MIRA PRECISION PGx™

**PATIENT INFORMATION**
**NAME:** MICKEY MOUSE
**DOB:** 12/Feb/1980
**SEX AT BIRTH:** Male

**SPECIMEN DETAILS**
**BARCODE:** TEST_MOUSE
**SAMPLE ID:** REMMTEST
**TYPE:** SWAB
**COLLECTED:** 09/Dec/2025

**ORDERED BY**
**DOCTOR**
**AMENDED:** 18/Dec/2025

This pharmacogenetic information is based on best evidence compiled from guidelines and databases including the FDA Table of Pharmacogenetic Associations and the Clinical Pharmacogenetics Implementation Consortium (CPIC). In some cases, PharmGKB and the Dutch Pharmacogenetics Working Group (DPWG) may also be referenced.
Please refer to the Methods, Limitations, and Liability Disclaimer at the end of this report.

# Current Medication Summary

The medications listed below indicate the patient's **Current Medications**.

1 Mild/no drug-gene or Minor drug-drug interaction

2 Moderate drug-gene or drug-drug interaction

3 Serious drug-gene or Major drug-drug interaction

## Allopurinol

**Drug-Gene Interactions:**

**Mild or no drug-gene interaction: no PGx-based action; standard precautions apply**

## Codeine

**Drug-Gene Interactions:**

**Mild or no drug-gene interaction: no PGx-based action; standard precautions apply**

## Ondansetron

**Drug-Gene Interactions:**

**Mild or no drug-gene interaction: no PGx-based action; standard precautions apply**

* Other clinical factors, medical conditions and drug-drug interactions may contribute to medication response.

## Tramadol

**Drug-Gene Interactions:**

**Mild or no drug-gene interaction: no PGx-based action; standard precautions apply**

## Methadone

No drug-gene interactions available based on selected content. Brand names and kidney/liver information not currently available.

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# Current Medications

The medications listed below indicate the patient's **Current Medications**.

1 Mild/no drug-gene or Minor drug-drug interaction

2 Moderate drug-gene or drug-drug interaction

3 Serious drug-gene or Major drug-drug interaction

| Allopurinol | Phenotype | Genetic Test | Results | Source/Evidence Level |
|---|---|---|---|---|
| Aloprim<br>Lopurin<br>Zyloprim | Reduced risk of adverse drug reactions | HLA-B*58:01 | Negative | CPIC A[41]; FDA 2[46] |

TreatG:x
ReviewG:x

**Drug-Gene Interactions:**

**Mild or no drug-gene interaction: no PGx-based action; standard precautions apply**

1 CPIC – HLA-B*58:01 Implication: Low or reduced risk of allopurinol-induced severe cutaneous adverse reaction (SCAR).
CPIC – HLA-B*58:01 Strong Recommendation: Use allopurinol per standard dosing guidelines.

**Drug-Drug Interactions:**

1 (Allopurinol)-(Ondansetron) The metabolism of Ondansetron can be decreased when combined with Allopurinol.

1 (Methadone)-(Allopurinol) Methadone may decrease the excretion rate of Allopurinol which could result in a higher serum level.

1 (Tramadol)-(Allopurinol) Tramadol may decrease the excretion rate of Allopurinol which could result in a higher serum level.

| Codeine | Phenotype | Genetic Test | Results | Source/Evidence Level |
|---|---|---|---|---|
| Codeine Contin<br>Tylenol with Codeine No. 2/3/4 | Normal metabolizer | CYP2D6 | *2/*2 | CPIC A[14]; FDA 1[46]; FDA 2[46] |

TreatGx
ReviewGx

**Drug-Gene Interactions:**

**Mild or no drug-gene interaction: no PGx-based action; standard precautions apply**

1 CPIC – Implication: Expected morphine formation.

1 CPIC – Strong Recommendation: Use codeine label recommended age-specific or weight-specific dosing.

**Drug-Drug Interactions:**

3 (Methadone)-(Codeine) The risk or severity of adverse effects can be increased when Methadone is combined with Codeine.

