

Genome-Wide Analysis of the Cytochrome P450 Monooxygenases in the Lichenized Fungi of the Class *Lecanoromycetes*

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Supplementary Dataset S1

P450s identified and annotated in *Lecanoromycetes* are presented with their assigned name, followed by protein ID from the Joint Genome Institute MycoCosm database and species code. P450 fragments and partials identified in *Lecanoromycetes* are also listed.

Acarospora strigata CBS 132363

>CYP531P1|119065|Acastr1

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*

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>CYP573A26|123219|Acastr1

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>CYP6001A24|123335|Acastr1

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>CYP548A32|123348|Acastr1

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>CYP51199A1|123476|Acastr1

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>CYP6456D1|124313|Acastr1

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>CYP504A49|124467|Acastr1

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>CYP534P1|124707|Acastr1

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>CYP5078J1|124755|Acastr1

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>CYP65FP1|124783|Acastr1

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>CYP65FM1|124788|Acastr1

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>CYP617G20|124868|Acastr1

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>CYP527X1|125258|Acastr1

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>CYP671L1|125397|Acastr1

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>CYP682BE1|125569|Acastr1

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>CYP682P2|125690|Acastr1

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>CYP5148B20|125970|Acastr1

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>CYP5089B1|126315|Acastr1

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>CYP5317A2|126469|Acastr1

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>CYP665A2|126478|Acastr1

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>CYP530A44|126571|Acastr1

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>CYP51F1|126818|Acastr1

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>CYP676A8|126930|Acastr1

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>CYP61A1|127065|Acastr1

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>CYP620E39|127250|Acastr1

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>CYP527R3|127753|Acastr1

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>CYP53A61|127786|Acastr1

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>CYP505A69|118843|Acastr1

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>CYP5087A3|118963|Acastr1

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>CYP5236B1|121044|Acastr1

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>CYP5192H1|121236|Acastr1

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>CYP6677E1|121603|Acastr1

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>CYP61B1|122715|Acastr1

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>CYP530A42|122732|Acastr1

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>CYP578Z1|123776|Acastr1

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>CYP52AZ1|125462|Acastr1

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>CYP6001C38|125721|Acastr1

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>CYP511D1|126182|Acastr1

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>CYP59X1|127667|Acastr1

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>CYP532A31|119882|Acastr1

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>CYP52K8|121808|Acastr1

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>CYP6003E1|124731|Acastr1

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>CYP52AA10|124970|Acastr1

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>CYP584E29|125593|Acastr1

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>CYP5328F1|119780|Acastr1

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>CYP6690A2|120689|Acastr1

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>CYP61A7|742|Clagr3

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>CYP51F18|758|Clagr3

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>CYP52BA1|1521|Clagr3

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>CYP511E1|2336|Clagr3

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>CYP6308D1|2782|Clagr3

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>CYP532X1|3083|Clagr3

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>CYP51198A1|3212|Clagr3

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>CYP544C3|3666|Clagr3

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>CYP541A11|3770|Clagr3

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>CYP50334B1|4140|Clagr3

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>CYP59U3|4315|Clagr3

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>CYP51189A1|4783|Clagr3

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>CYP51F17|4971|Clagr3

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>CYP61A1|5505|Clagr3

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>CYP619C8|5770|Clagr3

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>CYP51201A1|6448|Clagr3

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>CYP5080Z1|6778|Clagr3

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>CYP5127F1|6860|Clagr3

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>CYP617AB1|7119|Clagr3

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>CYP532A34|7337|Clagr3

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>CYP548BG1|7493|Clagr3

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>CYP6171A2|7645|Clagr3

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>CYP5168J1|8086|Clagr3

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>CYP53A63|8118|Clagr3

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>CYP5574D1|8153|Clagr3

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>CYP573A25|8435|Clagr3

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>CYP6259B2|8703|Clagr3

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>CYP6677A2|8830|Clagr3

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>CYP611C1|8987|Clagr3

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>CYP6406B1|8989|Clagr3

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>CYP51F19|8991|Clagr3

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>CYP6760B1|8996|Clagr3

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>CYP6389B1|8997|Clagr3

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>CYP548BF1|9839|Clagr3

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>CYP65FG1|9921|Clagr3

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>CYP6171A1|10074|Clagr3

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>CYP532W1|10380|Clagr3

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>CYP51F1|10426|Clagr3

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>CYP5328L1|10580|Clagr3

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>CYP6272B1|10772|Clagr3

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>CYP59AE1|10971|Clagr3

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>CYP559L1|11089|Clagr3

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>CYP6003D1|11283|Clagr3

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>CYP6001C42|715|Clagr3

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>CYP578AB2|1910|Clagr3

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>CYP682BG1|2763|Clagr3

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>CYP51203A1|3091|Clagr3

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>CYP5105E2|4317|Clagr3

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>CYP5042B6|4615|Clagr3

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>CYP5134G1|4621|Clagr3

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>CYP682AW1|4961|Clagr3

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>CYP51195A1|5450|Clagr3

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>CYP6573B1|5774|Clagr3

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>CYP65FD1|5876|Clagr3

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>CYP65FS1|6484|Clagr3

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>CYP526AB2|7158|Clagr3

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>CYP52K11|8178|Clagr3

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>CYP6001A25|8730|Clagr3

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>CYP59AC1|8988|Clagr3

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>CYP6352A1|9014|Clagr3

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*

>CYP5391D1|9060|Clagr3

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>CYP567E10|9343|Clagr3

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>CYP5070D6|9652|Clagr3

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>CYP6001J1|9791|Clagr3

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>CYP5436D1|10383|Clagr3

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>CYP578Y1|10401|Clagr3

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>CYP5436C1|10437|Clagr3

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>CYP5095N1|11287|Clagr3

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>CYP5094D1|11364|Clagr3

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>CYP584L8|2841|Clagr3

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>CYP584AQ1|3933|Clagr3

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>CYP6839B1|5322|Clagr3

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>CYP584AV1|9094|Clagr3

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>CYP52AJ5|9656|Clagr3

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>CYP539A53|10665|Clagr3

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>CYP52K9|10690|Clagr3

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>CYP534N1|6993|Clagr3

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>CYP6456B3|3122|Clagr3

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Dibaeis baeomyces

>CYP6001J3|12221|Dibbae1

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>CYP59U2|845|Dibbae1

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>CYP5039D4|898|Dibbae1

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>CYP548A29|2252|Dibbae1

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>CYP5128L1|3127|Dibbae1

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>CYP50230B1|3162|Dibbae1

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>CYP684M2|3389|Dibbae1

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>CYP65FN1|3450|Dibbae1

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DADHSRMRRLISHAFSEHALREQEHLILHYFDRLIAKLREQIDGPTQGKINAVRWYNYTTFDVIGDL
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>CYP59Z1|3598|Dibbae1

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GHDTTSSATAYMYLLSQNPDC LAKLRAEHDAVF GPDIGTVGAQVSANSHLLNKLPYTIGVIRETL
RLYPPASTIRAGAKDIYVKYDSKLWPTEGMMIWCVSLPLHRDPNYWPEPMKFM PERWTVPEGDPL
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>CYP6003A4|4288|Dibbae1

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SAAIKEGSLRSCGHRMVQEM LARGETPERIVDNGWLN AFGSVGVPVTA FSEILQFFLLPENEKLWG
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DPSDKEAVKDPKVFYKDRPDS DISHFSFGPHACFGREIALSYVTGLIKIIAGLKNLRPAPGNMGLLK
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>CYP65FR2|4578|Dibbae1

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AWYLIKERDIMDKLRNEVDRAFHKDETEINIQSVDGLPYLCAVVQELFRIYPVALAGQAHIVPPEGA
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>CYP6120A2|4640|Dibbae1

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RSRETLYRHA EYATEHTEARLKLYTSRKDFVYHILSSKGPSATNKEIASHFNVIMMAGAVTTATFLS
GVLYYLCHNLQAMQRLQDELRGTFPDIESIKSKELMQCTYLN AVVEEGLRIYPAGAAHLSRIVPKG
GVEMAGRFI PGGTRVSVHPWSILRNP NVFHMPEKFIPERWIASDPPGQM GDKLDRSLPFSYGPRGC
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>CYP6187C1|4764|Dibbae1

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GAGVETTAHTLKVITYHLYTNPTLLQNLRAELRTVQH PGSSVKLAQLEKLRYLTAVILEGLRLSYGV
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>CYP59AD1|4974|Dibbae1

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>CYP682AY1|4997|Dibbae1

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>CYP532A33|5125|Dibbae1

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>CYP6102C1|5261|Dibbae1

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>CYP682AX1|5292|Dibbae1

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>CYP6103B1|5457|Dibbae1

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>CYP660J1|5618|Dibbae1

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>CYP613C7|5651|Dibbae1

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>CYP51181A1|5661|Dibbae1

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>CYP504A48|5678|Dibbae1

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>CYP5090F1|5962|Dibbae1

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>CYP6415B1|5993|Dibbae1

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>CYP6828B1|5997|Dibbae1

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>CYP6264A2|6712|Dibbae1

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>CYP5130A2|6713|Dibbae1

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>CYP51202A1|6905|Dibbae1

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>CYP65FR1|6956|Dibbae1

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>CYP51200B1|7063|Dibbae1

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>CYP682BA1|7152|Dibbae1

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>CYP544C4|7403|Dibbae1

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>CYP6798A2|7580|Dibbae1

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>CYP6466A2|7584|Dibbae1

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>CYP6615B1|7746|Dibbae1

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>CYP5527B1|8142|Dibbae1

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>CYP548AJ6|8150|Dibbae1

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>CYP65FQ1|8543|Dibbae1

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>CYP5238F1|8618|Dibbae1

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>CYP677J3|9120|Dibbae1

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>CYP59V1|9977|Dibbae1

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>CYP682AT1|10284|Dibbae1

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>CYP5168K1|10516|Dibbae1

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>CYP6187B1|11009|Dibbae1

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>CYP511A4|11068|Dibbae1

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>CYP5180F1|11116|Dibbae1

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>CYP51181B1|11146|Dibbae1

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>CYP6174B1|11179|Dibbae1

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>CYP5180E1|11342|Dibbae1

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>CYP617G19|11501|Dibbae1

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>CYP5328K1|842|Dibbae1

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>CYP505A70|1661|Dibbae1

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>CYP6001C40|1702|Dibbae1

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>CYP6232A2|3412|Dibbae1

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>CYP59Y1|11092|Dibbae1

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>CYP6677C1|11371|Dibbae1

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>CYP51167A1|9745|Grascl

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>CYP5238E1|11492|Grascl

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>CYP65FJ2|442|Grascl

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WESFLQRLAPRSLTEDALEHQRYANQQINKRLDTKTNRPDFTLTPFMKNNVNFENMSRAEILSTFNF
VIVGGAETSATVLTGLFSHLSRYIKIQQRLCSEIRSALKREEDISIDACKDLVYLDAVLNEGLRMFNPI
PSGLPRVVEGGDTYCGAYLPGGTRIGVRTFAVNRSSSEYFHDPDRFVPERWLPITKRPKTYHNEQLT
ASRPFVGVFHSCLGRPLAWVELRLVICRILWKFDIADDAHCRVDFDDSPVIMMVQKGPVNIRVQVR
EDHRKQ*

