ID: 00000000000000

Genetics for people

Genetic Testing
Detoxification

My Detox

SUMMARY OF RESULTS

The following table shows the variants or haplotypes with non-standard metabolisation detected in the patient:

Gene	Metabolic process	State	Haplotype	Metabolizer
APOE	Transport	E2E4	Heterocigosys	INTERMEDIATE
CAT	Oxidative stress	*1*2	Heterocigosys	INTERMEDIATE
CDA	Oxidative stress	*1*2	Heterocigosys	SLOW
CYP1A2	Cytochrome P450	*1*1M	Heterocigosys	RAPID
CYP1B1	Cytochrome P450	*3*3	Homocigosys	SLOW
CYP2B6	Cytochrome P450	*5*6	Heterocigosys	INTERMEDIATE
CYP2C19	Cytochrome P450	*1*17	Heterocigosys	RAPID
CYP2C8	Cytochrome P450	*1*3	Heterocigosys	INTERMEDIATE
CYP2C9	Cytochrome P450	*1*2	Heterocigosys	INTERMEDIATE
CYP2D6	Cytochrome P450	*4*10	Heterocigosys	SLOW
CYP3A4	Cytochrome P450	*1*22	Heterocigosys	INTERMEDIATE
CYP3A5	Cytochrome P450	*3*3	Homocigosys	SLOW
CYP4F2	Cytochrome P450	*2*3	Heterocigosys	INTERMEDIATE
GSTM1	Glutathione	*I*D	Heterocigosys	SLOW
MTHFR	Methylation	*1*2	Heterocigosys	INTERMEDIATE
NAT1	Acetylation	*4*11A	Heterocigosys	RAPID
NAT2	Acetylation	*6A*6A	Homocigosys	SLOW
OGG1	Oxidative stress	*1*2	Heterocigosys	INTERMEDIATE
SLC15A2	Transport	*1*2	Heterocigosys	INTERMEDIATE
SLCO1B1	Transport	*1*14	Heterocigosys	RAPID
MNSOD	Oxidative stress	*1*2	Heterocigosys	INTERMEDIATE
UGT1A1	Glucuronidation	*1*28	Heterocigosys	INTERMEDIATE
UGT1A3	Glucuronidation	*1*2	Heterocigosys	INTERMEDIATE
UGT1A7	Glucuronidation	*3*11	Heterocigosys	INTERMEDIATE
UGT2B15	Glucuronidation	*1*2	Heterocigosys	INTERMEDIATE
UGT2B7	Glucuronidation	*2*2	Homocigosys	SLOW

DETAILED RESULTS

The following table shows all genotypes included in this study, as well as their haplotype and corresponding enzyme activity:

PHASE I					
Gene	Metabolic Process	Variants Analyzed	Reference Haplotype	Patient Haplotype	Metabolizer Type
CYP1A1	Cytochrome P450	6	*1*1	*1*1	NORMAL
CYP1A2	Cytochrome P450	25	*1A*1A	*1*1M	RAPID
CYP1B1	Cytochrome P450	12	*1*1	*3*3	SLOW
CYP2A6	Cytochrome P450	16	*1*1	*1*1	NORMAL
CYP2B6	Cytochrome P450	25	*1*1	*5*6	INTERMEDIATE
CYP2C8	Cytochrome P450	11	*1*1	*1*3	INTERMEDIATE
CYP2C9	Cytochrome P450	49	*1*1	*1*2	INTERMEDIATE
CYP2C19	Cytochrome P450	30	*38*38	*1*17	RAPID
CYP2D6	Cytochrome P450	86	*1*1	*4*10	SLOW
CYP2E1	Cytochrome P450	9	*1*1	*1*1	NORMAL
CYP3A4	Cytochrome P450	29	*1*1	*1*22	INTERMEDIATE
CYP3A5	Cytochrome P450	4	*1*1	*3*3	SLOW
CYP3A7	Cytochrome P450	8	*1A*1A	*1A*1A	NORMAL
CYP4B1	Cytochrome P450	4	*1*1	*1*1	NORMAL
CYP4F2	Cytochrome P450	3	*1*1	*2*3	INTERMEDIATE
TBXAS1 (CYP5A1)	Cytochrome P450	4	*1*1	*1*1	NORMAL
CYP19A1	Cytochrome P450	4	*1*1	*1*1	NORMAL
PTGIS (CYP8A1)	Cytochrome P450	1	*1*1	*1*1	NORMAL
FMO1	Cytochrome P450	2	*1*1	*1*1	NORMAL
POR (CYPOR)	Cytochrome P450	17	*1*1	*1*1	NORMAL
INTERMEDIATE PHASE					
Gene	Metabolic Process	Variants Analyzed	Reference Haplotype	Patient Haplotype	Metabolizer Type
CAT	Oxidative stress	1	*1*1	*1*2	INTERMEDIATE
CDA	Oxidative stress	1	*1*1	*1*2	SLOW
DPYD	Oxidative stress	15	*1*1	*1*1	NORMAL
G6PD	Oxidative stress	90	B	BB	NORMAL
OGG1	Oxidative stress	1	*1*1	*1*2	INTERMEDIATE
SOD1	Oxidative stress	2	*1*1	*1*1	NORMAL
MNSOD (SOD2)	Oxidative stress	1	*1*1	*1*2	INTERMEDIATE

PHASE II					
Gene	Metabolic Process	Analyzed Variants	Reference Haplotype	Patient Haplotype	Metabolizer Type
NAT1	Acetylation	18	*4*4	*4*11A	RAPID
NAT2	Acetylation	28	*4*4	*6A*6A	SLOW
UGT1A1	Glucuronidation	3	*1*1	*1*28	INTERMEDIATE
UGT1A3	Glucuronidation	6	*1*1	*1*2	INTERMEDIATE
UGT1A4	Glucuronidation	7	*1A*1A	*1A*1B	NORMAL
UGT1A7	Glucuronidation	2	*1*1	*3*11	INTERMEDIATE
UGT1A8	Glucuronidation	1	*1*1	*1*1	NORMAL
UGT1A9	Glucuronidation	3	*1*1	*1*1	NORMAL
UGT1A10	Glucuronidation	4	*1*1	*1*1	NORMAL
UGT2B7	Glucuronidation	2	*1*1	*2*2	SLOW
UGT2B15	Glucuronidation	4	*1*1	*1*2	INTERMEDIATE
GSTM1	Glutathione	1	II	*I*D	SLOW
GSTM3	Glutathione	1	*1*1	*1*1	NORMAL
GSTP1	Glutathione	2	*1A*1A	*1A*1A	NORMAL
GSTT1	Glutathione	1	II	*I*I	NORMAL
COMT	Methylation	1	*1*1	*1*1	NORMAL
MTHFR	Methylation	2	*1*1	*1*2	INTERMEDIATE
TPMT	Methylation	2	*1*1	*1*1	NORMAL
NUDT15	Methylation	3	*1*1	*1*1	NORMAL
SULT1A1	Sulphation	2	*1*1	*1*1	NORMAL
SULT1A2	Sulphation	2	*1*1	*1*1	NORMAL
OTHERS					
Gene	Metabolic Process	Analyzed Variants	Reference Haplotype	Patient Haplotype	Metabolizer Type
APOE	Transport	4	*E3*E3	E2E4	INTERMEDIATE
CFTR	Transport	35	*1*1	*1*1	NORMAL
SLC15A2	Transport	3	*1*1	*1*2	INTERMEDIATE
SLCO1B1	Transport	14	*1*1	*1*14	RAPID

CONCLUSIONS

APOE: E2E4 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

CAT: *1*2 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

CDA: *1*2 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate.

