Single-Molecule Resolution of Oligopeptides in Anti-Aging Cosmetics Combined with Nanopore Readouts and Deep Learning Model

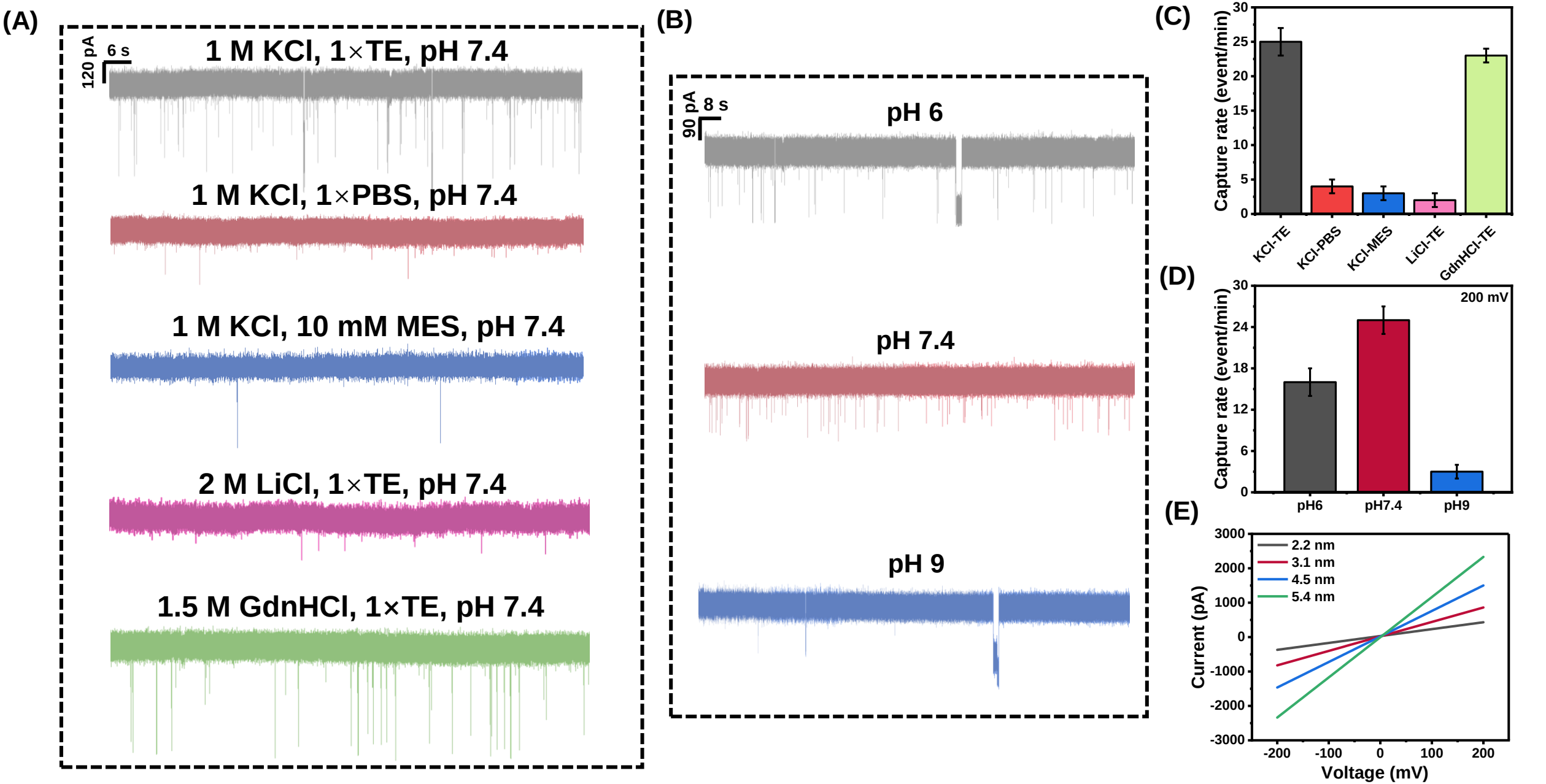

Figure S1. Translocatoin of 1 uM tripeptide under distinct conditions. Raw traces recorded in different buffered solution (A) and at different pH condition in 1 M KCl, TE (B). Histograms showing the capture rate in different buffered solution (C) and at different pH condition in 1 M KCl, TE (D). (E) *I-V* curves recorded with distinct nanopore in size. All data were collected with 1 uM tripeptide in a nanopore of ~3 nm in diameter at 200 mV.

