Demystifying
Cork Quality Assurance

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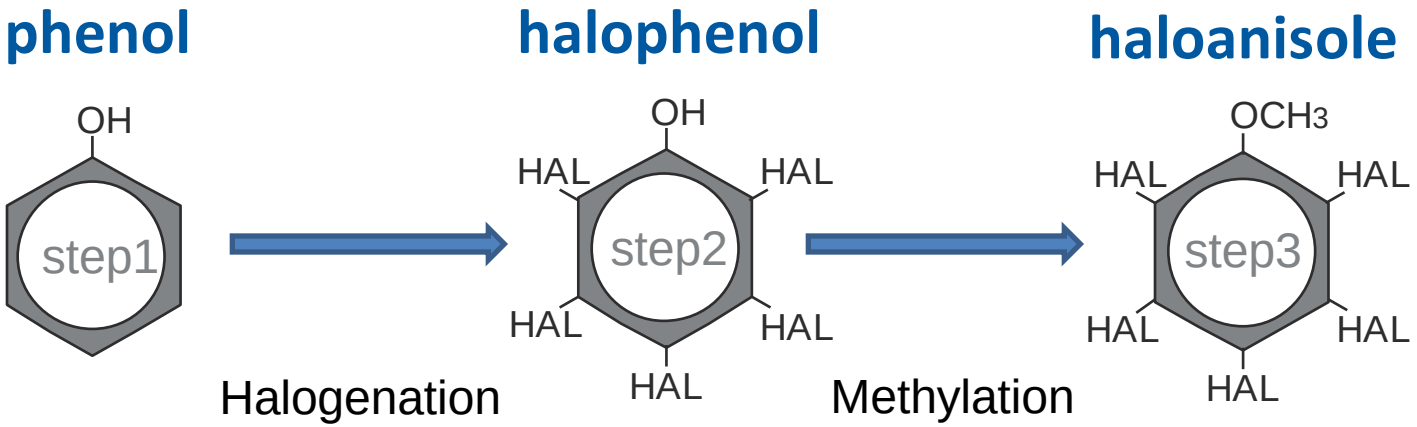
Demystifying
Cork Quality Assurance

1. What is Releasable TCA (RTCA)
2. RTCA from Group Soaks versus TCA in Bottled Wine
3. Group Cork Soaks Applied

Haloanisoles

- ETS Laboratory's primary analysis for the cork industry
- Volatile off-aromas with low sensory threshold
- Multiple compounds with numerous sources



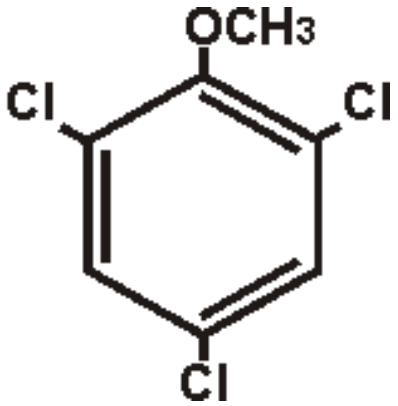
Cork Taint

Wine Related Haloanisoles

- Pentachloroanisole
- Tetrachloroanisole
- Trichloroanisole
- Tribromoanisole

Cork Related Haloanisoles

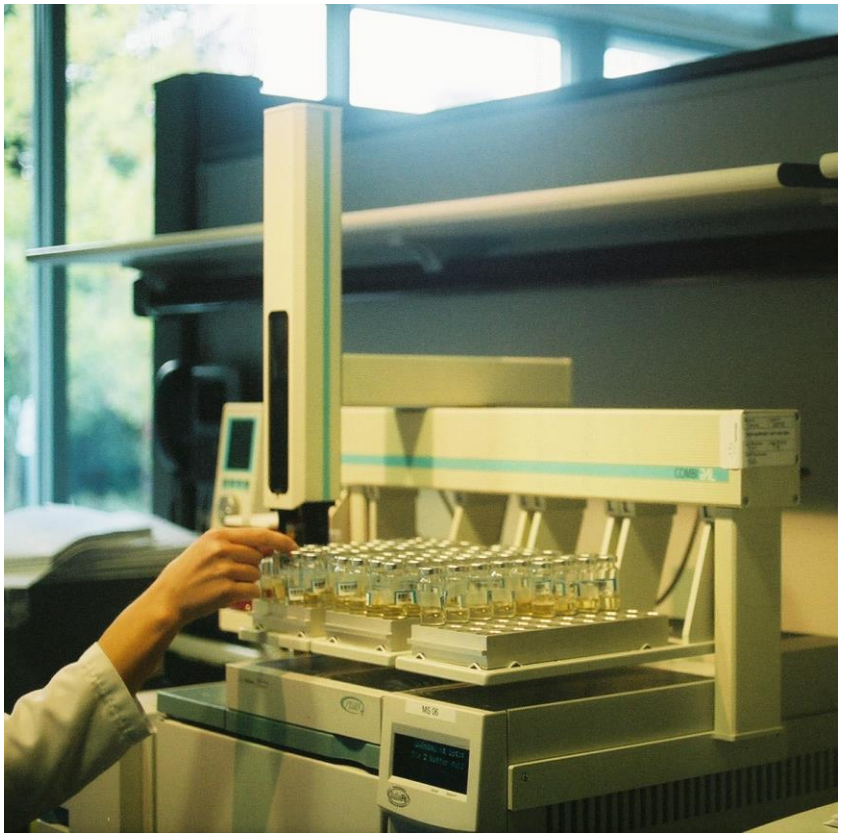
2,4,6-Trichloroanisole (TCA)



