5-ALA Evidence and Potential

Research across tumor visualization, diabetes, exercise, skin, mental health, and brain science

Note
This deck includes medical-use 5-ALA, topical formulations, dietary supplements, and 5-ALA combined with SFC/iron. Route, dose, and indication differ by study.
This material introduces research information only. It does not guarantee diagnosis, treatment, prevention, improvement of disease, or the effects of any specific product.

Biozipcode, Inc.

What Is 5-ALA?

5-Aminolevulinic Acid (5-ALA) is studied as a component related to the body’s energy production.

In Brief

5-ALA is a naturally present building block for energy production.

Reported in Clinical Studies

- **Human clinical studies have been reported.**
- **Glucose, skin, fatigue, muscle, and brain markers were studied.**
- **Medical 5-ALA can help identify tumors.**

- Therapeutic potential of 5-aminolevulinic acid in metabolic disorders
  https://www.cell.com/iscience/fulltext/S2589-0042(24)02704-4
- Biochemistry, Heme Synthesis
  https://www.ncbi.nlm.nih.gov/books/NBK537329/
- Dietary supplement 5-ALA and glucose/HbA1c in prediabetes
  https://pubmed.ncbi.nlm.nih.gov/22883608/
- Fluorescence-guided surgery with 5-ALA for malignant glioma
  https://pubmed.ncbi.nlm.nih.gov/16648043/

5-ALA Basics

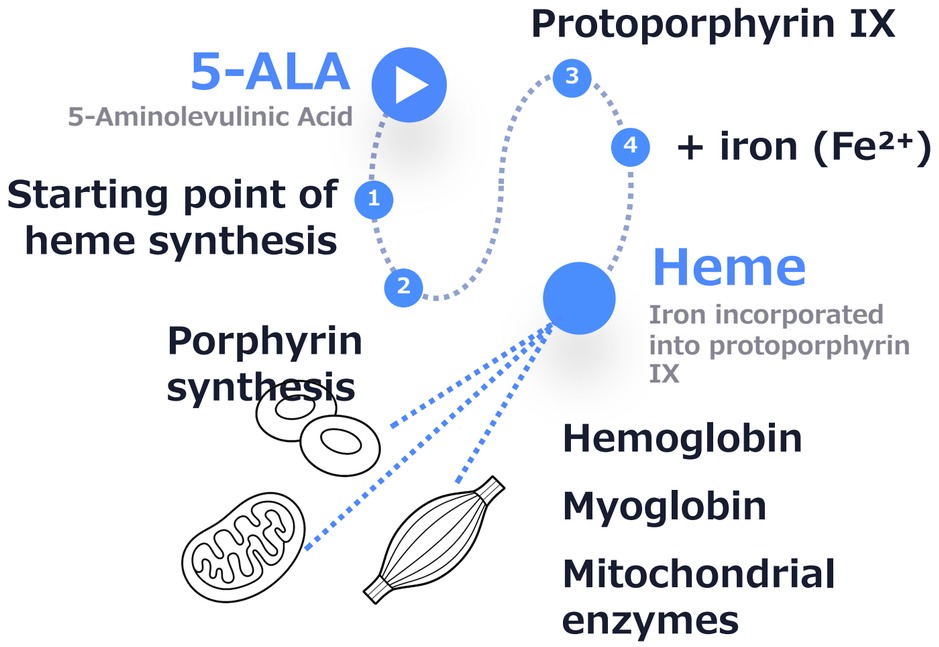
Mitochondria = the cell's power plants; 5-ALA = a building block for key components

In Brief

5-ALA is related to the body's energy-production process.

Reported in Clinical Studies

- **5-ALA is involved in heme production.**
- **Heme relates to oxygen transport and energy.**
- **Metabolism and fatigue are being studied.**



- Biochemistry, Heme Synthesis
  https://www.ncbi.nlm.nih.gov/books/NBK537329/
- 5-Aminolevulinate synthase and the first step of heme biosynthesis
  https://pubmed.ncbi.nlm.nih.gov/7592562/
- Structure of mitochondrial aminolevulinic acid synthase
  https://pubmed.ncbi.nlm.nih.gov/29551290/
- Therapeutic potential of 5-ALA in metabolic disorders
  https://www.cell.com/iscience/fulltext/S2589-0042(24)02704-4

Diabetes & Glucose

Some studies have reported lower glucose-related markers in people concerned a

In Brief

Studies have reported favorable changes in glucose, HbA1c, and related markers.

