

The background of the slide is a close-up, shallow depth-of-field photograph of numerous white, oval-shaped pills scattered across the surface. A single, prominent red, cylindrical pill is positioned slightly to the left of the center, standing out against the sea of white pills. The lighting is bright and even, highlighting the smooth texture of the pills.

Controlled Substance Analysis: Sampling Plans

**Oregon State Police
Forensic Services Division**

HOW WE TEST

- To report the identity of a controlled substance, we need at least two tests. One test is a *screening test* (presumptive) and the other test is an instrumental *confirmatory test* that confirms the drug in the sample by comparing it with a known standard of that drug.
- For substantial quantities, drugs are taken out of their packaging, net weighed, and re-packaged. A gross weight, which includes the packaging, may be taken for smaller amounts.
- For example, 25 ziploc bags of meth = 25 separate “units”. Each bag must be weighed, tested, and repackaged separately, even if they look similar and were submitted as one item by the agency.

Gross weights

You may see reports that list a gross weight rather than a net weight. A gross weight includes the weight of the packaging; a net weight is the weight of only the substance itself, even though the packaging is still listed on the report.

Analysts will report a net weight in cases in which the drug's weight exceeds a weight-related sentencing guideline

Using Sampling Plans

Advantages

- Decreases time per case (faster turn-around)
- Decreases use of costly chemicals and instrumentation
- Widely used in the forensic community
- Usually sufficient to prove PCS/DCS of a controlled substance

Disadvantages

- Means that some items are not tested
- Can be confusing to explain (statistics)
- In the legal community, there is a lack of understanding/communication of what we do.
- May be challenged in court.

When do we use a Sampling Plan?

When an agency exhibit of drug evidence is made up of multiple, separate units, and the expert opinion of the analyst is that all the units *within* that exhibit are the same, we may apply a Sampling Plan to that population. We base this expert opinion on:

- ❖ Visual examination of all the units: they must look the same
- ❖ Consistent analytical results for all tested units
- ❖ Training & Experience of the analyst and OSP's past success with use of sampling plans

Note: Contents of separate items are not physically combined with each other in drug analysis.

PAST PRACTICE:

Square Root Sampling Plan

- This is a traditional sampling plan, used since the 1990's . The analyst counts the number of visually similar units (ie. tablets, ziploc bags, or bindles) and does the screening test on the square root of that number. One unit is then confirmed.
- The controlled substance is confirmed in only one unit. There is no certainty about the rest of the units.
- From 2006-2009, OSP used this plan when weight was not an issue (ie. residue, a weight below a sentencing minimum, or for drugs without weight enhancements).
- Square root sampling has been thrown out in some courts: it is not statistical and there is less justification for applying the result to the whole sample population
- As of 2010, OSP labs no longer use this sampling plan.

PAST PRACTICE: SQUARE ROOT SAMPLING

Exhibit #	Agency #	Description	Finding
1	1	Fourteen round blue tablets with imprinted dolphin design (Net weight 3.36 grams) {Square root (4 tablets) “screened” (ie. color test); 1 tablet confirmed}	MDMA, Schedule I {No level of confidence statement can be made by analyst}
2	2	Twenty-five knotted balloon bindles, each containing a layer of plastic around dark brown tarry substance (Net weight 2.23 grams) {Square root (5 bindles) “screened”; 1 bindle confirmed}	Heroin, Schedule I {No level of confidence statement can be made by analyst}

This report lists findings applied to the entire population, but the analyst can not make any probability statements for anything other than the one unit that was confirmed. We are no longer using this type of sampling plan as of January 2010.

CURRENT PRACTICE: 2010

- **Hypergeometric Sampling Plan**

OSP adopted this plan for our ISO accreditation in 2006.

- **Break-apart itemization**

Units are confirmed until a weight enhancement is met; rest of units are not examined (based on ORS 475.900)

- **Confirm one unit only; the rest: not examined**

Used if weight is not a factor in sentencing

# of UNITS	SCREEN & CONFIRM
1-10	All
11-12	10
13	10
14	11
15-16	12
17	13
18	14
19-24	15
25-26	16
27	17
28-35	18
36-37	19
38-46	20
47-48	21
49-58	22
59-77	23
78-88	24
89-118	25
119-178	26
179-298	27
299-939	28
940+	29

Hypergeometric Sampling

- Based on statistical probability, there is a 95% likelihood that at least 90% of the units contain the drug
- Reality: Visual similarity adds another level of confidence. If a sampling plan was applied, the expert's opinion is that all units are the same substance.
- After confirming 29 units, there is no significant increase in confidence level.
- 29 units = ~6 hours of instrument time
- If any results are different than the rest, analyst re-evaluates the population.