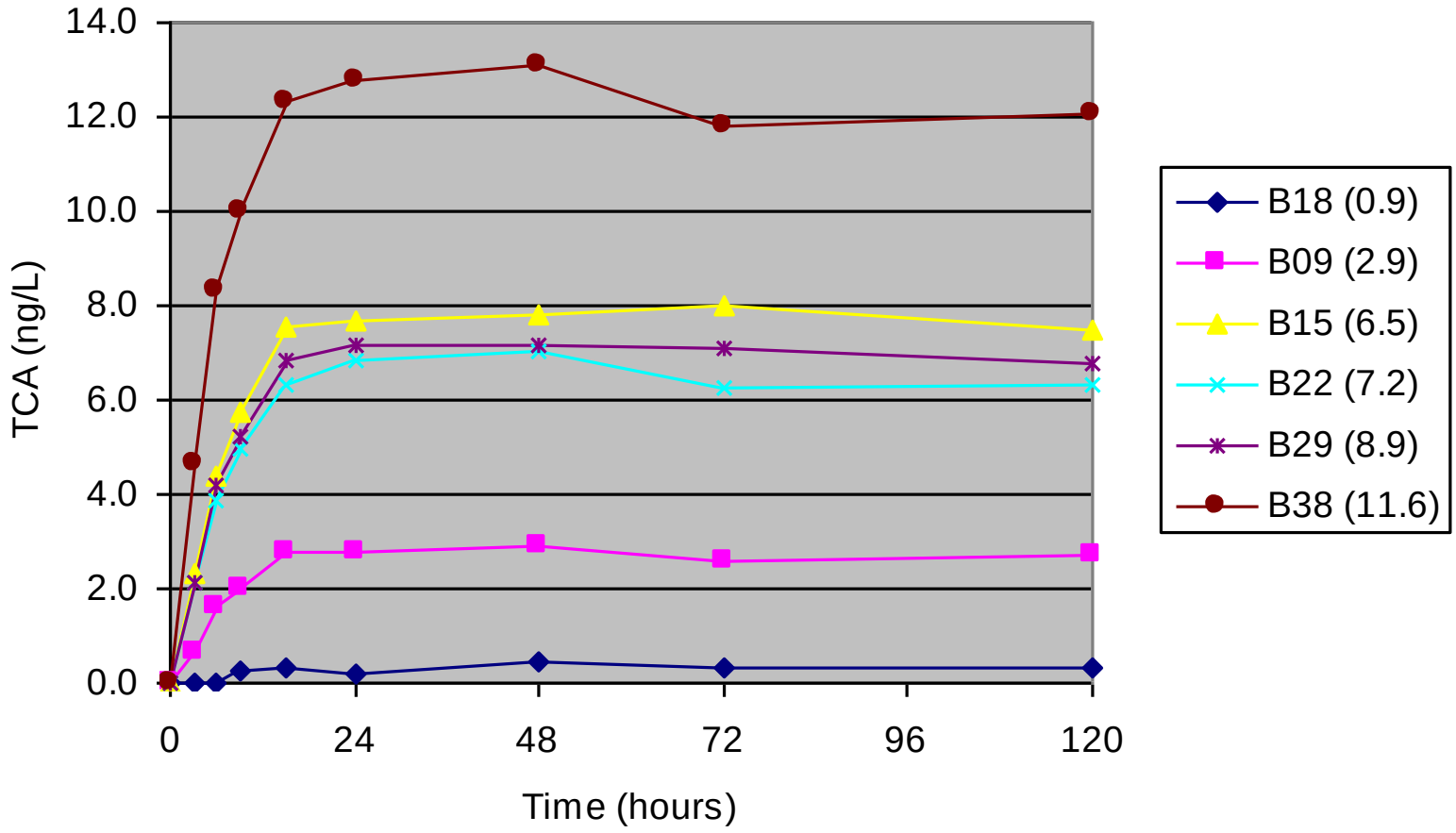
Detecting TCA

Gas Chromatography/ Mass Spectrometry – with SPME fiber absorption

- Quick and accurate
- Detects TCA below 1ppt
- Compares favorably to sensory detection levels
- We perform over 35,000 analyses per year for the cork industry.



Kinetics of cork soaks: equilibrium

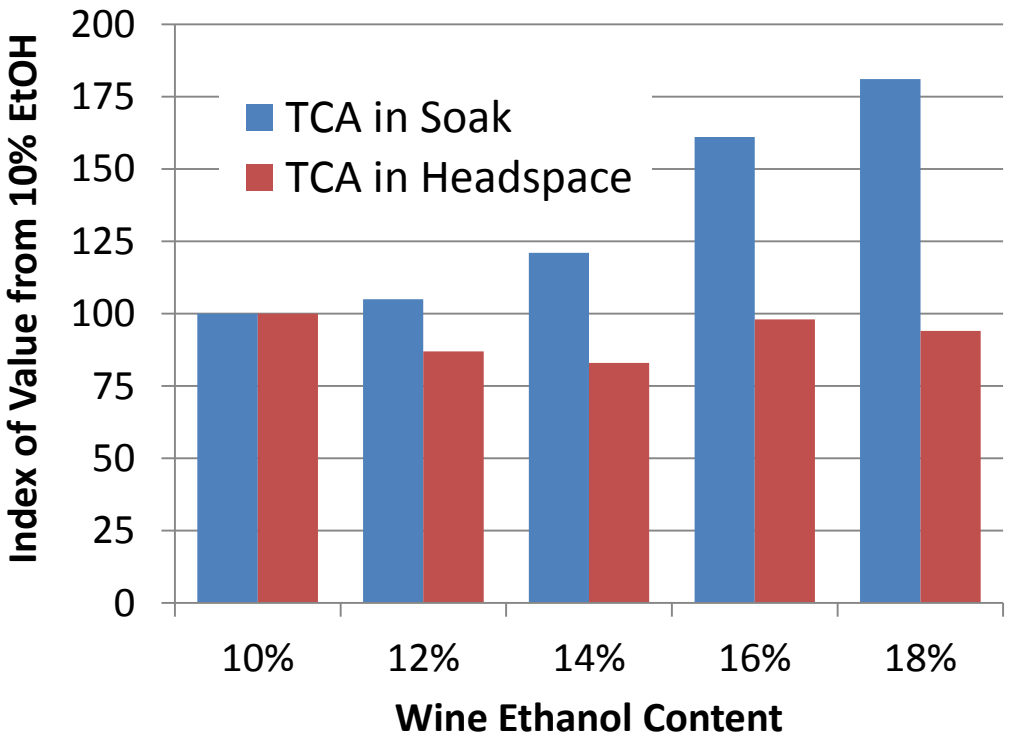


Ethanol Concentration of Soak Wine

Higher ethanol wines produce higher TCA concentrations in soaks

… but TCA becomes harder to detect either by analysis or sensory.

Preferred ethanol concentration between 10-12%



Releasable TCA

For a cork, or group of corks, the concentration of TCA reached at equilibrium in a wine soak. Expressed in ng/L (or ppt).

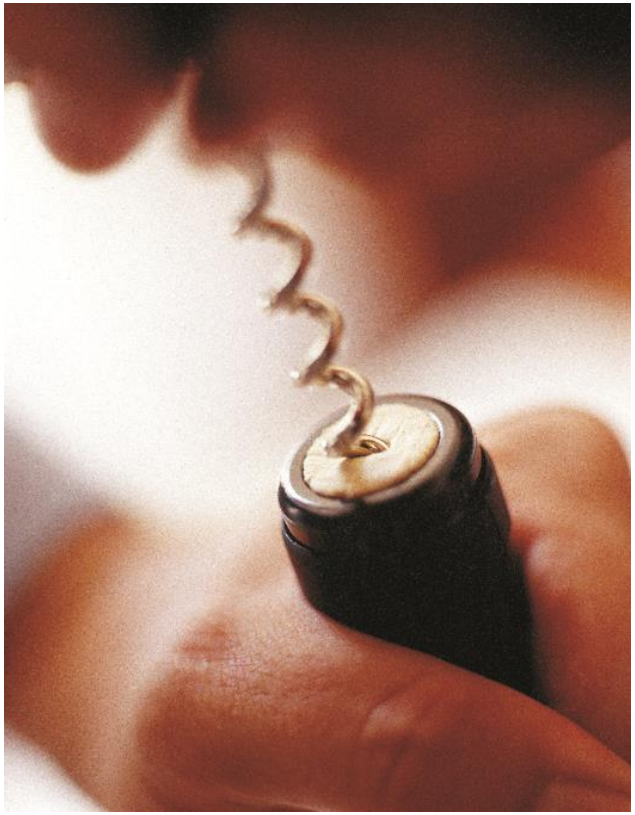
Hervé E., Price S., Weber P. and Burns G. - ASEV 1999

Group Cork Soaks

Preferred Sample Preparation

- Sample sizes of 50 and 100 corks give similar results
- Soak media is table wine at 10-12% ethanol
- Soak duration of 24 to 48 hours

How does RTCA Relate to TCA in Bottled Wine?