>CYP532V1|810|Grascr1

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LHRRYGDIIRLGTHVLSFNSPDALGEIYGLKANFPKSFYYPQQILDPKGNHVGSLFVIDSKEHARM
RKVVSGCFSLSALMRFSVIDSMTALFLEKTDEHFAQTGAECDLAQWLQFYAFDVICKITWGLEMG
TMRKNEDVQGVFKSVERRFAYMAVVGGQIPSLDLLLLKNPLRLLSKLNLIHANAPIVRFAQNRLSE
RLVRLKTESKSPAQPQPQFQSQFQSQPPNSLPKSEDPSQPNDLMSLFLHSRDLDPFTFFDTNRVLAMC
MTMANAGSDTTAISIAAIFYLLKSPACYRKLVAEIEGAVANGTLATHEIGTGSRLGLGLGPLVSW
SESQKLPYLDACIKEAFRLHPAVGLPLERVVPEGGATILGEWIPGGTVVGMSAWVVHMSRRVFGED
VERYRPERWIEVETEEERKRMERGLFHFHGMGSRSCVKGWISLLEVYKVVPVAVRRLEVSAPVWGKG
EVRGGGYGRFGGGAUVGVSEWMC*

>CYP5519B1|814|Grascr1

MPSVFFRELLAVSGTSISLYAIAVALVVSLLLIEAYCSRESLPGIPRLSRVPVLGALPVYMLHDIPRTL
HKLMTIGVDGISYAQIFNTVIVCIQNPMMAKEVLALPDEISSRLGNSGCISWSPFATLQRLIGNTLFSY
VGPTLSHRRSLYIMEFMHKKPLYEKFDTMIDIATIHMDTVAGKESTAEFKDLQRSADDF AISLWGEL
LYGNPNMHLNGVALTSLDKILEISTSPWSSLWHAFQRLLGTVTADEPTSEAKVRADMANLV DEN
MAVLEAHEHHHPDTPPKLIRKISLKS GGEFSGPLSEFAYEFTHLNIFGGHHSIGSNITWSLIELNKYPK
CLAKLMREIDSVHPNDFAA ISSKMPYLD AIILEINRLYSITVLLTMLDTLTPYRYPTVHSTVRVIDQEV
KLTASGAQSVVLKPGMLVYLSLLHINTSPKYWGDDAGTFVPERFLNKGDDQDGRPFMSFGYGPRSC
VGYKFAILVVKVYLITLLKSYTVEVTDLYPEVETGALLKTKKSICARICRRV*

>CYP5094D1|1054|Grascr1

MPFNFGELLLLSTLACLIYVPCVILYRLTLHPLSNYPGPKLAAATSLYELLYDAILGRGGNLFYQKVD
EMHDLYGPVIRVAPNELHIKDSFYTTLHANSPARRDKHHSTANATGAVQTTFATQEHD AHKRRR
IAISPVFTKGSINRSYNMIMQQLAILENLRQLHSGKDVVN LHQILLAFTSDTVSHFIIGSSTELQTHPE
KARQWESALQSLFEMIPLTKTFPTLIDVLLKLPKSILLALSPKLA AVIQWREGFFAAAAAEQKFNYLD
SKPDSGSATEKTLFQAIQTSNLPPSDKTPERMGIEAESVATAGAETTVTALTHAIYFLLAHPSNLERL
RKELLPLYFESKKQEPSLASLQELPYLPRALSSAAVELYTNAQRQQTAVIKETLRISPIITVRLPLLAHT
ELQYGKWRIPAMTPVSTSILDVHNDPAIFPSPTEFQPD RWITADGKKSSEPDKFLVPFGRGHRMCLG
YELAYAEIYLGLSMIVRKFDLELFETEW EQDVVKVRDCFVGLPGKDSRGVRVKVTGLRE*

>CYP682BB1|2037|Grascr1

MDLTHGRLRDGSYTWEIEKMHKEFGPIIRINPLELHVKTVDLEFMSQLYPSVAKNVEKFPWF AELFG
NTEMAFTTIGHNLHRLRRSAFQNFFSKASVRRLEPLL RDLDALCEQLLKRADTGQPVNLTYAFSA
LTQDVITEYCYSDRRNVLGMDDFAPLYYDMVQKPAILTAINILSFIPRTLFPFGFSVVRARKWPYISI
GKNTCAETFALSWPNTCAETFALSWPNTPRPTPKTLPKKPHLPMHPLQPNPQMRLFPTSHPNPPH
PRLPRLPQKSLTPQSSTPSFPPTYPHPSALLSSPDLPPEKSLQRLAFEAQSLIGAGTLTSTHTLSTTFY
HLLSNPPILTRLNTELSTHMPNPSSPLPPLSTLEKLPYLSAVVHEGLRISYGILHRLQRVHPDNELHFE
KWTIPRGTA VGMSPYFVHTDPSLFPPEPREFRPERWLGEEGEGRKKWIFNFRGRTRMCAGRELAMGE
IFLGIAAVGKRFAKEGEGRGGARMRLFDTERERDV DVV RDYFITFPSRESKGVRVVISSDERRV*

>CYP51157A1|2236|Grascr1

MFLTYSFLLPNTGHKTLDVLLFIAIAAFSVLFV TYGITSIRFRLEKTRYGADRKGREPPTLPYWIPYIGH
MLQMSDLHALYDYAASKSPDKSPVTLRIGSTTTYLIFGPDNVTALFKNSKHLERDNLTKRAFLNSN
QNASTNPQSSEHIVHQPSPPSSPSTTSPQSQPQTPIDDPTAFRIGRKLHDLQHLHLSTPTPLPTNP

NKSHSHQIHPNLPSPTRRPHILSLTPSLSKIYWAYDEAFLLGLPELVYPIGNSLQDKLRDAVEKWISH
GMEAYDWDELEKEKENEVWEENFGCRLFRDSVREMKERGVATGDMAGALLSLVWATASNSIVLV
GWMVGWLVEDQELLKQVRRELEEGVRRALISSRGLYADKRARISDDNEDEVFGKDLKTAHDGK
DGTFDLDISTLSFLPFLNSLYTESLRFHSSVTVTRRLTAPIEIAGYTLHKGNFVMTPSYLAHMDPNVW
GSRNNDAKSISKFSSASISTSTFTLASTPASTPTPTLTPTPSKISPTSTSTSIKSADLSTTLPSPPRRFFAQR
FLPSPSHPTSALNPSTFLPYGGGSAICPGRFLSQQQILSAVATMVLMFEMEFVSYAEKIEEGDGGGTG
TSGEDMERRKWRTRNKRPEPDQRYAGGGVMPPDGEWVVGFKWRRGLGRD*

>CYP65FE1|2250|Grasr1

MSSEIQTHYLTA PGQTTDNIVTTSDSKFHSRARSLLSNSFTADAVHAMHPLIEGHCNLLISRIGELVL
QKPDQGALINMTDWMIFFTIDVIGDLALGKSFGCLENGDYHDWVRQLFQYVKMITVAAAPRYYST
WIVDFVFQRLIPQSVLDGQNAHKRYADEKINRRLDSKLSNSRSDFMTPFMKHNANYQTMSREEILS
TFAFLITGSETTATALTGILNHLVRKPEVLARLTKEIRTYFVREKEIVLDVLVGENLPYLEATINEGL
RMCNPIPTGLPRQVPDGGDTYAGVFLPGGVRLRVQSYTVCRSAKYFHQPD AFHPERWLSKANGRP
QEFDNDRLSASKPFVSGYSACLGRAMALEEMRLVISRLLCRFDISEDPEERVEFDDWPMPSFVEKGP
MRIRVREKVP*

>CYP548A31|2252|Grasr1

MTRKGINAKSRIKTMKRYVQSAEESHDDASELMKSLIKECRRGGLNDQAIAGCLALNLWAPSSPQ
KYTANANEYRFIHWLAAYILHDPSSLATIRAETAPAFSTQPPNHKHIYESCPRTAVYNETLRCTFG
GVSVRTTVVSPLTLQNKTLRPGCTSMIAVRELRELHSNPDIFGANVDRFDAQRFLGNDLDSKYFRPF
ARGSTYCLGRLLAKRVSMVFAATMLERFEDEIVGRDGGELGEKQLGAETMRRRMLKLPAVDWVTP
SVGIMKPAKGEEVYVRLSEREAS*

>CYP596W1|2395|Grasr1

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VIEKGMRM TDGPFQVTSAFGPMVLLPTRFAHELNRNDPRVSLTKAISKAFFSHYPGF EAFVPADPNG
RVVRDVVQ GKLTQSLGLITNDLVDEADLALSDRFPAKSEWRTVEVKEDLLQVVARLSARVFLGFPF
CRNP SWLELSKSH TISTFIAASKLRRIAPYLRPFAARFWVPECKQIRQQVSQARTLLKAEIGLRRARA
EKALAAGQTTSKRND SVGWMVEAAHKGRIKTDYAAGQLNMSIGAIHTTAEAMTRSLLDCCQHPE
VVEPLRQEMLGALKEHGWNRNMLS KLRLMDSFLKESQRSHPGQLVNMHRMVTEDITLSNGTILPK
GTHMDVLP GFDNPQVFREPQKFDAERFLKMRNEPNQDLSWQYVSLHASHMGFGYGEHACPGRF
FATNEVKIALFFLLLRYDWEL ENDEPALMQPEDGV SIRPDLKLRYKSRTPEVDLISLIDAKELEEMRS
N*

>CYP5042B7|2438|Grasr1

MNTALQIGIGVLILLFCIRETLKPADQKWNFFTGRKSYKLPPGPKGIPLYGNLQFLYNRHPQRLTP
YLTSLRTHGELTTLR LGSQTWILLNSKRVA AHFISKSGRLTNERPHMPIASGLVSNKRTVIRQTASW
SEGRVMHHL LSGSVLKT YGNWMEFESL LNSYL RQPERWYAHHFRYSTAVLYRLVMGEKLDKS
KEELDKYQQVTMEFVRSIGLSVVDFFPELDMWVPKWMQPWRRFWSEMGRRH RGVFVDWWTPIYE
MVKKGEGKAGFVRD TLLHPEVKYKGD EEEAMYLATS VIAAGGDNTRMSLNTFVMSMVSNPEILK
RGRAEIDRLCGADEGKLRLPGADDMEQLPYVSAIIEVLRWRPTVPLVPPHQLTEDIEFEGYVFPKG
VSFVLNTISISQEYENWDDFNPERWMDGNEDNVTHDLWAFGGGRRICVGYRVAQQALFVAVARL
IFCFNITARGEIDNKNL NHVSLNEPFPVQVTVRSPA HETLILSGFDKAAKEESSQKMR*

>CYP573D1|2821|Grasr1

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TGKAFDFANWATYLVFDVISEVAFGKALGFTEAGSDVHNLIKSWHDGLWAFSVLGRLYPMTQWIK
KTPLKRFIVANPAQPF GIGMLMRMRDEIIEQRVRDLEEGKLQNQEKVDLLQQYAFSFPSPYPWPCFL
PQPLKHQPKTPTNLPSPSSILNSRSTGASLPLAQIKA EVLLIIIAGADTTATILSALLNRLSTSPSLYTR
LQTELTSAHSLHLLSSPIPTYNEITTHLPLYCATIKETLRLSPAAPLVGSRMV SPEGLTLP GGWKVPGG
KGIEVACNPWIVNRDKGVWGEDAERFRPERWLEEKEKV KTYNRYLMTFGYGTRVCLGRELAMME
FVKSGVTFLGGFEVRWEREGKGEGDGAGKYKTRGGIAWFEGVNM RIGERGGRKRE*

>CYP677J2|3079|Grasr1

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AWVPPTKRHVSHFAVRDEKLHAERRRIVNNVYSMSSVLESEGSIDSCTEMFCENMRDFAKRKSAID

LSLWTNMYAFDVVGELFFGSKFGFMQERTDIGGYMKSIDSLLPAFTIGGTVP SYLTKLCLVFTILFSSSI
RGALGAVKNIKTVSKVAVEKRRREVDKNTDDKHDMRLKMLQINAERGEKLDFTISDINVESQGAIF
AGADTTAIAMNSILYHLMRTPRAYKKLTRIVDDAVADGTLSPAKYAEAIKIPYLRACINEGMRLH
PSVGLVMPRIVPAGGATISGFQFPEGYRVGVNPAVVQYDEDEDIFGEDADQFNPDRWIEGDIVSMEKA
MIQFGAGTRTCIGKNISLSEIYKLILQLVRDFRFLVEPKRALRTHNYWFNKQTGIWVLVDERFQSSD
SHIEQESAS*

