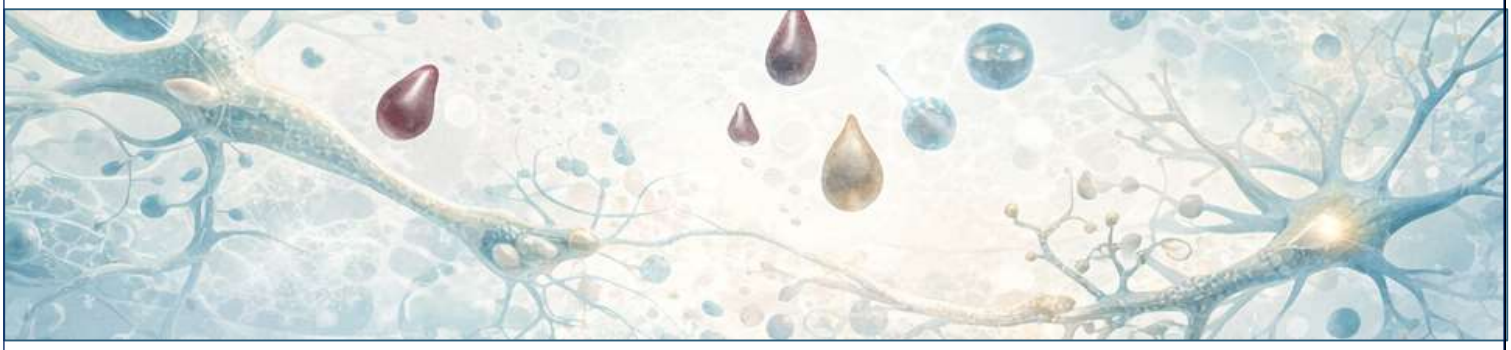
Ochsner Health

Ochsner Neurocognitive Program

Understanding Biomarkers



Biomarkers are **biological clues** that help doctors understand what is happening inside the brain by identifing the **underlying cause** of changes in cognition.

Biomarkers help your care team:

- Clarify the cause of cognitive change
- Distinguish neurodegenerative disease from reversible contributors
- Guide treatment decisions and monitoring

They do **not** predict the future or replace a clinical evaluation. They help explain *why* symptoms may be occurring

Key brain proteins biomarkers measure

- **Amyloid** – linked to Alzheimer's disease
- **Tau** – reflects disease activity and progression
- **Alpha-synuclein** – linked to Parkinson's and Lewy body disorders
- **Injury or stress markers** – show strain on brain cells

How biomarkers are checked

- **Blood tests** – simple screening
- **Spinal fluid (CSF)** – direct measure of brain biology
- **Brain imaging (MRI, PET)** – structure and protein activity
- **Skin biopsy** – detects alpha-synuclein in nerve fibers

What this means for you

Biomarkers are tools for **understanding**, not labels or predictions. Results are interpreted together with symptoms, daily function, and personal goals. **The goal is clarity and informed decision-making — not alarm.**

Key Points

- Biomarkers are biological **clues** about brain health
- They can be measured by blood, spinal fluid, imaging, or skin
- Biomarkers **can** clarify the cause of cognitive change
- Biomarkers **can** guide monitoring and decisions
- Biomarkers **cannot** predict the future
- Not everyone needs every test
- Biomarkers **cannot** replace clinical evaluation
- The goal is **understanding** and **informed care — not alarm**

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Understanding Blood-Based Biomarkers

Blood-based biomarkers are laboratory tests that measure specific proteins in the blood that can reflect changes happening in the brain. In memory and thinking evaluations, these tests are most often used to look for **biologic signals associated with Alzheimer's disease** and for evidence of **overall brain stress or injury**. They do **not** diagnose dementia by themselves and are always interpreted alongside symptoms, daily function, cognitive testing, and brain imaging.

