
Newborn Bloodspot Collection and Screening 2021

Leah Bjornskov Wessenberg, RN, FNP-C
Nurse Educator, Oregon State Public Health Laboratory
Nurse Practitioner, OHSU Metabolic Clinic
bjornsko@ohsu.edu



Oregon
Health
Authority

Three types of newborn screening

- Bloodspot (NBS)
- CCHD/pulse ox*
- Hearing*



GOAL of Newborn Screening: Diagnose and treat disorders before they cause permanent harm- we screen because we can treat!

*typically performed by birthing provider

What clinicians need to know about newborn bloodspot screening

Why it's important:

- Prevents death and/or disability
- Babies may look and act healthy at birth
- The disorders are not very common
- The disorders we screen for have treatments
- It's not just the "PKU" test!



Newborn Screening Saves Lives

- Baby boy, uncomplicated pregnancy, normal vaginal delivery at 38 weeks, joining two healthy parents and a healthy sibling.
- Apgars were 8&9, discharged after 24 hours with mom and baby doing very well, bilirubin at discharge was low-risk at 5.8. Newborn bloodspot screen (NBS) collected prior to discharge.
- 3 days of age: appt with PCP, gaining weight well, feeding well (exclusively breastmilk) every 2-4 hours, no jaundice, no parental or provider concerns.
- 9 days of age: presented to PCP for circumcision, parents and provider noted jaundice. Child otherwise well-appearing. NBS results received that day concerning for galactosemia (GALT of 0.0; Galactose of 30 (nl <20))

Continued...

- Due to NBS results in conjunction with the jaundice, child sent straight to emergency dept, and found to be in liver failure: Tbili at 32.9, Dbili 18.5, INR 2.12, AST 185, ALT 208, Alk Phos 786.
- Admitted to neonatal ICU
 - Immediate cessation of breast feeding
 - IV fluid with D10, then PO feedings with Isomil (soy) infant formula
 - Phototherapy x2 days for jaundice
- Discharged on admit day 4 in good health



Neonatal Emergency

- Children who aren't quickly identified with galactosemia have a high rate of mortality (liver failure, overwhelming sepsis, bleeding)
- Rare: 1:40,000-1:60,000 births in Western countries
- Making the diagnosis early will save the baby's life: transition feeding from breast milk or lactose-containing formula (typically to soy formula) and supportive care until condition improves.
- Lactose-free diet for life.



Newborn Bloodspot Screening includes



- Cystic Fibrosis
- Endocrine disorders
- Congenital hypothyroidism
- Fatty acid disorders
- Amino acid disorders
- Organic acid disorders
- Immune disorders
- Galactosemia
- Hemoglobin disorders
- Lysosomal storage disease
- More coming!

Dry Blood Spot Collection

- DBS is whole blood collected on filter paper from a heel stick
- Screening infants includes *proper specimen collection, proper handling and packaging, prompt shipment to the state lab for testing*
- An issue in any of these areas can result in a unsatisfactory screening attempt! This can delay a life-saving diagnosis!

What to tell parents?

- Educate parents about newborn screening
- Know your pediatrician or provider at time of birth
 - *we need to know where to result out to or who to contact. This is so important and often missed!*
- Ask your provider about the results
 - *don't assume no news is good news*
- Look for the card that is part 2 of the “kit” and bring it to your baby’s doctor

Parents should be sent home after birth with part 2 of the “kit” and a brochure about testing.

They should bring this to their baby’s Doctor for the 2-week check-up.

RETURN TO: OREGON STATE PUBLIC HEALTH LAB
7202 N.E. EVERGREEN PARKWAY, SUITE 100
HILLSBORO, OR 97124 (609)693-4174

2026-01-31 [LOT] 7200121 [LOT] W261

2nd Newborn Screening
SPECIMEN OR [SN] * 2 2 1 5 0 0 7 2 5 *

DO NOT WRITE IN THIS SPACE

Baby's Last Name: _____ Baby's First Name: _____ Send Report to PCP/Clinic: _____ CODE: _____

() Single Birth, or () Multi-Birth A B C D E F Circle One Address/Telephone Number: _____

Sex: M F ID Chart #: _____

Food Source Last 24 Hours: Breast, Soy Formula, NPO Check all that apply
 Lactose Formula, Other

Other Factors: Early Discharge/Transfer TPN None Transfusion: _____

Birth Date: (/ /) 24 Hour Time: : Birth Wt. _____ gms
Specimen Date: (/ /) 24 Hour Time: : Present Wt. _____ gms

Hosp. or Hosp. CODE/Submitter ID and Address: _____ Last RBC Transfusion Date OR None

Mother's Last Name: _____ Mother's First Name: _____

2026-01-31 [LOT] 7200121

Specimen taken by: _____

Do NOT use capillary tubes.
DO NOT REMOVE.
Fold flap over blood spots before mailing.