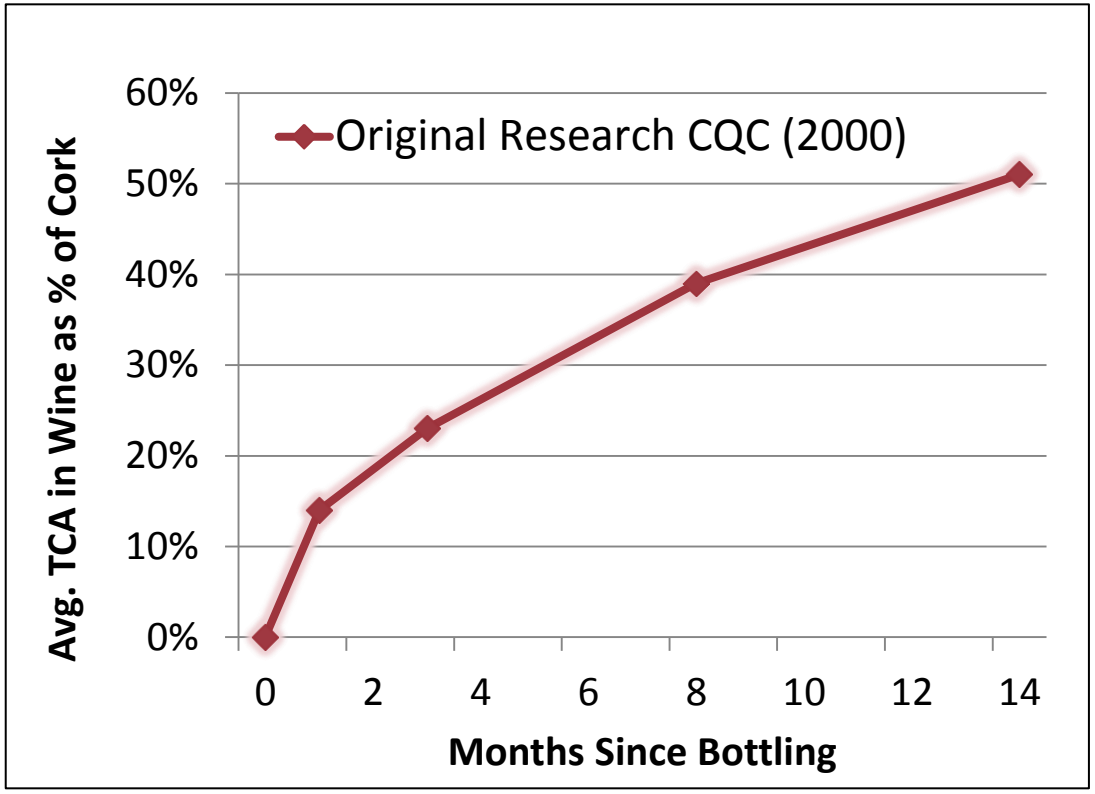
How does RTCA Relate to TCA in Bottled Wine?

“Transfer Rate”:

Original ETS research (2000) showed that bottle TCA was on average…

~40% of RTCA at 9 months

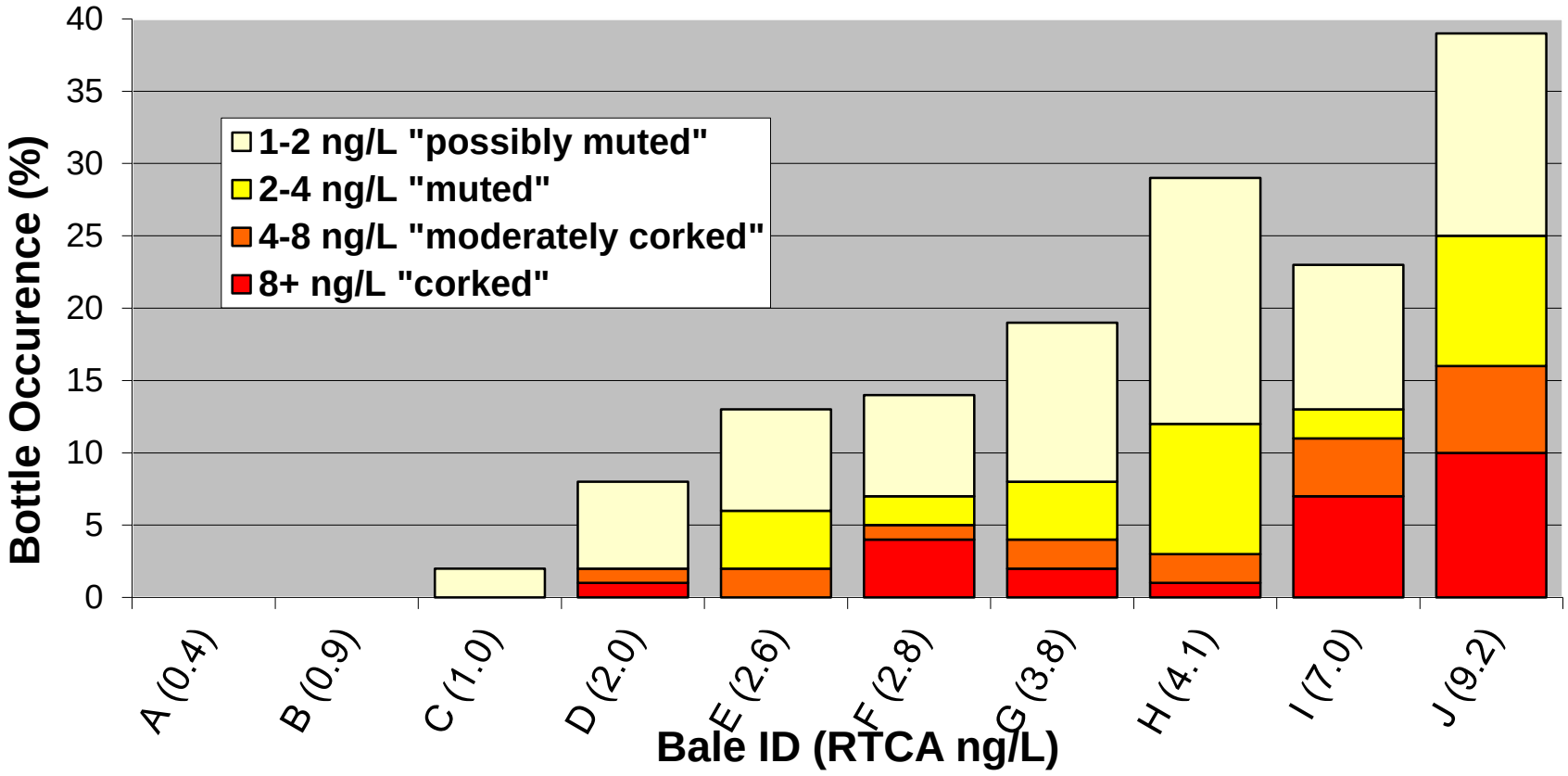
~50% of RTCA at 14 months



How does RTCA Relate to TCA in Bottled Wine?