Blood biomarkers are best understood as **decision-support tools**. Their role is to help clarify what disease biology may be present and to guide whether additional testing.

What blood biomarkers can tell us

Blood biomarkers can suggest whether Alzheimer-type proteins are likely present and whether there is evidence of active brain injury or stress. When results align with symptoms, they can increase diagnostic confidence and help guide next steps.

What blood biomarkers cannot tell us

They cannot predict how quickly symptoms will change, determine future independence, or replace a full clinical evaluation. A single blood test result **does <u>not</u> equal a diagnosis.**

Key blood biomarkers used in cognitive care

- **Aβ 42/40 ratio:** Screens for amyloid plaque; a lower ratio supports Alzheimer-type changes.
- **p-tau181:** An established tau marker; elevations suggest Alzheimer's disease.
- **p-tau217:** The most specific blood marker for Alzheimer's disease
- **p-tau231:** A newer tau marker that may become abnormal very early in the Alzheimer's disease process.
- **p-tau217 / Aβ42 ratio:** Combines tau and amyloid into one result to improve diagnostic accuracy.
- **GFAP:** Reflects non-specific brain stress and support-cell activation
- **NfL:** Reflects non-specific nerve cell injury; higher levels signal damage but do not identify the cause.

How results are used

Results are interpreted as part of a pattern. Some results support Alzheimer's disease, others diseases, and some are borderline or unclear. Additional testing such as spinal fluid analysis or PET imaging is recommended if it would change management.

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Key takeaway

Blood-based biomarkers are an important and evolving part of memory care. When used thoughtfully and in context, they help clarify diagnosis, guide next steps, and support personalized care—but they are only one piece of the overall evaluation.

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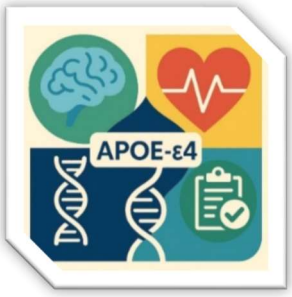
Understanding APOE

What Is APOE?

APOE (Apolipoprotein E) is a gene that helps the body process fats, including cholesterol, and plays an important role in brain health. It supports brain cell repair, communication between neurons, and how the brain clears waste proteins over time. Everyone inherits **two copies of APOE**, one from each parent.



What Are the APOE Types?

There are three common forms of APOE:

- **APOE-ε2** – Less common; associated with *lower* risk of Alzheimer's disease
- **APOE-ε3** – Most common; considered *neutral* risk
- **APOE-ε4** – Associated with *higher* risk of Alzheimer's disease and cardiovascular disease

Some people carry one copy of ε4, others carry two.

Does APOE Mean I Will Get Alzheimer's?

No.

APOE affects **risk**, not certainty. Many people with APOE-ε4 never develop dementia, and many people without ε4 do. APOE is **one factor** among many dementia risk factors, including lifestyle, diet, and sleep.

Why Does APOE Matter Clinically?

APOE influences:

- Inflammation levels in the brain
- Cholesterol and blood vessel health
- Risk related to certain Alzheimer's treatments

Understanding APOE helps guide **monitoring, prevention, and medical decisions**.

What This Means

APOE is a **tool for understanding risk**, not a diagnosis or prediction.
Knowledge allows for proactive care, thoughtful monitoring, and personalized prevention

Key Points

- APOE affects risk, not certainty
- Most people with APOE-ε4 do not develop dementia
- Lifestyle and vascular health strongly influence outcomes
- APOE is used for prevention and planning—not prediction
- Heart and brain health are closely connected
- Care decisions are individualized and