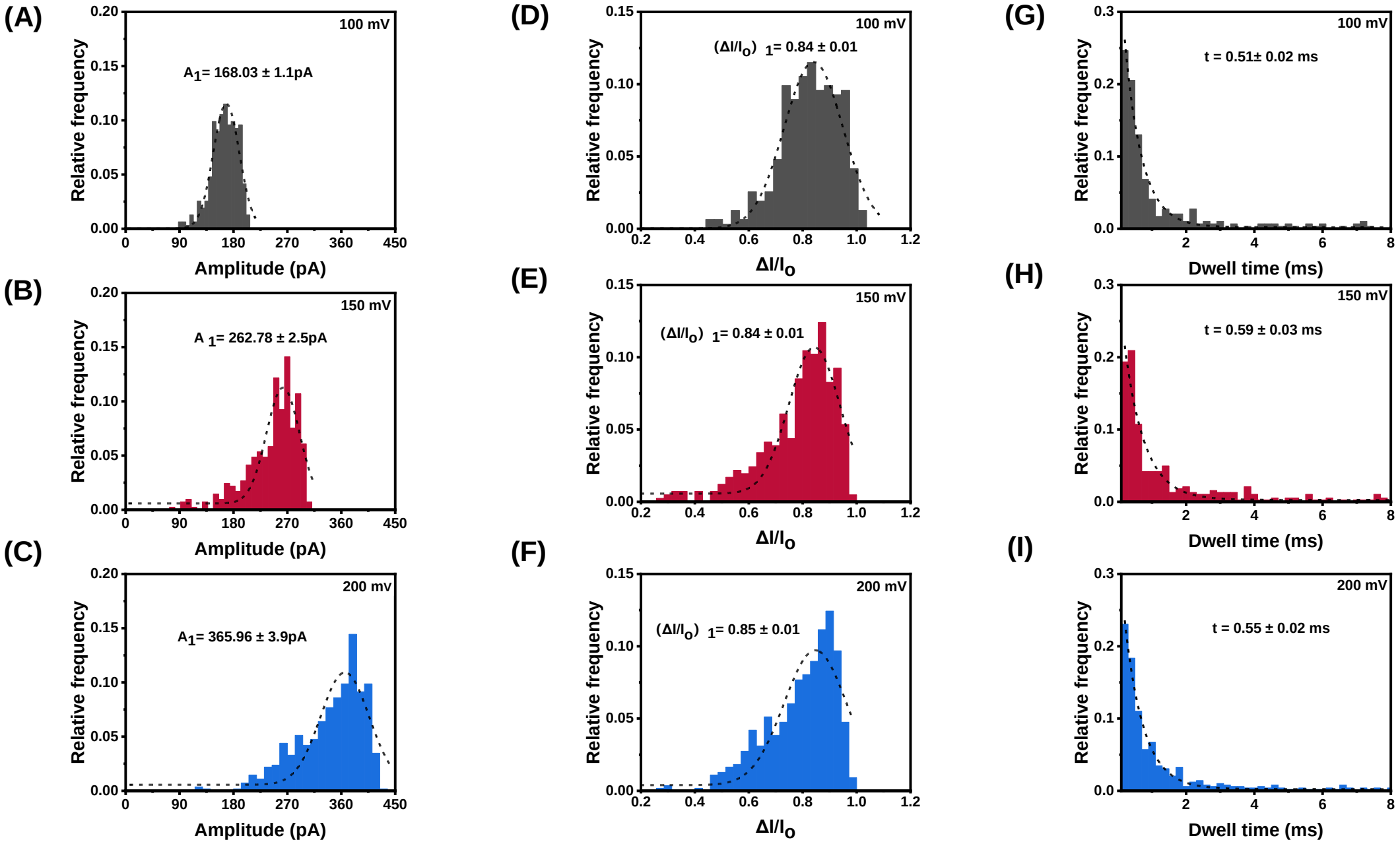

Figure S2. Translocation characteristics of tripeptide in a 2.2 nm nanopore. (A-C) Histograms of the current blockage amplitude under distinct bias voltages. (D-F) Histograms of $\Delta I/I_o$. (G-I) Histograms of blockage duration. All the data were recorded with 1 uM tripeptides in 1 M KCl, TE, pH 7.4 in a 2.2 nm nanopore in diameter.