CYP1A2: *1*1M haplotype has been detected in patient's sample. This haplotype has increased activity and, therefore, upper metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme, as there is a greater likelihood of not obtaining the expected therapeutic results.

CYP1B1: *3*3 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

CYP2B6: *5*6 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

CYP2C19: *1*17 haplotype has been detected in patient's sample. This haplotype has increased activity and, therefore, upper metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme, as there is a greater likelihood of not obtaining the expected therapeutic results.

CYP2C8: *1*3 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

CYP2C9: *1*2 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

CYP2D6: *4*10 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

CYP3A4: *1*22 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

CYP3A5: *3*3 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

CYP4F2: *2*3 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

GSTM1: *I*D haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate.

MTHFR: *1*2 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

NAT1: *4*11A haplotype has been detected in patient's sample. This haplotype has increased activity and, therefore, upper metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme, as there is a greater likelihood of not obtaining the expected therapeutic results.

NAT2: *6A*6A haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects due to liver toxicity.

OGG1: *1*2 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

SLC15A2: *1*2 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate.

SLCO1B1: *1*14 haplotype has been detected in patient's sample. This haplotype has increased activity and, therefore, upper metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme, as there is a greater likelihood of not obtaining the expected therapeutic results.

MNSOD: *1*2 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

UGT1A1: *1*28 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

UGT1A3: *1*2 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

UGT1A7: *3*11 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

UGT2B15: *1*2 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

UGT2B7: *2*2 haplotype has been detected in patient's sample. This haplotype has reduced activity and, therefore, lower metabolic rate. It is therefore recommended to avoid the use of drugs or substances that are metabolised by this enzyme as there is a greater likelihood of adverse effects.

ANNEX 1: GENES AND VARIANTS ANALYSED

Gene	Marker	Reference's genotype	Patient's genotype	Gene	Marker	Reference's genotype	Patient's genotype
APOE	rs7412	CC	CT	CYP2E1	rs2070676	GG	CC
APOE	rs429358	TT	TC	CYP2E1	rs3813867	GG	GG
APOE	rs11083750	CC	CC	CYP2E1	rs6413419	GG	GG
APOE	rs267606664	GG	GG	CYP2E1	rs6413420	GG	GG
CAT	rs1001179	CC	CT	CYP2E1	rs55897648	GG	GG
CDA	rs2072671	AA	AC	CYP2E1	rs72559710	GG	GG
CFTR	rs119711167	GG	GG	CYP3A4	rs2242480	CC	CC
CFTR	rs74503330	GG	GG	CYP3A4	rs2246709	AA	GG
CFTR	rs74551128	CC	CC	CYP3A4	rs2740574	CC	TT
CFTR	rs75039782	CC	CC	CYP3A4	rs3735451	TT	TT
CFTR	rs75527207	GG	GG	CYP3A4	rs4646437	GG	GG
CFTR	rs75541969	GG	GG	CYP3A4	rs4646440	GG	GG
CFTR	rs76151804	AA	AA	CYP3A4	rs4986907	CC	CC
CFTR	rs77834169	CC	CC	CYP3A4	rs4986908	CC	CC
CFTR	rs77932196	GG	GG	CYP3A4	rs4986909	GG	GG
CFTR	rs78655421	GG	GG	CYP3A4	rs4986910	AA	AA
CFTR	rs78769542	GG	GG	CYP3A4	rs4986910	AA	AA
CFTR	rs80224560	GG	GG	CYP3A4	rs4986913	GG	GG
CFTR	rs80282562	GG	GG	CYP3A4	rs4987161	AA	AA
CFTR	rs113993958	GG	GG	CYP3A4	rs12721627	GG	GG
CFTR	rs115545701	CC	CC	CYP3A4	rs12721629	GG	GG
CFTR	rs121908752	TT	TT	CYP3A4	rs12721634	AA	AA
CFTR	rs121908753	GG	GG	CYP3A4	rs28371759	AA	AA
CFTR	rs121908755	GG	GG	CYP3A4	rs35599367	GG	GA
CFTR	rs121908757	AA	AA	CYP3A4	rs55785340	AA	AA
CFTR	rs121909005	TT	TT	CYP3A4	rs55901263	GG	GG
CFTR	rs121909013	GG	GG	CYP3A4	rs55951658	TT	TT
CFTR	rs121909020	GG	GG	CYP3A4	rs56324128	CC	CC
CFTR	rs121909041	TT	TT	CYP3A4	rs57409622	GG	GG
CFTR	rs150212784	TT	TT	CYP3A4	rs67784355	GG	GG
CFTR	rs186045772	TT	TT	CYP3A4	rs72552798	CC	CC
CFTR	rs193922525	GG	GG	CYP3A4	rs72552799	CC	CC
CFTR	rs202179988	CC	CC	CYP3A4	rs113667357	TT	TT
CFTR	rs267606723	GG	GG	CYP3A4	rs138105638	GG	GG
CFTR	rs368505753	CC	CC	CYP3A4	rs201821708	TT	TT
CFTR	rs397508256	GG	GG	CYP3A5	rs776746	TT	CC
CFTR	rs397508288	AA	AA	CYP3A5	rs10264272	CC	CC

