Alkylresorcinol (AR) Can Not Indicate Whole Grain Barley Intake

Tu Hu
Supervisor: Gözde & Lars

University of Copenhagen

8th, Feb, 2019

@GitHub/tuhulab/bfi-wholegrain/presentation

Outline

Study Design

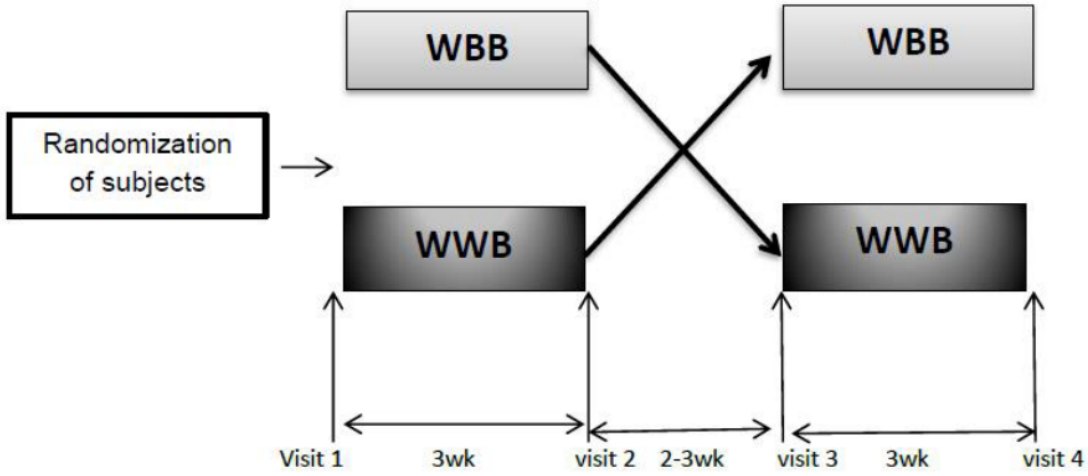


Figure 1: Schema of Study Design (WBB=whole barley bread; WWB=whole wheat bread)

- randomized cross-over intervention design. **In wash-out period, subjects did not have any dietary restrictions**
- 2 bread rolls/day during intervention period
- 14 healthy volunteers (6 men, 8 women)
- fasting plasma & 24-h pooled urine samples
- Conclusion: No significant changes of CVD risk factors and other health statue factors (before & after intervention; after barley & wheat)

Alkylresorcinols: biomarkers of whole grain cereal intake

Current status

- Widely reported and validated biomarker for whole grain cereals (Table)
- Detected both in urine and plasma

Limitations

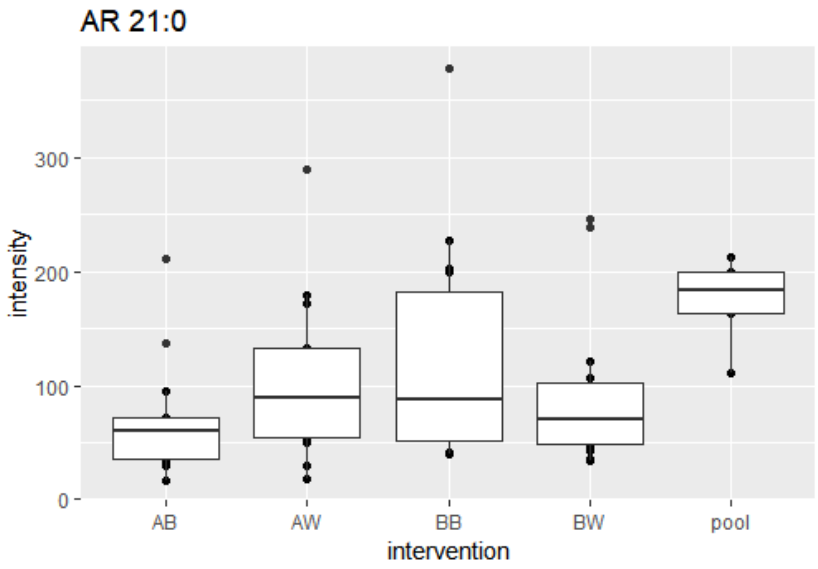
- Taking account of all whole grain cereals.
- Not specific to individual grain type (wheat, rye, oats, barley...)
- No barley biomarkers reported