BIOHAZARD

Newborn screening could save your BABY'S life

Why?
A special blood test can find rare disorders that can cause brain damage or death if they are not treated early.

Who?
State law requires hospitals and midwives to collect a screening specimen on every baby born in the state.

When?
The first test must be collected before your baby leaves the hospital or birth center. The second test should be collected before your baby is 15 days old. Take the second screening card to your baby's care provider at your first visit after birth.

How?
A few drops of blood from your baby's heel are put onto a special test paper.

What about test results?
Ask your baby's doctor for the test results. Another test is sometimes needed for different reasons. If your baby needs more testing it is important to act quickly. If needed, treatment should be started as soon as possible.

For more information
Talk with your doctor, midwife or nurse. Visit the following Web sites:
Oregon State Public Health Laboratory www.oregon.gov/DHS/ph/nbs/index.shtml
National Newborn Screening and Genetics Resource Center <http://nngenes.fda.us.hhs.gov>

Conditions identified by newborn screening

- Congenital Hypothyroidism
- Phenylketonuria (PKU)
- Cystic Fibrosis
- Galactosemia
- Biotinidase Deficiency
- Congenital Adrenal Hyperplasia
- Hemoglobinopathies
- Amino Acid Disorders
- Fatty Acid/Organic Acid Disorders

You can get this publication in an alternate format for individuals with disabilities by contacting (503) 229-5882.

DHS Department of Human Services
DHS 8541 Rev. 05/2008

Newborn Screening Tests

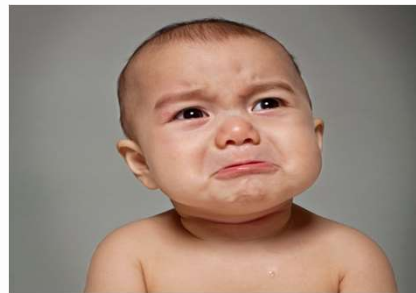
Postage Required
Post Office will not deliver without proper postage

OR

OREGON HEALTH AUTHORITY
PUBLIC HEALTH DIVISION
OREGON STATE PUBLIC HEALTH LABORATORY
PO BOX 275
PORTLAND OR 97207-0275

What to tell parents?

- The heel stick isn't a dangerous or risky procedure, and you can also help it be as comfortable for the baby as possible:
 - No anesthetic creams can be used (might interfere with the analytic testing) BUT:
 - You can gently massage the newborn's leg before doing a heel stick
 - You can provide non-nutritive sucking (such as a pacifier)
 - You can allow the newborn to breastfeed during the heel stick
 - You can give an oral glucose: sucrose (20-30%) solution a couple minutes before the heel stick
 - Swaddle the baby in an upright position during the heel stick



Timing of Specimen Collection

- Normal newborns should be tested at 24-48 hours old. Do it as soon as the baby has achieved 24 hours of life!
- The second screening for a normal newborn is collected between 10-14 days of age (typically at the 2 week follow up visit)
- NICU infants will get 3 screens
- Non-critical abnormal results: may require an *urgent* repeat screen, or early 2nd screen
- Unsatisfactory Specimen: requires an *urgent* repeat screen
- The goal is to have lab results to report at 5 days of life!

Why Two Screens?

If you only do one screen, some disorders may be missed!

A percentage of some disorders are found on the 2nd screen after a normal first screen

- Hypothyroidism 10%
- Adrenal Hyperplasia 20%
- Non-PKU Aminoacidopathies 10-50%
- MCAD 5%
- CPT1 78%
- Carnitine Uptake 60%
- LCHAD/VLCAD 15%

*Not all testing performed on a first screen is repeated on the second screen.

Who is responsible for which screen?

- Before leaving birth facility (due to early discharge home, or transfer to another facility for any reason), a first screen must be obtained
- This may mean the first NBS screen is obtained prior to 24hrs of age
 - please check the box on the card if this is the case!
 - if this cannot be done for a specific medical reason, this must be documented in the chart and the accepting facility must be informed
 - the goal is to prevent a missed first screen
- Subsequent screenings will happen at the accepting facility
 - at the usual timing intervals
 - as requested by the Oregon newborn screening follow up team
- After discharge home, the primary care provider is responsible for newborn bloodspot screening
 - Must obtain, review, and act upon (as needed) all previous screens
 - Must collect any additional screens as needed

Two Screens or Three Screens?

