Authenticating Results: Identify Sample Mishandling Issues Prior to Reporting

There are many touchpoints in a specimen's journey, from collection and transportation to accessioning and processing at the lab, and finally reporting of results. A research lab may receive specimens from other collaborating labs, while a clinical lab may receive specimens from various clinics and hospitals. Labs may also receive multiple specimens from the same individual for paired tumor and normal studies, or from multiple family members for inherited disease risk screening. Once at the lab, depending on the biomarkers being tested, a specimen may undergo multiple molecular biology workflows, such as next generation sequencing (NGS), microarrays, targeted genotyping, methylation profiling, etc. Each of these steps carry the risks of labeling errors or specimens being swapped, which may lead to incorrect results being reported.

Labs implement rigorous quality systems to ensure chain of custody for specimens. However, specimen mishandling may occur at various steps, and these mistakes can result in incorrect care, damaging a lab's reputation.[1]

The sample integrity panels from Agena Bioscience® enable labs to ensure that the results match the specimen, by using single nucleotide polymorphisms (SNPs) to generate a genetic fingerprint (SNP profile) to uniquely identify each specimen. With robust sample tracking, labs can prevent reporting errors due to sample mis-identification.

Sample Identification and Tracking Solutions on the MassARRAY® System

Agena Bioscience offers two sample integrity panels for specimen identification and tracking on the MassARRAY System:

	Sample ID Panel	Exome QC Panel
# SNPs for Identification	44	21
Genomic Regions Targeted	Introns and Exons	Exons
Biological Gender Markers	3	3
DNA Quantity: Amplifiable Template Copies	5,000 – 18,000 ~15 ng – 60 ng	100 – 100,000 ~0.3 ng – 300 ng
DNA Quality: Amplifiable Template Size	-	100bp – 500bp
Specimen Types	Blood, Urine, Oral swab, Cell lines	Tumor biopsies, FFPE tissue
Best Suited For	Whole genome sequencing (WGS), Targeted sequencing, Biobanking	Whole exome sequencing (WES), Cytogenetic arrays

Agena® BIOSCIENCE

Both panels are supported by powerful automated reporting software that enables:

- Creation of a local database to store the SNP profiles for every specimen.
- Comparison of SNP profiles to identify any unexpected matches or mismatches.
- Matching of paired specimens, including tumor and normal, taking loss of heterozygosity of tumor specimens into account.

Agena's sample integrity panels can be incorporated into a lab's workflow in a variety of ways; several examples are described below.

Scenario 1: Verifying specimens received from different sources

When conducting a research study, a lab may receive specimens from other collaborating labs and collection sites. A clinical lab may receive specimens from various doctor's office, clinics, and, with the increasing use of at-home collection, directly from patients. Handling errors often occur before specimens even reach the testing laboratory - during collection or transportation. Instituting a sample verification process can help a lab make sure its own chain of custody protocols have operated correctly, as well as catch some pre-lab mix ups (for example, flagging sample gender mismatches)

After accessioning the specimen and extracting DNA, labs can use one of Agena's sample identification panels to generate a unique SNP profile for each specimen. This can be done prior to (fig. 1), or in parallel with (fig. 2), other molecular testing. Labs can then compare this SNP profile with the profile generated by sequencing before reporting results, ensuring that the results match the specimen.