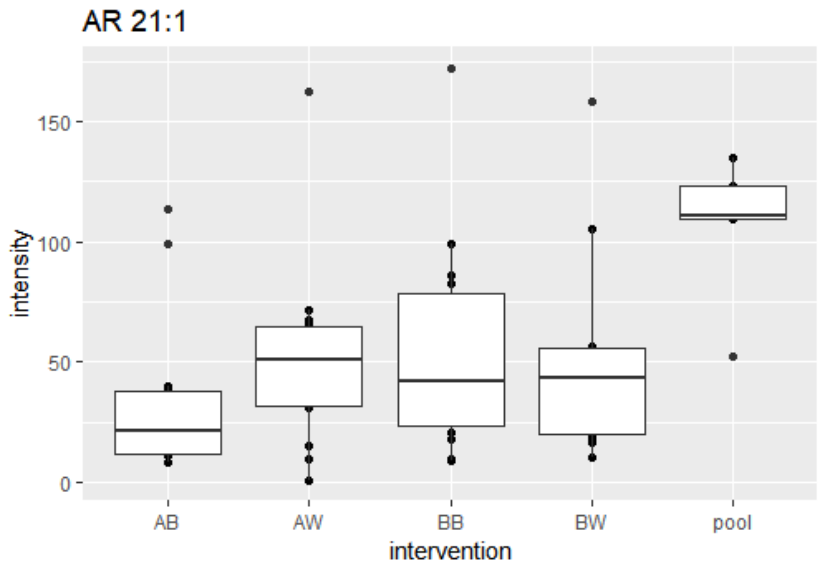
Alkylresorcinols (updated until Nov, 2018)

No	Authors	Experimental methods	Food types	Compounds	Subjects	Matrix	Reference
1	Wierzbicka, R etc.	three-day weighed food record	Whole grain cereals	alkylresorcinol metabolites	69 Swedish	urine	[15]
2	Zhu, YD etc.	Diet Intervention	Whole grain wheat	alkylresorcinol metabolites, benzoxazinoid derivatives,phenolic acid derivatives	12 healthy participants	urine	[16]
3	Garcia-Aloy, M etc.	Self-reported food frequency questionnaires	whole grain bread	phytochemicals (benzoxazinoids, alkylresorcinol metabolites)	155 subjects	urine	[17]
4	Magnusdottir, OK etc.	controlled diet	whole grain rye	alkylresorcinol C17:0/C21:0 ratio	93 metabolic syndrome patients in Nordic countries	plasma	[18]
5	Lappi, J etc.	Diet Intervention	whole grain and fibre riched rye bread	alkylrecorsinol		plasma	[19]
6	Ma, JT etc.	Self-reported food frequency questionnaires	whole grain cereals	alkylrecorsinol	407 olders	plasma	[20]
7	Ross, AB etc.	Diet Intervention	whole grain food (including wheat, oats, brown basmati rice, corn, rice, barley)	alkylrecorsinol	316 overweight and obese participants	plasma	[21]
8	Andersson, A etc.	Food records	whole grain wheat and rye	alkylrecorsinol	72 Swedish adults	nonfasting and fasting plasma	[22]
9	Landberg, R etc.	semi-quantitative food frequency questionnaires	rye bread	alkylrecorsinol	360 postmenopausal women	plasma	[23]
10	Montonen, J. etc.	Self-reported food frequency questionnaires	Whole grain food	alkylrecorsinol	100 healthy adults	plasma	[24]
11	Guyman, LA etc.	three-day food record and food frequency questionnaires	Whole grain food	3-(3,5-dihydroxyphenyl)-1-propanoic acid		urine	[25]
12	Landberg, R etc.	Diet Intervention	whole grain wheat and rye	alkylrecorsinol	22 women and 8 men	plasma	[26]

AR in Barley Dataset: serum

	Formula	Reference RT	Reference MZ	Annotation	Detected RT	Detected MZ
AR(C21:0) glucuronide	C33H56O8	5.03	579.389	[M-H]-	5.0222	579.3902
AR(C21:1) glucuronide	C33H54O8	4.92	577.375	[M-H]-	4.9199	577.3736
AR(C19:0) glucuronide	C31H52O8	4.92	551.360	[M-H]-	4.9143	551.3579