2 (Codeine)-(Ondansetron) The risk or severity of CNS depression can be increased when Codeine is combined with Ondansetron.

2 (Codeine)-(Tramadol) The risk or severity of serotonin syndrome can be increased when Codeine is combined with Tramadol.

| Ondansetron | Phenotype | Genetic Test | Results | Source/Evidence Level |
|---|---|---|---|---|
| Zofran<br>Zuplenz | Normal metabolizer | CYP2D6 | *2/*2 | CPIC A[7] |

ReviewGx

**Drug-Gene Interactions:**

**Mild or no drug-gene interaction: no PGx-based action; standard precautions apply**

1 CPIC – Implication: Normal metabolism.

1 CPIC – Strong Recommendation: Initiate therapy with recommended starting dose.
Drug-drug interactions and other patient characteristics (e.g., age, renal function, and liver function) should be considered when selecting alternative therapy.

**Drug-Drug Interactions:**

3 (Methadone)-(Ondansetron) The risk or severity of adverse effects can be increased when Methadone is combined with Ondansetron.

2 (Codeine)-(Ondansetron) The risk or severity of CNS depression can be increased when Codeine is combined with Ondansetron.

2 (Ondansetron)-(Tramadol) The risk or severity of serotonin syndrome can be increased when Ondansetron is combined with Tramadol.

1 (Allopurinol)-(Ondansetron) The metabolism of Ondansetron can be decreased when combined with Allopurinol.

* Other clinical factors, medical conditions and drug-drug interactions may contribute to medication response.

| Tramadol | Phenotype | Genetic Test | Results | Source/Evidence Level |
|---|---|---|---|---|
| Conzip<br>Durela<br>Ralivia<br>Ultram<br>Zytram XL | Normal metabolizer | CYP2D6 | *2/*2 | CPIC A[14]; FDA 1[46]; FDA 2[46] |

**Drug-Gene Interactions:**

**Mild or no drug-gene interaction: no PGx-based action; standard precautions apply**

1 CPIC – Implication: Expected O-desmethyltramadol (active metabolite) formation.

1 CPIC – Strong Recommendation: Use tramadol label recommended age specific or weight-specific dosing.

TreatG
ReviewG

**Drug-Drug Interactions:**

3 (Methadone)-(Tramadol) The risk or severity of adverse effects can be increased when Methadone is combined with Tramadol.

2 (Codeine)-(Tramadol) The risk or severity of serotonin syndrome can be increased when Codeine is combined with Tramadol.

2 (Ondansetron)-(Tramadol) The risk or severity of serotonin syndrome can be increased when Ondansetron is combined with Tramadol.

1 (Tramadol)-(Allopurinol) Tramadol may decrease the excretion rate of Allopurinol which could result in a higher serum level.

| Methadone | Phenotype | Genetic Test | Results | Source/Evidence Level |
|---|---|---|---|---|

No drug-gene interactions available based on selected content. Brand names and kidney/liver information not currently available.

**Drug-Drug Interactions:**

3 (Methadone)-(Tramadol) The risk or severity of adverse effects can be increased when Methadone is combined with Tramadol.

3 (Methadone)-(Codeine) The risk or severity of adverse effects can be increased when Methadone is combined with Codeine.

3 (Methadone)-(Ondansetron) The risk or severity of adverse effects can be increased when Methadone is combined with Ondansetron.

1 (Methadone)-(Allopurinol) Methadone may decrease the excretion rate of Allopurinol which could result in a higher serum level.

# Medication Summary

The Medication Summary lists medications with pharmacogenetic associations, organized by therapeutic area and drug-gene interaction severity. The highest severity is prioritized (moderate/severe) from all relevant sources and genes for a medication. See Medication Report for full details.