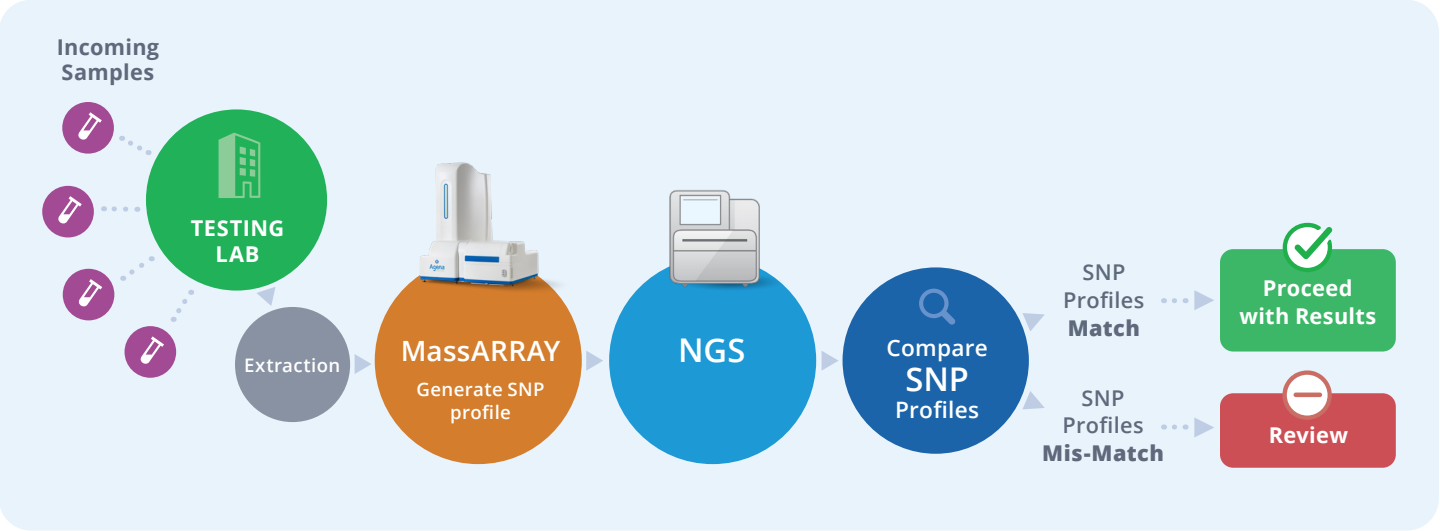

Figure 1. Verifying specimens received from different sources using a unique SNP profile prior to downstream molecular analysis

Next generation sequencing workflows can be complex as they involve transfer of specimens between multiple steps. With manual processes as well as with the use of automation, there is a risk of specimen mix-up during transfer from tube to microtiter plate, between two microtiter plates, or from tube to flow cell or ion chip.

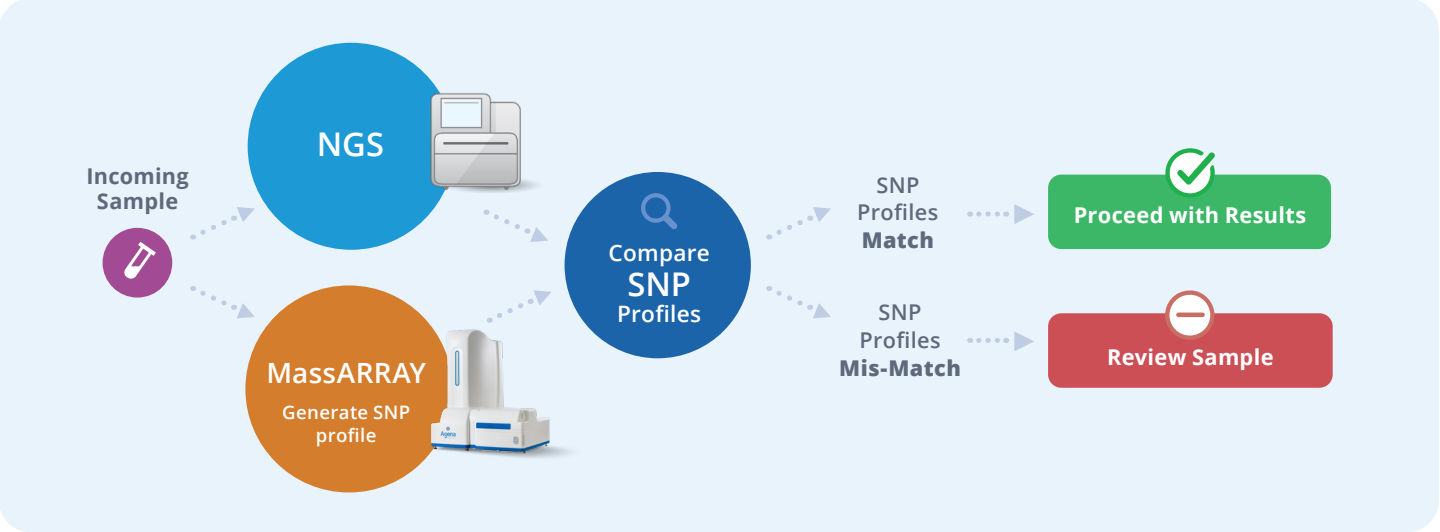

Figure 2. Generating unique SNP profiles in parallel with other molecular testing such as NGS.