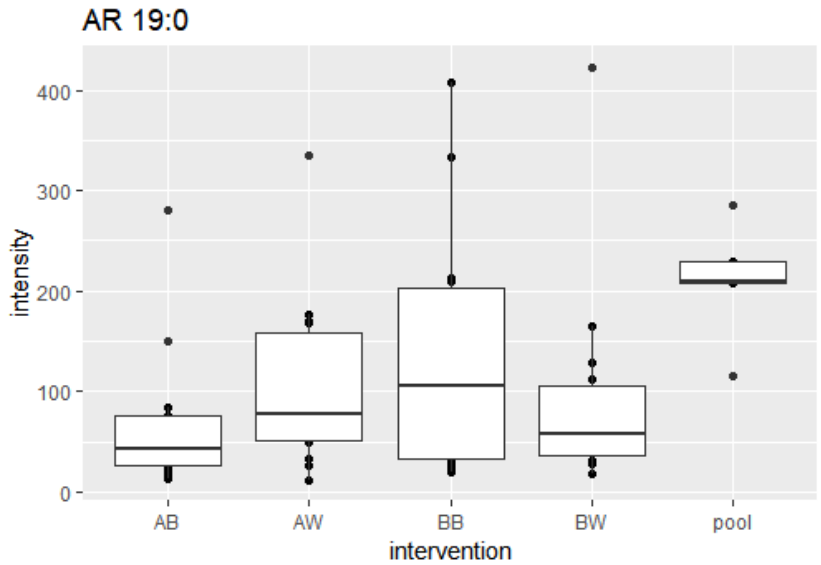




AB=After Barley
AW=After Wheat
BB=Before Barley
BW=Before Wheat

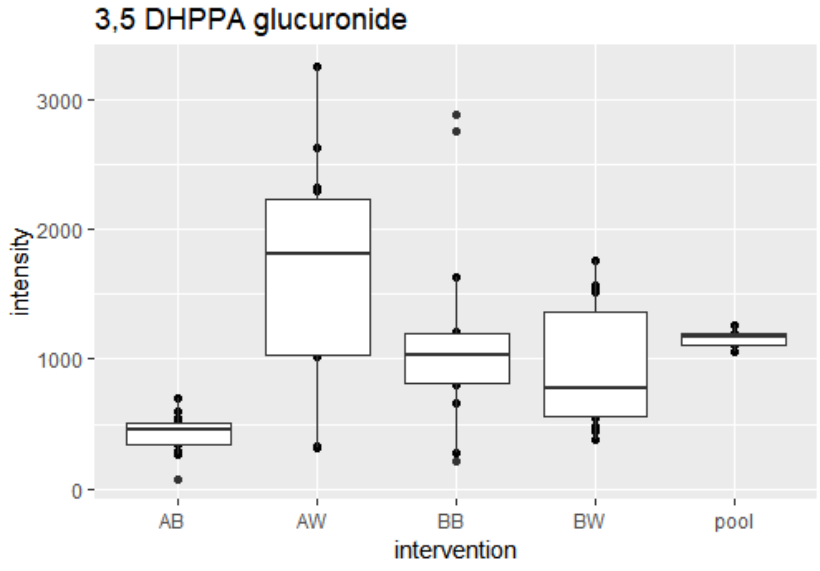
AR in Barley Dataset: serum

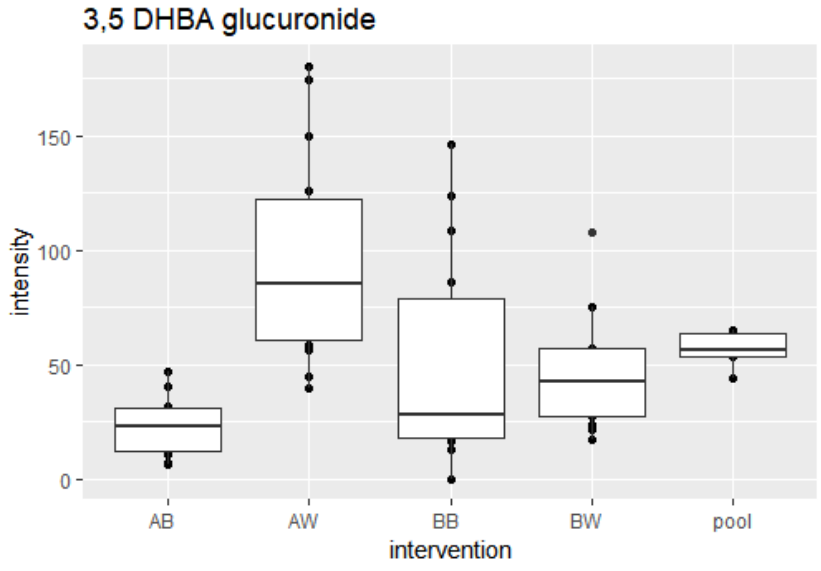
	Formula	Reference RT	Reference MZ	Annotation	Detected RT	Detected MZ
AR(C21:0) glucuronide	C33H56O8	5.03	579.389	[M-H]-	5.0222	579.3902
AR(C21:1) glucuronide	C33H54O8	4.92	577.375	[M-H]-	4.9199	577.3736
AR(C19:0) glucuronide	C31H52O8	4.92	551.360	[M-H]-	4.9143	551.3579