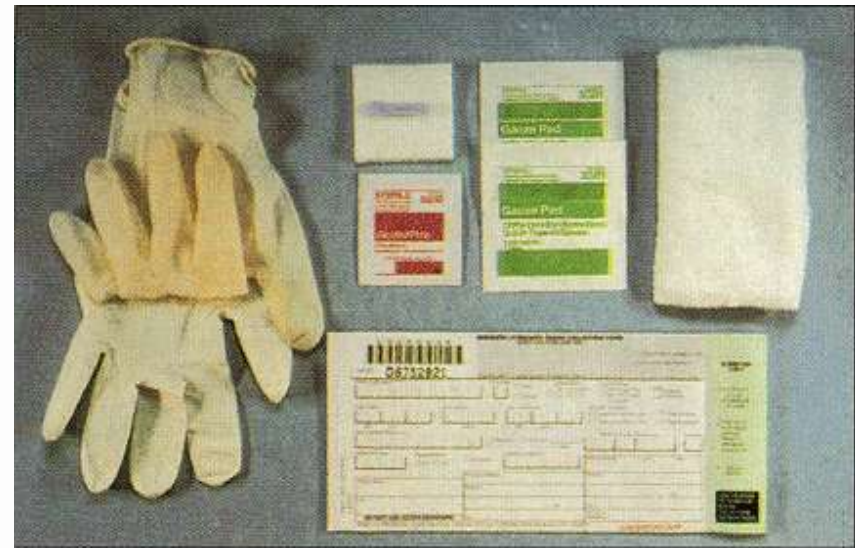
Table 2 — Age of infant at specimen collection

	Collection Kit	First specimen	Second specimen	Third specimen
Routine Birth	Double Kit	As soon as possible after 24 hours of age but before 48 hours of age	10-14 days	Not Collected
NICU infants transfused prior to 24 hours of age	Triple Kit	Prior to transfusion	48-72 hours after birth	~ 1 month, no sooner than 28 days
NICU infants not transfused prior to 24 hours of age	Triple Kit	As soon as possible after 24 hours of age but before 36 hours of age and prior to transfusion	10-14 days of age (11-15 days of life)	~ 1 month, no sooner than 28 days

Collecting a specimen: Gather your supplies

You will need:

- Blood collection card (Part 1 or Part 2, depending if this is the first or second screen)
- Gloves
- Alcohol wipe and gauze
- Heel warmer
- Lancet device (one specific for DBS collection!)



Complete the demographic form

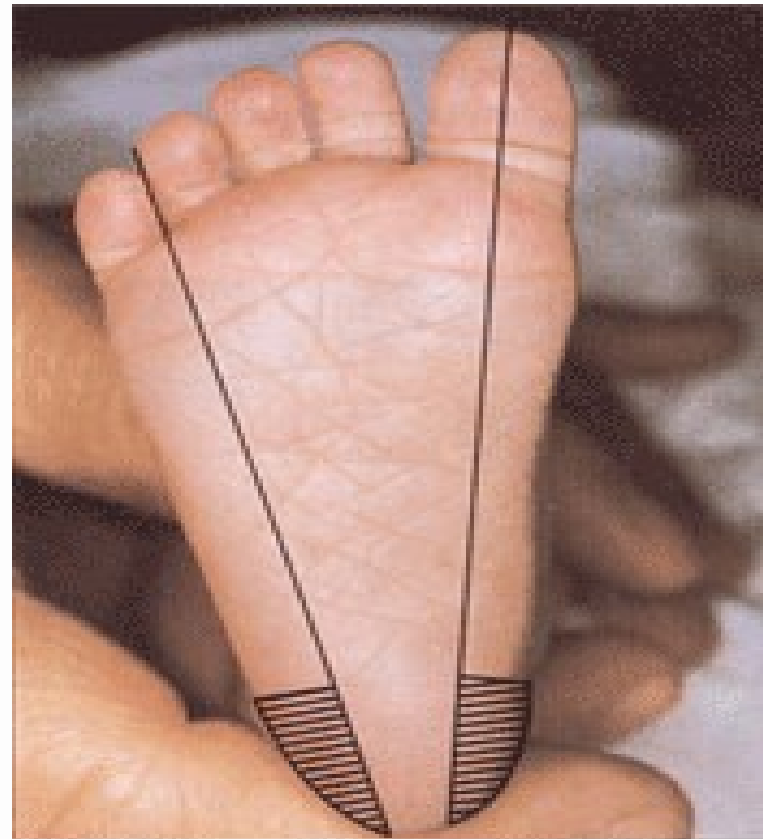
- Fill in the demographic information **completely** before collecting the specimen.
- Make sure to include the full name of the PCP/Clinic. Use the provider code if known. This is needed to follow up on results.