>CYP51168A1|3326|Grasr1

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YRSGQLPKQMPKLHDIYGTAFYKDWSFYNSRAFEHSTLNILDTPSARTRKDAYIRLFSKESISKLEPRI
NAHIDRFINVL YEAGTKRQPV DLSQGFKCLTADIIFDFMFQEDFGGLSAKNFHHPLIAPTDDIVIFAE
WGFYFRAIFHPVEILVDYIPDSILRVLFPPALGIKT LINLCRETIQNLKRKPLTDPKMTQT VFGALLNP
TSSKTSGITDEAVLTSESTFMLLAGVDTTANTLVTAVYAMLRNPEMHQKLMNELTAAFP GYSSTD S
LTFERLQSLPYLEACIKEALRLSYGAPGKLPRVVPSTGHKAAGLYIPPGSIVAHSSYTYQTDET VFPSP
TEFKPERWLTGNATELDRFLIPFSKGNRSCVGIHLARTELFITLAKLMLSVNMKVWKTTPRDM EW M
YYSVTVHRGHLKVIVEISHDEIAVYTDNE*

>CYP5078J2|3380|Grasr1

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PFIATFSNYWKIQAAWKEEMPQQNIELHKKYGPLVRVGP NMISVDDPAALGSIYGFKPIYQKSAFY P
IVEAIYKGRFLANLFTTTDEKYHARLKRASVNAYSMTTLNELEPHVQDVIQLFLRRIDEVTDNGQKP
FDIGNWVQYFAFDALGEVNFSSQLGFLETGTDVGNSIATIDGLLRYLSIIGQAPWIHKFLLGNRFIHK
LLPFLETSNEVQNFAIKMINKRVSGEQSDSRDMLARLLEASEKDDARLTREEIIALTTTNLIAGSDST
AIGLRAILYFLCKHPAVYSKLQREVDDAFAAGSLSQPVRYADGAKLEYLNAV VTEALRAHAATGF
VLERHVPEGGITIAGTHIPAGTIVGINSWVMHANKKVYGEDAEQFNPERWLNASEAQLREMRRCN
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TVRASA*

>CYP6980B1|3505|Grasr1

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NTAIFGSR LNEISRDPKHFRVFDGKVWQLLFQLPAPFAREMISAKMEIVKSFEQYVESPLETKADR
AWFIEALETEMAALNMSVKDQATMFFMLYWL FNVNAYKTCFWLLSYILTPGLLSSIRAETAPAIA
ADGGVNVTRLVNACPYLTASYDET LRLALDVASARNVMEDTMLNGRLYRAGSKIMMPYRQLHFE
EAVFGSNPEAFDPSRFLKNKDLNRNPSFKPFGGGSTMCSGRFLAKYEVLSFV ALSINRLELKVADGE
GEAQQRFP RYNRSKPGLGIMEPVDGDDLIVEVRRRRT*

>CYP53A65|3583|Grasr1

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GQFEQYIHSNLSDLLKQWNTLSDTATKAGKAYADIDSLHWFNYLAFDIIGDLAFGEPPGMVNVGA
DIAEVRETPTSPPRYAPAVQVLNRRGEVSNTLGSLPGLKPYAKYLPDPFFSQGLQAVSDLAGIAIARV
KARLEQERSGIKSERRDLLARLM EGKDERGEPMGQAE LTAEALTQLIAGSDTTSNTSCAFFFWATKT
PGVMENLRKEVDAVLPEGGIPSFELVKDLPYLHRAIDEALRIHSTSSLGLPRVVPPEGGEVEVC GKWF
PQGTVLSVPSYTIHHDRGIWGEDVMEFVPDRWLEGR LTERQKGAFIPFSYGPRACVGRKSILMSADE
FEKKILTAVVG NVAEMELALIVSTVVLNFDLELRQDTLETREGFLRKPLGCAMGLRKRVK*

>CYP654D1|3989|Grasr1

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LIPGVYVVGSKKH EVKATSARFRAESPELLLDGYRRTKGQEPFYVLSARGPRLIIPTRYMEELKSAP
MDQVDFTGIVHEMLEYKYTGLVDRSRMIPSTLSRMIPSTLNSHLTPRLPNIMPEVQDEINLAIDHEFP
QNDDCCVPLGTEVDVMPGITRMFAKATSRMVGGKAMSQNEEWIPVAINYTLWSFNAAQKV KSTP
WPIRRMITPWFEKVRKKIPWCFATAVKVGVPILEQREQTGEIANDFLQFLTETAKGVQTIGGILYDL
CQYPELIKVLREEYEGIVDRDGNIPKGGYAKLVKMD SVMKESQRHNPIAILTFERIINADRTLKD GFT
IPAGSYIGVASYNIAMDPEIYPEPEKFDGLRFERLRNDPAWTNKASFVSSNAQSLAFGYGRHACPRG
QFMEQEIKSFLVKFLTNYDIKF KDQGQTRVKSTPLEVQLVLRHTPILLKRRNL*

>CYP59X2|4262|Grascr1

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AMVEETLKFQCQTLDLRAQNKQAFQMKPLTDFLTLDIIGRVVLDVQLNSQVGSNPLTDGLRSQVPW
LIFGGDANPLAKLNPPRPLVLWYNAWRMDRYIAWILDRHLADSRTETSRKTIIDLAATAYLSANKD
NDISTGIDTTFKSFASSQVKLFLFSGHDTTSSVCYLFYVLANNPSVRNRMRAEQDKIFGPDIKSATSV
IQSQPALLNDLPYTTAVVKETLRLYPASSTRAGEPNFNITDQHGRLYPTDGFLIWANHIIHRDPA
YWPEPDEFLAERWLVTSPDDPLYPVKGVWRPFERGPRNCIGQELVMMEMKIILVMTARRYNIEAA
YEEIDGGALGSKWNTVHGERGYQIQRSQPSGDLPCRAIIETR*

>CYP684N1|4399|Grascr1

MELQSNPSQHLLLLLYAVLGLGLGFLFVRLAIRAYAGPAASVPGPWYTRWTNLPLKYYSLRARRTQ
WVHSLHQKYGPVVRLLKPSEVSISDVRAVREIHRISTPFLKTDYIMRLTGKGVLPGLFTFSDPKEHSAR
RRLLAGPLSESSLKNVEPTVNKNIDKAIEGIRMENKENGTAIDFKWFTFMATDVIGELSFAESFRML
DQGKPNQYSHDLHAVALATALNSELGILTHFLGALGLSPFRQAYEATGRFRSYSTESFKRYEQHVA
LNPTNPKPTLFTKFIQKVEGGEESLPRTALIREGQGYIVAGSDTTAFTTTTLYVAVTRNREVMEKLVA
ELEGLPEGFGWEDVRHLPLYLNKCIDEALRLYGAAAPSGLPWVVPKGGAGHLAGYTFPEKFVYSTQGYT
LHRDPGIWPEPERFNPDRWDAPTQQMQQAFMPFGGGTRICIGLHLARDEMMAVARFFRMFPHA
RVTSSDDDDMEFRAYFLATLKRKRCMVAAS*

>CYP5589C2|4661|Grascr1

MTSYAADSSNNHHFLPCLVALFLTCCFALQTRSTGIYTKFQRKRRFTIFNPFTVKPAHEVVATGYNE
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VKRGLSPKLPLLTPKLLEEMDYAFAIELGDPGHGKSFVAQRLLSRIAHRAVRASRIMVGHELCRNEMFI
NASLEFVMSLFGTALVICKLPLGPFREVLAPITLWHASKLNKVEKLVPVVRDRITDWQAGYGQS
EQLDCIQWTLDLMPTEGATDTKVISQELIHNWLWAGTSAPGGLVMDMLFQVLLPHYLVPLRAEAA
DAVHMFGWSEHTFNHLTLQDSFIREISRLYPTGSITVTRTVYDRPFVFSDDLTPVATRLAFAAPIL
HDESTFPNAKQFDGFRFARQHTKDNDRKVGEKQNSSSSMSTTNLAFGYGTHVCPGRFFAVRMVK
MIFTKLILDYDITWEGHVTQRPPPVCIQGQFIPNLKQKIIKKRV*

>CYP613U1|4665|Grascr1

MDRKVINANTLSLQNWFSVFSAFASACGLLVILPKLRKHVLSRINRCLSFLINQYLLFKYPICHNETG
RSIPTCPYVFPNGQGNVAKFLEGLSNAGEWSRQYGSVYRIWSGKPEIVLSRPEHVKAIFYDSRHT
KAKDNNSGYLMHQILGQCLGLISGKSWANLKEVVQTPFTYSSTTNHVQLVQRMVAEYIQELFDSK
TADELHPANDLKMLPFWITAQIIYGDLTPAMKTELQQLATARESIFRHVIRGGISRFAISRFLPTQTN
RDLSSFLRRWQAFNDKAAAAAETATKTTTTTSTSTSKPPPPPPITQMYRSLHNGTSTRPQLLQTLDE
ILFANLDLAPFTLESSRLHPAAFSVPQSAPTSRLLDGFTIPAGTDFIVDATTNLTNKEFWGEDAGEFR
PQRFLEGGGEVKEGKEGKREMRYNYWRFGFGPRVCLGRYLADLILRAVVAELVGGYEIEVPREWQ
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>CYP65FV1|5047|Grascr1

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KQAHWPVNNTFKSGIKQRVLFANARAIGIPFFDSTIARWVSPHQRKRHEQFEYARAVVGTRLQDKSR
RTDFVSNFIRENVMGVSVSREEIDSIFIIVTLACESPATALSALLHLLSNPTSYKKLQDEVRLPTDK
DLTITNISQLPYLRAVLDESMRIYPPVPAAMDRVVTGGRTISGYAVPEGTWVGIPQHATYHSEH
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EDWSGKQKVYGLWDKIPLIVKLEAR*

>CYP619N2|5107|Grascr1

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QMLQEPRCNREHIALVEAESSQLICDICLLPDDLMLHPGRYSNSIIMSLVFGARTPRHDTPHYLKLR
KIMTELSAIGEIGATPPVDLLPALKYLPEQLWGNWRTRVRDLRETIFDLRPLVDSVIERRKMGRV
NSFLDGVLDQQDDMQLSRDEIDIMCGNLEGGTDTMATLILTLQAMALNPLILEEAHTHIDSVD
DSRLPTWADYERLPYIAMIVKELLRWRRPPAPTGFPHTLDKDDEIDGMKLPKGSIVVLNIWGIHND

DRYPKPEVFDPRRFQNTALASVYANSSDYQRRDHFGYGIGRRICPGVHLAERALWLATARILWAF
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>CYP5105E4|5167|Grasr1

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KKSVDLQPMVQTKVGKLAEVFEKHKRSNTVVNLSSVYYAVVMQYSFGQGDNLDDDEVKAATLR
KNITDLLLGVKVSQHFPWIFTFLNALPFFIAKHIMPPGALDMLAFSEKIRRDINRVLEAKTSVEKDRK
RSIFYELRDNSSLPSEKSPKLEDDATLLVMAAFTHAAKGTESVAVTIATAHFYLLYLPDYMAKVR
AELRTVPVNASWAELEKLPYLTGVLLESRLRIDMSVTGRLARLAPEETLQYDTYKIPPNTPVSTT
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>CYP51165A1|5300|Grasr1