- 2004- 2006: ETS Study funded by the American Vineyard Foundation
- Population and Bottling Studies were done using 10 cork bales with a wide range of RTCA levels
- Ultimate goal was to determine the performance of cork soaks as a quality control tool

Review of AVF Data for TCA in Bottled Wine

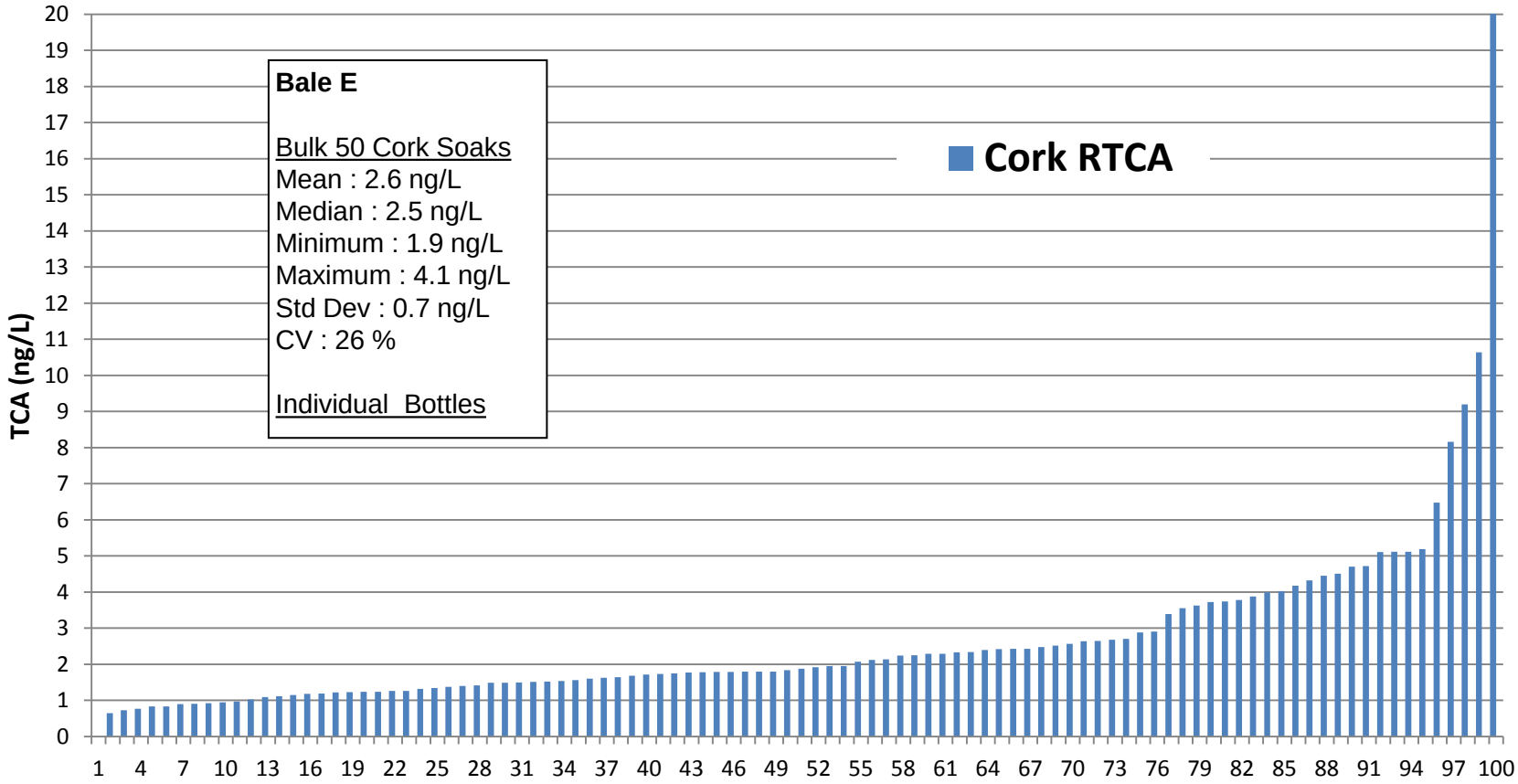


How does RTCA Relate to TCA in Bottled Wine?

Also… when comparing 1,000 individual cork's RTCA data to bottle TCA results after 9 months and 20 months:

- Transfer rates appeared lower than 40-50% results from the initial study, especially for corks with low to moderate RTCA
- In fact, a "threshold" effect was apparent: RTCA needed to be at least ~ 4 ppt for TCA to reach 0.5 ppt in bottled wine.

How does RTCA Relate to TCA in Bottled Wine?



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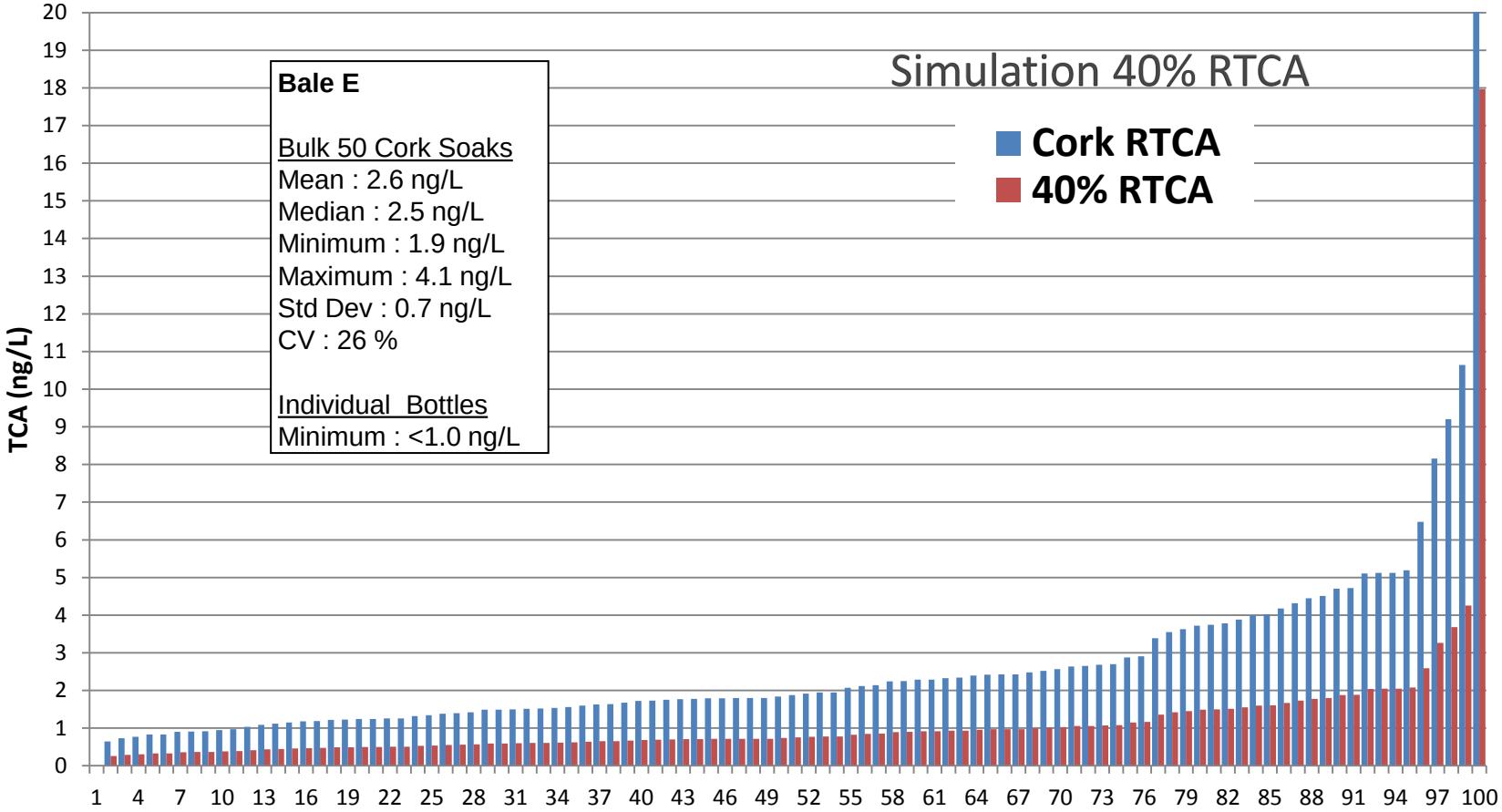