Gene	Marker	Reference's genotype	Patient's genotype	Gene	Marker	Reference's genotype	Patient's genotype
CFTR	rs397508387	GG	GG	CYP3A5	rs41303343	DD	DD
CFTR	rs397508442	CC	CC	CYP3A5	rs55817950	GG	GG
CFTR	rs397508759	GG	GG	CYP3A7	rs2257401	GG	GG
CFTR	rs397508761	AA	AA	CYP3A7	rs11568824	CC	CC
COMT	rs4680	GG	GG	CYP3A7	rs11568825	AA	AA
CYP1A1	rs1048943	AA	TT	CYP3A7	rs28451617	CC	CC
CYP1A1	rs1799814	GG	GG	CYP3A7	rs45446698	TT	TT
CYP1A1	rs28399430	GG	GG	CYP3A7	rs45465393	GG	GG
CYP1A1	rs41279188	GG	GG	CYP3A7	rs45494802	AA	AA
CYP1A1	rs56240201	GG	GG	CYP3A7	rs45575938	AA	AA
CYP1A1	rs56313657	CC	CC	CYP3A7	rs55798860	CC	CC
CYP1A2	rs2069514	GG	GG	CYP4B1	rs2297809	CC	CC
CYP1A2	rs2069526	TT	TT	CYP4B1	rs2297810	GG	GG
CYP1A2	rs2470890	TT	CT	CYP4B1	rs4646487	CC	CC
CYP1A2	rs2472304	GG	GA	CYP4B1	rs4646491	CC	CC
CYP1A2	rs4646425	CC	CC	CYP4B1	rs45467195	AA	AA
CYP1A2	rs4646427	TT	TT	CYP4F2	rs2108622	CC	CT
CYP1A2	rs12720461	CC	CC	CYP4F2	rs3093153	CC	CC
CYP1A2	rs16972381	GG	GG	CYP4F2	rs3093200	GG	GG
CYP1A2	rs17861157	CC	CC	CYP8A1	rs5622	AA	AA
CYP1A2	rs28399424	CC	CC	CYP19A1	rs700519	GG	GG
CYP1A2	rs35694136	II	II	CYP19A1	rs2236722	AA	AA
CYP1A2	rs35796837	GG	GG	CYP19A1	rs28757184	GG	GG
CYP1A2	rs45486893	CC	CC	CYP19A1	rs56658716	AA	AA
CYP1A2	rs55889066	GG	GG	DPYD	rs1801158	CC	CC
CYP1A2	rs56107638	GG	GG	DPYD	rs1801159	TT	TT
CYP1A2	rs56160784	CC	CC	DPYD	rs1801160	CC	CC
CYP1A2	rs56276455	GG	GG	DPYD	rs1801265	AA	AA
CYP1A2	rs59567621	TT	TT	DPYD	rs1801266	GG	GG
CYP1A2	rs72547512	GG	GG	DPYD	rs1801267	CC	CC
CYP1A2	rs72547513	CC	CC	DPYD	rs1801268	CC	CC
CYP1A2	rs72547515	GG	GG	DPYD	rs3918290	CC	CC
CYP1A2	rs72547516	AA	AA	DPYD	rs55886062	AA	AA
CYP1A2	rs72547517	GG	GG	DPYD	rs56038477	CC	CC
CYP1A2	rs138652540	TT	CC	DPYD	rs72549303	II	II
CYP1A2	rs143193369	CC	CC	DPYD	rs72549306	CC	CC
CYP1A2	rs144148965	GG	GG	DPYD	rs72549309	II	II
CYP1A2	rs149928755	CC	CC	DPYD	rs75017182	GG	GG

Gene	Marker	Reference's genotype	Patient's genotype	Gene	Marker	Reference's genotype	Patient's genotype
CYP1B1	rs10012	GG	GG	DPYD	rs78060119	CC	CC
CYP1B1	rs1056827	CC	CC	FMO1	rs12720462	CC	CC
CYP1B1	rs1056836	GG	CC	FMO1	rs60639054	CC	CC
CYP1B1	rs1800440	TT	TT	G6PD	rs1603411177	GG	GG
CYP1B1	rs4986888	GG	GG	G6PD	rs137852348	GG	GG
CYP1B1	rs28936701	GG	GG	G6PD	rs137852344	GG	GG
CYP1B1	rs55771538	CC	CC	G6PD	rs72554664	CC	CC
CYP1B1	rs55989760	CC	CC	G6PD	rs782608284	CC	CC
CYP1B1	rs56010818	CC	CC	G6PD	rs72554665	CC	CC
CYP1B1	rs56175199	GG	GG	G6PD	rs137852324	CC	CC
CYP1B1	rs56305281	GG	GG	G6PD	rs398123546	CC	GG
CYP1B1	rs72549387	CC	CC	G6PD	rs1557229572	GG	CC
CYP2A6	rs1801272	AA	AA	G6PD	rs137852317	AA	CC
CYP2A6	rs5031016	AA	AA	G6PD	rs1557229599	CC	GG
CYP2A6	rs5031017	CC	CA	G6PD	rs137852337	GG	CC
CYP2A6	rs6413474	TT	TT	G6PD	rs2230037	CC	GG
CYP2A6	rs28399433	AA	AA	G6PD	rs782098548	GG	CC
CYP2A6	rs28399435	CC	CC	G6PD	rs137852336	GG	CC
CYP2A6	rs28399440	AA	AA	G6PD	rs137852323	GG	CC
CYP2A6	rs28399445	II	CC	G6PD	rs137852325	GG	CC
CYP2A6	rs28399447	AA	AA	G6PD	rs1557229683	TT	GG
CYP2A6	rs28399454	CC	CC	G6PD	rs137852335	CC	CC
CYP2A6	rs28399468	CC	CC	G6PD	rs137852316	CC	CC
CYP2A6	rs60563539	GG	GG	G6PD	rs137852321	GG	CC
CYP2A6	rs376817657	CC	CC	G6PD	rs137852334	AA	GG
CYP2A6	rs568811809	II	II	G6PD	rs137852320	AA	TT
CYP2A6	rs763469584	AA	AA	G6PD	rs137852322	AA	AA
CYP2A6	rs1967144166	GG	GG	G6PD	rs371489738	AA	CC
CYP2B6	rs2279343	AA	AG	G6PD	rs1057518975	AA	TT
CYP2B6	rs3211371	CC	CT	G6PD	rs137852329	TT	GG
CYP2B6	rs3745274	GG	GT	G6PD	rs137852345	CC	GG
CYP2B6	rs8192709	CC	CC	G6PD	rs2148328996	AA	CC
CYP2B6	rs12721655	AA	AA	G6PD	rs137852333	AA	GG
CYP2B6	rs28399499	TT	TT	G6PD	rs2070355916	AA	CC
CYP2B6	rs33926104	TT	CC	G6PD	rs34193178	AA	CC
CYP2B6	rs34223104	TT	TT	G6PD	rs398123544	AA	TT
CYP2B6	rs34698757	CC	CC	G6PD	rs137852342	AA	GG
CYP2B6	rs34826503	CC	CC	G6PD	rs1557229854	GG	GG