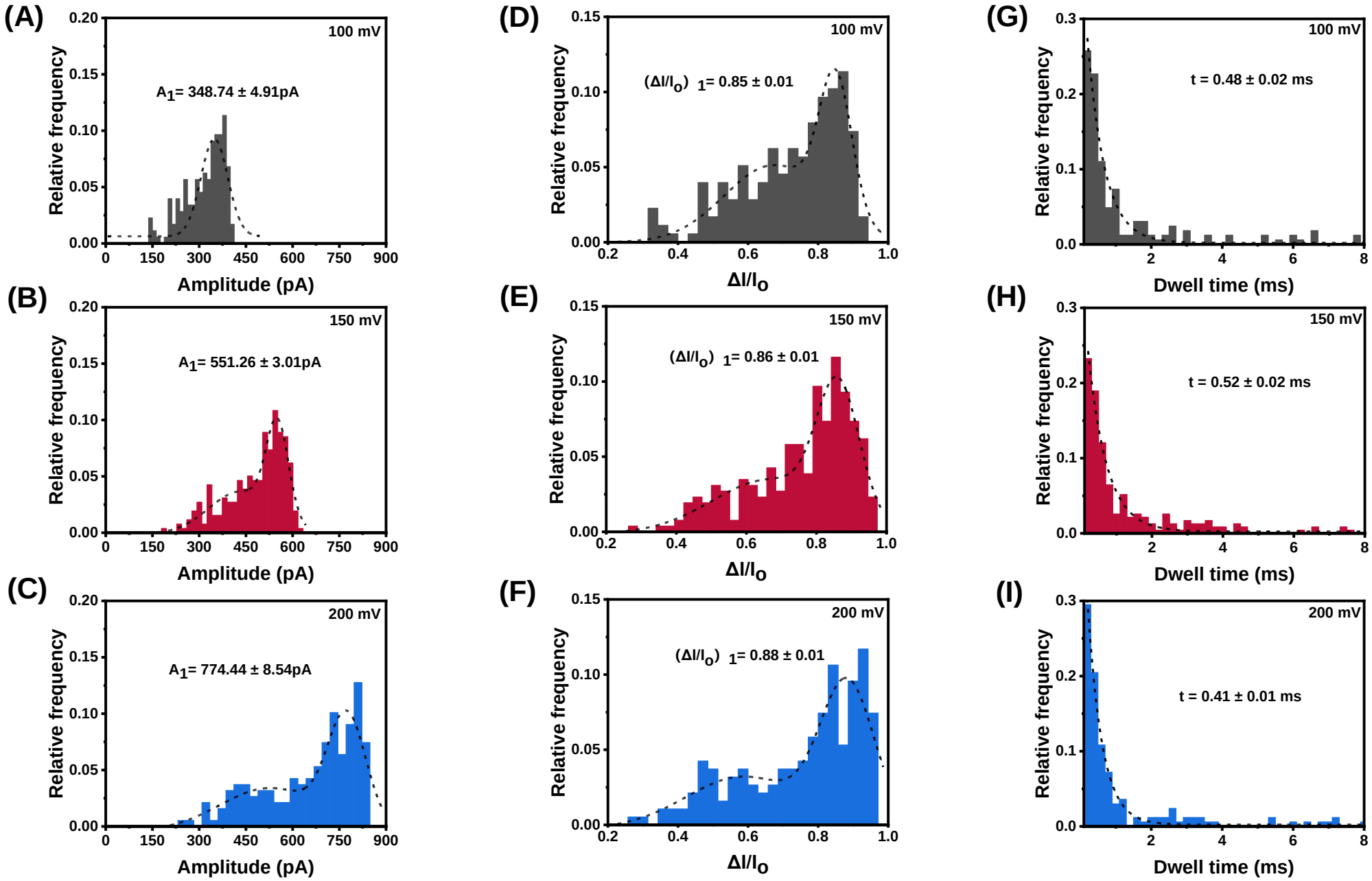

Figure S3. Translocation characteristics of tripeptide in a 3.1 nm nanopore. (A-C) Histograms of the current blockage amplitude under distinct bias voltages. (D-F) Histograms of $\Delta I/I_o$. (G-I) Histograms of blockage duration. All the data were recorded with 1 uM tripeptides in 1 M KCl, TE, pH 7.4 in a 3.1 nm nanopore in diameter.