Part 7 - 903 Lot W201
 7 1/3" x 2 1/16" (4 1/16") - Prints Bio Black 586 Ink
 Tips to back of Part 6 with EBF Glue #1003
 Indicated in Green
 Circle size: 12mm ID

DO NOT WRITE IN THESE SPACES CODE	
Report to PCP/Clinic: _____ address/Telephone Number _____	Birth Date _____ 24 Hour Time _____ Birth Wt. _____ gms Specimen Date _____ 24 Hour Time _____ Present Wt. _____ gms
address/Telephone Number _____	DO NOT WRITE IN THESE SPACES CODE
DO NOT WRITE IN THESE SPACES CODE	DO NOT WRITE IN THESE SPACES CODE
Birth Date _____ 24 Hour Time _____ Birth Wt. _____ gms Specimen Date _____ 24 Hour Time _____ Present Wt. _____ gms Other's Last Name _____ Mother's First Name _____	DO NOT WRITE IN THESE SPACES CODE
DO NOT WRITE IN THESE SPACES CODE	DO NOT WRITE IN THESE SPACES CODE
Telephone Number: _____ State _____ Zip Code _____ 2026-01-31 [LOT] 7200121	Telephone Number: _____ State _____ Zip Code _____ 2026-01-31 [LOT] 7200121
AVOID HANDLING COLLECTION AREA. Be sure that blood soaks completely through filter paper. Only collect on ONE SIDE of the card. DO NOT spot blood on top of blood. DO NOT use capillary tubes. It is acceptable to spot blood on and outside of lines. [LOT] 7200121 W201	AVOID HANDLING COLLECTION AREA. Be sure that blood soaks completely through filter paper. Only collect on ONE SIDE of the card. DO NOT spot blood on top of blood. DO NOT use capillary tubes. It is acceptable to spot blood on and outside of lines. [LOT] 7200121 W201
2026-01-31 903TM OR SN 2215500001	2026-01-31 903TM OR SN 1215500001

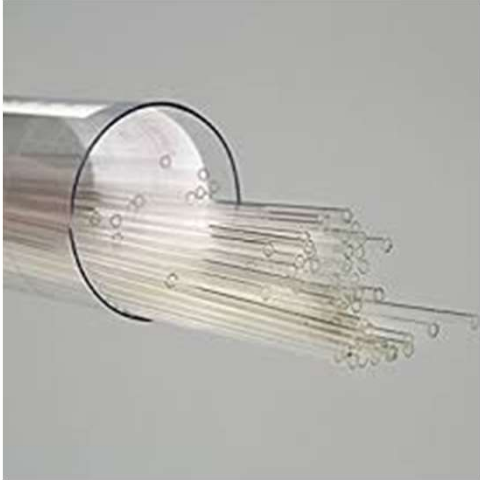
Choose your collection site

- A heel stick is preferred
- IV and central lines (sometimes used in NICU) not preferred due to high risk of fluid contamination and uneven saturation.

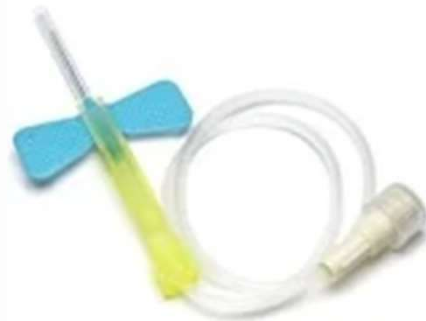


Hatched area () indicates safe areas for puncture site.

Avoid capillary tubes or needles when applying blood to filter paper



- Scratches or tears filter paper
- Causes uneven saturation
- Needles & cap tubes lyse the red cells, which leads to false negative or positive results!

