

An evidence-based guide for women who train

Built Different

Your Hormones, Your Shape

The science of losing stubborn fat, building glutes and beating cravings

About this guide

Endo & Iron publishes evidence-based guides on hormones, metabolism and training.

These guides grew out of the research reading behind a master's degree in endocrinology and metabolism, in France. Every claim is checked against published, peer-reviewed studies, and every study is listed with a link to the original paper or its official abstract.

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Why your body plays by different rules

Two women start the same program on the same day. Same workouts, same calories, same discipline. Twelve weeks later, one has leaner legs, rounder glutes and a steady appetite. The other has lost weight mostly from her face and chest, still carries the same fat on her hips and thighs, and fights cravings every evening. Effort does not explain the gap. Hormones do, along with a plan that was never built around them.

Most fitness advice was never designed for you. Sport and exercise science has been built largely on men: in a review of more than 5,000 studies from leading sports science journals, only about 6% were done exclusively on women (Cowley et al., 2021). Training rules, diet rules and “fat-burning” advice were often worked out on male bodies and handed to women unchanged.

A woman’s body differs in ways that decide her shape:

- **Estrogen** improves insulin sensitivity and helps muscle burn fat, a real metabolic advantage when you use it well.
- **The menstrual cycle** shifts insulin sensitivity, hunger and energy expenditure every month. A plan that ignores it feels easy for two weeks and much harder for the next two.
- **Lower-body fat** is stored in tissue built to hold on to its reserves. It is not “bad genetics”: it follows rules, and those rules can be worked with.
- **Female muscle** resists fatigue better than male muscle, so the best training for your glutes is not a copy of a man’s program.

This guide has three goals: **lose stubborn fat, build your glutes and legs, and stop fighting your hunger**. They sit in one book because they run on the same hormones. Improve the hormonal environment, and all three move together.

It is written for women who train, or want to start, without drugs. Everything in it relies on training, nutrition, sleep, stress management and evidence-based supplements. It does not replace medical care: if you are pregnant or breastfeeding, have diabetes, PCOS, a thyroid condition or a history of eating disorders, talk to your doctor before changing your diet or training.

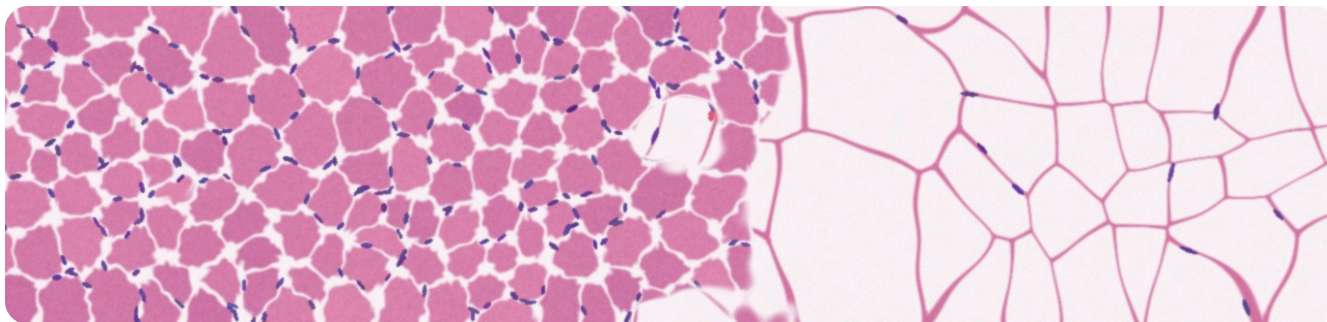
How to read this guide

Each chapter has two layers:

- **The Science:** the mechanisms, with references to the studies behind them. This is the part you will rarely find explained properly online.
- **In Plain English:** a short box that tells you what it means for you, ending with a one-line **Do this** action. If you just want the practical side, read these boxes, then go straight to the protocols in Chapter 6.

Chapter 1 maps the hormones that run your shape. Chapters 2 to 4 apply that map to the three goals: stubborn fat, glutes and hunger. Chapter 5 covers the hidden levers: cycle syncing, the pill, undereating, supplements and the years after 40. Chapter 6 turns everything into a plan, and a glossary at the end explains every scientific term in plain words.

Units. Like the research it is based on, this guide uses metric units, with US equivalents for the numbers you will use yourself. 1 kg = 2.2 lb, so 1.6 g of protein per kg of body weight is about 0.7 g per pound.



Chapter 1

The Female Hormonal Map

Your shape is not decided by calories alone. A small group of hormones tells your body where to store fuel, when to burn it, how fast to build muscle and how hungry to feel. This chapter maps them: what each one does, how they change across your cycle, and why the same plan can work brilliantly one week and stall the next. Every chapter after this one builds on this map.

