

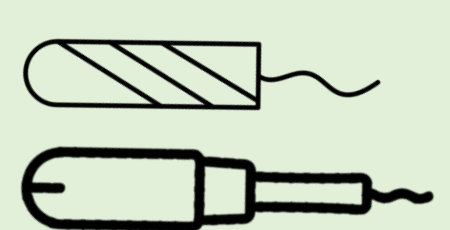
Tampon use as a source of toxic metal exposure: Results from NHANES 2001-2004

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Background

Tampons commonly used



50% - 86%
US menstruators Use tampons

Menstrual bleeding

- Regular, common occurrence
- Experienced by half of population
- Menstruators may use >10,000 menstrual products over lifetime

Tampons as source of metal exposure

Product design

- Absorbent core: cotton, rayon, or mixture
- Outer thin layer: non-woven or perforated film
- Withdrawal cord
- Fragrances may be added

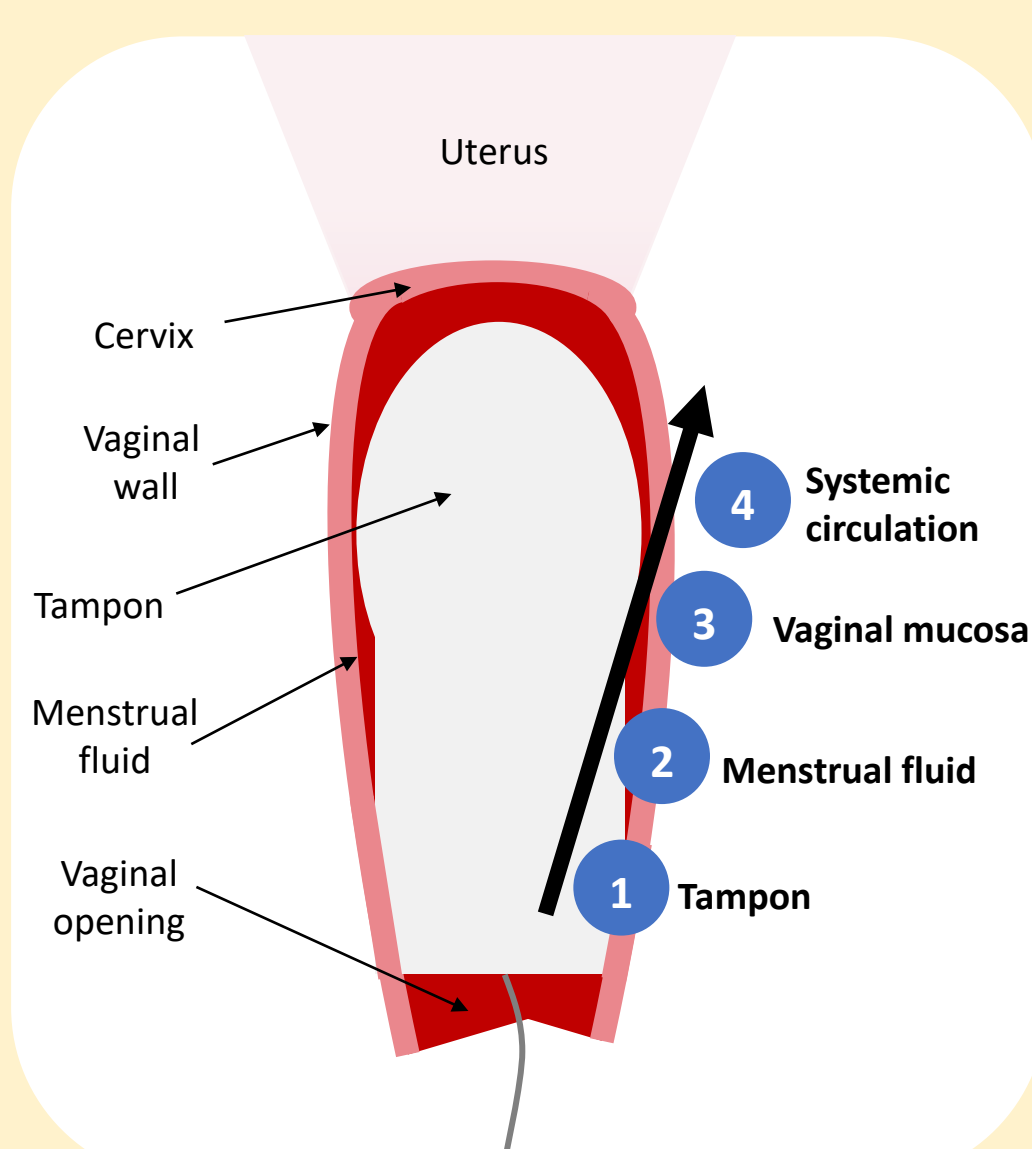
Cotton plants, wood pulp accumulate metals from soil and H₂O

Metals introduced during production and assembly

Range of other chemicals detected in tampons

Tampons interact with vaginal environment and menstrual fluid

- Absorb and retain menstrual fluid in vagina
- Prolonged contact with vaginal wall that is
 - Well-vascularized
 - Permeable
 - Allows chemicals to directly enter systemic circulation
 - By-pass first-pass liver metabolism