Scenario 2: Working with paired specimens

In some cases, more than one type of specimen may be collected from a patient such as blood and tissue biopsy, blood and urine, tissue biopsy and liquid biopsy, etc. When reporting results, labs need to ensure that the results from the paired specimens are from the same individual, and that the specimens have not been mislabeled or swapped.

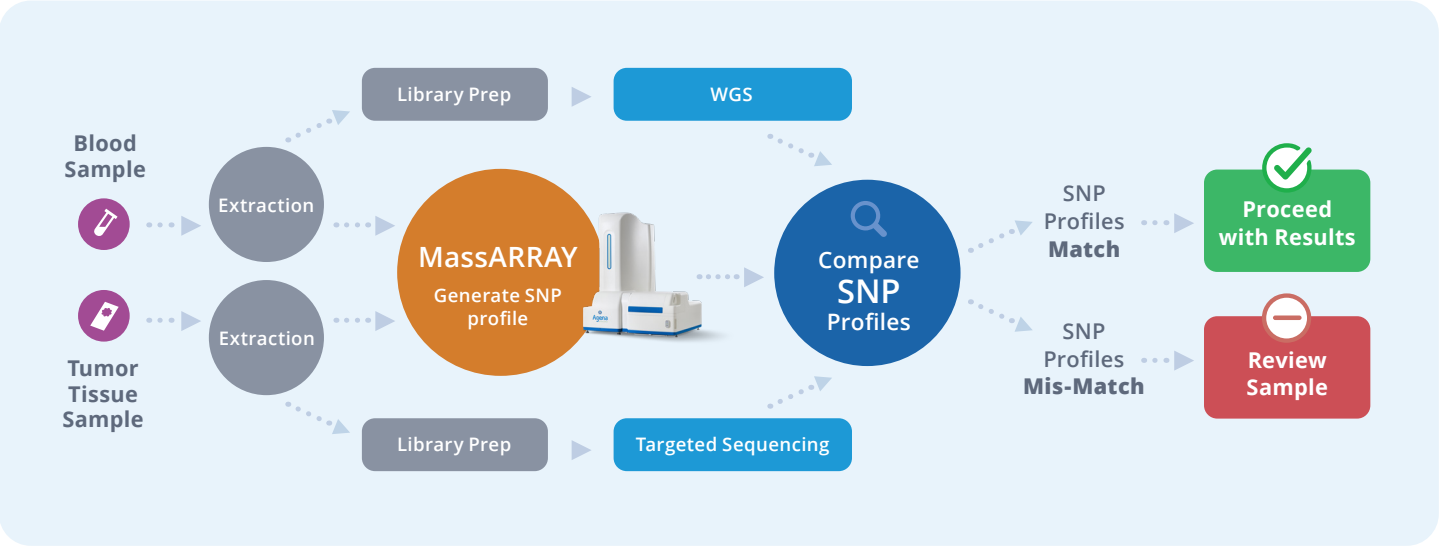

Figure 3. Matching paired tumor and normal specimens in an NGS workflow

With the exception of the MassARRAY Dx and MassARRAY SARS-CoV-2 Panel, all other products are For Research Use Only. Not for use in diagnostic procedures.

The sample integrity software enables matching of paired tumor and normal specimens, while taking into consideration the loss of heterozygosity in tumor specimens as well as specimen degradation from formalin fixation.

Scenario 3: Specimen verification at a biobank

Biobanks receive specimens from various sources for storage, testing, and later distribution. Using one of Agena's sample integrity panels, a biobank can generate a SNP profile for each specimen it receives, prior to storage as well as prior to distribution, to ensure accurate specimen identification. This is especially critical when multiple specimen types from the same individual are being collected, or in longitudinal studies, where multiple specimens are collected over periods of time and data needs to be correlated.