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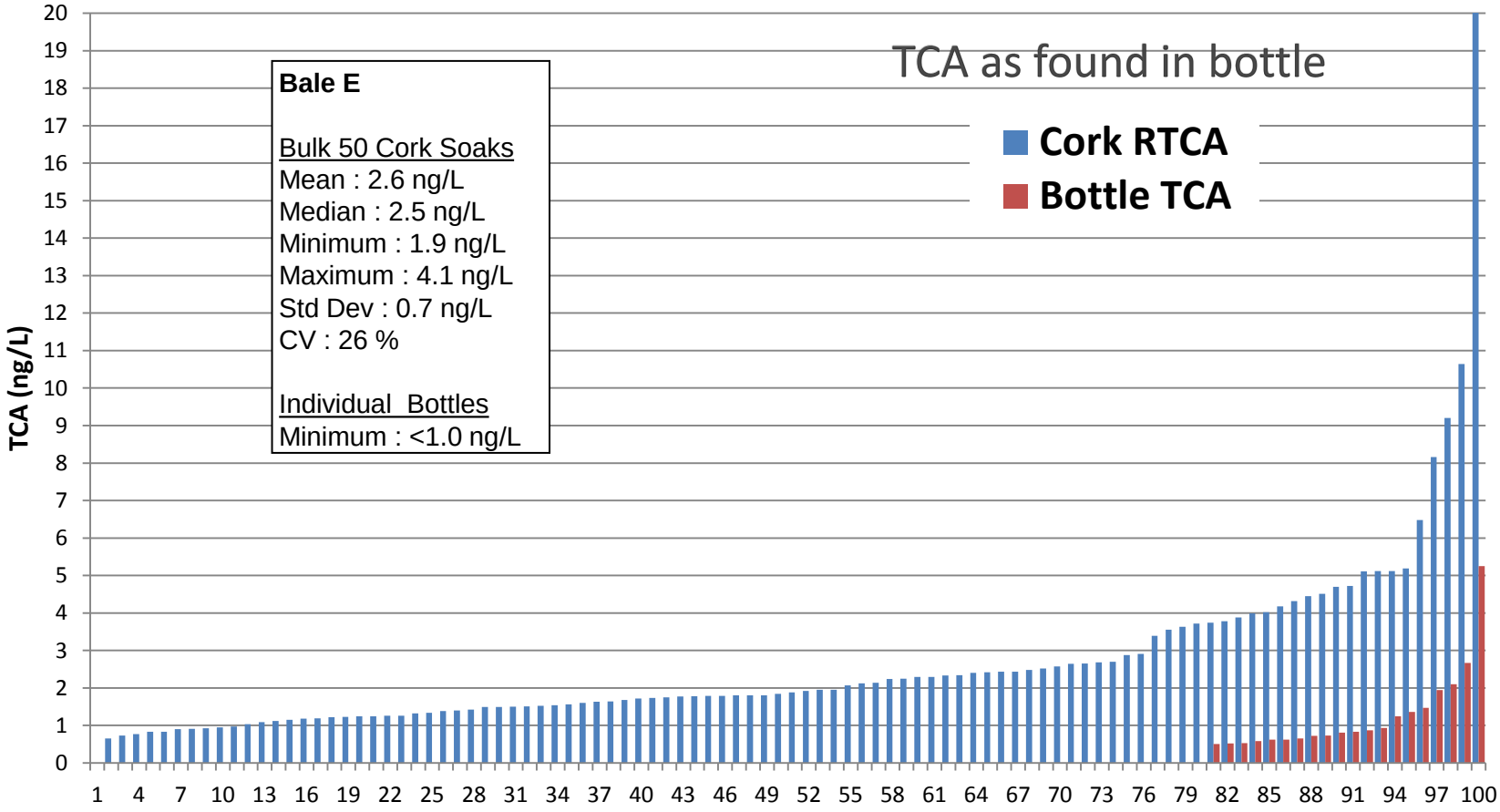


Group Cork Soaks Applied

- The CQC uses group soaks for its attribute sampling program
- Based on ISO-2859-1 Inspection Standards
- The CQC has a reporting limit for TCA of 1 ppt and its conformity flag level is 1.5 ppt.

Group Cork Soaks Applied

- CQC Members are required to subject all incoming corks to releasable TCA screening in accordance with approved guidelines
- Sampling is based on individual Cork Lots – defined as a single shipment from the same producer, cork type, visual grade, treatment and arriving on the same shipment
- Corks rejected during inspection are removed from inventory and are returned to manufacturer
- Adherence is subjected to an annual audit

Group Cork Soaks Applied

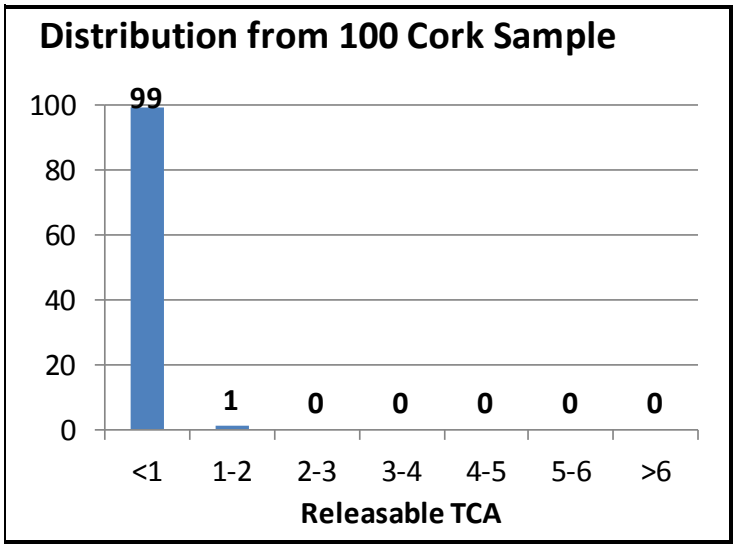
BALE AVF-A

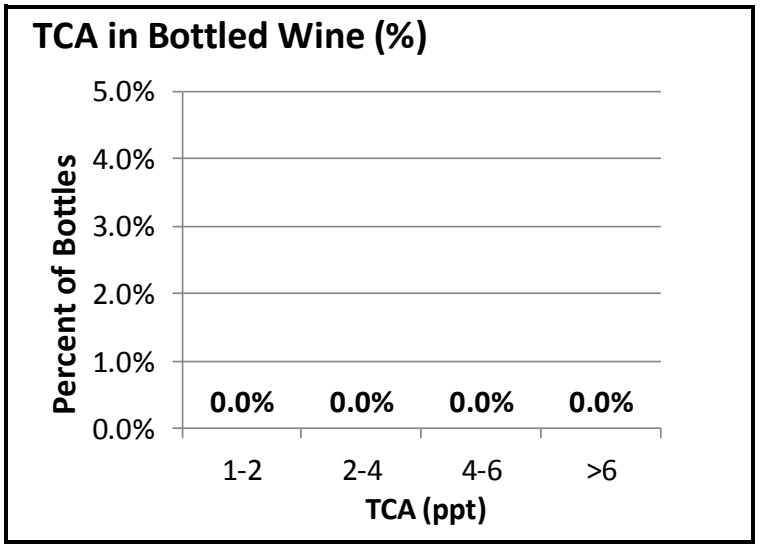
Inspection Results Pass

Example From AVF Study

50-Cork Group Soaks

Replicate	1	2	3	4	5	6	7	8	9	10	Mean	StDev	Flags
rTCA	<0.5	<0.5	0.63	<0.5	0.92	<0.5	0.49	<0.5	<0.5	<0.5	**0.44**	**0.22**	**0**





