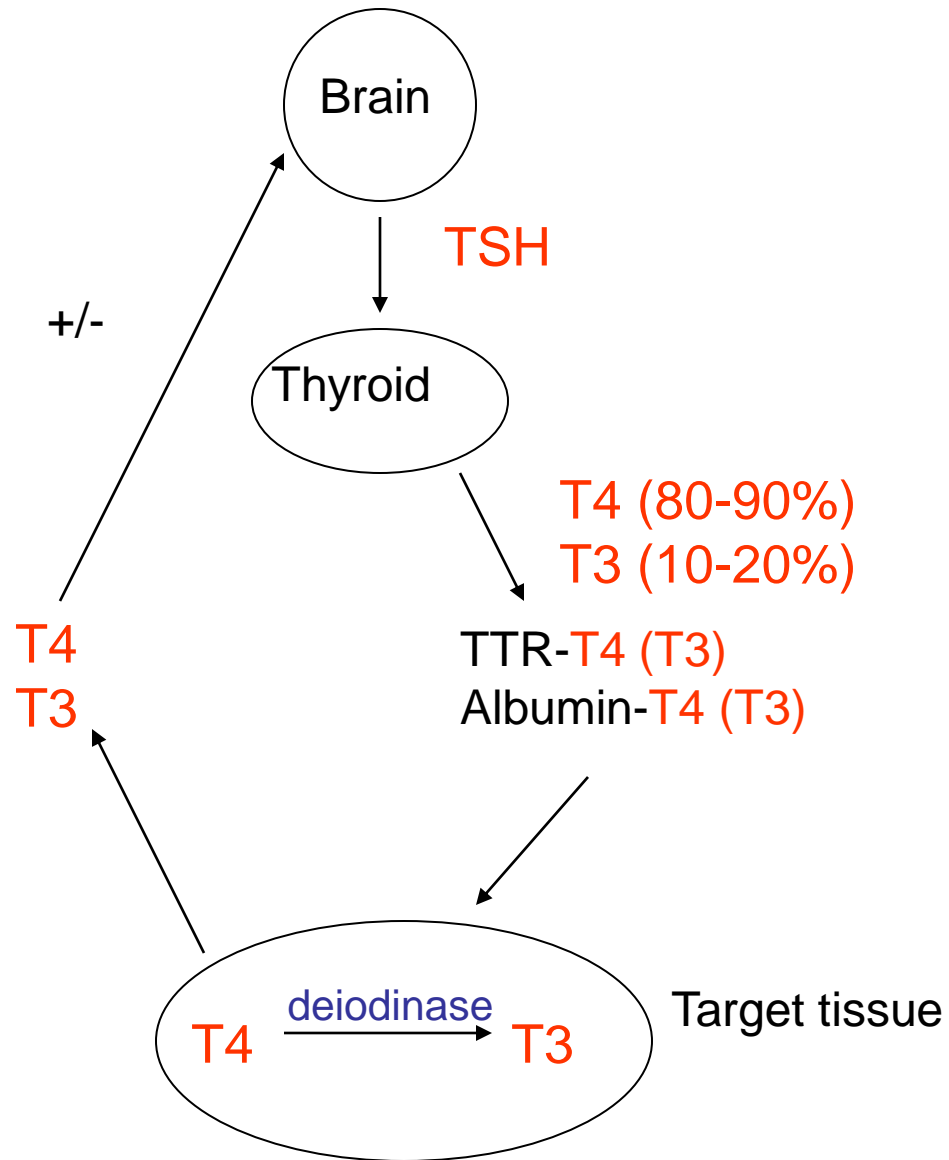
- Rodents
- Birds
- Humans

Rodent studies

- Thyroid effects
 - Technical Penta mixtures
 - Technical Octa mixtures
 - BDE 47, 99 and 209 individually



Reviews: Darnerud, 2003; 2008
Birnbaum and Staskal 2004,
Costa and Giordano 2007



Rodent studies

- Thyroid effects
 - Technical Penta mixtures
 - Technical Octa mixtures
 - BDE 47, 99 and 209 individually
- Immune effects
 - Technical Penta mixtures
 - BDE 47



Reviews: Darnerud, 2003; 2008
Birnbaum and Staskal 2004,
Costa and Giordano 2007

Rodent studies contd

- Reproductive effects
 - Technical Penta mixtures
 - BDE 47 and 99 individually
- Developmental neurobehavioral effects
 - Technical Penta mixtures
 - BDE 47, 99, 153 individually
 - BDE 183
 - BDE 209



Bird studies (kestrels) – PentaBDE congeners (mix of BDE 47, 99, 100, 153)

- Thyroid effects
 - Immune effects
 - Reproductive effects
 - Egg shell thinning
 - Decreased adult reproductive behavior
 - Decreased pipping
 - Decreased hatching success
- } More sensitive than mallards and chickens



Human studies

- Thyroid effects
 - BDE 28, 47, 99, 100, 153, OH-BDEs
- Reproductive effects
 - Reduced sperm concentration
 - BDE 153
 - Decreased fecundability
 - BDE 47, 99, 100, 153
 - Changed male hormones
 - Increased cryptorchidism
 - Sum of BDE 28, 47, 99, 100, 153, 154



Akutsu et al. 2008, Turyk et al. 2008, Chevrier et al. 2010, Harley et al. 2010, 2011, Main et al. 2007, Stapleton et al. 2011, Zota et al. 2011