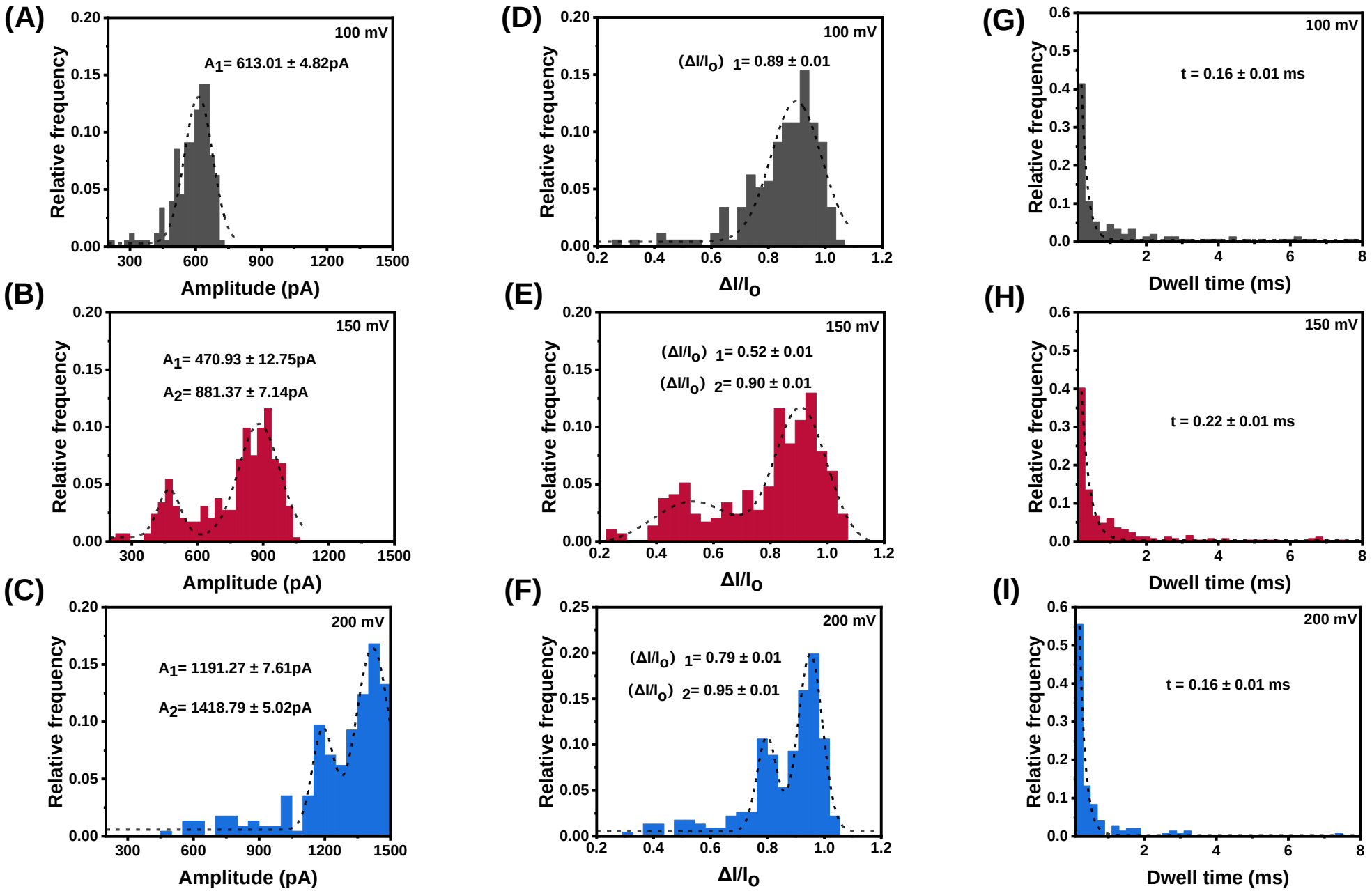

Figure S4. Translocation characteristics of tripeptide in a 4.5 nm nanopore. (A-C) Histograms of the current blockage amplitude under distinct bias voltages. (D-F) Histograms of $\Delta I/I_o$. (G-I) Histograms of blockage duration. All the data were recorded with 1 uM tripeptides in 1 M KCl, TE, pH 7.4 in a 4.5 nm nanopore in diameter.