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WQKIIDGYVSSISLALTYGKEIRSYNDHNVRRIVEHYRNFENASRPDYLVNLFILRHLPAPLAPFK
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QGLTLEEAAYTLGSFATAALASSPAVLKTFFLAMLHHPPEWQQRLQDEVDVRYRDAAIHRKESTEQ
LWTKKETFPVARAIVKEVLRWRPTLPTGFPHILTQDDVYDGYTIKKGTMVLWSQWHMAHDPISLYA
DPHTFNPAPRHLPCTSLPLSLANDSSFGFGRRACPGWQQAEDMLLAAVISIARSLELNRRERDEKGE
VGKLPWVEYEGGSTTRPRWFKVEIRRRGREDKET*

>CYP59U4|5662|Grasr1

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GGSSARGSVIDIVLAYMNENTEGNTESTISEENIDPLFRFTAITQIRSFLFLGHDSMSTICYAIYLLSK
NTAALESIRSEHSRIFGANPDPSVADMIRASPYLLEGLQYTTAVIKETLRLFPFGSGIRQGFAGADLI
GEDGTHYPTENTLIWILHTAMHNEETYWVNASSFMPERWLVDPGLELYPRKGAWRPFEWGPRACI
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CRVSMAKIK*

>CYP617Z1|5774|Grasr1

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FSKPAHIREDMYQRKHLQPAFKHRQIKDLYPIFMTHACRMVEKVDTEISAKARNSEVDEEGYTLVP
LRAKIHGTLMGTIGKAGADAQLGALDDRD AEINRLYGKVLSSGGAVRYLLTVLSTLLPASFCYSVPL
KQNKALNDAGKEFRVLARGVVSRRKTRKIKDPDNDPNDILGVIIDGQAFTDEGLEDDQVMNMIAA
GLDVTSAVSWGLLTLCQHPEIATRLREEIRQHLPSPDKADGMKAITSDVVDGLPYLNAFCNEVNR
FFPGVPTTTRVAIRD TVISGQVIPKGTTLVISPAAINKDERFWGPDASHFNPERFMKPGQANS GGAN
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VPGW*

>CYP6481B1|6125|Grasr1

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QDPKNDERVVSIIHQWTLVLVNAVTRSFFGDALPNLLPDISTIFDQWDMNSYMTNYQYPAFLSQA
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KQSPTPASTSSTTNLNRSTTPVSIHSTHTNSCPHLNSLFDITIRITSTTHIRCAHNPNVHIHNKLIPAS
ARVIVPVRQLMLDPSGFGPDAAELDPERFLRTKNLERSPYRPFGGGEYLCSGRHLGRRAVLGFVAI
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>CYP5603B1|6346|Grasr1

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MVNRLGCKSCSASCEICEGEGKIPFWRSCFDTVAYLDQFAASELSQRVEKPQDAHDL LSGFLELRES
EPTRISIAEII GALYINLPDTESGTGRAEGNPNEKKVQRYSRLLLNQSSRQAGHDVLA VTLRILYLLA
RSPATRDKLRLEIDDAARLT YSEPIPYAVIARLPYLEAVIHEALRAHPNTGLILERVVSRGGATIDGY
DIPGDTIVGVNAWVLHRDREIFGEDVDVFRAERWLEADKKMLQGMKQNLFSFGAGPRMCIGRNI
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>CYP531M1|6385|Grascr1

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NPVKS VGPPFIWATIESYKAVAERQLEPTQIAFSRSDSDFLDKFLVAKKEHPEIVTDDMVVNYLLSN
VLGSDSTAIYACAALYILRTPGVLEKVRKDLDPQKV KVPVSWKTAKQLPYFDAVMKEAARIHP
GIGMLERL VPEGGLTLPDGRFIPEG TIVGMNPWVVNRSEKTFGKDTDKFIPERWLQQPNESHEAFE
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KLTPRTVV*

>CYP65FL1|6555|Grascr1

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DENHNRIRRLLSHAMSERALREQHEVILGYVNV LIDRVKATAQGLDAGEIDLVRWYNFASF DIIAD
LSFGEPMGMLQLGEWTPWIKAINDSMPFATLVQV ASRCLPFLGPVLNLSLARMREALVLNLSLAR
MREALKTHIAYSRTQV NKRRLARKTDRTDFWKYILREQRSQGT AIGVSA AENHALGMTLMVAGSET
TATALSGLTDCLLNNPDKHEKLVAEIRNTFNSPAEMNEESLARLPYLGACIEETLRLHPPAPVGLER
WVPAGGHRICGEFVPAGTHLLIGFTHWVAYRSPALWHRPEDYCPERWLPESKITGPFTNDVRQVL
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>CYP51196B1|7072|Grascr1

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CLETILTDVGFTELF GPNILTAQGETWSRQRKIIAPILNESISESVWIEGAYQATDMLDSL TESSTNGHS
KQLVKQDSAESIEGLRRIAINVLGAVGYGRPSW KSKDEVPPGHKLSYMESRSLFSIISHLALAVFIPP
SILCLPIFRPDIQKVGI AKREYPEHNKEMVAHERKTADITKNNLMSVIVRLSDQEKNA MSKSKLYLSE
DELSGNLFIFTLAAFD TTSNTMAYAFTQLALHPELQDWIIEIDQVLPNTKEIPPYEEAFPR LKRVLAL
MFETLRLYTPVPHLARETKVPLTLPSSSGTRHSIPADTNIYISPAL THVCPLYWGS DSTTYRPSRWIVTS
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>CYP526B4|7091|Grascr1

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AFHGIYKTGDKFKSNRQLIQDLMTSTFLNSHVGT AIYQKGLEVMKLFELKMKLANGRPFS AKKDFE
YASLDVMCDFAFGSNWKQTATGPQVDLLKKIKPSEVKAGDSDEPIEFPLVPLAEFLESVYEAPELVE
RTINAVMPKLQSL SCKRGGGPSSPGHVETGLEHMLMREQARA EKLGRDPDFDSAMFGDIIGGHHT
TSGAMMWMAKYLTDLPHVQDR LRSVLHEALSGARDENRLFTFEEIRRVKLPYLD AVIEEMLRINA
VTVTREALCDTTILG CPIKKGTQVFFVSNGPGFLSPSLPVDDSKRSENSRVAKLNGTWDET KDLTIFD
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>CYP6577A2|7424|Grascr1

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EAVDGVFLDV IHRKLTRNLLKLQGD LAEEVSRNMDAVLGTDTENWVESNVWSTVENTVSSAVMR
ILLGRSVCREASLHEDIRRYTRAFGYSSIFVGRILPRFLKPF LGSILSGLTLHRQRNLLRKWFNPMVEER
FTNLLKKNQDPSYDYTPPEDLVTWAADALLCTGNAERCPPSGLSRR LAIMIPAALPSIKSTATNAIF
DILSAPPEMNLQDHLYNEVASAFDTTPEKGWADQSLLPRLVFLNSATRETMRVNPIAVVVAERKIL

PKEGVTLPSGQHLPQGTWLGVP TVGVQSDENNYTNAARYEPFRFCNRKPGEEADSKDASGPVIST
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MVRRRKH*

>CYP51160A1|7425|Grascr1

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VLQRSNQALNNRSASQTRFSSQPKSSEISRADQVWEDFQEVSDTNLVAKDSVALIAQH FVGGGLVAQ
FDQFPRGKWSLIGVPKLFQQHMLEASIRTLFGPSLTKDSPLFSECLWKYHKAITACLTPSSDFCHKTF
WETRKECLEAVKAHLRKF WSEFDMQEV DATHGATLGSRLLREREQALTKANLSFDERAQLELELL
VSIESKTIPLATYMITAILQRPD LHGRICTELKKA AKTASRGTLAFDHAKLEQLPLLSVYQECLRFH
SSHHEAWQLEQEIKL KNSALKAGTVFLCPSYLAQYDGTWDSA EYQSDVFWPERFLEEKPYHFGM
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LRRR*

>CYP51203B1|7426|Grascr1

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SHDFVTQSVKSVKKFKISVTGDVTTFLAEQFLILAFAGMATTGAAATNIFLDIFSANPRINLWENLRL
EAASIFKSEDNWTSPALMKDMIKT DSTIRESLRKNTLQSRGLLKQVMPKSGITLPDGT HVPQGTWL
GVPVQAMQRDQRIYPNPHEYDPFRFAQLRAAGEVEGKDDPSTSKNLDAAQPSDVYVSFSYGRNSC
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>CYP59AB1|7427|Grascr1

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IIRKHAITGDSFLEKATLAMSMDDIIGRVVLDHELNSQKSYNPLTSGLIDQLAWCDAGMHSNPLEYI
NIRRYETANLRPKSKYPADLIMSAYLKETSSDGRPTKMDPVFSEFMRAQVKLFLEAGHDTTAASIVF
TLYMLQKHPERLIRLREELDTVFGPDITATCDFLKNPHLLHHCSFLLAVTKETLRLFPPTATARFGV
PDFYL VNTDGKRLPTENCLV VANHYGIHNP RYWP RVEEFLPERWLVDETHPLYPVKNGWRPFER
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NFP CRVSLVAGKEAN*

>CYP51166A1|7476|Grascr1

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QLDKDPKYA AFGFDDAVFVLS DNKKWAERQTVMANHFRGKVWQEFPQLRRELD SLCAKLGKV
AENKTD FENISRGFRKTSNDIMRTFLLGDEYSGINANSRDFGPDAEPVFHPLFRMVAFTRVFKWMFT
LHEYMPDIVLETLLPMAKYKREIDRMVRS LVGNYQP EEEKLIQDKALFYRMIDSDPSYLERSGVAAV
EEFLELLWGGREVLGHASSNIVFHLVKNPQVMEKLHTELLKVPFDLHSAPYSQLKTIPYLVAVCKE
GLRVQLGGNFRIPRVTRKDIYYGDHLLPAGTSVSMCPKFFHDDAEIYLDPDQFIPERWIEADAAKLE
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>CYP6466B1|7621|Grascr1

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LNPYRDPTIESGFWHLSENVSLILGIFPSLLARKGYHGRET VQAFTKYETAGGPSQASMMTKEYQ
ISKSHGISPLDRARFETESGMAILSN TIPAA MWAFFHVFSRPEALSLVRERALTLTTLTQRKNQNGNQ
ITVRIIPLLLKREDPILSSIIHETLRLQAYGAPSRMV MRDTMLNGYLLKQGSVLMMPNEAIHTDASISE
KPLEFDARLFSP PSEGKEDGEGEKEVREELPKGA FRNFGGGANWCPGRFFAINEILFMLVLVALKYE
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>CYP6846B1|7702|Grascr1

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DKLWSPPTKEQKMNNPRRKLPPNQMIIEEYEHQLLPGKNHDDIASKFAVELDKLVSWRTLRSRSC
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FAYLLHYPELLSVVSEEVKAGMLNGKPNVTASPTFPTCWITVLASRRFTSNVVKETVVGGKIFRKRN
NVMVPIRQLHLNTEFWGPDAAEFKAERFLHDKNLAKSSNYRPFGGGQHLCPRFLAKKVVSFIA
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>CYP561Q1|7800|Grascr1

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AIRAQEPILQKFVSLLLQRLGEQEGKGVDTINTWFNYTSFDMGELTFGEFPHCLDRSELHGWIALIFE
NLKAVVSLRAFRSYALPRELLPFLMTKEQLAKKEGHERYTQEKVLQRISEGRDARQDLMMHFMKH
MEKGELTEDEVVRNAGVFIVAGSETTAVTLSTLVYHICKDNEIYNGLTREIRGTFKEDDITISSTMN
LEYFNMCLNEALRIHAPAPDLASRTSPGAFVGGHWLPDGTETLPTYSTFRSPLHFHNPTVFVPTFR
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WLERQRGLGGE*