1 Mild or no drug-gene interaction: no PGx-based action; standard precautions apply

2 Moderate drug-gene interaction

3 Serious drug-gene interaction: avoid/select alternative

## Mental Health

1
- Amitriptyline
- Amphetamine
- Aripiprazole
- Aripiprazole lauroxil
- Brexpiprazole
- Carbamazepine
- Citalopram
- Clomipramine
- Clozapine

## ...Mental Health

1
- Desipramine
- Doxepin
- Escitalopram
- Fluvoxamine
- Iloperidone
- Imipramine
- Lofexidine
- Nortriptyline
- Oxcarbazepine
- Paroxetine

## ...Mental Health

1
- Perphenazine
- Pimozide
- Thioridazine
- Trimipramine
- Venlafaxine
- Vortioxetine

2
- Atomoxetine
- Sertraline

## Analgesia

1
- Amitriptyline
- Carbamazepine
- Codeine
- Desipramine
- Hydrocodone
- Imipramine
- Nortriptyline
- Oliceridine
- Oxcarbazepine

## ...Analgesia

1
- Tramadol
- Venlafaxine

2
- Celecoxib
- Flurbiprofen
- Ibuprofen
- Meloxicam
- Piroxicam
- Tenoxicam

## Autoimmune

1
- Azathioprine
- Mercaptopurine
- Thioguanine

2
- Siponimod

## Cancer

1
- Capecitabine
- Erdafitinib

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## ...Cancer

1

Fluorouracil
Gefitinib
Irinotecan
Mercaptopurine
Pazopanib
Tamoxifen
Thioguanine

## Cardiovascular

1

Atorvastatin
Carvedilol
Clopidogrel
Lovastatin
Mavacamten
Metoprolol
Pitavastatin
Pravastatin
Propafenone
Rosuvastatin
Simvastatin

2

Fluvastatin

## ...Cardiovascular

2

Warfarin

## Endocrinology

1

Nateglinide

## Gastroenterology

1

Meclizine
Metoclopramide
Ondansetron

2

Dexlansoprazole
Dronabinol
Lansoprazole
Omeprazole
Pantoprazole

## Infection

1

Abacavir
Atazanavir
Voriconazole

2

Efavirenz

## Neurology

1

Amitriptyline
Brivaracetam
Carbamazepine
Clobazam
Deutetrabenazine
Metoprolol
Oxcarbazepine
Pitolisant
Tetrabenazine
Valbenazine
Venlafaxine

2

Fosphenytoin
Phenytoin

## Other

1

Abrocitinib
Cevimeline
Eliglustat
Flibanserin

## Rheumatology

1

Allopurinol
Azathioprine

2

Celecoxib
Flurbiprofen
Ibuprofen
Meloxicam
Piroxicam
Tenoxicam

## Urology

1

Tolterodine

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# Medication Summary Table

**The Medication Summary Table lists medications with pharmacogenetic associations, organized by therapeutic area and drug-gene interaction severity. Some medications appear in multiple columns within moderate drug-gene interactions due to various possible effects or associations with multiple genes. The highest severity is prioritized (moderate/severe) from all relevant sources and genes for a medication.**
**Warfarin appears in multiple columns because its dosing cannot be predicted based on PGx alone and other factors may increase or reduce dose requirement. See Medication Report for full details.**
*** Indicates current medications**

| | 1 Mild or no drug-gene interaction: no PGx-based action; standard precautions apply | 2 Moderate drug-gene interaction: Consider alternative medications | 2 Moderate drug-gene interaction: May require an increased dose | 2 Moderate drug-gene interaction: May require a reduced dose | 2 Moderate drug-gene interaction: May reduce efficacy | 2 Moderate drug-gene interaction: May increase adverse events | 3 Serious drug-gene interaction: avoid/select alternative |
|---|---|---|---|---|---|---|---|
| Mental Health | Amitriptyline<br>Amphetamine<br>Aripiprazole<br>Aripiprazole lauroxil<br>Brexpiprazole<br>Carbamazepine<br>Citalopram<br>Clomipramine<br>Clozapine<br>Desipramine<br>Doxepin<br>Escitalopram<br>Fluvoxamine<br>Iloperidone<br>Imipramine<br>Lofexidine<br>Nortriptyline | Sertraline | Atomoxetine | Sertraline | Atomoxetine | Sertraline | |