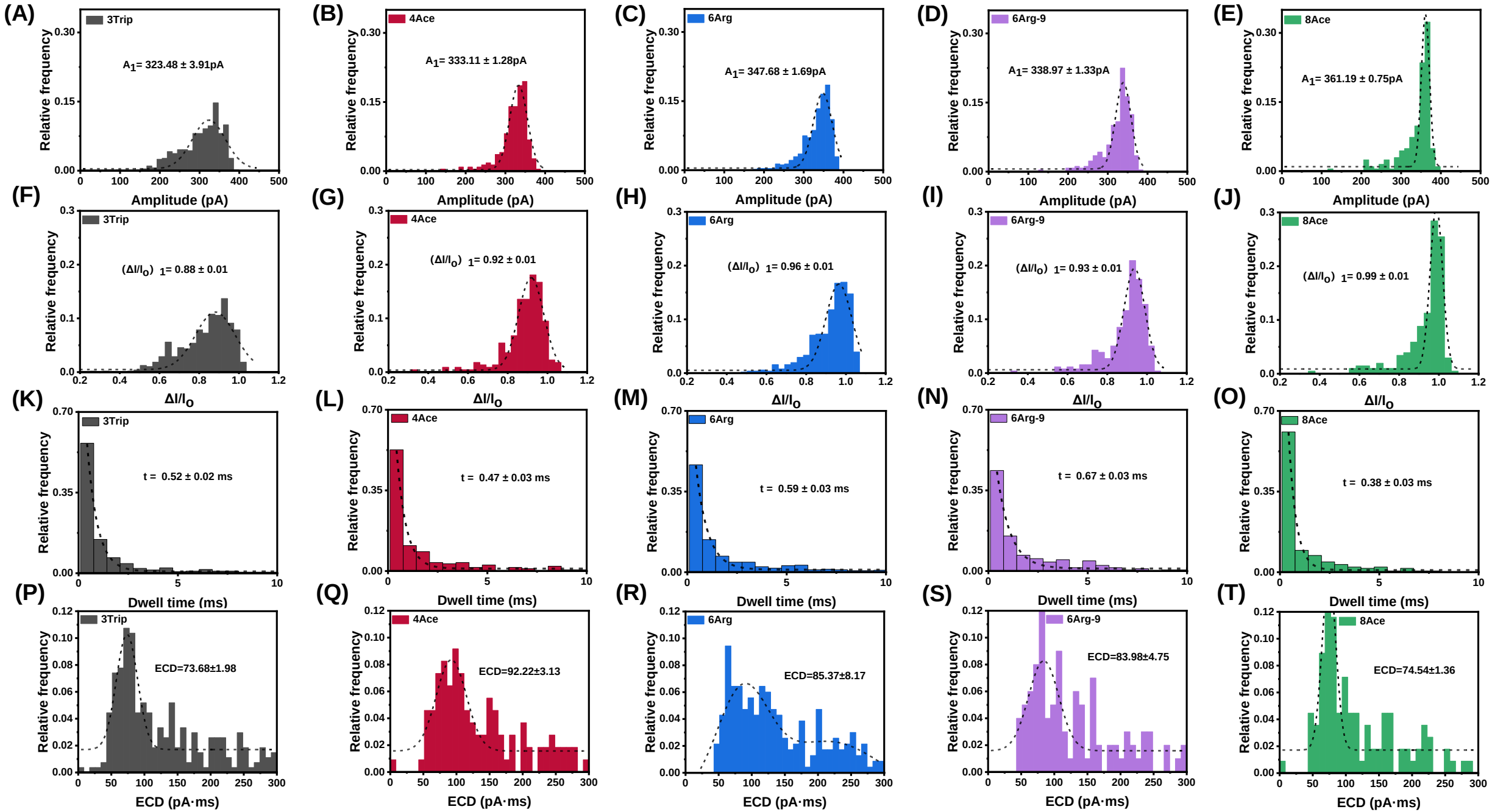

Figure S5. Nanopore translocation characteristics of the five oligopeptides in KCl. (A-E) Histograms of the current blockage amplitude. (F-J) Histograms of $\Delta I/I_o$. (K-O) Histograms of blockage duration. (P-T) Histograms of ECD. All the data were recorded with 1 uM of the five oligopeptides in 1 M KCl, TE, pH 7.4 in a 2 nm nanopore in diameter under 200 mV.