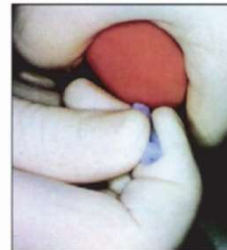


Heel Stick Procedure, step-by-step:

- Fill out the demographic data on the card. It must be complete- every detail counts when we are interpreting the results or need to follow up
- Use appropriate patient identification technique. Make sure you have the right filter paper kit (Part 1 or 2)
 - Note: be careful not to crush or compress filter paper while it is being stored for use, or put anything on top of the card- it will keep the blood from saturating properly
- Don't touch the filter paper- handle properly and wear gloves to avoid contamination.
 - Always use Universal Safety Precautions (as with any other specimen collection)
 - Do not touch or contaminate filter paper on the card with hands, gloves, bodily fluids, powder, formula, water, coffee, or anything else
 - DNA testing is sometimes performed as part of the NBS process, and it is important to prevent contamination with extraneous DNA from handlers!

Heel Stick Procedure, step-by-step:

- Apply heat pack- this will improve your blood flow!
- Cleans the site on the baby's heel with alcohol swab and air dry
- Lance the site, and *wipe away the first drop of blood* (it will be contaminated)
- Allow one large drop to collect, and drop to the filter paper so that it fills up the circle completely AND is able to saturate the filter paper evenly- the front side and back side should look the same. Continue for each circle
 - Take care to avoid touching the heel directly to the filter paper! Only the blood drop itself should come into contact with the paper!



- Apply pressure to heel until bleeding stops

Helpful Hints

- Positioning baby
- Massage the blood downwards
- Apply lancet to the heel with some pressure
- Forewarn parents: it might take more than one heel stick
- You can apply blood anywhere on the filter paper

An example:

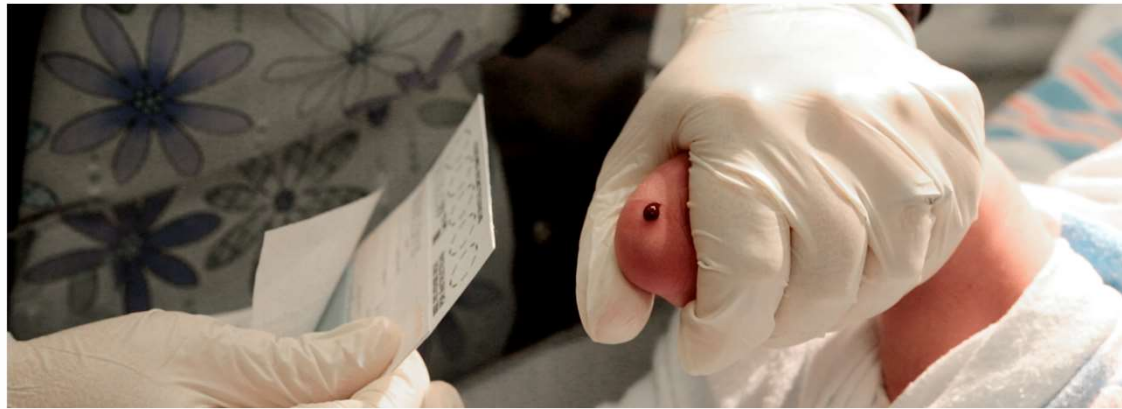
<https://www.youtube.com/watch?v=30qbkhp1jQ8>

<https://www.youtube.com/watch?v=u5S3OfWFelc>



Helpful Hints

- Neatness does not count!
- You can use either side of the filter paper to fill, but only fill from one side
- Don't superimpose or put blood drops on top of each other ("layering")
- Don't "milk" the heel- you will get serosanguinous fluid and we need whole blood only
- If the blood flow is slow, restick!



Proper Handling Post-Collection

- Take care not to touch or smear your blood spots
- Allow to air-dry horizontally for 3-4 hours at room temp
- Keep away from direct sunlight
- No not heat, stack or allow the blood spots to touch other surfaces during the drying process



- No need to dry longer than 3-4 hrs
- No not hang filter paper in a dependent position
- Do not cover blood spots with end paper until dry
- Do not store or ship in plastic bags

And then ship to the OSPHL

- Place the protective cover over the DBS
- When stacking multiple cards, reverse ends so blood spots don't touch
- Make sure all demographic data is complete and card is fully filled out. Inspect to be sure the DBS are adequate
- Prepare a packing list of the specimens
- Put the specimens into their sealable paper envelopes or your large mailing envelope (when sending multiple specimens)
- Ship the same day by courier, express mail or a postal service
- Don't accumulate specimens
- Consider weather and holidays

Weekends and Holidays

- Keep your specimens in a cool, dry, and at room temperature until able to send out. **AVOID** sunlight, heat, humidity, hot mailboxes, or similar conditions.
- **Send by overnight or express mail on the following business day.**
- **Even with holidays, the goal is always to have the specimen received by the OSPHL within 1-2 days of the specimen collection.**