1.1 Estrogen: your metabolic ally

Estrogen is not just a reproductive hormone. It is one of the main reasons a woman's muscles handle sugar and fat differently from a man's, and one of the main reasons her fat sits where it does.

THE SCIENCE

Better insulin sensitivity. Estradiol, the main estrogen before menopause, acts on receptors in muscle, liver, fat tissue and the brain. Through estrogen receptor alpha ($ER\alpha$), it supports insulin signaling, the GLUT4 transporters that let glucose into muscle, and fat burning inside the cell (Mauvais-Jarvis, Clegg & Hevener, *Endocr Rev* 2013). The effect is measurable: in clamp studies, the gold-standard test of insulin action, women in the follicular phase took up 29 to 35% more glucose into their leg muscles under insulin than matched men (Lundsgaard & Kiens, *Front Endocrinol* 2014).

A built-in fat-burning engine. During moderate exercise, women burn proportionally more fat and less carbohydrate than men, and draw more on the fat stored inside their muscle fibers (Lundsgaard & Kiens, 2014). Estrogen is a direct cause. When healthy men took estradiol for 8 days, their fat oxidation rose by 22 to 44% at rest and during 90 minutes of cycling, while their use of carbohydrate and protein fell (Hamadeh, Devries & Tarnopolsky, *J Clin Endocrinol Metab* 2005).

Muscle protection. Estrogen limits the inflammation that follows hard exercise and supports satellite cells, the repair cells that help muscle recover and grow. The evidence is strongest in animals and less clear in humans, but it points the same way (Enns & Tiidus, *Sports Med* 2010). It is one reason women often recover faster between sessions, which Chapter 3 turns into training rules.

Where fat goes. Estrogen steers fat storage toward the hips, buttocks and thighs (gluteofemoral fat) rather than the belly. This lower-body fat is the healthier store: it acts as a safe reservoir for excess energy, instead of letting fat spill into the liver and around the organs (Karastergiou et al., *Biol Sex Differ* 2012). The flip side is that it is built to last, which is why it is the last fat to go. Chapter 2 explains the mechanism and what to do about it.

When estrogen falls. At menopause, fat storage shifts toward the belly and insulin sensitivity declines (Mauvais-Jarvis et al., 2013); 5.5 shows how to train and eat through that change. A similar drop can happen at any age when a woman eats far too little for how much she trains, a warning sign covered in 5.3.

In Plain English

Estrogen is on your side.

It helps your muscles use sugar and fat, protects them after hard workouts, and stores fat on your hips and thighs rather than your belly. That lower-body fat is the healthier kind, but it is designed to stay, so it leaves last.

Do this: Keep estrogen working for you: eat enough to keep regular periods, and train your legs and glutes, your biggest fuel-burning muscles.

1.2 The cycle in two phases

Your hormones change from week to week. Knowing the two halves of your cycle explains why some weeks of a diet feel easy and others feel like a fight, and why the scale can jump overnight without any fat gain.

THE SCIENCE

The basic calendar. A cycle runs from the first day of your period to the day before the next one, usually 21 to 35 days in adults. It has two halves:

- **The follicular phase** runs from day 1 of your period to ovulation. Estrogen rises steadily and peaks just before ovulation; progesterone stays low.
- **The luteal phase** runs from ovulation to your next period and lasts about two weeks. Progesterone rises and dominates, estrogen stays moderately high, and both drop in the last days, which triggers the next period.

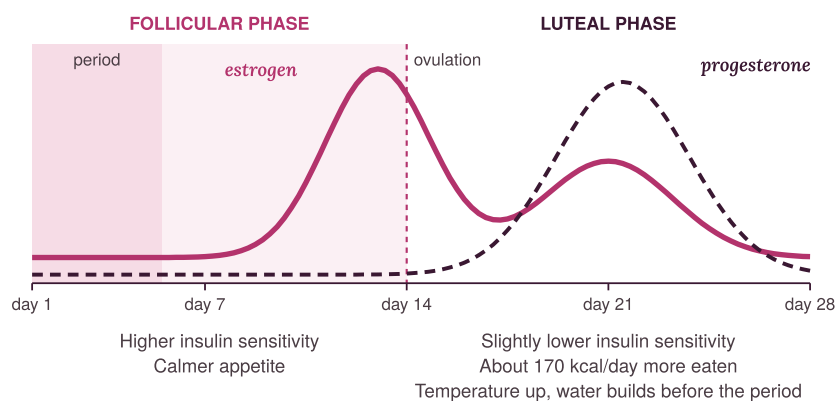


Figure 1. Your cycle at a glance. Schematic of a typical 28-day cycle: hormone levels are relative and not to scale. If your cycle is longer or shorter, the luteal phase still lasts about 14 days.