Human studies

- Decreased birth weight
 - BDE 47, 99, 100
- Younger age at menarche
 - Sum of BDE 28, 47, 99, 100, 153, 154
- Neurodevelopmental effects (children)
 - BDE 47, 99, 100



Herbstman et al. 2010; Roze et al. 2009
Harley et al. 2011; Chen et al. 2011

Hexabromocyclododecane

- Rodents
- Birds

Rodent studies

- Thyroid effects
- Reproductive effects
- Developmental neurobehavioral effects



Van der ven et al. 2006, 2009; Saegusa et al. 2009; Ema et al. 2008; Eriksson et al. 2006; Lilienthal et al. 2009

Bird studies (chickens)

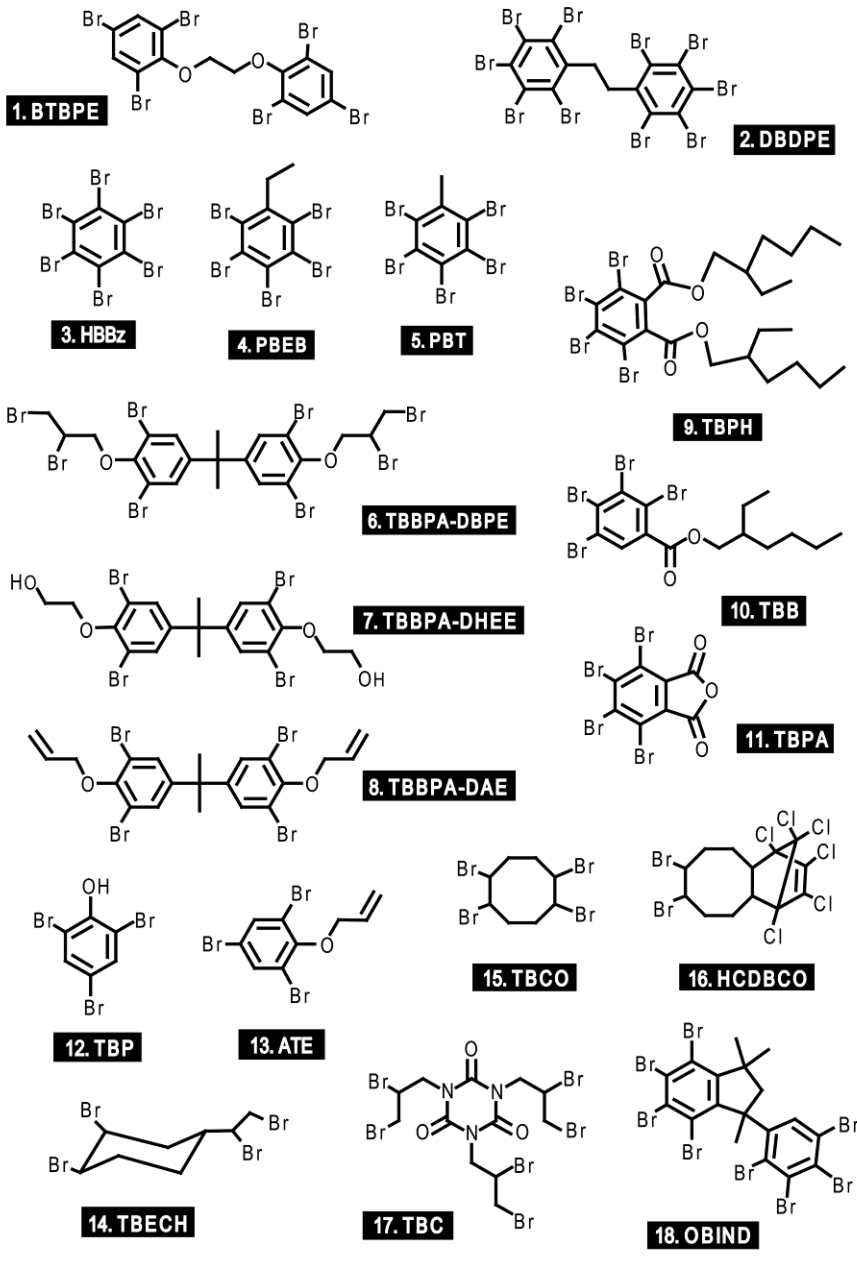
- Thyroid effects *in vitro* (α -HBCD)
- Reproductive effects *in vivo*
 - Reduced pipping



Polybrominated dioxins and furans

- Not new BFRs, but byproducts when BFRs incinerated
- 2,3,7,8-bromination – some as potent as their chlorinated analogues
- Ah receptor activity

New BFRS



New BFRs - effects

- TBECH
 - strong androgen agonist
 - thyroid effects in fish
- PBT
 - some Ah receptor activity
- TBP
 - thyroid effects
- HxBBz
 - liver effects, porphyria

New BFRs with little or no data

- PBEB
- TBAE
- TBPH
- TBB
- TBBPA-derivatives
- OBIND
- TBCO
- ATE
- TBC
- and more....

Conclusions

- What do we know about the effects of "new" BFRs?
 - Not much
- Large knowledge gaps that need to be filled

Conclusions contd

- What can we suspect about effects from new BFRs?
- Probably similar types of effects as seen with PBDEs and HBCD?
- Can suspect effects on
 - the thyroid system
 - neurobehavior
 - reproduction
- Some may have dioxin-like activity

Thanks for listening!