Gene	Marker	Reference's genotype	Patient's genotype	Gene	Marker	Reference's genotype	Patient's genotype
CYP2B6	rs35010098	CC	CC	G6PD	rs5030869	GG	CC
CYP2B6	rs35303484	AA	AA	G6PD	rs1379306569	TT	GG
CYP2B6	rs35773040	GG	GG	G6PD	rs76723693	GG	AA
CYP2B6	rs35979566	TT	TT	G6PD	rs137852347	GG	AA
CYP2B6	rs36056539	CC	CC	G6PD	rs137852339	CC	CC
CYP2B6	rs36060847	GG	GG	G6PD	rs2070360793	CC	CC
CYP2B6	rs45482602	CC	CC	G6PD	rs137852327	TT	CC
CYP2B6	rs145884402	GG	GG	G6PD	rs74575103	GG	CC
CYP2B6	rs186335453	GG	GG	G6PD	rs192737996	GG	GG
CYP2B6	rs193922917	CC	CC	G6PD	rs137852318	CC	CC
CYP2B6	rs193922918	GG	GG	G6PD	rs137852346	TT	CC
CYP2B6	rs281864907	TT	TT	G6PD	rs2070375134	GG	GG
CYP2B6	rs373489637	TT	TT	G6PD	rs782757170	TT	GG
CYP2B6	rs564083989	GG	GG	G6PD	rs137852328	TT	CC
CYP2C8	rs1058930	GG	GG	G6PD	rs137852319	TT	AA
CYP2C8	rs3832694	DD	II	G6PD	rs137852326	TT	CC
CYP2C8	rs10509681	TT	TC	G6PD	rs782754619	GG	TT
CYP2C8	rs11572103	TT	TT	G6PD	rs781865768	GG	TT
CYP2C8	rs41286886	CC	CC	G6PD	rs137852330	CC	GG
CYP2C8	rs45438799	GG	GG	G6PD	rs782170731	GG	GG
CYP2C8	rs72558195	GG	GG	G6PD	rs5030868	GG	GG
CYP2C8	rs72558196	II	II	G6PD	rs267606836	TT	GG
CYP2C8	rs78637571	CC	CC	G6PD	rs5030872	TT	TT
CYP2C8	rs188934928	CC	CC	G6PD	rs137852343	TT	AA
CYP2C8	rs769460274	TT	TT	G6PD	rs137852331	GG	TT
CYP2C9	rs1057910	AA	AA	G6PD	rs137852314	CC	CC
CYP2C9	rs1799853	CC	CT	G6PD	rs370918918	GG	CC
CYP2C9	rs1934969	AA	TT	G6PD	rs782487723	AA	CC
CYP2C9	rs2185570	TT	TC	G6PD	rs137852313	GG	CC
CYP2C9	rs2256871	AA	AA	G6PD	rs979416826	AA	GG
CYP2C9	rs4917636	AA	AG	G6PD	rs782322505	CC	TT
CYP2C9	rs7900194	GG	GG	G6PD	rs137852341	TT	CC
CYP2C9	rs9332119	GG	GC	G6PD	rs78365220	GG	AA
CYP2C9	rs9332130	AA	AA	G6PD	rs1050829	TT	TT
CYP2C9	rs9332131	DD	II	G6PD	rs782130334	GG	CC
CYP2C9	rs9332239	CC	CC	G6PD	rs5030870	TT	CC
CYP2C9	rs12414460	GG	GG	G6PD	rs1557230626	CC	AA
CYP2C9	rs12772884	AA	TT	G6PD	rs267606835	GG	GG

Gene	Marker	Reference's genotype	Patient's genotype	Gene	Marker	Reference's genotype	Patient's genotype
CYP2C9	rs17847037	CC	CC	G6PD	rs181277621	GG	CC
CYP2C9	rs28371685	CC	CC	G6PD	rs782308266	GG	CC
CYP2C9	rs28371686	CC	CC	G6PD	rs782090947	GG	TT
CYP2C9	rs56165452	TT	TT	G6PD	rs137852349	CC	AA
CYP2C9	rs57505750	TT	TT	G6PD	rs1050828	GG	CC
CYP2C9	rs71486745	DD	II	G6PD	rs2070404146	CC	AA
CYP2C9	rs72558187	TT	TT	G6PD	rs2070404412	GG	II
CYP2C9	rs72558189	GG	GG	G6PD	rs137852315	AA	CC
CYP2C9	rs72558190	CC	CC	G6PD	rs1000937138	GG	CC
CYP2C9	rs72558192	AA	AA	G6PD	rs2070404778	CC	GG
CYP2C9	rs72558193	AA	AA	G6PD	rs76645461	GG	AA
CYP2C9	rs114071557	AA	AA	G6PD	rs78478128	GG	GG
CYP2C9	rs142240658	CC	CC	G6PD	rs1163458456	TT	TT
CYP2C9	rs182132442	CC	CC	G6PD	rs137852340	GG	TT
CYP2C9	rs199523631	CC	CC	G6PD	rs2070705276	TT	CC
CYP2C9	rs200183364	GG	GG	G6PD	rs797043472	GG	CC
CYP2C9	rs200965026	CC	CC	G6PD	rs1273138455	GG	GG
CYP2C9	rs202201137	AA	AA	GSTM1	CNV	II	ID
CYP2C9	rs367826293	GG	GG	GSTM3	rs7483	CC	CC
CYP2C9	rs371055887	GG	GG	GSTP1	rs1695	AA	AA
CYP2C9	rs564813580	AA	AA	GSTP1	rs1138272	CC	CC
CYP2C9	rs749060448	GG	GG	GSTT1	CNV	II	II
CYP2C9	rs754487195	GG	GG	MTHFR	rs1801133	GG	GA
CYP2C9	rs762239445	GG	GG	MTHFR	rs373398993	AA	AA
CYP2C9	rs764211126	AA	AA	NAT1	rs15561	AA	AC
CYP2C9	rs767284820	TT	TT	NAT1	rs4986782	GG	GG
CYP2C9	rs767576260	CC	CC	NAT1	rs4986783	TT	TG
CYP2C9	rs769942899	GG	GG	NAT1	rs4986988	CC	CT
CYP2C9	rs774550549	CC	CC	NAT1	rs4986989	AA	AT
CYP2C9	rs781583846	GG	GG	NAT1	rs4986990	GG	GA
CYP2C9	rs868182778	GG	GG	NAT1	rs4986991	TT	TT
CYP2C9	rs988617574	CC	CC	NAT1	rs4986992	TT	TT
CYP2C9	rs1237225311	CC	CC	NAT1	rs4987076	GG	GA
CYP2C9	rs1250577724	CC	CC	NAT1	rs5030839	CC	CC
CYP2C9	rs1274535931	CC	CC	NAT1	rs55793712	AA	AA
CYP2C9	rs2031308986	AA	AA	NAT1	rs56172717	AA	AA
CYP2C19	rs3758581	AA	GG	NAT1	rs56318881	CC	CC
CYP2C19	rs4244285	GG	GG	NAT1	rs56379106	CC	CC