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|---|---|---|---|---|---|---|---|
| | Oxcarbazepine<br>Paroxetine<br>Perphenazine<br>Pimozide<br>Thioridazine<br>Trimipramine<br>Venlafaxine<br>Vortioxetine | | | | | | |
| **Analgesia** | Amitriptyline<br>Carbamazepine<br>**Codeine ***<br>Desipramine<br>Hydrocodone<br>Imipramine<br>Nortriptyline<br>Oliceridine<br>Oxcarbazepine<br>**Tramadol ***<br>Venlafaxine | Piroxicam<br>Tenoxicam | | Celecoxib<br>Flurbiprofen<br>Ibuprofen<br>Meloxicam | | Celecoxib<br>Flurbiprofen<br>Ibuprofen<br>Meloxicam<br>Piroxicam<br>Tenoxicam | |
| **Autoimmune** | Azathioprine<br>Mercaptopurine<br>Thioguanine | | | Siponimod | | Siponimod | |

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|---|---|---|---|---|---|---|---|
| **Cancer** | Capecitabine<br>Erdafitinib<br>Fluorouracil<br>Gefitinib<br>Irinotecan<br>Mercaptopurine<br>Pazopanib<br>Tamoxifen<br>Thioguanine | | | | | | |
| **Cardiovascular** | Atorvastatin<br>Carvedilol<br>Clopidogrel<br>Lovastatin<br>Mavacamten<br>Metoprolol<br>Pitavastatin<br>Pravastatin<br>Propafenone<br>Rosuvastatin<br>Simvastatin | Fluvastatin | Warfarin | Fluvastatin<br>Warfarin | Warfarin | Fluvastatin<br>Warfarin | |
| **Endocrinology** | Nateglinide | | | | | | |
| **Gastroenterology** | | | | | | | |

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|---|---|---|---|---|---|---|---|
| | Meclizine<br>Metoclopramide<br>**Ondansetron *** | | Dexlansoprazole<br>Lansoprazole<br>Omeprazole<br>Pantoprazole | Dronabinol | Dexlansoprazole<br>Lansoprazole<br>Omeprazole<br>Pantoprazole | Dronabinol | |
| **Infection** | Abacavir<br>Atazanavir<br>Voriconazole | | | Efavirenz | | Efavirenz | |
| **Neurology** | Amitriptyline<br>Brivaracetam<br>Carbamazepine<br>Clobazam<br>Deutetrabenazine<br>Metoprolol<br>Oxcarbazepine<br>Pitolisant<br>Tetrabenazine<br>Valbenazine<br>Venlafaxine | | | Fosphenytoin<br>Phenytoin | | Fosphenytoin<br>Phenytoin | |
| **Other** | Abrocitinib<br>Cevimeline<br>Eliglustat<br>Flibanserin | | | | | | |

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|---|---|---|---|---|---|---|---|
| **Rheumatology** | **Allopurinol** * <br> Azathioprine | Piroxicam <br> Tenoxicam | | Celecoxib <br> Flurbiprofen <br> Ibuprofen <br> Meloxicam | | Celecoxib <br> Flurbiprofen <br> Ibuprofen <br> Meloxicam <br> Piroxicam <br> Tenoxicam | |
| **Urology** | Tolterodine | | | | | | |