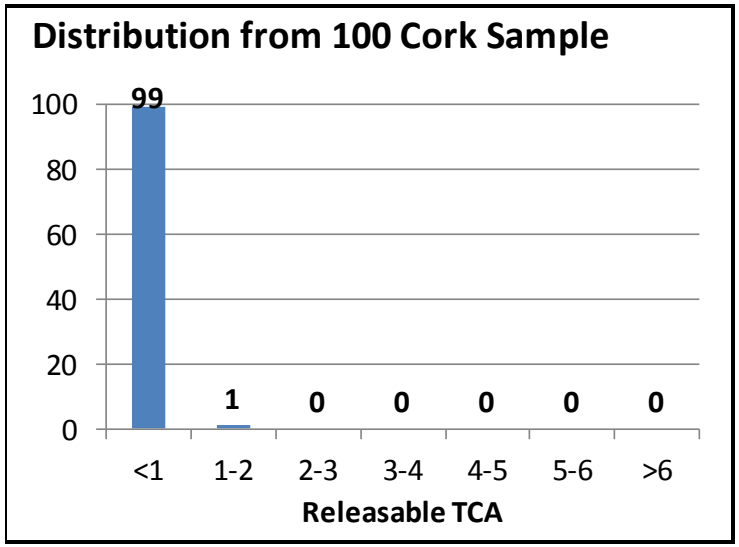
Group Cork Soaks Applied

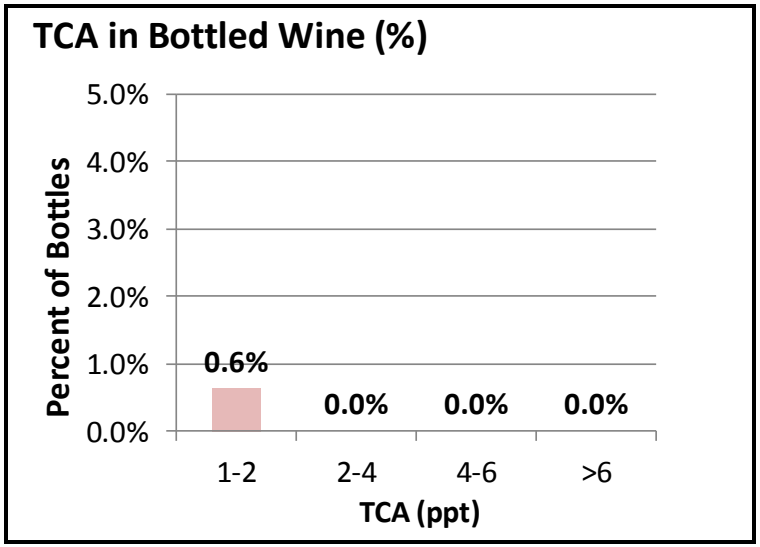
BALE **AVF-B**

Inspection Results Expanded Resample

50-Cork Group Soaks

Replicate	1	2	3	4	5	6	7	8	9	10	Mean	StDev	Flags
rTCA	1.14	0.70	0.89	0.53	<0.5	**2.82**	0.57	0.61	0.75	0.56	**0.90**	**0.71**	**1**





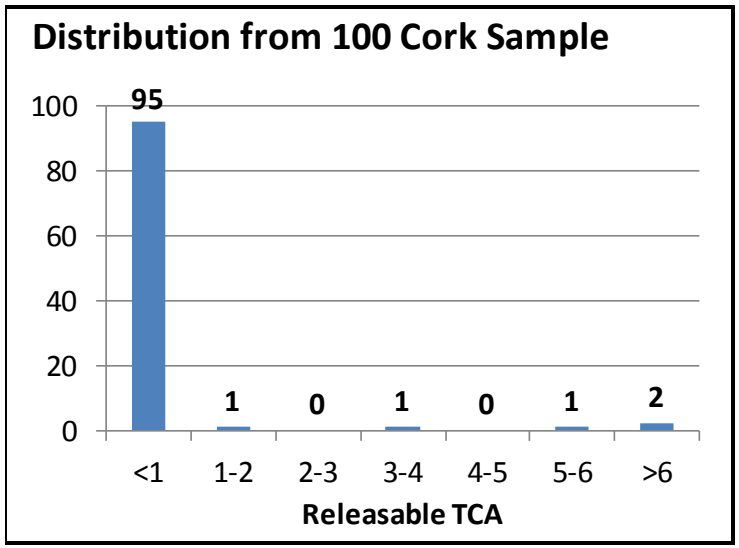
Group Cork Soaks Applied

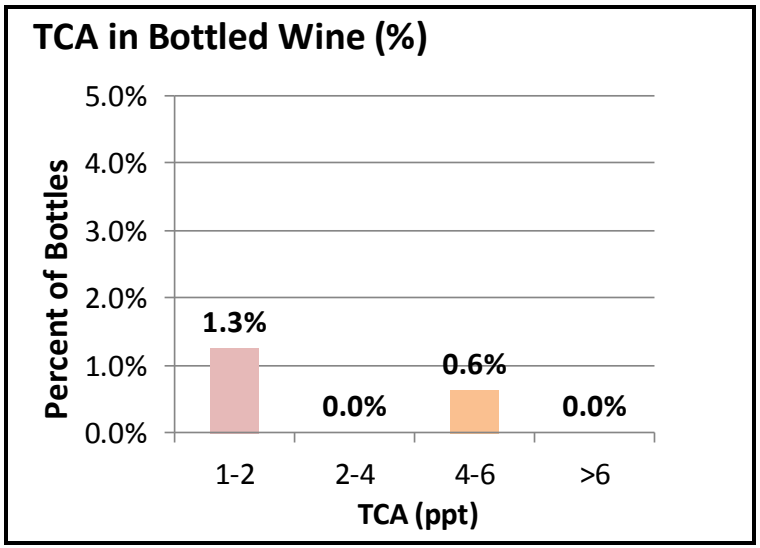
BALE **AVF-C**

Inspection Results Expanded Resample

50-Cork Group Soaks

Replicate	1	2	3	4	5	6	7	8	9	10	Mean	StDev	Flags
rTCA	<0.5	<0.5	**4.24**	<0.5	<0.5	<0.5	0.81	0.72	<0.5	**1.95**	**1.02**	**1.23**	**2**