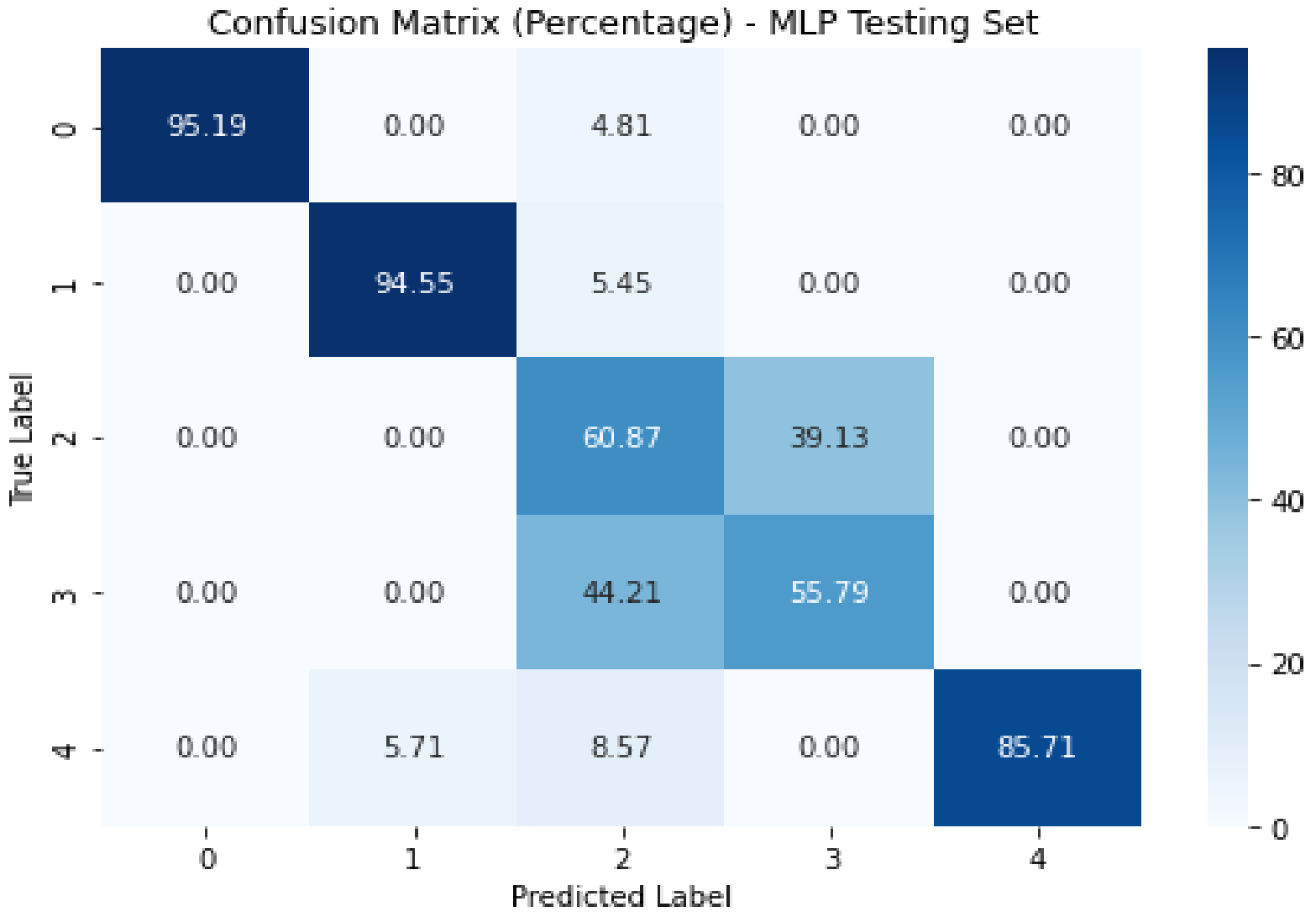

Figure S6. The confusion matrix result of five oligopeptides identification performed with the MLP model. The row of the matrix represents the true class and the column represents the predicted class. 0, 1,2,3,4 represent 3-pep, 4-pep, 6-pep, 6-pep-9, 8-pep. All data used in this model were collected with 1 μM oligopeptides in 1 M KCl, TE, pH 7.4 at 200 mV, with a nanopore of 2 nm in diameter.