Gene	Marker	Reference's genotype	Patient's genotype	Gene	Marker	Reference's genotype	Patient's genotype
CYP2C19	rs4986893	GG	GG	NAT1	rs72554609	AA	AA
CYP2C19	rs6413438	CC	CC	NAT1	rs72554610	GG	GG
CYP2C19	rs11188072	CC	CT	NAT1	rs72554611	AA	AA
CYP2C19	rs12248560	CC	CT	NAT1	rs146727732	TT	TT
CYP2C19	rs12769205	AA	AA	NAT2	rs1208	GG	AA
CYP2C19	rs17879685	CC	CC	NAT2	rs1041983	CC	TT
CYP2C19	rs17884712	GG	GG	NAT2	rs1799929	CC	CC
CYP2C19	rs17885179	AA	AA	NAT2	rs1799930	GG	AA
CYP2C19	rs28399504	AA	AA	NAT2	rs1799931	GG	GG
CYP2C19	rs41291556	TT	TT	NAT2	rs1801279	GG	GG
CYP2C19	rs55640102	AA	AA	NAT2	rs1805158	CC	CC
CYP2C19	rs55752064	TT	TT	NAT2	rs4271002	GG	GG
CYP2C19	rs56337013	CC	CC	NAT2	rs4986996	GG	GG
CYP2C19	rs58973490	GG	GG	NAT2	rs12720065	CC	CC
CYP2C19	rs72552267	GG	GG	NAT2	rs45477599	TT	TT
CYP2C19	rs72558186	TT	TT	NAT2	rs45518335	CC	CC
CYP2C19	rs113934938	GG	AA	NAT2	rs45618543	GG	GG
CYP2C19	rs118203756	GG	GG	NAT2	rs55700793	AA	AA
CYP2C19	rs118203759	CC	CC	NAT2	rs56011192	CC	CC
CYP2C19	rs138142612	GG	GG	NAT2	rs56054745	AA	AA
CYP2C19	rs140278421	GG	GG	NAT2	rs56387565	TT	TT
CYP2C19	rs145328984	CC	CC	NAT2	rs56393504	GG	GG
CYP2C19	rs192154563	CC	CC	NAT2	rs72466456	TT	TT
CYP2C19	rs375781227	GG	GG	NAT2	rs72466459	CC	CC
CYP2C19	rs1288601658	AA	AA	NAT2	rs72466460	CC	CC
CYP2C19	rs1564656981	AA	AA	NAT2	rs72466461	AA	AA
CYP2C19	rs1564657013	AA	AA	NAT2	rs72554615	TT	TT
CYP2C19	rs1564660997	CC	CC	NAT2	rs72554616	AA	AA
CYP2D6	CNV	II	II	NAT2	rs72554617	GG	GG
CYP2D6	rs1058172	CC	–	NAT2	rs79050330	CC	CC
CYP2D6	rs1081003	GG	GG	NAT2	rs138707146	CC	CC
CYP2D6	rs1135822	AA	–	NAT2	rs139351995	AA	AA
CYP2D6	rs1135823	CC	AA	NUDT15	rs186364861	GG	GG
CYP2D6	rs1135824	TT	TT	NUDT15	rs116855232	CC	CC
CYP2D6	rs1135833	GG	GG	NUDT15	rs147390019	GG	GG
CYP2D6	rs1135835	TT	TT	OGG1	rs1052133	CC	CG
CYP2D6	rs1135837	CC	CC	POR	rs1057868	CC	CC
CYP2D6	rs1135838	AA	AA	POR	rs17853284	CC	CC

Gene	Marker	Reference's genotype	Patient's genotype	Gene	Marker	Reference's genotype	Patient's genotype
CYP2D6	rs4078249	CC	CC	POR	rs28931607	GG	GG
CYP2D6	rs5030655	II	II	POR	rs28931608	GG	GG
CYP2D6	rs5030862	CC	CC	POR	rs56256515	TT	TT
CYP2D6	rs5030865	CC	CC	POR	rs56355228	GG	GG
CYP2D6	rs5030867	TT	TT	POR	rs72552772	GG	GG
CYP2D6	rs28371703	GG	TT	POR	rs121912974	GG	GG
CYP2D6	rs28371704	TT	CC	POR	rs121912975	AA	AA
CYP2D6	rs28371705	GG	GG	POR	rs145782750	GG	GG
CYP2D6	rs28371706	GG	GG	POR	rs199634961	CC	CC
CYP2D6	rs28371710	CC	CC	POR	rs201513102	GG	GG
CYP2D6	rs28371717	CC	CC	POR	rs567904247	GG	GG
CYP2D6	rs28371725	CC	CC	POR	rs781946801	CC	CC
CYP2D6	rs28371730	CC	CC	POR	rs782128221	GG	GG
CYP2D6	rs28371733	CC	CC	POR	rs1304915832	AA	AA
CYP2D6	rs28371735	GG	GG	POR	rs1312625886	TT	TT
CYP2D6	rs35028622	AA	CC	SLC15A2	rs1143672	GG	GA
CYP2D6	rs35742686	II	II	SLC15A2	rs2257212	CC	CT
CYP2D6	rs59421388	CC	CC	SLC15A2	rs1143671	CC	CT
CYP2D6	rs72549346	DD	DD	SLCO1B1	rs2306283	AA	AG
CYP2D6	rs72549347	GG	GG	SLCO1B1	rs4149056	TT	TT
CYP2D6	rs72549348	TT	TT	SLCO1B1	rs11045819	CC	CA
CYP2D6	rs72549349	CC	CC	SLCO1B1	rs34671512	AA	AA
CYP2D6	rs72549353	II	II	SLCO1B1	rs55737008	AA	AA
CYP2D6	rs72549354	DD	DD	SLCO1B1	rs55901008	TT	TT
CYP2D6	rs72549358	CC	CC	SLCO1B1	rs56061388	TT	TT
CYP2D6	rs74478221	CC	CC	SLCO1B1	rs56101265	TT	TT
CYP2D6	rs74802369	TT	TT	SLCO1B1	rs56199088	AA	AA
CYP2D6	rs75386357	CC	CC	SLCO1B1	rs56387224	AA	AA
CYP2D6	rs75467367	GG	GG	SLCO1B1	rs59502379	GG	GG
CYP2D6	rs77312092	CC	CC	SLCO1B1	rs72559745	AA	AA
CYP2D6	rs78482768	GG	GG	SLCO1B1	rs72559748	AA	AA
CYP2D6	rs79292917	CC	CC	SLCO1B1	rs373327528	GG	GG
CYP2D6	rs118203758	CC	CC	SOD1	rs121912442	CC	CC
CYP2D6	rs138100349	GG	GG	SOD1	rs121912443	AA	AA
CYP2D6	rs148769737	GG	GG	MNSOD	rs4880	AA	AG
CYP2D6	rs199535154	AA	–	SULT1A1	rs750155	CC	TT
CYP2D6	rs201377835	CC	CC	SULT1A1	rs1042028	CC	CC
CYP2D6	rs267608276	CC	CC	SULT1A2	rs1136703	AA	AA