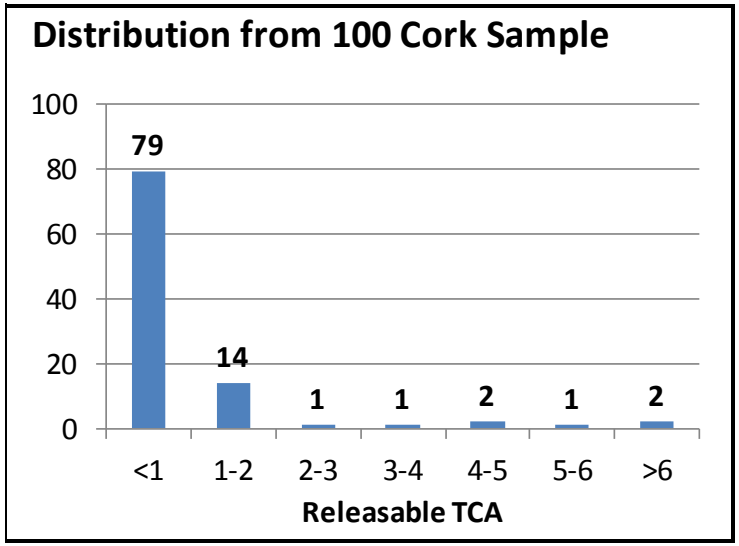
Group Cork Soaks Applied

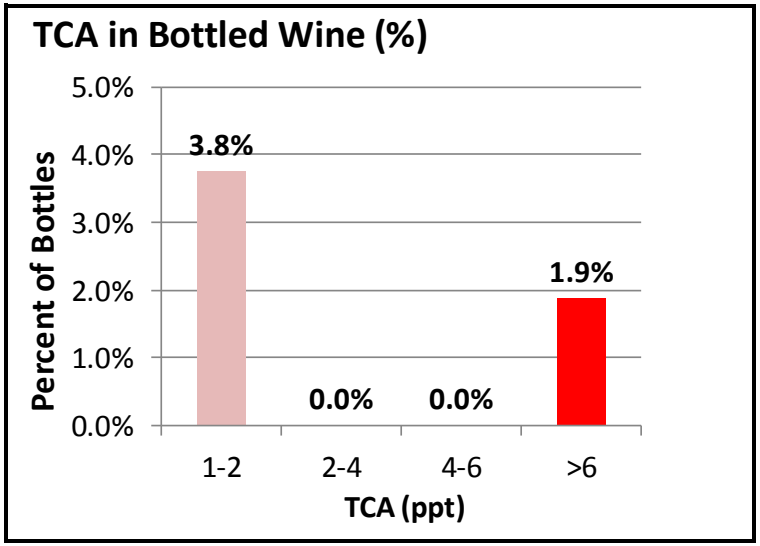
BALE **AVF-D**

Inspection Results **FAIL**

50-Cork Group Soaks

Replicate	1	2	3	4	5	6	7	8	9	10	Mean	StDev	Flags
rTCA	1.36	1.30	**1.75**	**1.70**	**1.86**	1.21	**5.20**	1.29	**2.14**	**1.69**	**1.95**	**1.18**	**6**





Group Cork Soaks Applied

Minimum CQC Sampling and Acceptance Criteria for:

Revised Protocol AQL 2.5

Approved 02/26/2013

Effective Date 1/17/2014

NATURAL CORK LOTS

Tests based on number of Bales

NUMBER OF BALES		2–8	9–15	16–25	26–50	51-90	91-150
SPME TESTING	**REQUIRED**						
Initial Bale Samples	*for all*	2	3	5	8	13	20
Pass / Fail	*natural corks*	0/1	0/1	0/1	0/1	1/2	1/2
Supplemental	**Conditional**						
Sampling (48hr Soak)	*based on*	3	5	8	13	20	32
Accept / Reject	*Initial Results*	0/1	0/1	0/1	1/2	1/2	2/3

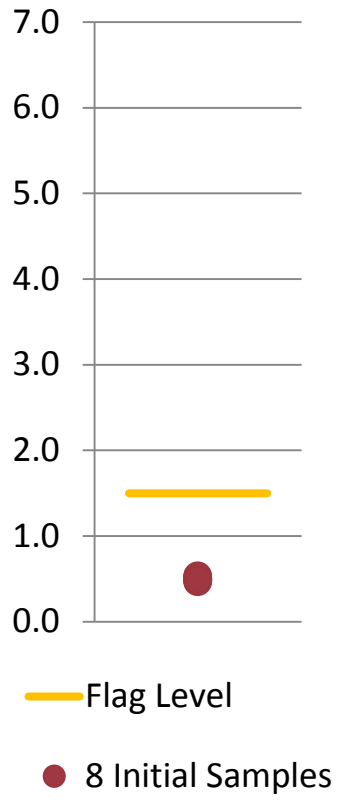
Group Cork Soaks Applied

Example 1

Eight initial samples, all at with scores of <MDL.

Lot accepted

Currently, 89% of incoming lots are accepted in the first pass.

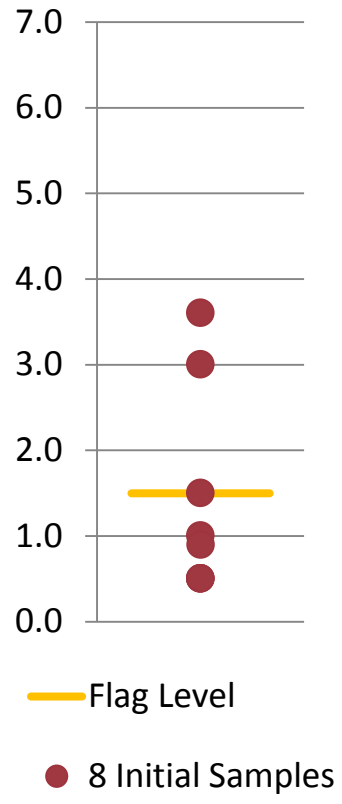


Example 2

Eight initial samples with three flagged scores.

No resample is performed.

Lot rejected



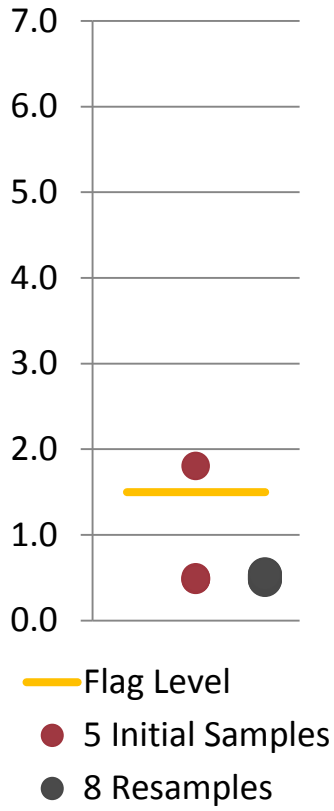
Group Cork Soaks Applied

Example 3

Five initial samples with one flagged score.

Resample of 8 tests with no flags.