AR in Barley Dataset: urine

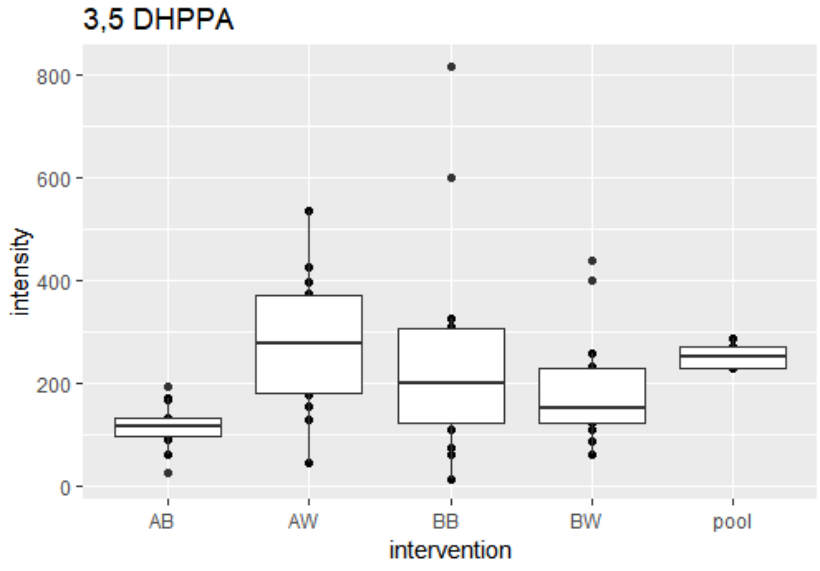
Molecular	Formula	Reference RT	Reference MZ
3,5 DHPPA glucuronide	C15H18O10	1.98	357.09
3,5 DHBA glucuronide	C33H14O10	0.93	329.051
3,5 DHPPA	C9H10O4	2.66	181.041
3,5DHBA	C7H6O4	1.94	153.018

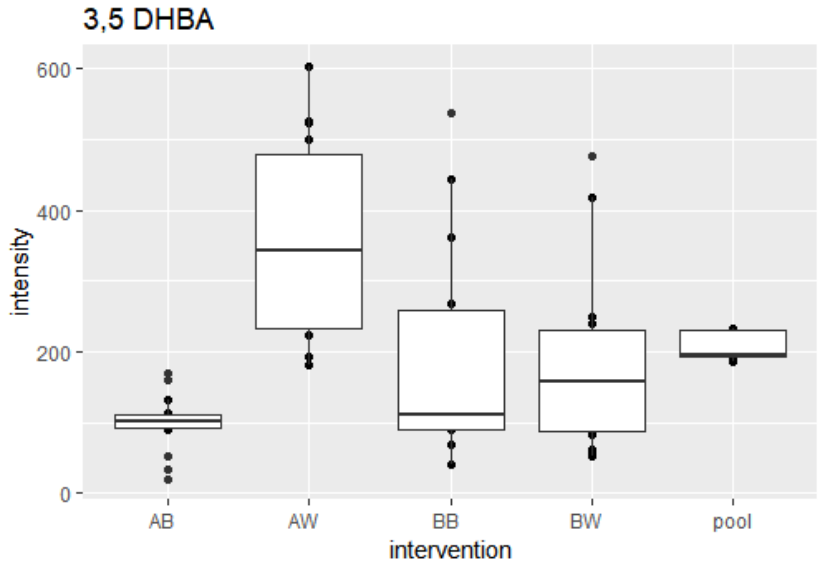




AR in Barley Dataset: urine

Molecular	Formula	Reference RT	Reference MZ
3,5 DHPPA glucuronide	C15H18O10	1.98	357.09
3,5 DHBA glucuronide	C33H14O10	0.93	329.051
3,5 DHPPA	C9H10O4	2.66	181.041
3,5DHBA	C7H6O4	1.94	153.018





Conclusion & Feedback

- Subjects regularly consume whole grain food. But exposure amount varied individually.
  - Background value in 'BB', 'BW' groups
  - High deviation in 'BB', 'BW' groups
- AR metabolites in serum can indicate long-term (cumulative) whole grain food exposure.
- AR metabolites in urine can indicate short-term whole grain food exposure.
- However, AR can not indicate whole grain barley intake
  - AR conc. decreased in 'AB' group
- Questions
  - Safer conclusion?
  - Better statistics or visualization method to tell the story?
  - Compare AR conc. in barley & wheat?