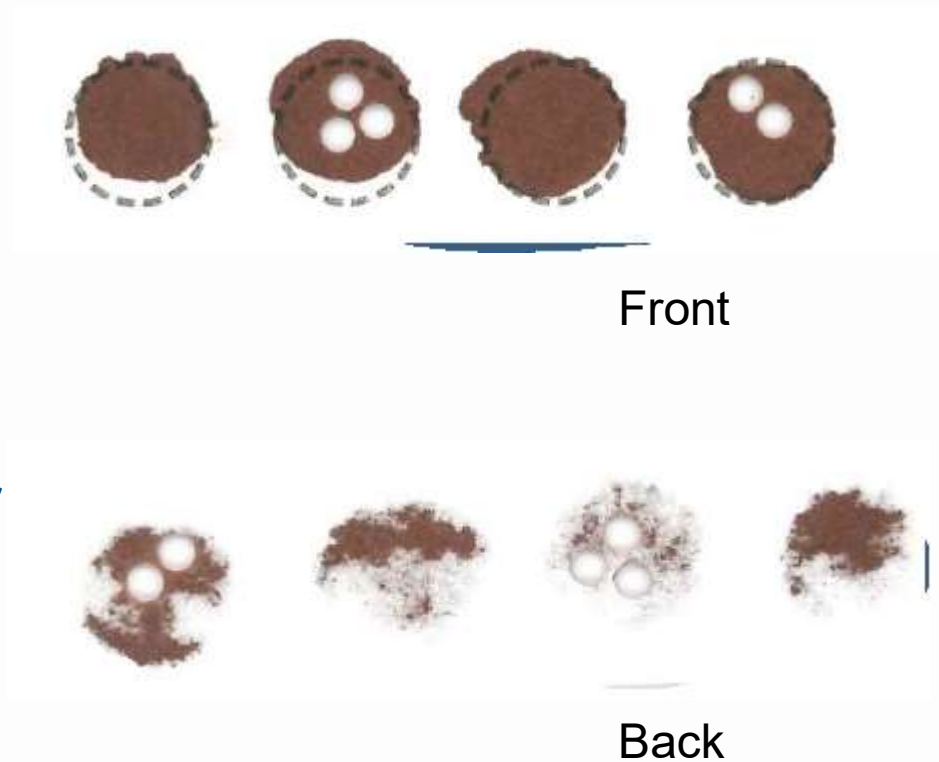
A Good Specimen Collection

- The circles are completely filled
- Blood is evenly saturated
- Looks the same on both sides of filter paper
- No contamination evident
- No heat/humidity exposure
- Was laid flat to dry



Uneven Saturation

- When blood applied with needle or capillary tube
- Touching filter paper with gloves or hands
- Other contaminate or damage to paper
- Hanging them to dry
- Poor blood flow!

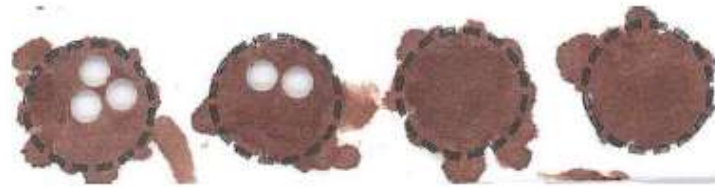


Uneven Saturation

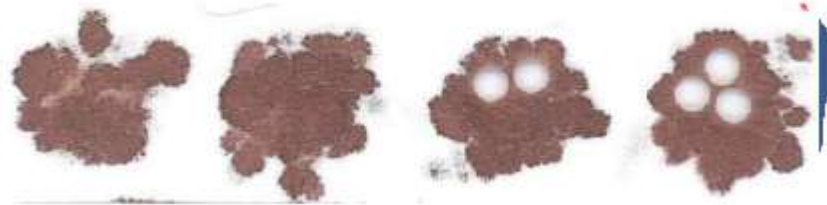


Layering

- Usually due to collecting multiple small spots to fill in the circle
- Happens when blood flow is poor