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# Summary of Genetic and Phenotype Data

| Gene | Genotype Result | Phenotype Result OR Genotype Explanation |
|---|---|---|
| APOE | E3/E3 | E3 Homozygous |
| ABCG2 (rs2231142) | G/G | Normal Function |
| CYP2B6 | *6/*6 | Poor Metabolizer |
| CYP2C (rs12777823) | G/G | Typical response to warfarin (no change in PGx-related dose requirement) |
| CYP2C9 | *1/*3 | Intermediate Metabolizer |
| CYP2C19 | *1/*1 | Normal Metabolizer |
| CYP2D6 | *2/*2 | Normal Metabolizer |
| CYP3A4 | *1/*1 | Normal Metabolizer |
| CYP3A5 | *3/*3 | Poor Metabolizer |
| CYP4F2 (rs2108622) | C/C | Typical response to warfarin (no change in PGx-related dose requirement) |
| DPYD | WT/WT | Normal Metabolizer |
| F2 (rs1799963) | G/G | Homozygous Wild Type |
| F5 (rs6025) | C/C | Homozygous Wild Type |
| MTHFR | rs1801131 A/C and rs1801133 C/T | Significantly Reduced Enzyme Activity |
| NUDT15 | *1/*1 | Normal Metabolizer |
| SLCO1B1 | *1/*1 | Normal Function |
| TPMT | *1/*1 | Normal Metabolizer |
| UGT1A1 | *1/*1 | Normal Metabolizer |
| VKORC1 (rs9923231) | G/A | Medium warfarin sensitivity (moderately reduced PGx-related dose requirement) |
| **Gene** | **Allele** | **Result** |
| HLA-A | *31:01 | Negative |
| HLA-B | *15:02 | Negative |
| HLA-B | *58:01 | Negative |
| HLA-B | *57:01 | Negative |

## Definition of Phenotype

| Phenotype Term | Functional Definition | Genetic Definition |
|---|---|---|
| Ultrarapid metabolizer | Increased enzyme activity compared to rapid metabolizers | Two increased function alleles, or more than two normal function alleles |
| Rapid metabolizer | Increased enzyme activity compared to normal metabolizers but less than ultrarapid metabolizers | Combinations of normal function and increased function alleles |
| Normal metabolizer | Fully functional enzyme activity | Combinations of normal function and decreased function alleles |
| Intermediate metabolizer | Decreased enzyme activity (activity between normal and poor metabolizers) | Combinations of normal function, decreased function and/or no function alleles |
| Poor metabolizer | Little to no enzyme activity | Combination of no function alleles and/or decreased function alleles |

Adapted from Caudle KE, et al. Standardizing terms for clinical pharmacogenetic test results: consensus terms from the Clinical Pharmacogenetics Implementation Consortium (CPIC). Genet Med. 2017;19(2):215-223.

**This is a short summary of the full medication report. The patient's results are now accessible within the clinical decision support software, TreatGx and ReviewGx, and can be used with other clinical information to enable precision prescribing and medication management. The final genotype/phenotype call is at the discretion of the laboratory director. Medication changes should only be initiated at the discretion of the patient's healthcare provider after a full assessment.**