>CYP61A1|8069|Grascr1

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KLLRPNNWVFLDGAHVYRKGGLNGLFTRQALEMYLPMQEEVYDDYFERFIKISQEQNNGKPV
WMPVFRELMCALALRTFVGYYMSES AVKKIADDDYINVTAALELVNFPIIPFTKTWYGKKASDMIL
EEFSKCAAMSKMHESSEYRKKIAKGIEVDPAEKPAQILREFSDFEIAMTLFTFLFASQDATSAATTWL
FQIMADNPQMLDRIRAEQLAVRDGDRNVRFSLDRIEKMTYTRAVVKETLRYRPPVILVPYLAKKDF
PITDTYTAPKGSMPVPSVYPATHDPEAYPNPDTFDPERWISGDAEKQVKNWL VFGTGPHYCLGQTY
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>CYP570V1|8207|Grascr1

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RPVVADGEARKLPYLQAVVREGLRIFPPVTGMMPKEDDTVCGRYVPAGTNVCWTAVGIMRNKEV
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>CYP5076L1|8251|Grascr1

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RRVWSPA FSDKALRGYEQRIQPYVDKLALQIGA HNGQKVNVS KWFNYSFDVMGELAYGSSFGML
EKDEEHWA I KVLGEGLKPIGLMLPMWVFR LIQAIPGVCYQCGFSGSFKLSLAQWGTGGGINAFVK
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TSLTFTFLELARHPEHVDKLRKELEAVISDP SGDIPHQNIINLDHLNGIYESLRLYPPVPSAVQRLTPP
EGLDIGGT FVPGNMTVYCPYVMARTTT FIPERWYKEPELIQEKNCWFPFGMGPGYGCIGKPLALME
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>CYP531Q1|8268|Grascr1

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YALKTIMDMEPLIDRATETLVRALDTKFVDNKLPCELNKWLLYYAWDVVGLVTFGEPIGFLERGAD
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TTAATLRAILYYVLKNPQVDRKLYGELEAAKLETPVQYRETRSLPYLGAVVQEACRMCPGVGLPLE
RVVPPEGLQLPDGRLIPGGTVVGMNPWIIHGNKEVYGQDADIFRPERWLRNEDEAEETEGEFDARRL
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KRL*

>CYP59U5|8342|Grasr1

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>CYP5093K1|8366|Grasr1

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KGTTVLGNSWAINLNEEYARAEFEFGRWMGGELKGREVPGYLLGDGKEGEGDVVVGKTETKE
EGDGEGSTATYRLSREYLQSFPKKQHPSPSGHSSFGWGRRICPGQGLAENSLFIALARICWGFILP
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>CYP5586C1|8467|Grasr1

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MFKEAHMSFTEVTSYFHEFYAQAASNIQEIAAKRYKSILEAIAISAADEELTGKVPLPKESVVGNIFFT
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LYIYHPASLILRKVVEAITVVDDAGKSYRIPEGTALLNLAGAARNPNVWKRPEVAQERIAALSDSP
ALYFNPERWLETDDRDPDDFKGEVLQWQAFGAGGRTCPGRAFAQIEMTSMMATIFKDYSLELVVTD
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>CYP609Q1|8469|Grasr1

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CPDKSPPIRERLAYVPYEAWESEFPVIDLCLKDCIRLQVSAACFRKNISGRDIPIDKAGTEIIPPNAVYA
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>CYP605B4|8603|Grasr1

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>CYP5589C1|8610|Grasr1

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>CYP51163A1|8622|Grasr1

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MLKQLASFSDRLEAVATGKADSNLQSRSDVNDIFWQRSKVYTSGLTMDDRASLELALFWAMNG
NTSPFVFWAVAFIYADQELLKKVREELDPLIKVSGRIDDLDVEEINPLTKVSEMKEGRKIDDLDMEGI
ARRCPVFKAAYMETFRCAHEPTSLRYVQQDFNIVDPTLGKDAKPVAFRKGTFTVTFHTVQQFDRGI
YPEPEEFRVERFLKESEGVKVDYGNLKPWGEGSGICKGRLEFAEREVLVAVALIVRCWDMQAVDGA
WKMPKKIPGTGVMKPSSSLRVRISPRT*

>CYP603C2|8636|Grasr1

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RNPIAELGPQLFLPMKYLDEVKNARVSLFSFPAFSEKVRHPSCSGSLRRIDETVDVSSELQQCTAAD
RRLSTRILAEAMHGEVIAALDETLSDKQGPITVNAYRFITGIVARVTALALVGPELCRNQEWLELSI
GTTHAIMGASNVIRHAYSPRWRLARWRDEAPRQMIAMRKRAIKLLSPLYKDRAEADKSGGDL
TTPDCLAYLLMRDADTSLDGIANQQFLTIASMHHTSATATSILFDLLAHPEYEPDILADIEMGLA
EKGDGPWTLQNVAAAMRKLDSEFMKESQRIHPLGFITAQRLSLKPHTFKDGLHLPRNTIFQFPADAV
HHDPSPVYSPYNFDPWRFYKLRETVDPNRFHFATASDTSLNFGAGSHACPGRFFSGLVIKFLVLGGL
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>CYP6251B1|8729|Grasr1

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TPEGIVPIHGAESLCRTAWYDNPLPIFSVATIRTKVSHEPRRRVWDQGFMSKALRDHETVILKHA
MKDVIAAQDENHVRDFQEWLQYYGFDVMGEVQFNYSFNMLEHDKNRWVVDLIKDGNAILGSM
TSLPWAIRVALTVPYLTDLKLFIRWCIDRLSQRMQSDPSNADTIGWLLQHASENEGKADWFGLV
GDMMGMVLGGTEPVVNGMVFTLYHLAESPRTAKLRSEIKTLTSYSDNTQLAALPYLNALINETYR
LHPGVPSGGLRTTPPAGLMIGGTFFPGGTTVLTPQYSIQKREDCFERAEFIPERWTSRPEMVRDKRA
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REPEAQIAQPKSYEK*

>CYP5104H1|8775|Grasr1

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NVQITVYSWSLHRSEKVFEGGDAGEFRPERWLDDDEEGDSDDDEGGGDDGDKEGGGGEENCMGIRG
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>CYP5105F1|8788|Grasr1

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QRIMNYLPISLRKRFEPKGVQDMRDLRKSIHNDVAEVLKTNDDTVVKATKAHSILYGLRDSEALPPH
KKTAQRLEDEATLLVMAGTESTAKSLTIAHLYLLSQPDILRKLSELLSYNYTRLPLSKLQDLPYLSSI
MTEAHRLSFGLTGRNPRCAPDETLYPPLPPQQTESLSSHENHDTTKSYVLPPLTPISAPTLIIHTDPAI
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EDDVKLNSQGVKARVLRWRGGR*

>CYP55D1|9052|Grascr1

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DDFIKRGAGGKTVDLMEYFASPVPTQIILEILGVPEKDIEAVSNDSEVRHSTSRNAAETSNNRLNDY
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ATATGTSSISTPEIVVLLQLCFGLFSVLTIWGIRTGASAGDPVRFLIGSTIRLALATLISVYGVWFWF
YGLQQYEPEPDPCGTVLFIFSPVSVSGGLGLFYKIQSVVVLATYAILFVKEYLLIICFLCYTAIWTSVVA
LISLIFSPHFEEHSWEVLRPEFDRLAKKRKRNGDSWKKVFLRGIRTEIKTLWLVLVHWLQLSACIFWS
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TIFFTFVAFLPFMLLRICRKHFPAVEERAQEATLQLTEMLFAHYTPAWYREIDFESQIEHLKLT
PEEARKLRMKKALQTWAKRQDKKLEHARAVRDPPFQFVNAAPMILTGA VKLLL TGAVKLLLLGL
LYLIKGRLTRNKESETHGDDDNVDDPPHQTEGEIKHSEPPPPPPSPKTHG DVAGNTHPSKSPPSAEE
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SLFDYLHSTNFLSILRKRSLPLCTLHIATYVLLL CEDRKLHEAERWMTGIRDSVLHLKEVRVKKKGG
MMSRSKQHEETMQVWKKIMGYENWKECFELTVERMEDGMRERVERGLGAGSEGGLRRSLRRRR
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>CYP503N2|9076|Grascr1

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SKYKDSIFKVQCNTIEIVLLPRKHVDELRSLSSEQKVSSPQALYNKSNPGPYTGLGIIESHIFDAVQRH
LTSNLAGFLPPIKDEL DYARRKELPPCDHEWVPLAVHATIA RLITRLSSRTFAGEELARNDEW IQIST
TYPMNSFATTLALRMVPAIHPLVAMAIPHYWRVQNNISSAKRIVGQIIDERRETGVKRRRSKDEPI
DLLQWMMDEAAGPHAQTEKLAHRLLFVSKASVMTTSLISHCLFDLCAHPQYLEPIREEISAALRE
DGGLQHTTLGKMRKLD SALKESQRLNPAFLMTFDRIVKEPLALSDGTRLPVGTHLAMPTDPMLRD
ADFLPSGADADSFPDRFRSAREDSSKPTNAQRFQLASTEATSLPFGHGKHACPRFFASSEAKLILT
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>CYP65FT1|9093|Grascr1

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DHTRMRRNLAHAFSNTALKEQEDLMTGYFKLFMKKLWEEVNGPQNGKVDLVK WYNCTTFD VIGDL
AFGQPFGALEAGEYHFWIRNIFKALKRSQFDRITNAYPVIQWYTNIRDRLVPQANEARIQHAQYSA
DAATKRMALETDRKDFMSYILRHKDEKGMTLPEIKQTSKVLVLAGSETTATLLSGCTYFLLKNPEKL
KKVSDEVRAAFASDEEINMTTAMQLPYLQAVLEESFRLYPPVSTLPRRTGPQGNSICGQNMPPN
VSVGYNQWAANHCESNFRDAESFVPERWLN DERYKTDDLGVVQPF SIGPRGCIGKNLAYAEMRSI
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>CYP50330B1|9184|Grascr1

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LLLRHLQAAKRRKLTSMLSFTPNLLCIPVSIVRLVYIYGTPVTS DYTWNVFALELVTSLHAILSVLTA
AIPFVKQFIDSLVSLPEVIADGTQVYTSNSPNRTSNPNRTFKNSLKGSSILSYGKGLFGHSRSQPTPTGT

VGNFTEISSVPEDHEMQRYETREGSQEQMDLKFakkMDTMLAFLKRESVISKPNKQSGNIPAFQLQSP
DGKLQQALQALTETTLATRAKAGSSSLRHLWHLNPNFVSTSPKLQHAYRHALIKHFNTSNALTW
TATTSAAVAVVHSYQYPSRNPPTASEPQIRIRYLIRDLSDATLA AVLQDLFGIRGVPRATLDYIGTEI
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TPDCQSSSSSVSSEDFNPLNLIIPAFEAPWRAVFYTLAALQPGPRYP SHVHALRNCAAEMLGAPLA
PMPAAAHAHVLESRLYPPVRRVRREERVDVEALQORDERYWGPRARVFEPERFLVDKEEGEQREI
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WDEAAKMGEPLRAGREEYESVELVVENAT*

>CYP51179B1|9440|Grascr1

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PLCRNPEWLGLLINHTQAIIVAAAAARRYPLFLRPLVVPFTKEVKAVHAARRRMEALIAPMLKERL
EKWRADPDQEMP SDFISWTIKESEGKAWDPFIQSEFQMGI AFAAISTTTQLLTNVIFDLCTDPTYIPIL
RAELSN SKPLSSSHSPQTRASLAGLHKLDSFMKESQRLNPNM LLSLSRHIGQDLVLSDGKILPRGTSV
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THAKENMNFYGRHACPRFFAVNEVSWLRLSP*