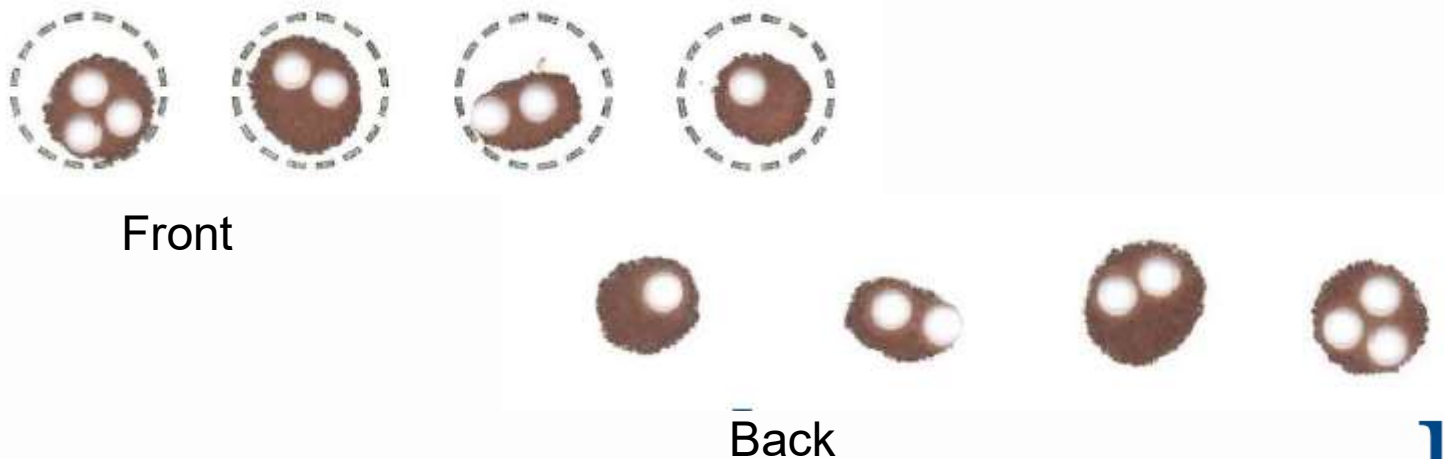
Front



Back

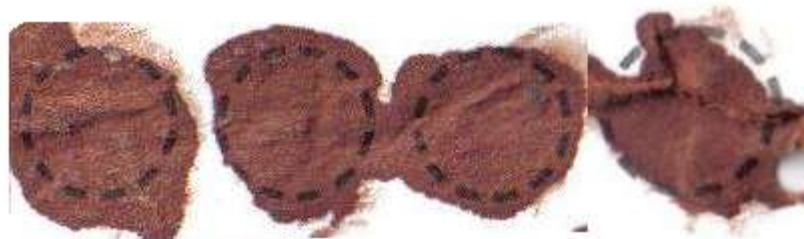
Quantity Not Sufficient

- When not enough blood is applied within the circles
- When the drops of blood are too small to saturate the filter paper
- Inadequate blood flow



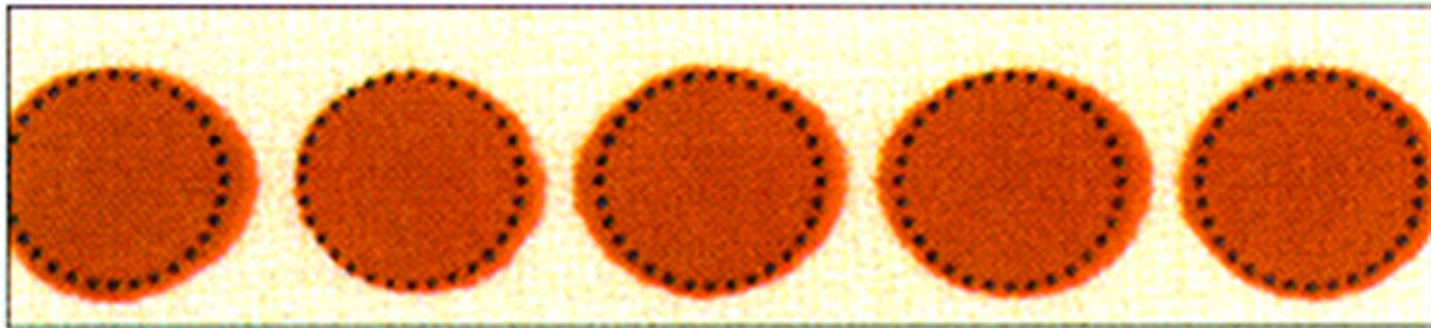
Scratched or abraded

- Applying blood with a capillary tube or a needle
- Oversaturation can abrade the paper
- Not dried properly



Odd color, or wet

- Specimen not dried sufficiently
- Sometimes if baby is very anemic pre-transfusion



