# EEF1A2 D91N: proximity, geometry and an unresolved exchange hypothesis

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**Exploratory computational study | eef1a2-d91n-seed11-v1.0.0 | 12 November 2026 UTC**

This replacement research brief was prepared from the verified seed-11 report because no separate original brief or editable brief was located. It is a public derivative, not the missing original document.

## The question

Does D91N alter how human EEF1A2 engages its nucleotide-exchange partner EEF1B2 and releases GDP? This pilot compares saved structural predictions to formulate a testable question; it does not measure exchange kinetics or establish a mechanism.

## What was done

Three Boltz-2 predictions were retained: WT, D91N and D252H, all seed 11, one model per condition. Five historical attempts produced these three models; failed attempts are not replicates. Each system contains full-length human EEF1A2 (463 residues; chain A), full-length EEF1B2 (225 residues; chain B), one GDP (chain C) and one magnesium ion (chain D). ExoMBridge connected the molecular inputs, execution records, saved confidence outputs and structural analyses.

## What the saved models show

| Measurement | WT | D91N | D252H |
|---|---|---|---|
| Interface heavy-atom pairs within 4.0 Å | 461 | 365 | 454 |
| A backbone O91 to B backbone N224, Å | 2.661 | 3.869 | 2.696 |
| A residue 91 to B residue 224 minimum, Å | 2.661 | 2.721 | 2.635 |
| Mean PAE, A frame to B position, Å | 13.870 | 16.461 | 14.604 |
| Mean PAE, B frame to A position, Å | 15.036 | 17.660 | 15.789 |

D91N retains local partner proximity while differing in common-backbone geometry. Different atoms account for the nearly unchanged residue minimum; Asp and Asn side-chain atoms are not chemically equivalent. PAE is directional predicted aligned error, a model uncertainty output, not an experimental error bar or affinity score.

## Plain language summary

The predicted proteins remain close near residue 91, but the exact local arrangement changes in the D91N model. That gives a useful question to test: could the proteins still meet while the steps that release GDP work differently? One prediction cannot tell whether that difference is consistent, functional, or ordinary predictor variation.

## Hypothesis and alternatives

After inspecting the results, the working hypothesis was that D91N may alter coupling between EEF1B2 engagement and GDP release while retaining partner proximity. The direction and biological importance remain unresolved. Altered intrinsic nucleotide behavior, reduced availability of competent protein and predictor variation remain alternatives. D252H is a comparator, not a calibrated positive control.

## Limits and next work

One prediction per condition cannot establish a variant-specific effect. Contacts and confidence do not measure affinity, exchange kinetics, stability or clinical severity. No MD trajectory or biochemical exchange measurement was generated by this pilot. The data do not establish a broken salt bridge, lost Mg coordination or weaker binding.

Additional matched seeds assess computational consistency; they are not biological replicates. A separate seed-23 successor had begun after the preserved plan and is outside this seed-11 release. Proposed functional work would compare intrinsic and EEF1B2-stimulated GDP release at matched soluble, nucleotide-competent protein abundance, with association measured separately.

## Authorship, tools and access

Filippo D. Galbo is the sole human author. Boltz-2 generated the predictions; ExoMBridge provided the recorded orchestration, provenance and analysis workflow. Automated agents assisted coding, analysis implementation, checks, literature retrieval, hypothesis exploration, visualization and writing. Internal checks are not peer review or independent human validation. Detailed methods, limitations and public scientific references accompany the full report and tools and methods ledger.

Galbo FD. EEF1A2 D91N: proximity, geometry and an unresolved exchange hypothesis. Research brief accompanying eef1a2-d91n-seed11-v1.0.0. 2026-11-12.
https://www.filippogalbo.com/research/eef1a2-d91n .