>CYP548A30|9633|Grascr1

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HARKRRVLSQGFSDAAMKGLQPHILSVIRTF TDAVGDFSVRNAFGNEKKERDWSTPKDMGLWAN
YMSYDVLGDICYGESFDTLEKPDNRFAINLV ARSSQFH YLNAQMPGLKKLGLDRIFFRDLRANRLRF
MGYSRARLQKRMQLGTD TDRRDFFFFLLKAKDPETGQG FSTQELWGESNVLLIAGSDTTSTAFSSSF
YYLLNNPAYLSELTTLIRSKFSSVEEIVSGPVLSDLRFLRACIDEAMRLCPPVPSLLPREVL DGGIDVDG
MHFPAGTVVGVPYIALQHNPTYHPDPFKYNPYRWMERGSGSGSGEKGDGKGASAKELQLAQSAF
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>CYP6148B1|9754|Grascr1

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FSRCIFLAAGYLKLC PDLRPLAAWVIPHYRIQAYRRDAKQLLLPEITRQREAAAGKGYANLARTRN
MIEILEHV SPEKERSLEQLFDRQLGLLFAATHGASNHIVNMIDLATRWDEYGEQLRHEVEQALEN
TEGSMTKAMLEKLPKLD SFMKESQRLNPASASLVPLQLSTGQIIPSTHIAIAAAPMAQSSEYCKSPD
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>CYP504A46|9917|Grascr1

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RKA AATALNRPAVQSYMPIIDHECTASIRQLIRDSKNGQLDIDPIRYFQEFALNTSLTLNYGQRVDD
AELLREITDVSNRIGKSEKLTILRDYVPILRLGFKKNREAE EFRNRDKYMTLLLET LKDRIAKGEDN
PCISGNVLKDPEAKLNEAEIKSIGLTMVSAGLDTVPGNLIMGLAFLSSPEGQH VQNKAFQEIVTAYP
NGDAWQKVVEEERVEYVTA FVKEVLRFFTVPISLPRVSISDVKYEGTTIPAGTTFYMNAYAADYDA
SHFESPHTFSPERYLSPSVHASSGTPHYGYGAGSRMCAGSHLANRELFVAFSRIIMSMHLSEATNP SD
RPILDALECN AHTSLTTDPLPFLRLRIRNGAEKWLPE*

>CYP5043G1|10213|Grascr1

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GSKFQTVILEMAMA EYDKTNDGIPRSDFLGFLRAAQEKDPNRYTDRQIISNL SVNIFAGSDTTGASL
RAIFYYL MKNPLRYQRLMAEIDAAD EARKLSTFVTFEESNNLPYLRNQRI PPPLPRSPAVGIPLERLV
PPEGATISDHFLPGNSVIGINAWV VHRSSLVYGPDPDAFRPERWLVCES EHVDSANTGIDVKREGST
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>CYP544D1|10699|Grascr1

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RLIGKIAYDMDISPDLPFSKAFDHASGVTANRFTNPLWRIDDLQGFKFRACLREIKSFGLEVNTA
VKRRTSTKTTLDAPPPLHTILDSLLDHISDPEVVADA AVNFLSAGRDTTAQSLTWTFYSLLRHPE
WKQKLSSIKSSFPAANRASSIPLSYDLISGQH ALPYAQAIFAEALRLNPVVPFELKECVEATTMPDG
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PTPNTGIPPSMPQNIPNPLPSAPASPTPAPSPTPLSRSSVWKRASVEVEEDIALKEFRLAFSRLDIAA
KKVWLESIVESCDNHLLSHLHHLVGPKLKKDPFQTLPNELCFEILTYFDDPKTFVRASRVSRRWREV
LSDDQAWMVLCEKHAYRRKSNESSTSPNANNNLGFLQQLPNASTSTESSAQSSDAKDSNLLRA
AEHVRNLKRPRPRSTHRSHFKHRYLVESA WRKGGQMTAKHITPDQGVVTSLHLTRKYIIVGLDNA
KIHVFNVKGDHQRTLQGHVMGVWAMVPWGD TLVSGGCDRDVRVWNMATGTAIHALRGHTST
VRCLKMADANTAISGSRDTTLRIWDIKNGTIKSTLMGHQASVRCLEIHGDLVVSGSYDTTAKIWSIS
TGQCLKTLTGHFHSQIYAI AFDGVRVATGSLDTSVRIWDPVTGQCTAILQGHTSLVGQLQMRGSTLVT
CGSDGSVRVWSLESYTPIHRLAAHDNSVTS LQFDDTRIVSGSDGRVKIWDLHAGLLIRELSQPAEA
VWRVA FEEERSVVLASRQGRTVMEVWDFSPPEELEGSSSA AAWARPLSGLTRSENSSAGGLVEDAV
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E*

>CYP567AA1|10765|Grascr1

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SDRSLKEQEGLVVCVIDRFINQIGALPDNTGDLTKWFNLLTFDVAGELAFGKSFGGLATGSMHPWV
AVIMASMRESSLVDPFRRFPLFGLLYVMFRPGWLRSLKGA SENADYAMRAIEERKRNDSDRKDFM
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PNQVDMISAARLPFLRAVCLEALRIYSPVPIGLPRIAPKGGTVIDGYFIPGGSIISSHGLATSHYSQNW
QDPKTFNPDRWLTPSPADKLDACQPSLGVRGCLGRSMAWMEL YITLAKLYLTYDIELLDKDEDLL
ENVEVYLFWKKPELRARITVRHFKGEAIDVVA VPNARSQSMSTLTPEHRVASKVEIDASKSRLPTR
SAKHDSVTIPKVGSTQSLKETEP LSYDFWTKNDLRQKFITIIPGRKYAALFFLGAKGGGLAAKFNLQ
SKVTITKSGQARIFYPPRAFDIARKHHWTDWLIY APDSKSALALAYEA EFDIPAVNIVKKLYNHVY
MSGGHWAFSIDTRSHQISETWVKGHGVFSGQEPKSIKTLGA EKQNFRQIVQNYIKRPWERKQENIF
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>CYP6306C1|10946|Grascr1

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AAISAPSKVKNKYPRWLYWLSRYTNDGVKTMWKHQARAVELLTPVLHNRIKATEELKARGVKKS
KGPRKYEDGVQWLLDAHAAHGKDLTPTQLARDLFVIMTVSIHSTSGAGLSILFDMLDHPEVLSEIQ
AEILQVRSRLPAGIWTRKALGELRI LDSFMRESTRMHALAQYTAVQRILTSTWTFKDGTEVPAATTL
VFPSYHHS LDP AVHTNPDTFDAKRYLRKREGSDTHKYHFASVSKDMLQWGSGRHACPRFFAQET
LKLMMVRL LTHYEFKHTEQDKEVPRFIPNNLFIIPNPALHV VFRERQVPLQ*

>CYP6789B1|11355|Grascr1

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EGKDLHGLIREWHAIFPLGGMVSTLPSIVHPLITS RFLKKYLMPRKGHTRGSGHIMSVSQSSQNASH
RCFGSLVIDIQPVHEKLFRE RLTQPQLSRPGNVFDSVRQTKFLDGRQMTLDEAERECFLVTVGGQD
TSPAFISAFFELL SNPRVYAKLVEEIDAFEIEGKLSSPVPRYDETCAMPYF MACVQEALRLEPSASLIL
PRYAPKGGIQLGGHWPENTEIAANPYVIHRN QDVFGPDAEMFRPERWLED PARRKMMTKYSLA
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>CYP5089C1|11421|Grascr1

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ATKVQSYEPTVLKNVQLLLLDAIAAQHSEGD TDTVDVSTLIHCFLIKTTFTIYGTPLPGGLDAQEHISI
ALRDVSKFAFGSGYLPWLSWLINSCPVR AFTHRPKYEKDGSPIGMTAIVSKARKTLAAVLASSTPTS
LHPSVLRSFGEAGAASEKRLSNEQISTECLNLMIAQGCGSTTASLTAVFYELSTSQQGEWQHRIRKEAL
RAPDAPALALNAVIKETLRFHPPFACGFPLDVARNAPSQIPGLTAPLPTGTTVTCNFYVLGRSKEI
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SRGELVGKNC FEMQYN SCRIAFLEGRSIDIQIE*

>CYP51193A1|11487|Grascr1

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SERIMHAVVWVETVNQIQQMLREILSHESTREPESNEVIEGIRTIAINVIGSITYGNQHPWIDSHRQAKL
SLKSELT FIESLMWVVNHHVIAVFLPDKIMRHSMMPRWLRRLGA AVVAFSDHAHQLIQAHRMNS
DGRPTIVGSLVRLVDISSQAVSGKDTSAWTEDEVVGNLFNLTIAGFDTTASTIAYALLALTIEPQWQ
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RIPAVEVA AEY*

>CYP6524C1|11489|Grascr1

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LVSADGEEWGRHRRIVAPVLNERIMSVVWKESCNQTRDMVEALGKRITATDNREANDDASDKIC
DTVD SLRTVTINVINSASYGSERTWSSAMTSSKPPPGFNFSFMDTVVIAKNLMVSLLLPARLLRLPV
MPSSVQRIGQAVYEFPLHAKSIIVREREAPWSAVGSGNTLMGSLVRAADTESSQAGGKPLRSAYLSE
DEIVGNLFNFTIAGFDTTANTLAYAVMILALDTQWQDWIIAEIDEVKRLHPEQGYPDSRPETLRLYT
PIPHIARIVEQPTRLNLHELPAKTMVQVSA AVIHVSPDFYGPDPLAFRPTRWIAPPSSATKAPRTLAC
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>CYP51F1|11779|Grascr1

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YDCPNAKLMEQKKFVKFGLTAKALQSYVELIVKEVHDFTTNSPLFKGNEG VVNITDAMAELTYT
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SGKEKDSEDMIWNLMNCSYKDGKPIPDKEIAHMMIALLMAGQHSSSATS AWILLRLATNPQIVDE
LLEEQRRLVLGSESAPLTHDNLQLLNLNSQVVKETLRIHV PITSIMRNVKSPMHLDTPTPTIPTSHWLL
ASPGASSRMEKFFPEPLKWDPHRWDGEQVIKAENDEKVD FGYGIVSKGTNSPYIPFGAGRHCIGE
QFAYIQLGAIVATWVRLIKLSTVDGKKDVPD TDYSSLSRPMNPAKLRWERKEKVEKS*

>CYP50230C1|11860|Grascr1

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LHRRHRDVVRIGPNRLSIANPDYVGRIYSTQDAYPKSEMYDSFSLRTKEGRQQITLSQRDQKIHART
RKAVAHTFTLTAMQDYEPHMD EIIKLFLRLKEKTEETS NFLCDFGLWIRFYVTDITILYLTFGSTFGF
LDAGKDSVEFFDNMNANMDKDSLYIPMPWWSLITKFNPITLFSSENSFVPGWCMTQIRKRQDARA
ELEEQTGQSGIDVKSDFLDKFLDASKISTPPGIDY TALIDWCLTNLQAGSETITVELISTLYHLLKQPEK
MAKLLKEIRSTLSNPV TYKEAQKLPYLDACLREGLRIHPAVGLGMERTVTSNLGLKLPDGSVVPCG
VLVSMNAWVLSRDRSLFGDDADD FRPERWLQGKEETEAAYMERMNAWKRADIVFSYGVHSCSG
KNVAMMEMYKVLPSLLLEFDIELKDPKKEWGVINRFIVRQTGFECVVRQRA*

