

RESEARCH MONOGRAPH . COMPOUND PROFILE

Erythropoietin (EPO)

The hormone that stimulates red blood cell production; recombinant human EPO is approved for anemia and is widely abused in endurance sports.

DOCUMENT	KDC-MN-363
ISSUED	2026-05-09
REVISION	1.0
AUTHOR	Kodiac biolabs Research
COMPOUND CLASS	Glycoprotein hormone (erythropoiesis-stimulating)

ABSTRACT

Erythropoietin (EPO; CAS 11096-26-7; 165-amino-acid glycoprotein with three N-linked and one O-linked glycan chains; molecular weight approximately 30 kDa) is the principal regulatory hormone of erythropoiesis, produced by interstitial fibroblasts in the renal cortex in response to hypoxia.

Recombinant human EPO (epoetin alfa, Procrit, Epogen) was approved by the FDA in 1989 as one of the first commercial recombinant proteins. Mechanism: binding to the EPO receptor (homodimer) on erythroid progenitor cells (BFU-E, CFU-E) prevents apoptosis and stimulates proliferation and differentiation, increasing red blood cell production over 1 to 2 weeks. Approved indications: anemia of chronic kidney disease, chemotherapy-induced anemia, anemia in zidovudine-treated HIV, anemia of prematurity, surgical blood conservation. The compound is among the most notorious performance-enhancing substances in endurance sport (cycling, distance running, cross-country skiing) owing to the oxygen-delivery advantage of supranormal hematocrit; the WADA prohibited list and modern biological passport monitoring address this. Plasma half-life is approximately 4 to 13 hours subcutaneous; longer-acting analogs (darbepoetin, methoxy polyethylene glycol-epoetin beta) extend dosing intervals. Used as the canonical erythropoiesis-stimulating agent in research.

1. Compound Identification

Erythropoietin (EPO) is described as glycoprotein hormone (erythropoiesis-stimulating). The hormone that stimulates red blood cell production; recombinant human EPO is approved for anemia and is widely abused in endurance sports.

1.1 Class summary

Glycoprotein hormone (erythropoiesis-stimulating)

1.2 Subtitle

The hormone that stimulates red blood cell production; recombinant human EPO is approved for anemia and is widely abused in endurance sports.

2. Abstract

Erythropoietin (EPO; CAS 11096-26-7; 165-amino-acid glycoprotein with three N-linked and one O-linked glycan chains; molecular weight approximately 30 kDa) is the principal regulatory hormone of erythropoiesis, produced by interstitial fibroblasts in the renal cortex in response to hypoxia. Recombinant human EPO (epoetin alfa, Procrit, Epogen) was approved by the FDA in 1989 as one of the first commercial recombinant proteins. Mechanism: binding to the EPO receptor (homodimer) on erythroid progenitor cells (BFU-E, CFU-E) prevents apoptosis and stimulates proliferation and differentiation, increasing red blood cell production over 1 to 2 weeks. Approved indications: anemia of chronic kidney disease, chemotherapy-induced anemia, anemia in zidovudine-treated HIV, anemia of prematurity, surgical blood conservation. The compound is among the most notorious performance-enhancing substances in endurance sport (cycling, distance running, cross-country skiing) owing to the oxygen-delivery advantage of supranormal hematocrit; the WADA prohibited list and modern biological passport monitoring address this. Plasma half-life is approximately 4 to 13 hours subcutaneous; longer-acting analogs (darbepoetin, methoxy polyethylene glycol-epoetin beta) extend dosing intervals. Used as the canonical erythropoiesis-stimulating agent in research.

3. Mechanism of Action

EPO receptor agonist on erythroid progenitor cells; stimulates red blood cell production over 1 to 2 weeks. Hypoxia-responsive renal hormone.

The mechanistic profile described above represents the consensus position from peer-reviewed literature where available; for compounds with sparse formal characterization, this section reflects vendor-grade reports and structurally-related class pharmacology and should be interpreted with appropriate caution.

4. Pharmacokinetics and Routes of Administration

Pharmacokinetic data are summarized within the abstract for compounds with formal Phase 1 records. Compounds without published human pharmacokinetic studies are noted as such; investigators should treat the absence of data as a research limitation.

5. Reported Research Dose Ranges

Clinical 50 to 300 IU/kg subcutaneous three times weekly; doping use is suprathreshold.

Doses are scaled from clinical use where the compound is approved as a medicine, from Phase 2/3 trials where development advanced, or from rodent dose-response data scaled by allometric assumptions where the compound has no human clinical record. Investigators should treat dose ranges from research-chemical-grade vendors as starting points for their own pharmacokinetic and tolerability characterization rather than validated dosing recommendations.

6. Sourcing and Quality Verification

Investigators should obtain analytical confirmation of identity (mass spectrometry; for peptides, additionally amino acid analysis or N-terminal sequencing) and purity (HPLC area-percent, ideally greater than 95 percent) on every lot. Vendor certificates of analysis vary in quality; third-party analytical confirmation through independent laboratories (e.g., Janoshik Analytical, Anabolic Lab) is the gold standard for research-grade peptides and small molecules.

For compounds with established pharmaceutical-grade marketing in any jurisdiction, sourcing from the marketed product (where legal and accessible) provides the highest quality assurance.

7. Reconstitution and Handling

Peptides should be reconstituted in bacteriostatic water or sterile water for injection in the volume appropriate to the desired concentration; lyophilized peptides should be allowed to come to room temperature before reconstitution to minimize precipitation. Reconstituted peptides should be stored refrigerated and used within the timeframe specified by the manufacturer (typically 14 to 30 days for bacteriostatic water reconstitutions, shorter for sterile water).

Small molecules: storage conditions vary by compound; consult the certificate of analysis for the specific product. Most are stable at room temperature in dry, dark conditions; oxidation-sensitive compounds (e.g., catecholamine precursors) require cool storage and protection from light.

8. Stack Interaction Considerations

Investigators combining this compound with other research substances should consider receptor-level interactions (additive effects at shared targets), enzyme-level interactions (CYP-mediated drug-drug interactions where applicable), and pharmacodynamic interactions (additive sedation, additive serotonergic activity, additive hemodynamic effects).

The stack interaction section in published monographs of well-characterized compounds is necessarily incomplete for any specific combination; investigators should treat novel combinations with elevated caution and titrate gradually.

9. References

1. Jelkmann W. Molecular biology of erythropoietin. Intern Med 2004.
2. Lippi G, et al. Recombinant human erythropoietin (rhEPO) and the misuse in sport. Br J Sports Med 2006.
3. Kelley LA, et al. EPO use in nephrology: history and impact. Adv Chronic Kidney Dis 2019.

This monograph is provided for research use only. Not for medical, diagnostic, or therapeutic purposes. Not for human consumption. Compound class generalizations are noted where compound-specific data are sparse; investigators should weight the evidence accordingly.