Gene	Marker	Reference's genotype	Patient's genotype	Gene	Marker	Reference's genotype	Patient's genotype
CYP2D6	rs267608279	II	II	SULT1A2	rs10797300	GG	GG
CYP2D6	rs267608295	GG	GG	TBXAS1	rs4528	CC	CC
CYP2D6	rs267608297	GG	GG	TBXAS1	rs4529	CC	CC
CYP2D6	rs267608308	CC	CC	TBXAS1	rs5763	CC	CC
CYP2D6	rs267608310	GG	GG	TBXAS1	rs8192868	GG	GG
CYP2D6	rs267608311	GG	GG	TPMT	rs1142345	TT	TT
CYP2D6	rs267608313	GG	GG	TPMT	rs1800460	CC	CC
CYP2D6	rs267608319	CC	CC	TPMT	rs1800462	CC	CC
CYP2D6	rs367543000	GG	GG	UGT1A1	rs887829	CC	CT
CYP2D6	rs368858603	DD	II	UGT1A1	rs4148323	GG	GG
CYP2D6	rs374616348	CC	CC	UGT1A1	rs35350960	CC	CC
CYP2D6	rs375135093	AA	AA	UGT1A3	rs3821242	TT	TC
CYP2D6	rs532668079	CC	CC	UGT1A3	rs28898619	GG	GG
CYP2D6	rs535642512	CC	CC	UGT1A3	rs45449995	AA	AA
CYP2D6	rs536109057	GG	GG	UGT1A3	rs45625338	CC	CC
CYP2D6	rs567606867	CC	CC	UGT1A3	rs61764030	CC	CC
CYP2D6	rs568495591	GG	GG	UGT1A3	rs758737792	TT	TT
CYP2D6	rs569229126	TT	TT	UGT1A4	rs2011219	CC	CC
CYP2D6	rs569439709	CC	CC	UGT1A4	rs2011404	TT	TC
CYP2D6	rs569926140	AA	AA	UGT1A4	rs3732218	GG	GG
CYP2D6	rs730882170	II	II	UGT1A4	rs3732219	CC	CC
CYP2D6	rs730882251	GG	GG	UGT1A4	rs3732220	GG	GG
CYP2D6	rs748712690	TT	TT	UGT1A4	rs6755571	CC	CC
CYP2D6	rs751092905	CC	CC	UGT1A4	rs12468274	TT	TT
CYP2D6	rs753126547	II	GG	UGT1A7	rs61261057	GG	GG
CYP2D6	rs763964554	GG	GG	UGT1A7	rs61261057	GG	GG
CYP2D6	rs765776661	DD	DD	UGT1A8	rs17863762	GG	GG
CYP2D6	rs766507177	TT	TT	UGT1A9	rs58597806	GG	GG
CYP2D6	rs770790629	CC	CC	UGT1A9	rs72551330	TT	TT
CYP2D6	rs773790593	GG	GG	UGT1A9	rs66915469	TT	TT
CYP2D6	rs774943042	CC	CC	UGT1A10	rs10187694	GG	GG
CYP2D6	rs949717872	TT	TT	UGT1A10	rs28969685	CC	CC
CYP2D6	rs1450378700	GG	GG	UGT1A10	rs56935833	GG	GG
CYP2D6	rs1555888899	AA	AA	UGT1A10	rs58704432	CC	CC
CYP2D6	rs1555888910	AA	AA	UGT2B7	rs7439366	TT	TT
CYP2D6	rs1930945471	AA	AA	UGT2B7	rs12233719	GG	GG
CYP2D6	rs1931013246	TT	TT	UGT2B15	rs1531022	GG	GA
CYP2D6	rs2146934648	TT	TT	UGT2B15	rs1902023	AA	AC

Gene	Marker	Reference's genotype	Patient's genotype	Gene	Marker	Reference's genotype	Patient's genotype
CYP2E1	rs2031920	CC	CC	UGT2B15	rs148583958	GG	GG
CYP2E1	rs2070672	AA	AA	UGT2B15	rs368012995	AA	AA
CYP2E1	rs2070673	AA	TT				

ANNEX 2: DRUGS WITH FDA AND EMA RECOMMENDATIONS FOR GENETIC ANALYSIS

Antidepressant	
Gene	**Drug**
CYP2D6	Amitriptyline, Citalopram, Clomipramine, Desipramine, Fluoxetine, Fluvoxamine, Imipramine, Nefazodone, Nortryptiline, Paroxetine, Protryptiline, Timipramine, Venlafaxine, Vortioxetine
CYP2C19	Citalopram
SLCO1B1	Viloxacin
Antiarrhythmic	
Gene	**Drug**
CYP2D6	Propafenone, Quinine
CYP3A4	Droneradone
Antianginal	
Gene	**Drug**
NAT2	Isosorbide
Antibiotic	
Gene	**Drug**
CYP3A4	Telitromicina
NAT2	Isoniazid, Pyrazinamide, Rifampicin
Antiviral	
Gene	**Drug**
CYP2B6	Efavirenz, Tenofovir, Emtricitabine
CYP3A4	Darunavir, Fosamprenavir, Nelfinavir, Indinavir, Ritonavir, Dolutegravir
SLCO1B1	Letermovil
Antineoplastic	
Gene	**Drug**
UGT1A1	Irinotecan, Nilotinib, Pazopanib
CYP1A2	Rucaparib
CYP2A6	Letrozole
CYP2A6	Cabazitaxel, Sunitinib, Sirolimus, Ruxolitinib
DPYD	Fluorouracil, Capecitabine, Tegafur, Gimeracil, Oteracil
MTHFR	Ethinyl Estradiol
TPMT	Cisplatin, Azathioprine, Thioguanine, Mercaptopurine
Attention Deficit	
Gene	**Drug**
CYP2D6	Atomoxetine

Analgesic	
Gene	**Drug**
CYP2D6	Codeine, Tramadol
CYP2C9	Celecoxib
DPYD	Salicylic acid
Proton Pump Inhibitor	
Gene	**Drug**
CYP2C19	Dexlansoprazole, Esomeprazole, Lansoprazole, Omeprazole, Rabeprazole , Pantoprazole
Antifungal	
Gene	**Drug**
CYP2C19	Voriconazole
CYP3A4	Posaconazole
Cholesterol Modifier	
Gene	**Drug**
SLCO1B1	Rousvastatine, Simvastatine, Atorvastatine, Pitavastatine, Fenofibrate
Anticoagulant	
Gene	**Drug**
CYP2C9	Prasugrel, Warfarin
CYP2C19	Prasugrel, Ticagrelor
CYP3A4	Prasugrel
CYP3A5	Prasugrel
NAT2	Clopidogrel
Anxiolytic	
Gene	**Drug**
CYP2C19	Diazepam, Doxepine
CYP2D6	Doxepina
Antimalarial	
Gene	**Drug**
CYP2D6	Quinine sulphate
Contraceptive	
Gene	**Drug**
CYP2C19	Drosperinone
CYP2B6	Ospemifen
CYP3A4	Tamsulosin
MTHFR	Norelgestromin

Antipasmodic	
Gene	**Drug**
CYP3A4	Tolteridone
Narcolepsy Treatment	
Gene	**Drug**
CYP2D6	Modafinil
Gaucher disease	
Gene	**Drug**
CYP2D6	Eliglustat
Cardiovascular System	
Gene	**Drug**
CYP3A4	Ivabradine, Losartan
SLCO1B1	Ezetimiba, Amlodipine, Perindopril Arginine
Anti-epileptic	
Gene	**Drug**
CYP2C19	Clobazam
CYP3A4	Zonsamide
Antihypertensive	
Gene	**Drug**
CYP2D6	Cavedilol, Metoprolol, Propranolol
Anti-inflammatory	
Gene	**Drug**
CYP2C9	Flurbiprofen
Antipsychotic	
Gene	**Drug**
CYP2D6	Aripiprazole, Iloperidone, Clozapine, Perphenazine, Pimozide, Risperidone, Thioridazine
Muscle Relaxant	
Gene	**Drug**
CYP2C19	Carisoprodol
CYP2D6	Tolterodine
NAT2	Hydralazine
Antitussive	
Gene	**Drug**
CYP2D6	Dextromethorphan
Bronchodilator	