>CYP682BD1|11925|Grascr1

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TTASSDLHKVRRAAIAPSF SRRSILALEPAMKEKIGKACSRLESFKSSGKAIDLRLIFTCLATDIISEFTF
AECFNLLDTEDFAPAWRKQFSEGARNFQWFKHFPALWPAFRSIPNRLLAALMPDMELLRKWERN
AQKLMKESINTFEP SQKKENSPKVLYDLLASDLPKEEKHFDRLWQEASIILGAGVETTANTLTVILYY
LATIPEYNARLKNELRAAMPDTSQELKLC DLEQLPFLSAIVSEGLRKAYGTTTMRMIRVAPEATIKFNG

HEFPPGTAISMSPIMLDDPKIFDQPDKFQPERFLERNSRADLMVFGKGPRMCLGQNLAIAELYLTV
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>CYP532A35|12065|Grasr1

MIEVLLRIFVGHWPVSVALVGVALYFTLNYLNHGLNKYPGPLMASLTDWWRFLDVWGRRPDKTHL
RLHRQHGDIVRLGPNLTSFADPKAIKTIYGLNKGFRKCLFYVGLGPLVQYEAGVDVVTQKFLDQTE
KLYATKDSICDFAQWLQFYAFDVIGQITYSKSHGFVEKNEDIDGMVGYLGRLFSYVAPIGQIPFLDN
FFLKNPIVRLLDRCGVRTFAFPVVTFFARARMNERILKKSRTTATFTSNDNRNAPRDDLLSQFFKAKEN
NPAFFHEGRVLVMAVSMAGSETTAISLA AVFYLLRNPHSLNLLRKEIKEAIASGKLESREDGLTS
WAESQTLPLYDACIKEAFRLHPAAGLPLERLTPPGGIEICGEKIPGGTIVGCNAWVIHKRPEVFGEDI
DSYRPERWLDVVSADKRKEMDGTLFQFGAGSRTCIGKNISLLEIYKLVPSFLRRFDVRSPAVFWTFH*

>CYP6102B1|12145|Grasr1

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GRSSNRIFVGLPLCRNEEFVEGILGFAYAVVISGILLRMIPLCIRRFVAVPLLFANRKNFNKVAKHLV
PLIQQRQANISKIDNDEKGASEEPADLLQWNIQNSMRNPDPREWDPDTLIAKRTMATNFAMHTTS
ITTAHILLDLASSSPETKVLEDLREEVRQVYAESGDKWTKASVAKLFRLDVIRESLRMSPLGLFGLVR
KVVAKGGIVTSDGLHIPEGAIVAINHYGEQVIHERHENADTFDAFRFSRPRESLMTNDAVQNSSEH
EAANVIEKKLASTSTGVGLLNFGHGKHACPGRFFAVQEIKLLLAYILLDFEIQYLKERPKNQFLGTS
CLPPAKATLVRKLCSRP*

>CYP5077E1|12176|Grasr1

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AMDVIGDLAFGEFPGCLELGDYHEWTRTLIEYLNIAFAVAPIRQC�LLGFLFNKNRNRFELMSHEEI
LSTFNIIIVGGFETVATVLTGIITHLIQNESILQQLCHEIRSFRFRGSEIEARNIANLPYLDVINEGLRM
CHPTPDGFPRVVRPGDDYMGVWLPEGTKISVHMLTVNRSKKYFTDPDCFIPERWLGGNKRPARY
RNDRLSASKPFTVGYHSCIGRHLGLVEMQLVLARLLWAFDLRKVPGCDVKFDDFPVIGIIQKQVVP
VLLKVRNINNDNC*

>CYP51196A1|12380|Grasr1

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DVAIRGYEFRLRNKLHENLGPTLLLVGPGCVQVVTTRDAEVIRKVTGHGTSKGFAQSALIEQITGIFG
PSIIGANGEDWQRHRKIIAPIINERISLTVWNESVQQAEGMLDHFVKESFGNTQSATDQSIKGLRRIVI
NVLGSSAYGTPRAWTNHEEQPPPGYKLGYNLSLLAIADHQAAAIFFSPRTLLLSIMPFAFAKEVGTAK
VEFPRYVESMIAKERSSADVERHNILSAMVKASDRGRDASESDTKEAALSIAESEIYGNLYLFTLAGY
DTTSNALAFAFTLLAIYPEWQEWLIEEINLVFKNGDLSYEQAFPRLRRLALMFETLRLYSPVEHLTR
TTIGPQTILTSSGSNHTIPSGLDVIVSQAGVHVDPDYWPPDPLMWKPSRWITDTSSDDNEKFQGVK
HERLMEPEKGTFIPWSFGPRICPGQKMSQVEFVAVIATVFRACTIEPVVLPTEKTMDEARRRLAGILA
DSEPTVSLSMKRPDEVVVKWVRRH*

>CYP5105A6|12927|Grasr1

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AQLARAYTVNPLQLVREMLKVADYAYPYGWHWTEEPPEKLRRRLRADFELISVLKEAGDKKEEEER
ARRRELAKMPENFMEWSRWILYGAIWRLFLSPLARIPGPKLAALTWWYEFHYDVVQPGKYVFKIQ
ELHKKYGPRIIRVTPCELHINDVDFLDTVYAPSSQRRDKYEYQLRTLRIPTAVGTTSYHLHKKRRETL
SPVFAKKNVLSFEPLIKSKVDQLCHLIEEFAAKGSPANLSDAFFAFTTDVVTNFLFALQSNVLADPTK
AAVLRNNSNQLLLGKIVNQHFPPWIPDSFESPLSWSKHLMPPGGLIDIMELSGRTDEVKSTFQPTKLPP
VCLIGEHWYFRGIRVRSELLEIHKARDEGEKQSSYDGKRSVFYTLLESSVLPPAEKAISRLEQEGTLLV
LAGSESPARSLTIIFYHLICNPGILQKLRLLELQTAPIDASWSRLEQLPYLSAVIEEGNRLSWGVTARLA
RIAPEPLRYGSYTIPAGTPVSITTLAHTNETIFPDPRSFPDRWLGAEGATRRKYQMAFNKGSRKCL
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>CYP51179A1|12972|Grasr1

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ARRMVECIAVMEDESSFALTEKLGTSNEWQPPAFLTVLGLVAQITARIFVGLPNCRNPEWLHLFAS
HTRSIRNGAAALRKYPKWLRLPLAASFVKEMRDIHYARKKMRELVTPIMNERLAKLKANLDADLPS
DFISWTLKESRGQAWDPFIQTEYQMGVAFGAITTTYVPHPSILSQYSHPPRTQLFTNVLLDICAHQSS
IEPLRAEWQSMOLDSTNGIISKPSLMQLPKMDSFIKESQRTHPNTLLTFSRYIASDFALSDGTILPKGTSV
ATPLYAMNFDRLSFEDPEMFDALRFEKMRKQAEIEAGGKKVQRWGLWGLTHSDAVENMNFQFG
KHACPGRWLAANEVKMLLGKILMEYDVRLEHPEKGRPDNILIEKALVPDPTKRVMFRRR*

>CYP65FU1|13049|Grasr1

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QIDGPANGKVNVAWYNFTTTFDIIGDLSFGEPFGSLANGEYHNWVATMFAGIKFSRFIRVAYRYKL
FGVVLGIFYKLFTAVGEGRKKNLMYAHDKALERLSAKTDRKDFMTYITRYNDERGMTERELAGNT
GVLVIAGSETTATLLSGATYFLTKNPRVWNKLKDEVRNAFQSAEDIDIVSTGKLPYLHAVLEESLRR
YPPVPSRLPRKTGAEEVIDGHVVPKTSVGVTQYAANHSPANFNNPEVFAPERWLPNPPAEYAN
DDKASMQPFSLGPRNCLGKNLAYVEMRSILARIVWNFDMELCPSEHWAETETGNQKAYVLWEK
PPLWVRLQRREKD*

>CYP617AA1|21|Grasr1

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SRTALVQLLNGVVLVAEGDAHKFQQRKNLMPAFKYHHVRDLYPIFWSKSGEMINVLKSKEISTAIESD
PSLDAKGGYGFEMGNWLSRCTLDLIGIAGLGDFQAIQDPHNHLNEIYRTVFSPSGGLGMRLFLAA
TAFPPWLMQRIPIKRNKQLAKARHEIRAIKRPQTSPPPAPTTTTPTTTINPSDHDDDDQPQRSQK
DILSVALSSGAFTIENLVDQTMFLAAGHETTATVSAWALLELAQRPSLQSAIRAEIRAAALPSFSDCD
EKGRPLKTNIPMTADLMDKSCPLLHAGTTVFICPWAVNFSTEQWGS DAGEFRPERWLVPPEGEGKE
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QTTGVVARPKGGLRVRGRVVGW*

>CYP534Q1|138|Grasr1

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RMYRSINIYGRNLVTVEGQLWRRHRKITGPPFTEKNNHVVAESIRQATSMIKSWTGKDGNSSRTI
TTIAHDAMRLSLHVISRAGFGVRLSWPDDDEDANESGKAGEMSATNLGTGHEMTYTEALETLLHN
MLPVVAIPHSLKILPFFKTKLAYQSFIEWGKYMNEMMQAKKIQLASGEDEEGGMDLMGALVKS
GYGASNTLEKGSSQAETLSDEEILGNAFVFILAGHETTANTVHFSLVYLAMNLAQRRLQADLDSIF
QGRTPQWDYDFDLPRFLFGGMTGAVLNETLRLIPPAIHIPKESPQPQSLIEGKEYTPGNSLVLLSA
VGVHRNPRFWPHGPPSNPDKPIHETSNRDNDLEEFKPERWLLTGEHATCTTANPTSTSNTNSGAT
KPSLALAPDSLPSAETEDLAVNTAADTAASLYKPEKGAYVPFSEGRSCIGRRFAQVEVLVVIALV
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RKGGERFER*

>CYP51182A1|394|Grasr1

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FYGDGIIGNSGHEWKKSRIVHPAIALNSPDQAIQDRHASHLVEAIRSLPAGPFDFSKYASEYMLDV
ASEIFFGESTNVLQGGQGDARLRQFATDFTMLGRMARVMTIFNRQFPFLRYLMFRNDYRPTTQRV
NEFVDIEVQKAFASKQTPPPSPAEEKQEDFKTTRTPKTLVEGLASQCPDKQVRQETLNCLLPARDSN
AIVLGETLYKLARHPKIWAKLRQEVSDTLHGSAAPTIALDNKMTYLKYILNEGKSIHTSHLPPPSLI
LLPHPNLCILVRLNPTISTHGRALATRHFLPRGGGPTGLSPLFVPRGTYVVYSIHALQRNPAVFGPD
AESFRPERWENVSPKQFEYFPFGAGPRVCLGKTLGWTMVAYAVVKMAQGFREVLPREDSPYEEAR
AFGFMNRCCGAWVECLGDEEEKGRGGDEGDGW*

>CYP52Z5|641|Grasr1

MLNLELAIAEQHGCCKPVTPEVPYKWPLALDLVKRQIDILYSEHTFELLTPYINIVGTVRVETFGATGF
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TTNLLFGEPHSSLSKGSSEKRPTDFRKTCKNVRDWATFFSSKAMKYKDDVGEEEP AEKYSFIIDLWK
KMRDKRLVRDQLLHILVAGRDSTAALLSWTLYVFDNIDLTLALLIHTKLSPLRLYPTLPLNLRFA
NKTIVLPRGGGPDGQSPILMPKSGIVWSVYHLHRLESIYGADSKVFRPERCESGELFKKARSGAGY
VDFNGGPRLCLGKDFALMEASYAIIRILQAFSAIRLPRDVPNEPVGA EKQTYTIGVTPTDGVKVLLY*