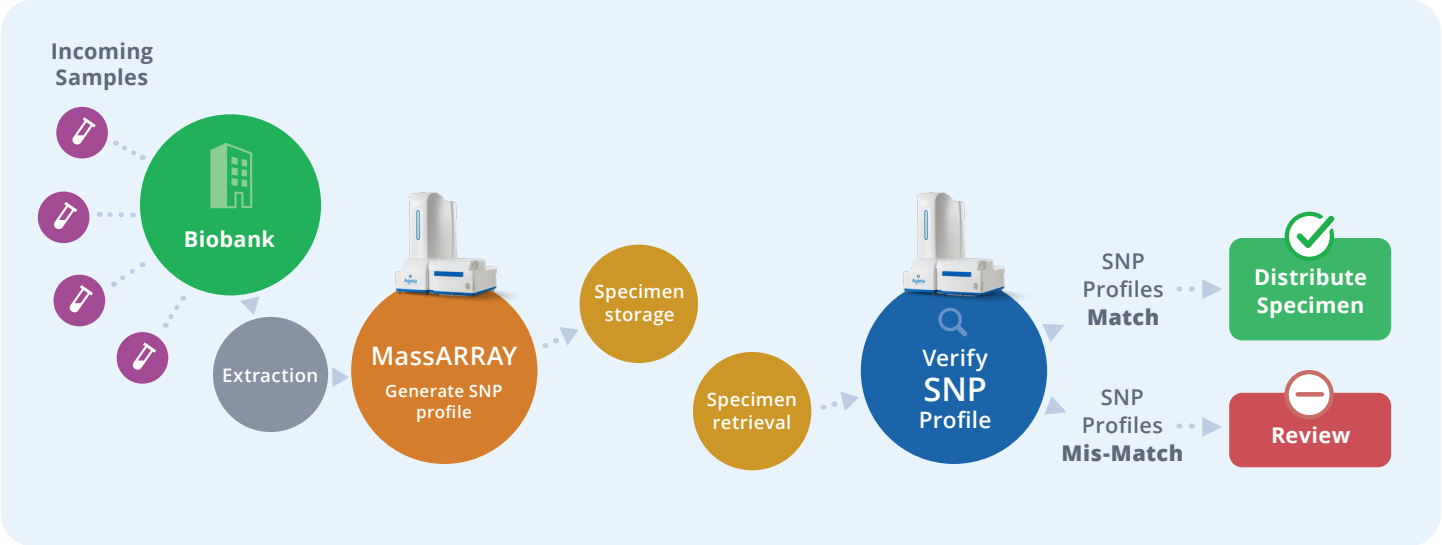

Figure 4. Verifying specimen identification at a biobank

Scenario 4: Resolve unknown specimens

A lab may occasionally be faced with an unlabeled aliquot or a tissue section whose source or identity may be unknown. Agena's sample integrity panels can be used to accurately match the tissue to the source, preserving precious specimens and enabling labs to provide accurate results.

Figure 5. Accurately identify tissue sections and match them with the right block

Agena's sample integrity panels offer a low-cost, high-throughput, and reliable method to identify and match specimens, providing labs with confidence when reporting results.

- Prevent reporting mistakes by verifying specimen identity using unique SNP profiles.
- Automatically compare SNP profiles to determine if sample originated from the stated source, especially when working with paired specimens.

References

1. Marberger M, McConnell JD, Fowler I, et al. Biopsy Misidentification Identified by DNA Profiling in a Large Multicenter Trial. Journal of Clinical Oncology. 2011;29(13):1744-1749. doi:10.1200/JCO.2010.32.1646

Agena Bioscience, Inc.
4755 Eastgate Mall
San Diego, CA 92121
Phone: +1.858.882.2800

Order Desk: +1.858.202.9301
Order Desk Fax: +1.858.202.9220
orderdesk@agenabio.com
Web: www.agenabio.com

GEN0055 01