Gene	Drug
CYP2D6	Arformoterol
UGT1A1	Arformoterol, Indicaterol
ALS Treatment	
Gene	**Drug**
SOD1	Tofersen
Treatment Korea	
Gene	**Drug**
CYP2D6	Tetrabenazine
Dry Mouth Treatment	
Gene	**Drug**
CYP2D6	Cevimeline
Amino Acid Derivatives	
Gene	**Drug**
CYP2D6	Cevimeline
Respiratory System	
Gene	**Drug**
CFTR	Ivacaftor, Tezacaftor, Lumacaftor, Elexacaftor
Respiratory System	
Gene	**Drug**
SLCO1B1	Elagolix

ANNEX 3: FOODS AND FOOD-DERIVED COMPONENTS THAT MODULATE METABOLIC DETOXIFICATION

Cytochrome enzyme inducers

CYP1A1		
Bioactive foods, beverages or compounds	Type of study	Dosages
Green tea	*In vivo*	45 mL/d green tea
Black tea	*In vivo*	54 mL/d black tea
Curcumin	*In vivo*	1 g/kg/d curcumin, found in turmeric and curry powderder
Soy	*In vivo*	100 mg/kg soybean extract
Garlic	*In vivo*	30-200 mg/kg garlic oil
Fish oil	*In vivo*	20.5 g/kg fish oil
Rosemary	*In vivo*	Diet of 0.5 % rosemary extract
Astaxanthin	*In vivo*	Diet of between 0.001 % and 0.03 % astaxanthin for 15 days
CYP1A2		
Bioactive foods, beverages or compounds	Type of study	Dosages
Cruciferous vegetables	Clinic	7-14 g/kg cruciferous vegetables, including frozen broccoli and cauliflower, radish sprouts, fresh daikon and shredded raw cabbage, 250 g/d Brussels sprouts and broccoli
Green tea	*In vivo*	Green tea (2,5 % p/v)
Black tea	*In vivo*	Do not exceed 3 cups per day
Chicory root	*In vivo*	10 % dried chicory root diet
Astaxanthin	*In vivo*	Diet of between 0.001 % and 0.03 % astaxanthin for 15 days
CYP1B1		
Bioactive foods, beverages or compounds	Type of study	Dosages
Curcumin	*In vivo*	1 g/kg/d curcumin, found in turmeric and curry powderder
Cruciferous vegetables	*In vivo*	25-250 mg/kg indole-3-carbinol, occurring in cruciferous vegetables
CYP2A		
Bioactive foods, beverages or compounds	Type of study	Dosages
Chicory root	*In vivo*	10 % dried chicory root diet
CYP2A6		
Bioactive foods, beverages or compounds	Type of study	Dosages
Quercetin	Clinic	500 mg/d quercetin, found in apples, apricots, blueberries, alfalfa sprouts, broccoli, black tea, green beans, kale, and chili powder
Broccoli	Clinic	10 % dried chicory root diet

CYP2E1		
Bioactive foods, beverages or compounds	Type of study	Dosages
Fish oil	*In vivo*	20.5 g/kg fish oil
Chicory root	*In vivo*	10 % dried chicory root diet
CYP3A4		
Bioactive foods, beverages or compounds	Type of study	Dosages
Curcumin	*In vivo*	1 g/kg/d curcumin, found in turmeric and curry powderder
CYP4B1		
Bioactive foods, beverages or compounds	Type of study	Dosages
Caffeic acid	*In vivo*	179 mg/kg caffeic acid, present in coffee

Enzyme inducers involved in phase II of liver detoxification

NRF2		
Bioactive foods, beverages or compounds	Type of study	Dosages
Curcumin	*In vivo*	200 mg/kg/d de cucumina, presenta en la cúrcuma o en el curry
Cruciferous vegetables	*In vivo*	0.5 mg/kg/d sulforaphane (compound found in cruciferous vegetables)
Garlic	*In vivo*	250 mg/kg/d raw garlic
Catechins	*In vivo*	15 mg/kg epicatechins, found in blackberries, cherries, red wine or dark chocolate
Resveratrol	*In vivo*	10 mg/kg/d, present in grapes, wine, nuts, soya or tea itadori
Ginger	*In vivo*	Between 10 and 100 mg/kg ginger extract, kudze root
Purple sweet potato	*In vivo*	100-200 mg/kg anthocyanin, present in purple sweet potato
Isoflavones	*In vivo*	80 mg/kg/d of isoflavones, found in soya and red clover
Coffee	*In vivo*	1 % of your weight in mL of coffee per day
Rosemary	*In vivo*	50-100 mg/kg carnosic acid, present in rosemary
Blueberries	*In vivo*	Between 0.6 and 10 g per day
Pomegranate	*In vivo*	1 to 10 mg/kg of pomegranate extract
Naringenin	*In vivo*	50 mg/kg/d of naringenin, found in citrus fruits
Ellagic acid	*In vivo*	Dieta de 0.4 % de ácido elágico, presente en bayas, granada, uvas, nueces y grosellas negras
Astaxanthin	*In vivo*	15 mg/kg astaxanthin, found in algae, yeast, salmon, trout, krill, shrimps and crayfish
γ-tocoferol	*In vivo*	80 mg/kg of γ-tocoferol

Cytochrome enzyme inhibitors (phase I of hepatic detoxification)

CYP1A1		
Bioactive foods, beverages or compounds	Type of study	Dosages
Black raspberry	*In vivo*	2.5 % black raspberry diet
Blueberries	*In vivo*	2.5 % blueberry diet
Ellagic acid	*In vivo*	30 mg/kg/d ellagic acid, found in berries, pomegranates, grapes, walnuts and blackcurrants
Soy	*In vivo*	1 mg/kg/d black soybean seed coat extract
Black tea	*In vivo*	20 mg/kg thiaflavins, found in black tea
Turmeric	*In vivo*	Turmeric diet 1 %.
CYP1A2		
Bioactive foods, beverages or compounds	Type of study	Dosages
Apiaceous Vegetables	Clinic	4 g/kg of celery vegetables, including frozen carrots and fresh celery, dill, parsley, parsnips and parsnips
Quercetin	Clinic	500 mg/d quercetin, found in apples, apricot, blueberries, yellow onion, kale, alfalfa sprouts, green beans, broccoli, black tea and chilli powder.
Daidzein Soy	Clinic	200 mg twice daily dose of daidzein
Grapefruit	Clinic	300 ml grapefruit juice
Kale	*In vivo*	2 g/kg/d kale or as freeze-dried kale drink
Garlic	*In vivo*	30 to 200 mg/kg garlic oil, 3 times a week
Camomile	*In vivo*	Camomile tea at 2 %
Peppermint	*In vivo*	Peppermint tea at 2 Dandelion
In vivo	Dandelion tea at 2 %	
Curcumin	*In vivo*	Curcumin diet at 1 %
CYP2C6		
Bioactive foods, beverages or compounds	Type of study	Dosages
Ácido elágico	*In vivo*	Dieta de 1 % de ácido elágico presente en bayas, granadas, uvas, nueces y grosellas negras
CYP2C9		
Bioactive foods, beverages or compounds	Type of study	Dosages
Resveratrol	Clinic	1 g/d of resveratrol (high dose used). Found in wine, grapes, peanuts, soybeans and itadori tea
Myricetin	*In vivo*	2-8 mg/kg myricetin, found in onions, berries, grapes and red wine