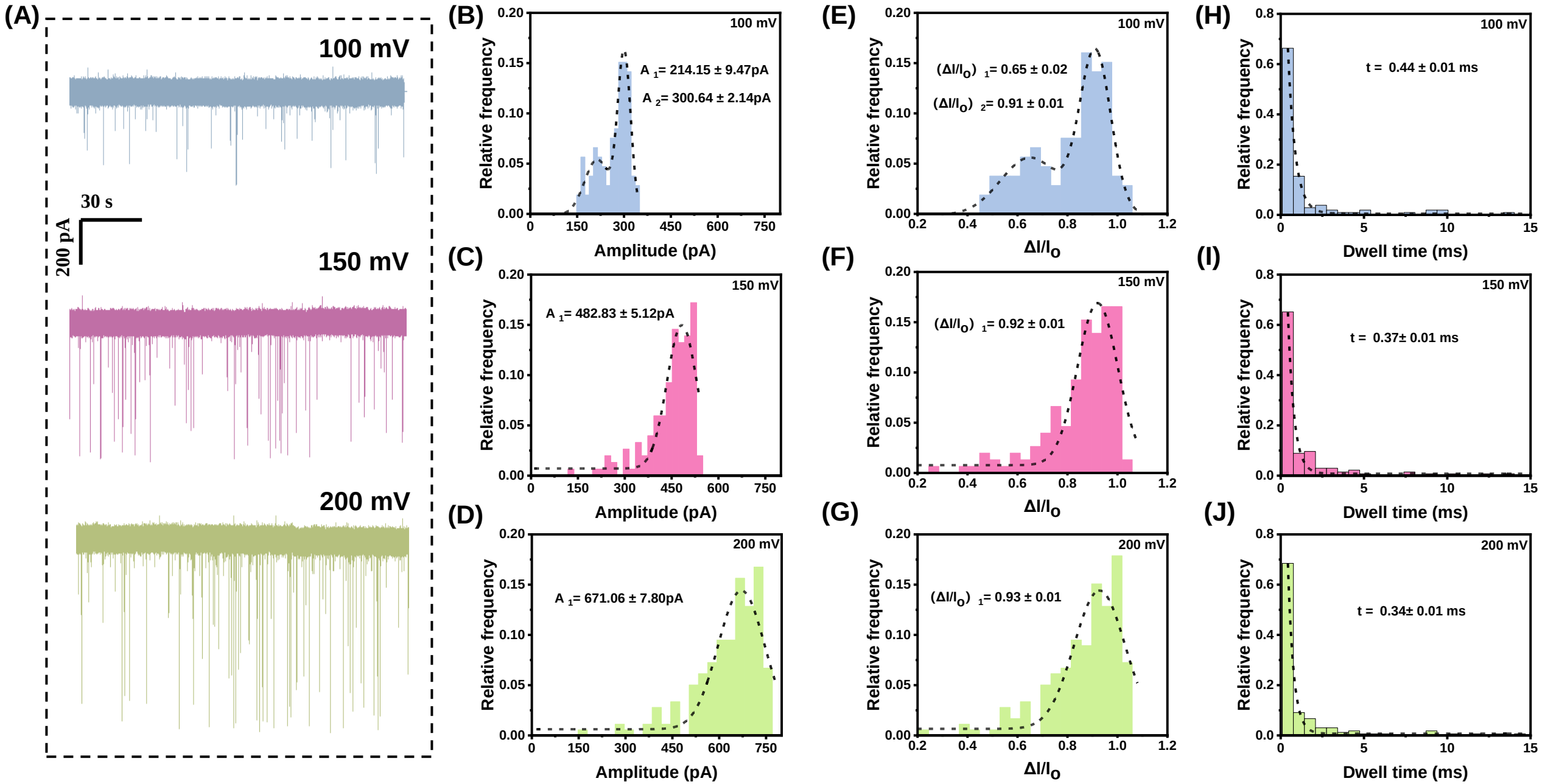

Figure S7. Nanopore detection of argireline at different voltages in GdnHCl. (A) Raw traces in 165 s. (B-D) Histograms of the current blockage amplitude under distinct bias voltages. (E-G) Histograms of $\Delta I/I_0$. (H-J) Histograms of blockage duration. All the data were recorded with 50 uM hexapeptides in 1.5 M Gn-HCl, TE, pH 7.4 in a 2.8 nm nanopore in diameter.