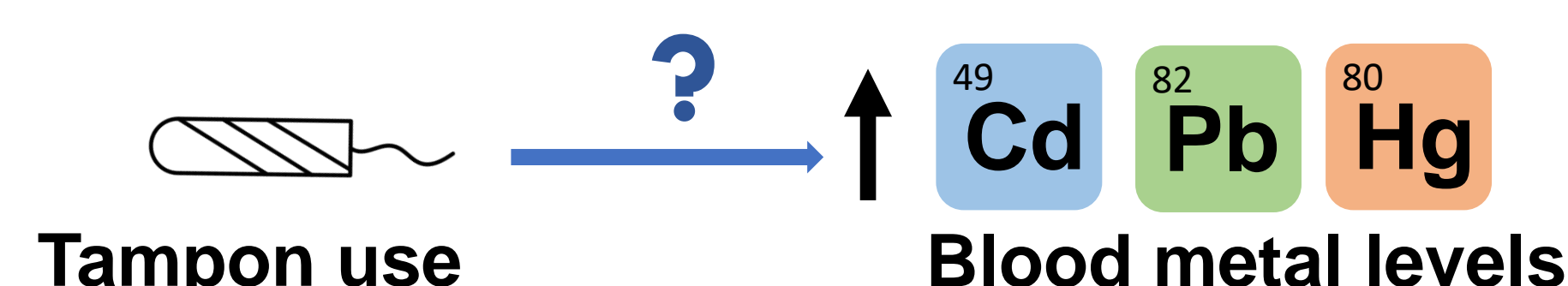
Tampon use and blood metal concentrations, Singh et al. *Environ Health* (2019)

Metals	% Difference (95% CI)*
Cd	-6% (-22%, 12%)
Pb	-8% (-20, 5%)
Hg	25% (-7%, 68%)

*Adjusted for age, BMI, smoking, education, race, parity, and physical activity. Analyses of mercury additionally adjusted for fish consumption.

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Prior study

Objective



Methods

Data: National Health and Nutrition Examination Survey Cycles 2001-2004

Study population:

- Females, ages 20-49 years
- Blood metal and reproductive health data
- Intact uterus, ≥1 ovary, non-pregnant
- Regular period in past 12 months
- First day of LMP in past 30 days
- unweighted n = 1,220



Current menstruators, menses in past month

Exposure:

- Tampon use
- Tampon use in past 30 days

Outcome:

- Whole blood metal levels
- Samples collected at NHANES interview
- Measured Pb, Cd, and total Hg

Analyses:

- Multivariable linear regression
- Percent difference and 95% CI
- Adjusted for age, education, smoking, parity, and other metals
- Accounted for complex survey sampling design

Results

Characteristics (tampon users vs. non-users)

62% tampon users

- Younger
- Non-Hispanic White
- ↑ Education
- ↑ Income
- Current smokers
- Current alcohol consumers
- ↓ BMI
- Nulliparous
- ↑ birth control pill use

Limitations & Strengths

Limitations

- Cross-sectional analysis
- No metal measurement of tampons or menstrual fluid
- No information on tampon product

Stay tuned!

Strengths

- Sample representative of U.S. population
- Measurement of blood metals in menstruators

Results

Tampon use and blood cadmium concentrations

	n ^a (%) ^b	Cd (µg/l)		
		GM (95% CI)	% Difference (95% CI) ^c	
Tampon use past 30 days				
No	539 (38)	0.38 (0.36, 0.40)	Reference	No association
Yes	681 (62)	0.38 (0.36, 0.41)	1% (-10%, 13%)	

^aUnweighted n. ^bWeighted percent. ^cAdjusted for age, education, smoking, parity, blood Pb, and blood total Hg levels.

Tampon use and blood lead concentrations

	n ^a (%) ^b	Pb (µg/l)		
		GM (95% CI)	% Difference (95% CI) ^c	
Tampon use past 30 days				
No	539 (38)	1.07(1.01, 1.13)	Reference	Tampon use and ↓Pb
Yes	681 (62)	0.96 (0.92, 1.00)	-9% (-16%, 0%)	

^aUnweighted n. ^bWeighted percent. ^cAdjusted for age, education, smoking, parity, blood Cd, and blood total Hg levels.

Tampon use and blood total mercury concentrations

	n ^a (%) ^b	Hg (µg/l)		
		GM (95% CI)	% Difference (95% CI) ^c	
Tampon use past 30 days				
No	539 (38)	0.84 (0.77, 0.91)	Reference	Tampon use and ↑Hg
Yes	681 (62)	0.94 (0.87, 1.02)	11% (1%, 23%)	

^aUnweighted n. ^bWeighted percent. ^cAdjusted for age, education, smoking, parity, blood Cd, blood Pb, and fish/shellfish intake.

Stronger Association:
Among those whose menses started in past 7 days (unweighted n = 342):
28% (1%, 63%)
Tampon users had 28% higher Hg

Conclusion

- Observed tampon use and ↑total Hg
 - Consistent results across two studies
 - Concerning given known adverse effects of Hg exposure
- Supports further investigation on tampons as exposure source

Acknowledgments

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