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## Methodology

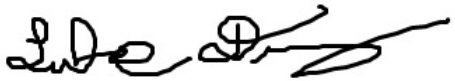
DNA is isolated and regions of interest are amplified using polymerase chain reaction (PCR). Results are analyzed using MassArray technology (Agena Biosciences). UGT1A1 *28 is analyzed using melt curve analysis. Reports are customized by Mira Health Precision and generated using GenXys LabGx software. Our assay detects the following variants: ABCG2 (NM_004827.3)- c.421C>A (p.Gln141Lys); APOE- E2, E3, E4; CYP2B6- *18, *4 (*6, *13), *9 (*6); CYP2C19- *2, *3, *4, *5, *6, *7, *8, *9, *10, *17, *35; CYP2C9- *2, *3/*18, *4, *5, *6, *8, *11, *12, *13, *15; CYP2D6- *2, *3, *4, *5, *6, *7, *8, *9, *Exon9, *10, *11, *12, *13, *14, *15, *17, *18, *19, *21, *29, *30/*40/*58, *31, *41, *42, *49/*53, *54, *56, *59, *68; CYP3A4- *20, *22; CYP3A5- *3, *6, *7; CYP2F4- *3; DPYD (NM_000110.4)- *2A, *3, *13, c.2846A>T (p.Asp949Val), c.557A>G (p.Tyr186Cys), c.868A>G (p.Lys290Glu), c.2279C>T (p.Thr760Ile), HapB3; F2 (NM_000506.4)- c.*97G>A, F5 (NM_000130.4)- c.1601G>A (p.Arg534Gln); HLA-A- *31:01; HLA-B- *15:02, *57:01; *58:01; MTHFR (NM_005957.5)- c.665C>T (p.Ala222Val), c.1286A>C (p.Glu429Ala); NUDT15- *3 (*2), *4, *9 (*2, *6), *14; SLCO1B1- *5; TPMT- *2, *3C (*3A), *3B (*3A), *4, *11, *29, *42; UGT1A1- *6, *28, *37, *36; VKORC1 (NM_024006.6)- c.-1639G>A, c.196G>A (p.Val66Met), c.106G>T (p.Asp36Tyr); 2C Cluster. *1 allele denotes the default reference allele for each gene. Variant Interpretation and Reporting Criteria Gene-drug interaction interpretations are based on guidelines from the Clinical Pharmacogenetics Implementation Consortium (CPIC) and the U.S. Food and Drug Administration (FDA). Only medications with associated genotypes classified as CPIC level A or B and/or FDA evidence levels 1 or 2 are included in the gene-drug interaction section. Genotypes with CPIC level C or D and/or FDA level 3 evidence are reported only in the laboratory report, phenotype table, and summary of genetic and phenotype data tables. MTHFR gene variants c.665C>T (C677T) and c.1286A>C (A1298C) are known to reduce enzyme activity, impairing folic acid metabolism, lowering serum folate levels, and contributing to elevated homocysteine levels (Dean L. Methylenetetrahydrofolate Reductase Deficiency. 2012 Mar 8 PMID: 28520345). However, the American College of Medical Genetics and Genomics (ACMG) does not support the use of MTHFR polymorphism testing for assessing thrombophilia risk (Hickey SE, Curry CJ, Toriello HV. ACMG Practice Guideline: lack of evidence for MTHFR polymorphism testing. Genet Med. 2013 Feb;15(2):153-6. PMID: 23288205). Patients with reduced MTHFR activity levels may benefit from L-methylfolate supplementation.

## Limitations

The determination of genotypes and use of this information for predicting haplotypes is based upon the interrogation of a limited number of defined variants in target genes. PCR amplification may be affected by rare sequence variants, interfering substances, or poor quality DNA and could affect haplotype calls. Multiple genotype assignments may be analyzed in combination (composite assays) to predict more complex haplotypes. The assignment of haplotypes is based on information provided on publicly available haplotyping schemas as found in current literature and input from experts in the field of pharmacogenetics. In some cases, our assay cannot differentiate between two haplotypes due to sequence homology; for example, TPMT *1/*3A and *3B/*3C. Both metabolizer phenotypes will be listed in the "Summary of Genetic Lab Data & Phenotypes" table as the exact metabolizer status is unclear. The most severe metabolizer status will be displayed in the medications summary table. In cases where a patient carries one CYP2D6*5 gene deletion allele (i.e., is heterozygous), the genotyping table will report the result as homozygous due to the absence of signal from the deleted allele. Clinically, these individuals are hemizygous, as they have only one functional allele.

## Liability Disclaimer

This test was developed and validated by Mira Precision Health for clinical use. It has not been cleared or approved by the FDA. The report is not a diagnostic test, does not provide medical advice and TreatGx is not a prescribing system. Pharmacogenetic results should be discussed with a physician or other health care provider to determine the best course of treatment for patients. The medication brand names are not an exhaustive list and do not include combination therapies. Not all medications in this report are included in the TreatGx or ReviewGx software or other GenXys derivative works. Mira Precision Health is certified under CLIA-88 as qualified to perform high complexity clinical laboratory testing.



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CLIA #36D2194362

18/Dec/2025

Date of Signature