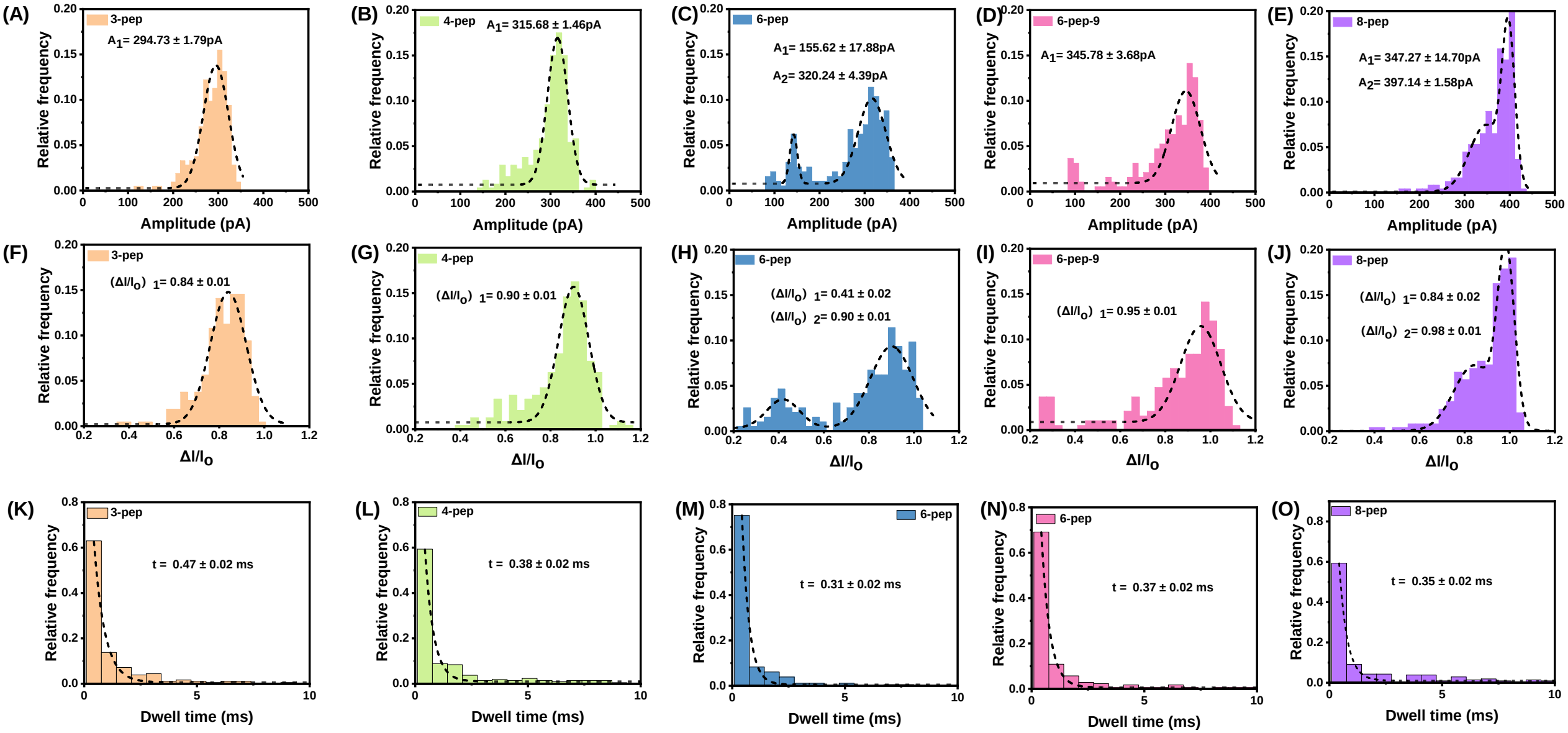

Figure S8. Nanopore translocation characteristics of the five oligopeptides in GdnHCl. (A-E) Histograms of the current blockage amplitude. (F-J) Histograms of $\Delta I/I_o$. (K-O) Histograms of blockage duration. All the data were recorded with 50 uM of the five oligopeptides in 1.5 M GdnHCl, TE, pH 7.4 in a 2 nm nanopore in diameter and 15nm in thickness under 175 mV.