Reported in Clinical Studies

- **Prediabetes and mild hyperglycemia have been studied.**
- **Glucose and HbA1c changes were reported.**
- **Some studies used 5-ALA alone or with iron.**

- Use of Dietary Supplement 5-ALA and Glucose/HbA1c in Prediabetes
  https://pubmed.ncbi.nlm.nih.gov/22883608/
- 5-ALA reduces fasting and postprandial glucose levels
  https://pubmed.ncbi.nlm.nih.gov/23759263/
- Safety and tolerability of 5-ALA phosphate with sodium ferrous citrate in patients with type 2 diabetes mellitus in Bahrain
  https://pubmed.ncbi.nlm.nih.gov/27738640/
- Pilot trial on glucose tolerance in maternally inherited diabetes and deafness
  https://pubmed.ncbi.nlm.nih.gov/36418716/
- Safety test of 5-ALA phosphate with SFC in diabetic patients
  https://ffhdj.com/index.php/ffhd/article/view/151

Skin Health

Studies have evaluated skin moisture, wrinkles, and skin properties.

In Brief

Favorable changes in skin moisture and related markers have been reported.

Reported in Clinical Studies

- **Studies include middle-aged and older women.**
- **Moisture, wrinkles, and skin properties were evaluated.**
- **Some markers for moisture and elasticity changed.**

- Effects of 5-ALA supplements on the skin of middle-aged women
  https://www.lifescience.co.jp/yk/yk18/yke1805.html
- Assessing effects of 5-ALA supplementation on skin properties
  https://www.lifescience.co.jp/yk/yk19/yke1902.html
- J-GLOBAL: 5-ALA supplementation on skin properties
  https://jglobal.jst.go.jp/en/public/201902244656509384
- Photorejuvenation with topical 5-ALA and IPL
  https://pubmed.ncbi.nlm.nih.gov/15696983/

Exercise & Fatigue

Studies have looked at fatigue, walking ability, and exercise efficiency.

In Brief

Changes in fatigue and exercise-efficiency markers have been reported.

Reported in Clinical Studies

- **Fatigue and mood scores have been studied.**
- **Walking and exercise efficiency were studied in older women.**
- **Some fatigue and exercise markers changed.**

- 5-ALA with iron on exercise efficiency and walking in older women
  https://pubmed.ncbi.nlm.nih.gov/26514619/
- 5-ALA with iron on respiratory responses in women over 75
  https://pubmed.ncbi.nlm.nih.gov/33864830/
- Impact of 5-ALA supplementation on redox balance and aerobic capacity
  https://pubmed.ncbi.nlm.nih.gov/38256062/
- Reduction of fatigue and anger-hostility by oral 5-ALA phosphate
  https://pubmed.ncbi.nlm.nih.gov/32994490/

Mood & Sleep

Relationships with mood, sleep, and fatigue are being studied.

In Brief

5-ALA is being studied for its possible relationship with the foundations of mood and sleep.

Reported in Clinical Studies

- **Fatigue and anger-hostility scores decreased in one study.**
- **Walking training was studied in depressive tendencies.**
- **Links with sleep have also been reviewed.**

- 5-ALA supplementation and walking training in depressive women
  https://pubmed.ncbi.nlm.nih.gov/29740015/
- Reduction of fatigue and anger-hostility by oral 5-ALA phosphate
  https://pubmed.ncbi.nlm.nih.gov/32994490/
- Relationship of 5-ALA on mood and coping ability in prediabetic adults
  https://pubmed.ncbi.nlm.nih.gov/29862247/
- The Role of 5-Aminolevulinic Acid and Sleep
  https://www.scirp.org/journal/paperinformation?paperid=38440

Alzheimer’s & Brain

The relationship with brain energy metabolism is still at the research stage.

In Brief

Some studies are also exploring relationships with brain function.

Reported in Clinical Studies

- **Clinical trial registration exists for MCI and early Alzheimer’s.**
- **Animal studies examined brain mitochondria.**
- **Oxidative stress and Parkinson’s models were also studied.**

- UMIN: 5-ALA for mild cognitive impairment and early Alzheimer disease
  https://upload.umin.ac.jp/cgi-open-bin/ctr/ctr_view.cgi?recptno=R000028658
- Facilitation of brain mitochondrial activity by 5-ALA in Alzheimer’s disease model mice
  https://doi.org/10.1080/1028415X.2016.1199114
- Neuroprotective effects of 5-ALA in Parkinson disease and stroke models
  https://pubmed.ncbi.nlm.nih.gov/32807663/
- 5-ALA and oxidative stress / autistic-like behaviors in rats
  https://pubmed.ncbi.nlm.nih.gov/?term=5-aminolevulinic+acid+autistic-like+behaviors

Muscle & Sarcopenia

Studies have examined age-related muscle decline.

In Brief

Research results have been reported for muscle and physical function in older adults.

Reported in Clinical Studies

- **Muscle mass and physical function were studied in sarcopenia.**
- **Clinical research assessed 5-ALA plus iron.**
- **Walking and respiratory responses were also studied.**

- 5-ALA with iron on skeletal muscle mass index and physical performance in sarcopenia
  https://pubmed.ncbi.nlm.nih.gov/37447194/
- 5-ALA with iron on exercise efficiency and walking training in older women
  https://pubmed.ncbi.nlm.nih.gov/26514619/
- 5-ALA with iron on respiratory responses in older women over 75
  https://pubmed.ncbi.nlm.nih.gov/33864830/
- 5-ALA bypasses mitochondrial complex I deficiency
  https://pubmed.ncbi.nlm.nih.gov/37364055/

Cancer: Diagnostic Support

In medical settings, 5-ALA is used to help make tumors easier to identify.