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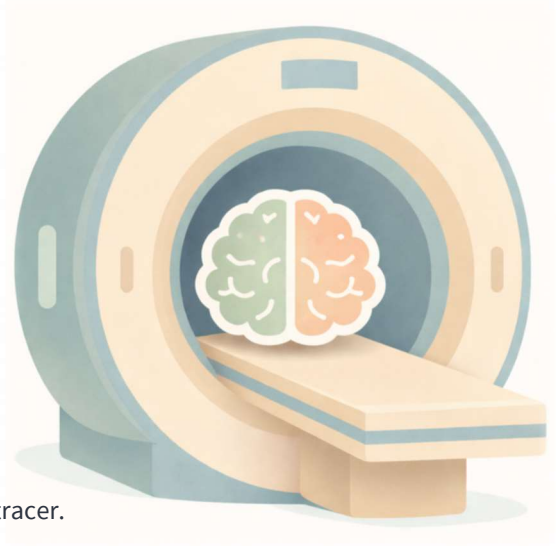
Understanding Brain MRI and PET Imaging

Brain imaging helps clinicians understand *why* changes in memory, thinking, behavior, or movement may be occurring. These tests do not diagnose symptoms on their own. They provide biological and structural context that supports accurate diagnosis and care planning.



Brain MRI

MRI shows the **structure of the brain** and does not use radiation.

It helps identify:

- Brain volume and shrinkage
- Strokes, small vessel disease, or microbleeds
- Prior injury or inflammation
- Treatment safety considerations

MRI asks: *What does the brain look like?*

PET Imaging

PET scans look at **brain function or protein buildup** using a small injected tracer.

Common PET Scans

- **FDG-PET:** Shows how active brain regions are by measuring energy use.
- **Amyloid PET:** Detects amyloid protein associated with Alzheimer's disease.
- **Tau PET:** Maps tau protein, often reflecting disease stage and symptom patterns. Avaiable only through research.

PET asks: *What is happening biologically in the brain?*

How Results Are Used

Imaging results are interpreted alongside:

- Symptoms and daily function
- Cognitive testing
- Medical history
- Blood or spinal fluid biomarkers

What this means

MRI and PET provide complementary information. MRI focuses on structure and safety. PET reveals brain biology and function. Together, they help guide personalized care..

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Understanding Lumbar Puncture

Why Are We Recommending This Test?

When someone has changes in memory or thinking, an important question is why those changes are happening. A lumbar puncture lets us look at brain biology, not just symptoms, helping us make a more confident diagnosis and avoid missing conditions that can look similar.

What Does a Lumbar Puncture Help Us Determine?

A lumbar puncture helps us answer two key questions:

Certain proteins in spinal fluid can confirm whether Alzheimer's disease is truly affecting the brain.

Some conditions can **mimic Alzheimer's disease**, including:

- Lewy body disease
- Autoimmune or inflammatory brain conditions
- Infections or other rare causes

These conditions require **different treatments and care plans**, which is why clarity matters.

What Is a Lumbar Puncture?

A lumbar puncture (sometimes called a "spinal tap") is a procedure where a small needle is placed in the **lower back** to collect a small amount of fluid that surrounds the brain and spinal cord. This fluid is called **cerebrospinal fluid (CSF)**. It carries important information about brain health. The needle is placed **below the spinal cord**, so it does not touch the spinal cord or brain.

What Are the Most Common Side Effects?

- **Headache (most common)**
  - Caused by a small, temporary fluid leak
  - Worse upright, better lying flat. Usually improves with rest, fluids, and caffeine
  - Severe or lasting headaches are uncommon and treatable
- **Other effects (less common)**
  - Mild lower back soreness
  - Temporary leg tingling
  - Rare bleeding or infection
  - Serious complications are very rare

Key Points

- Helps confirm Alzheimer's disease and rule out mimics
- Tests spinal fluid, which reflects brain biology
- Done below the spinal cord — does not touch the brain, does not touch the spinal cord.
- Similar to an epidural used in childbirth. >70% of U.S. women receive epidurals safely
- Most common side effect: temporary headache (~1 in 4)
- Serious complications are rare, and the goal of testing is clarity and accurate diagnosis, not alarm.

Want to Learn More?