	Follicular phase (period to ovulation)	Luteal phase (ovulation to next period)
Lead hormone	Estrogen, rising	Progesterone, with moderate estrogen
Insulin sensitivity	Higher	Slightly lower
Appetite	Calmer	Higher, about 170 kcal/day more eaten on average
Resting metabolism	Baseline	Slightly higher, a small effect
Body temperature	Baseline	About 0.3 to 0.5 °C (0.5 to 0.9 °F) higher
Water retention	Lowest in mid-phase	Builds up, peaks on the first day of the period

Insulin sensitivity dips after ovulation. In the BioCycle study, healthy women had their hormones and insulin measured repeatedly over up to two cycles. HOMA-IR, a marker of insulin resistance, rose from 1.35 in the mid-follicular phase to 1.59 in the early luteal phase, and was still 1.55 in the late luteal phase (Yeung et al., J Clin Endocrinol Metab 2010). The authors call the change minor, and it is: about 15 to 18%. But it lands in the same two weeks as the rise in appetite.

You burn a little more, and you want to eat more. Progesterone raises body temperature by about 0.3 to 0.5 °C (0.5 to 0.9 °F) after ovulation (Baker, Siboz & Fuller, Temperature 2020). Resting metabolic rate tends to be slightly higher in the luteal phase, but a meta-analysis found the effect small, and smaller still in studies published since 2000 (Benton, Hutchins & Dawes, PLoS One 2020). Appetite moves more than metabolism: a 2025 meta-analysis of 330 women found they ate about 168 kcal more per day in the luteal phase than in the follicular phase (Hazell et al., Nutr Rev 2025). The small rise in metabolism rarely covers that extra appetite, which is why the second half of the cycle is where many diets quietly break.

The scale lies before your period. In a year-long study, fluid retention built up through the luteal phase, peaked on the first day of bleeding and was lowest in the mid-follicular phase (White et al., Obstet Gynecol Int 2011). A jump on the scale in the days before your period is mostly water, not fat.

Tracking your own cycle. Note the first day of each period in an app or a notebook. After two or three cycles you will know your average length and roughly when your luteal phase starts (about two weeks before your next period). Compare your weight with the same point of your previous cycle, not with last week. Cycles that are very irregular, shorter than 21 days, longer than 35 days, or periods that stop should be checked by a doctor; a period that disappears during hard training or dieting is a warning sign covered in 5.3. If you use hormonal contraception, your natural cycle is largely switched off, so these phases do not apply in the same way (5.2); the same goes for the irregular cycles of perimenopause (5.5).

In Plain English

Your cycle has two halves.

In the first, from your period to ovulation, estrogen leads: your body handles carbs well and your appetite is calmer. In the second, from ovulation to your next period, progesterone leads: you handle carbs slightly less well, you get hungrier, and you hold more water before your period.

Do this: Log the first day of each period, and compare your weight only with the same point of your previous cycle.

1.3 Testosterone: small amounts, real muscle

Women make testosterone too, in the ovaries and adrenal glands, just far less of it than men. Far less does not mean it holds you back from building muscle.

THE SCIENCE

The gap. Circulating testosterone in healthy women sits at roughly 0 to 1.7 nmol/L (about 0 to 50 ng/dL), against 7.7 to 29.4 nmol/L (about 220 to 850 ng/dL) in healthy men: a 15- to 20-fold difference (Handelsman, Hirschberg & Berman, Endocr Rev 2018). That gap explains most of the difference in absolute muscle mass and strength between the sexes.

The same response to training. A 2025 meta-analysis compared muscle growth in men and women following the same resistance training. Men gained slightly more muscle in absolute terms, but relative to their starting size, the increase was similar in both sexes (Refalo et al., PeerJ 2025). Your muscle responds to training as well as a man's; it simply starts smaller. Two practical consequences follow. First, you will not get "bulky" by accident: building visible muscle takes years of deliberate work. Second, there is no reason to train with light weights and endless reps to "tone": the muscle you want is built the same way any muscle is built, which is the subject of Chapter 3.

End of the free sample

Thanks for reading. The full guide picks up from here.

You have just read the introduction and the opening of Chapter 1. The complete guide continues with:

- Why lower-body fat holds on, and what actually makes it leave
- The glute program: exercises, sets and the fuel to grow
- Hunger and cravings across your cycle, and how to plan around them
- The pill, undereating, supplements, life after 40, and an 8-week plan

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