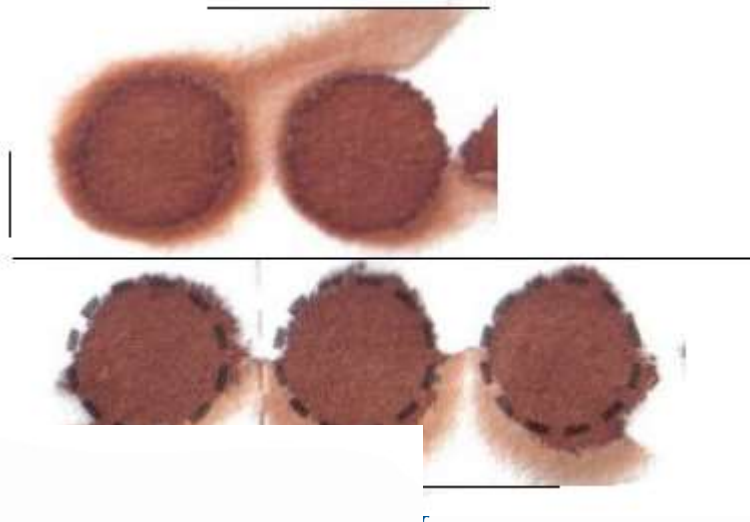
Clotted, layered, or super-saturated

- Applying excess blood, usually from a device
- Blood applied from both sides of the filter paper
- Blood applied on top of dried or semi-dried or already-saturated blood- usually when a restick should have been done due to insufficient blood flow.



Serum rings and contamination

- Not letting alcohol dry, not wiping away the first drop
- Contamination, with IV fluid, water, another substance
- Milking heel- sero sanguinous fluid
- Improper drying- exposed to heat or humidity, sunlight
- Cap tubes- can separate blood components



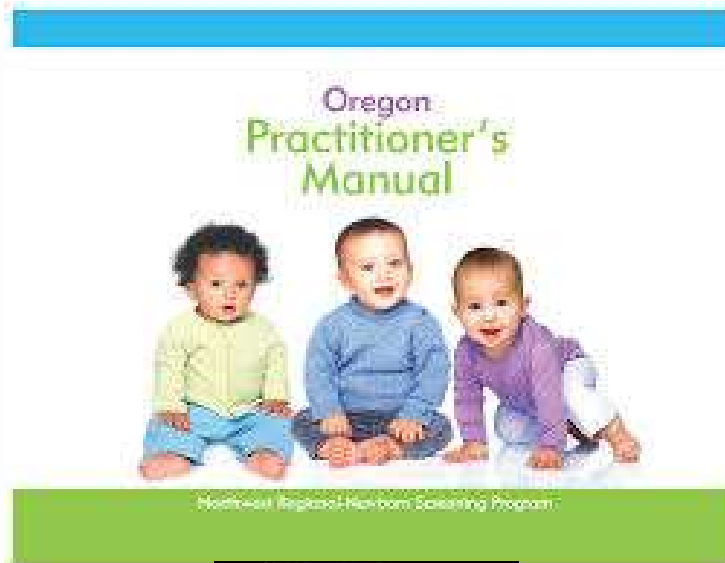
I'm happy to help!

Leah Wessenberg, RN, FNP-C

bjornsko@ohsu.edu

503-494-2776

Education



Resource from: Babysfirsttest.org

Screening Checklist

First Trimester	WEEK
● First Trimester Ultrasound	5 - 8
Determines: Viable pregnancy, heartbeat, gestational age, molar or ectopic pregnancies, abnormal gestation	
● Prenatal Blood Work	8
Determines: Blood type, Rh factor, glucose, iron and hemoglobin levels, rubella immunity, STDs, hepatitis, toxoplasmosis infection	
● First Trimester Screening	11 - 14
Assesses: Risk of Down Syndrome and Trisomy 18	

Second Trimester	WEEK
● Second Trimester Screening	15 - 20
Assesses: Risk of Down Syndrome, Trisomy 18, and neural tube defects	
● Second Trimester Ultrasound	18 - 20
Determines: Structural abnormalities, amniotic fluid levels, well-being	
● Glucose Screening	24 - 28
Determines: Mother's risk of gestational diabetes	

Third Trimester	WEEK
● Strep B Test	35 - 37
Determines: Presence of group B strep infection	

Newborn Screenings	WEEK
● Blood Test	24-48 hours
Results:	
● Hearing Screens	24-48 hours
Results:	
● Pulse Oximetry Test	24-48 hours
Results:	

Prenatal & Newborn Screening

My Contacts

OB/GYN
Phone: ()

Pediatrician
Phone: ()

Appointment Notes:

For more information about newborn screening, please visit www.babysfirsttest.org

Everything you need to know about your baby's first tests