Lot accepted

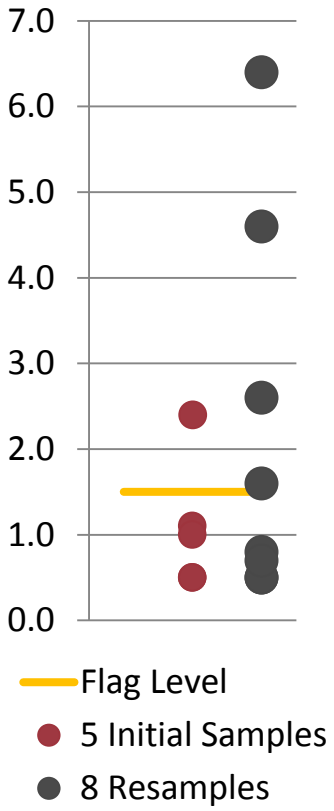


Example 4

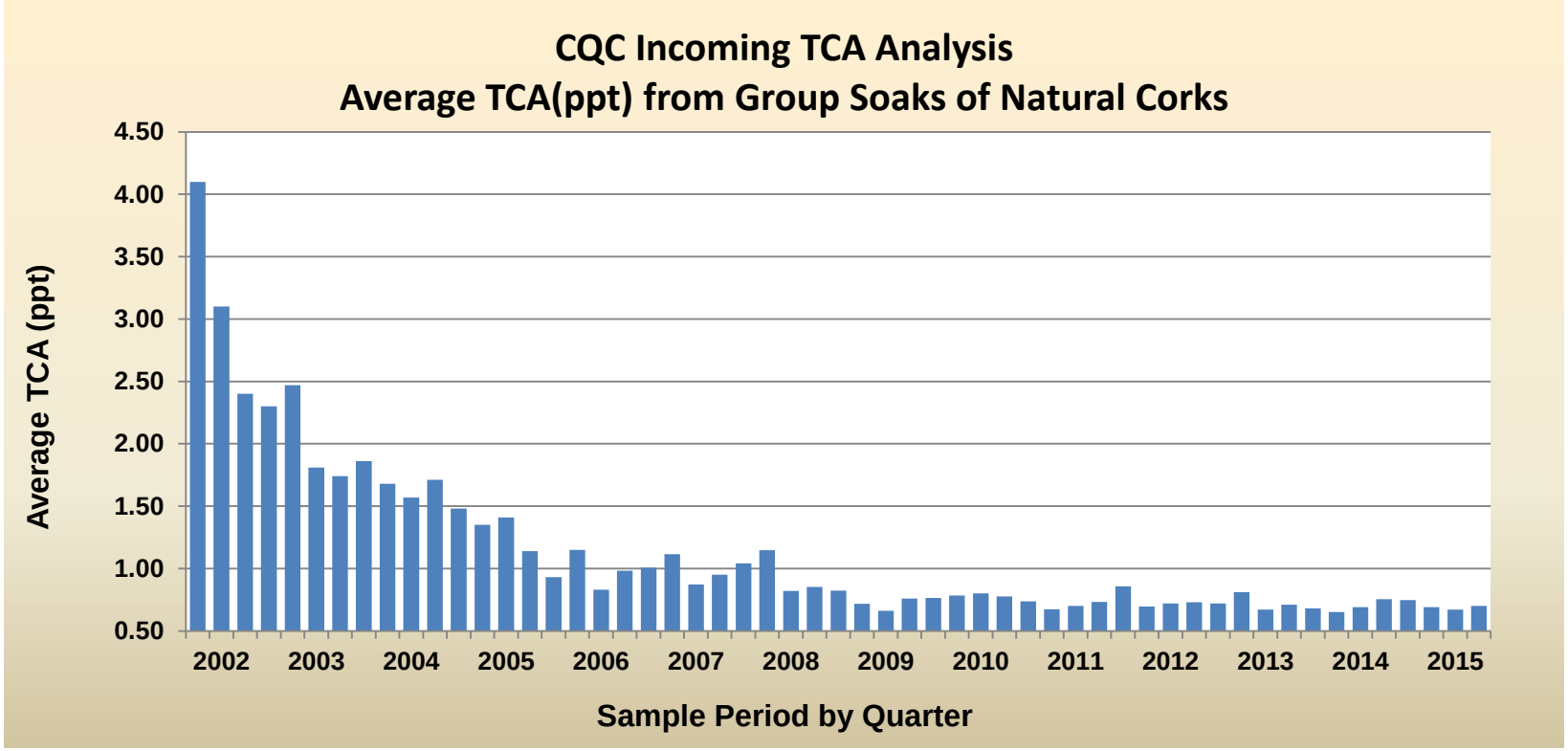
Five initial samples with one flagged score.

Resample of 8 tests with three flags.

Lot rejected

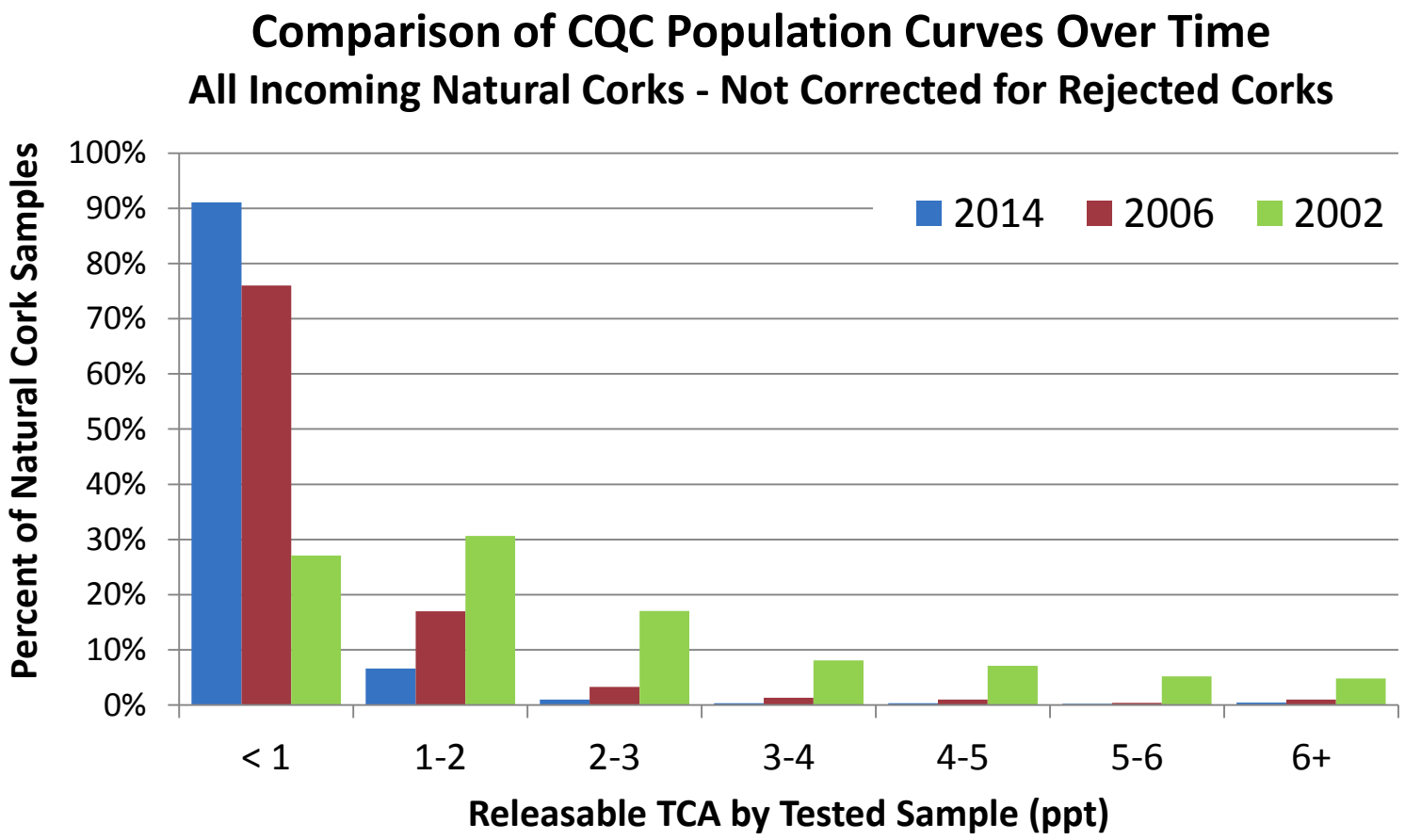


Group Cork Soaks Applied



N = 200,000+ Not Corrected for Rejected Corks

Group Cork Soaks Applied



Group Cork Soaks Applied

The CQC recently updated population statistics by selecting seven cork bales from accepted inventory.

Cork Population Profiles

TCA Range	CQC 2015 700 Corks	AVF (A&B) 200 Corks
<1.0	98.0%	97.0%
1-2	0.7%	2.0%
2-3	0.3%	0.5%
3-4	0.4%	0.0%
4-5	0.3%	0.0%
5-6	0.0%	0.0%
>6	0.3%	0.5%
Total	100%	100%

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Thanks to the CQC for providing their data and helping compile this today's presentation.