CURRENT PRACTICE: HYPERGEOMETRIC SAMPLING

Exhibit #	Agency #	Description	Finding
1	1	Four hundred round blue tablets with imprinted dolphin design (Net weight 80.01 grams) {A statistically-determined number (28 tablets) screened and confirmed}	MDMA, Schedule I Analyst can testify: 95% probability that 90% of tablets contain MDMA
2	2	One hundred knotted balloon bindles, each containing a layer of plastic around dark brown tarry substance (Net weight 15.23 grams) {A statistically-determined number (25 bindles) screened and confirmed}	Heroin, Schedule I Analyst can testify: 95% probability that 90% of bindles contain heroin

This report lists findings applied to the entire population; the analyst has a statistical level of certainty that all units contain the controlled substance.

CURRENT PRACTICE: BREAK-APART ITEMIZATION

Exhibit #	Agency #	Description	Finding
1	1	Thirty-four knotted balloon bindles, each containing a layer of plastic around dark brown tarry substance (Net weight 5.14 grams) {All 34 bindles confirmed}	Heroin, Schedule I Analyst can testify: 100% certain to contain heroin (all 34 bindles).
2	1	Sixty-six knotted balloon bindles, each containing a layer of plastic around dark brown tarry substance	Not examined. Analyst can testify: only that they appeared visually similar to Exh. 1

Finding for Exhibit 1 is 100% certain. No certainty (no analysis) for the rest of the population.

CURRENT PRACTICE: CONFIRM ONLY ONE UNIT

Exhibit #	Agency #	Description	Finding
1	1	One knotted balloon bindle containing a layer of plastic around dark brown tarry substance (Net weight 0.14 grams) {One bindle confirmed}	Heroin, Schedule I Analyst can testify: 100% certain to contain heroin.
2	1	Three knotted balloon bindles, each containing a layer of plastic around dark brown tarry substance	Not examined. Analyst can testify: only that they appeared visually similar to Exh. 1

Finding for Exhibit 1 is 100% certain. No certainty (no analysis) for the rest of the population. This applies to cases where a weight enhancement is not a factor.

Sampling plan summary

- If the drug reaches a weight enhancement we will either:
 - Do hypergeometric sampling: report the result applied to the entire population (statistical certainty)
 - Break the exhibit apart; confirm all units up to the weight, not examine the remainder
- If there is no weight enhancement reached, we may only confirm one unit, not examine the remainder.

Why should you care?

- Forensic testing methods should be accurately represented to juries and members of the court
- New procedures may take more time
- Analysts can testify to explain sampling plans and reasons behind them
- In certain cases, *you* might want a certain type of sampling plan applied. Contact us before the case is worked to discuss this. Here's an example:



Let's say you have 100 bindles of suspected crack cocaine; each one weighing about 0.25 grams.

- If we use the break-apart method, we would confirm 20 bindles to get up to the 5-gram weight enhancement. Nothing certain could be said about the other 80 bindles that are “not examined”, but we are 100% sure that the 20 tested all contain cocaine base. The analyst may give their expert opinion in court about the untested bindles.
- If we use hyper-geometric sampling, we would confirm 25 of the 100 (using the chart). We can now say that we have a 95% confidence that 90% of the entire group, all 100 bindles, contain cocaine base. In other words, 95% confidence that 90 bindles contain crack cocaine.
- Which one you prefer will depend on the specifics of the case and what you would rather have the expert testify to. If you don't contact the lab, the analyst will decide.

Limitations on time and resources prevent us from analyzing every item in every case. Sampling plans help us minimize turn-around time by balancing efficiency with certainty. However, this sampling strategy may have legal ramifications in a particular case. If in doubt, call your local lab to discuss the case with the analyst or supervisor.

For general questions contact:

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