CYP2C19		
Bioactive foods, beverages or compounds	Type of study	Dosages
Kale	*In vivo*	2 g/kg/d kale or as freeze-dried kale drink

CYP2D6		
Bioactive foods, beverages or compounds	Type of study	Dosages
Resveratrol	Clinic	1 g/d of resveratrol (high dose used). Found in wine, grapes, peanuts, soybeans and itadori tea
Garden cress	Clinic	7.5 g/d in the form of seed powder, divided into two doses
Kale	*In vivo*	2 g/kg/d kale or as freeze-dried kale drink

CYP2E1		
Bioactive foods, beverages or compounds	Type of study	Dosages
Garlic	*In vivo*	Diet between 2-5 % garlic powder
N-acetil cisteine	*In vivo*	25 mg/kg N-acetyl cysteine, found in vegetables of the genus Allium, onions, garlic, leeks and shallots
Ellagic acid	*In vivo*	10-30 mg/kg ellagic acid, found in berries, pomegranate, grapes, walnuts and blackcurrants
Green tea	*In vivo*	45 mL/d green tea
Black tea	*In vivo*	54 mL/d black tea
Dandelion	*In vivo*	0.5 to 2 g/kg aqueous dandelion leaf extract
Crisina	*In vivo*	20-40 mg/kg/d chrysin, present in honey
Medium Chain Triglycerides (MCTs)	*In vivo*	32 % of calories from MCTs, found in coconut and coconut oil.

CYP3A4		
Bioactive foods, beverages or compounds	Type of study	Dosages
Grapefruit	Clinic	300 ml grapefruit juice
Resveratrol	Clinic	1 g/d of resveratrol (note high dose used). Found in wine, grapes, peanuts, soya and itadori tea.
Garden cress	Clinic	7.5 g/d in the form of seed powder, divided into two doses
Soy bean	*In vivo*	Soybean extract 100 mg/kg
Kale	*In vivo*	2 g/kg/d kale or as freeze-dried kale drink
Myricetin	*In vivo*	2-8 mg/kg myricetin, found in onions, berries, grapes and red wine

Inhibitors of enzymes involved in phase II of liver detoxification

NRF2		
Bioactive foods, beverages or compounds	Type of study	Dosages
Luteolin	*In vivo*	40 mg/kg luotelin three times a week, found in oranges, artichokes, carrots, broccoli and celery
Quercetin	*In vivo*	50 mg/kg/d quercetin, found in onions, berries, apples, red wine and green tea

Foods, beverages and bioactive compounds with demonstrated or potential clinical impact on detoxification systems

Food or beverage	Compounds with bioactive nutrients
Verdura allium	Astaxanthin
Apiculent vegetables	Caffeic acid
Black raspberry	Catechins (including EGCG)
Black tea	Crisine
Blueberries	Curcumin
Camomille	Daidzein
Chicory root	Ellagic acid
Citrus fruit	Feluric acid
Coffee	Fish oil
Cruciferous vegetables	Genistein
Dandelion tea	Luteolin
Garlic	Lycopene
Ghee	MCTs
Ginger	Myricetin
Grapefruit	N-acil cisteine
Green tea	Naringenine
Honeybush tea	Quercetin
Peppermint	Resveratrol
Pomegranate	vitamin A
Sweet potatoes	
Tea Rooibos	
Rosemary	
Soy bean	

TECHNOLOGY

DNA Microarray technology consists of a solid surface with microscopic reactions (microreactions) or DNA chip, on which molecular probes are attached to detect the presence of target DNA molecules. Probe-target hybridization is usually detected and quantified by measuring the intensity of a given fluorescence provided by the molecular probe in samples. This type of technology allows the detection of thousands of specific DNA fragments present in a DNA sample. On the other hand, the specificity in terms of DNA sequence recognition is very high since single nucleotide exchange (single-base resolution) can be detected using short oligonucleotide probes (20-25 nucleotides). As a result, DNA Microarray technology has also evolved to be applied as a DNA sequencing technique to genotype several hundred thousand single nucleotide variants (SNVs) in target genes located throughout the genome (Whole Genome DNA Microarray).

Bead Chip Infinium Global Screening Array Orion (GSA Orion) is a line of DNA chips developed by Illumina for its DNA Microarray iScan platform, widely used in population genetic studies and precision medicine, providing optimized content with 100 % reliable and reproducible high-quality genotyping results. The construction of the GSA Chip was carried out in collaboration with a consortium of experts, and for the selection of SNVs, information from prestigious scientific databases such as gnomAD, NHGRI-EBI-GWAS Catalog, ClinVAr, MHC-HLA-KIR and PharmGKB has been used. The GSA allows the analysis of approximately 700,000 SNVs that cover variants of interest (hot spots) throughout the entire genome, impacting a wide range of genetic traits with physiological and pathophysiological implications. In addition, it allows the customization by users to incorporate Ad Hoc 50,000-100,000 variants of interest.

QUALITY

The analysis laboratory has standard and effective procedures to protect against technical and operational problems. However, results can be altered due to problems with sample collection (contamination) and labelling (identification), delay in receiving the sample in the laboratory (integrity), among other problems. This could lead to invalidation of the test results. In such cases, the patient would be asked to repeat the entire procedure to perform the test.

As with all clinical analytical tests, there is a small chance that the laboratory may report inaccurate information. If there is a suspicion of an error in the genotype detected, further verification testing may be requested.

LIMITATIONS

The results of the detox test should be used as one more tool in a wide range of factors tobe taken into consideration when making therapeutic decisions.

Metabolic response is affected by other factors such as concomitant treatments with other drugs, diseases, toxic habits, age, gender, etc. Treatment decisions should be made according to the judgement of the responsible physician.

REFERENCES

[1] Hodges RE, Minich DM. *Modulation of Metabolic Detoxification Pathways Using Foods and Food-Derived Components: A Scientific Review with Clinical Application*. Journal of Nutrition and Metabolism Volume 2015, Article ID 760689 http://dx.doi.org/10.1155/2015/760689

Genetics for people

Contact:

Scientific Park
Valencia University

St, Agustín Escardino Benlloch, 9
Paterna, Valencia

(+34)96 321 77 58
info@overgenes.com

www.overgenes.com