In Brief

A use for “making tumors easier to identify,” not for “curing cancer.”

Reported in Clinical Studies

- **Medical 5-ALA can make some tumors fluoresce.**
- **Brain tumor and bladder cancer uses support diagnosis.**
- **Goal: help identify tumor areas during procedures.**

- Fluorescence-guided surgery with 5-ALA for malignant glioma
  https://pubmed.ncbi.nlm.nih.gov/16648043/
- Oral 5-ALA photodynamic diagnosis using fluorescence cystoscopy
  https://pubmed.ncbi.nlm.nih.gov/25843912/
- 5-ALA-induced fluorescence cystoscopy during TURBT
  https://pubmed.ncbi.nlm.nih.gov/16153204/
- PMDA: aminolevulinic acid hydrochloride safety information
  https://www.pmda.go.jp/files/000234079.pdf

Summary

5-ALA is being studied for “favorable changes” across multiple fields.

In Brief

Research findings have been reported in glucose, skin, fatigue, muscle, and brain-related areas.

Reported in Clinical Studies

- **Glucose, skin, and fatigue markers changed in studies.**
- **Medical 5-ALA can help identify tumors in oncology.**
- **Cure/prevention effects cannot yet be generalized.**

- Therapeutic potential of 5-aminolevulinic acid in metabolic disorders
  https://www.cell.com/iscience/fulltext/S2589-0042(24)02704-4
- Dietary supplement 5-ALA and glucose/HbA1c in prediabetes
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FAQs

How many 5-ALA tablets per day?

Intake depends on product type, amount per tablet, purpose, health status, medical conditions, and medications. Commercial 5-ALA supplements are health foods, not prescription drugs with a fixed dose.

If you are being treated for diabetes, use insulin or glucose-lowering drugs, have kidney/liver concerns, or are pregnant or breastfeeding, consult a physician before use.

FAQs

Is 5-ALA a medicine or a supplement?

5-ALA is classified differently depending on its use and product type. In medicine, 5-ALA hydrochloride has approved uses as a drug for photodynamic cancer diagnosis.

In Japan, 5-ALA supplements sold to consumers, generally using 5-ALA phosphate, are health foods, not medicines approved to treat diabetes. As a health-food ingredient, 5-ALA is also known to be present in sake, natto, fermented foods, and the human body.

FAQs

Does 5-ALA have side effects?

5-ALA exists in the human body and is involved in mitochondrial energy production. In a clinical study using 5-ALA with SFC up to 200 mg/day in type 2 diabetes, major safety issues appeared limited. However, being naturally present does not mean side effects are impossible; intake, constitution, medical conditions, and medicines matter.

Do not increase the amount or reduce medicines by yourself. Consult a physician.

FAQs

Will 5-ALA lower blood glucose?

Some studies using 5-ALA with the iron component SFC have reported improvement trends in fasting glucose, glycated albumin, 2-hour oral glucose tolerance values, HbA1c, and related markers. Studies on type 2 diabetes and mitochondrial diabetes suggest that 5-ALA may support glucose metabolism.

However, responses vary by individual and depend on diabetes status, pancreatic function, insulin resistance, diet, exercise, and medications. 5-ALA should not be used on one’s own as a substitute for diabetes drugs or insulin.

People using diabetes medicines need particular care. If taking 5-ALA, decisions should be made cautiously with glucose monitoring and medical supervision.

FAQs

Can 5-ALA cure type 1/2 diabetes?

At present, it cannot be said that 5-ALA cures type 1 or type 2 diabetes. 5-ALA is studied for its relationship with glucose metabolism and mitochondrial function. Clinical studies combining 5-ALA with SFC have reported safety findings and trends in glucose-related markers in type 2 diabetes.

Biozipcode Inc. is studying abnormal bone-marrow cells, sometimes called “diabetes stem cells,” as one possible reason diabetes is difficult to resolve. In mice, temporary insulin plus an HDAC inhibitor was reported to maintain normal blood glucose after treatment ended.

5-ALA is one candidate related to this research, but clinical trials are still needed before it can be considered a curative treatment.

FAQs

Can 5-ALA help diabetes complications?

Possibly, but it cannot be stated now that diabetic complications can be cured or fully resolved. Complications involve blood vessels, nerves, kidneys, eyes, heart, and other organs. Our research has organized more than 20 years of reports on bone-marrow-derived cell abnormalities and organ injury in diabetes by organ.

For details, see: “Previous research reports on bone-marrow-derived cells in diabetes and its complications” https://biozipcode.net/lab/achievement

5-ALA is studied in relation to mitochondrial function and energy metabolism. Future research may examine its relevance to vascular injury, neuropathy, inflammation, and tissue repair associated with diabetic complications.