>CYP505AL1|1642|Grascr1

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AVSGGIRQLRALTHDGLFTAITGEHNWEIAHRTLVP AFGPLPIDAMFDDMHDIASQLVLKWARFG
PENKIVVTEDFTRLTLDIAITAMGVRFNSFYSNEMHFPVVGMLAVLDEAGQRSARPTLVSRFMSSK
QYKYDQDIAFLRGI AKDLLDQRRQHPTDKDLLNAMIFGKDPRTHEGLNEQSIIDNMITFLIAGHET
TSGLLSFLFYHLLKNPAALQRAREEVDALVGTS AVKVEHLRKIPYINACLREALRLNPTAAAFSVQA
KKDDVLGG EYFVHKGQSIACLLPAVHRD FEVYGEDADVFRPEPQLAVVM LLQNFDFTMDDPSYQL
EIKQTLTIKPKDFFIHATLRHIKPKDFFIHATLRHENPIAGSGGVEHSATKPKTKTPTQSTPVGATGT
MSIFYGSNTGTCESMANSLASAAAAGHYKASVDILDKAVETKPKDGPVVVITASYEGEPPDNAVHF
VNWVRNLKGKALAGVKYAVFGCGNRDWVTTYQKIPKLVDDVLADRGAERLTERGFADANDGEL
FDTFDRWQDEQLWPGIQEAFGKQDGSDETENDGLTLELSTSSRSNLLRQDVQDALVTENKVLTAS
GVAKKMHT EIQLTGTSYTTGDYLA VLPLNPSRTIRRAMARFHLPWDATVKIQPSSRTALPSGRDIG
VFNIFSA YVELAQPVTLKQATKVAASIPDADLR SNLEQKISTSFKSEIQSKNLSLLDLLEQYPTATFSL
GQFLDSVPTMRVRQYSISSSPLADPTKCTLT YTVLDQPLAHDPTKRYLGVASNYLALAEPGDRIHVA
VRPSAGFHPPKDDTATPILMICAGTGLAPFRAFIQERALKIEAGKTLAPAILFYGCGAPD TDAMYS
ELAKWEEMGAVSVKRAF SKKPEKSEGCRYVQERLWKDREKAAGLFGQEAKIYLCGSGKVGE EVG
AIKRIYGEFKEREKGEKVGE EERE EEWFRGLRGGRYWADIFS*

>CYP5042D1|1654|Grascr1

MEYVQTGPAALILLFTVALWELSKPIDKRWISLPSRWKLPPGPEGRPIVGNLLQFFRARDSSG GITPYL
DSLSKYGEMTTLHMGSRIWVILNSDRVSDILVKY GKQTQERPYPMPVGSGLVSNDRWVFRQSPK
WQEGRQVVQQLLNGSYLHLYGDWYQTESIHL LHAYLHDPQHWFAHHFRYAVSVLYCLILGEPFD
KSKADLDEYQRVQTEFTLSLRHYVDFFP WMAKLP SFLHYWAAPWK RMAANHRAFFASWWD PV
AS AIDAGTAPPSFTRDSL LHPDTKYRG TRE EAMYLALS NMGAGSDTARMMLNTFVMAMISHPSAL
KQLQSDLDQVCNKDDGTLRLPELADMPSLPYCAALVKEVLRWRPTVPLNPPHELTVPLEYDGYFF
PPGT AFLINNVALKDPRWDDGGVFRPERFIDGKG GEMDPVLGLWAFGGGRRICPGYRVAQQALFV
AYARIA YCFDIVPRGDVDDTVLRREILGEPFPVEIRVRSEAHGK LIEEEEERTKVDGW WPGQVAVGG
LSVLK*

>CYP505AM1|4286|Grascr1

MSCPFAPDATGPAPHPLPDDMTESRTAQSTNSGAVVLPQPPEHLFGVLGNLPDIDPSNPPMSLWKL
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RVLVPSFGPMSIRKMFPEMLDIASQMLLKWDRQ GKDH AIDVADD FTRLAFDTIGFCAFSYRFNEFYS
DKSHPFAEQMSQVLLESGRRAHRTDIENS MHRWSEQLRQDNVKKMHAVCDEIVADRKRNPQPD
NKDLLNVMLTKADPVTGEKLSDESIRFNLCTFLVAGHETTSGTLGFCMYQLLKNPEKLLKAQQQV
DEIVGDGV LKLEHLTKLSYIDAVIKETLRLTSP IAFSVHPKEDTMLDGKYPVSKDTLIEVLIRPLHHD
PTIWGEDVEEFKPERMLKGRFEALPPNSWKPFGNGMRACIGRSFAEQEMLISVALILQRFQIEFADPS
YELRMKTTLTMKPSDLKIKVSRRP GKSLMTGLPGGGLAEPTLQSTKGTHAGDNRSSKESKQFPLAVF
YGGNSGTCKAFAEDIETKAASHGMKATVESLDSATEHLPTDRPVIIITASYEGKPPDNAGKFVKWLE
LGAE EQRLRGVNYTVFVG VNSDWASTFHKIPKLVDQTMHQMGAQR FIEAGYTNVKGDMVGPWE
DWSDKLWEGLSQISGSNTETKTDNGLEVT VKLSSTKTTLGTEKIKTGTVLANYELANADIGPAKRH
MIVRLPEGTSYESGDYLVVLPRNPSDTVQRVLKRFELSDDDVLTIANSSKKFLPIEPKSAIDVFSTSVEL
GTPITRRQLATIA TFAPENLKSTIAL LGTDDAAYSSLLEKRYTILDILDEHPTVALSLSVYLDMLPPLST
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QQLLASDYPPTLQHL*

>CYP51197A1|4884|Grascr1

MPSLLSALQTLTYSSSTMP SLLSALQTLQVQIPSLPFILLSFFFIYLT SRLYHLRRHIRLAKSTNLPYILSP
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TQITQRKNDFVKPVETYKVTDIFGKNVLSVEGDVWRRHRRVVGPSFGEGVNRVVWGESLRQAEGM

VGSWVCVGGQEEGEGMGWGKVESLAEDCMRLSLGVISRAGFGREMSWSEEKSAGGREVGEGHD
MSFQDALAILVSSVYLVALLPRIFLRFIPLSLRRGYQSFVEIKKYMLEFKQQAEEDEPEGGRGSSLLK
AMVNAAATADGDDEEDALKQGASKQSFTQDELFGNAFIMIVAGHETTANTLQYAMINLAMHPK
VQRRLOTELDEAFGSRGQSEWSYEDDLQKLLNGLPGAIMAEQLRVQSPVAGIGKLTLDQALAVN
GDNHILPKGTLIYLDTTGAHLNPEAWKDVDSDNLGSEFNPDRWLKKTADSADKDSERSLYQPEAGA
FIAFSAGARSCIGKRFAQIEFVAVIAGLFREWSVELDVEGQASAKELLSMTEIEKKAVWERARQDVK
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>CYP6677F1|5185|Grasr1

MHFSLYAGVPVLTFAWQTLALLKNYKTALSIGLPVLRPLFGLAKWAKYTYLDWQFDDKHAIHDE
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TSFDERISASVWTEANFQAGQMLDSWLSRGKQGTHDTV KDTTALALHVQTYAGFGIKYDFKDSNT
KLEAPHRLTYRDALLRVHRNFTLLKVGEAFSECVLYMQEMIHKGKTAINTGPKGEPDNLNLVQ
ASHKIFIAGIIDNFEAGLKNNGKLDSDPFFPTKGLYDSELYGNLFIYAMAGHESTANTLATSIA YRAA
EPRRQDWLHEEISQLQLPNTLPPSPNLSSTPTRPYLETFLLPRCLAIMHETLRLHGSTVFLPKPTPS
NPQQHKSEPYNHPLHLRSNPPFPPLYFRNNKLPSPPYRSRDLGSRRFGLATRSLDKPRCHNGQRK
HKRDERRGICRLGRRATGVSREEVWYGGVCGVYGCAGGEGEGGG*

>CYP51161A1|5870|Grasr1

MALLQALTDSGLLLVLQSLLLWLLQKV FVFVQRRAKRLSLGCKNPKTCPLPDGVALSLASRRRFQR
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VTTDGELWKKTREALRPHFYGSTADAIDL DLENHLQRLFLKIPRNGEALNLQPLWHDLA FDMAF
VYLMGEEIKDVPGLENLSTNIRQQMDYGMVGCRI RYSKGPLKVFHKDAKWQTALKDIREFTSAV
MKRAIERKQALRKQALDERAHTSNDGKEYPESKLLIYTFMRRWPKRNDLSEGLIQYFVGASPAVAG
FFTNAMEHLLSLKPEAWNKLKLEASKLSGSPMKEDCKQRRLPYTMSVFNETLRMPFTTLEARS AKH
DTILPYGGGSDGQDPVLATKGTMFKANIWALHRDVS VFGPEPEAYNPDRWDEIKPDRWQFMPFG
GGPRVCLGRDKARTEG

>CYP578AA1|5984|Grasr1

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SPTMAA IERILLYERLLPLLSRAGKALDAYLLFN TAA LDAITGYVFGIRSATSRLSNPEAHQE WMD
KYFMRMPYRY YDQDISHFTSPLKRIGLNFV PKAVYEANDAIENWCHGLCESASEVIEEIRGGKY IKA
ENVPVVDKLRGALEKERENKDQIENSIPSN GQSSQAPIPLQLEIASEVWDHVAAGFDTSGIFLTYA
AWELSRHPEIQRQLREELLTSPPIVISSAPSLPR PQD VDSLPLLHAIAMETLRLHPSIPGAQPRSTPYP
SCTLGPYMDIPGGVKINAQAYSLHRNEA AFPKAE EWIPDRWLSKLPGETEKKERWFWAFGSGGRM
CVGSN FAMNSNKHILA AVYSNFRTVIEDDEGIEQSDAYTAP PKGQRLMLRFEGLGQEEK*

>CYP51158A1|6687|Grasr1

MCQYAEITVAIPLAARAIEKNRGILALGVSKPCCLWCQYYLEELNKFYEH RKFEFVYKGTHGKQP
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MGQWDGDR LTSKR FQKQIHGIHIPYLIGRHLSLLRMAVAIPVLTHVLAGVFSLDLKT DENPEGFYDI
ATPYNPARSWNRRRDARKACSRLRGKTKAYLKRHLPHLPDSKPEDVGLWQKIAGFFQGP HFRAS
HIEKGTIRWYGLQVAAKVVA AVGDLDKAADILTTVAFAKSYSYLLSTNAQEYQKLSTLSLGKGKD
VDNKIEGYMYEAFRLSDGLKAIRVARSDISVDGVKYKPGDVIVIPLGKNGAGANPEGFPDPTASKPD
RKRDSYILFGWGQHECIGKPISNQYVVAM LKAVTGLQKVQLNEGAFRRIDVRLQDYIISP DGSELER
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>CYP547M1|6952|Grasr1

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EKPAPVRSFLLQILGAGLILVEGDEHRFQRKHLLPAFQNKQIKDLYPVFWGKGRGLLEAVGEELREG
GAGSGSGFEGGTGGGDGSGGANATARTGASGVVEFGEWATRVTVDIIGLAGMGRDFNTLKNSD
DVLVQNYNSLLEPSRANALYFASNLFVPQWFIRALPWHKNKDLARTTGNLHRYCIDLVHERQAE
MKSGRAMDKMDILTLLIRS NDFKDEELEELADQMLTFLAAGHETTSSALTWLT YLLSLHPTIQSSLR

HEIRTHLPSPTFSSSSPSSTSSPTASDIDALPLLNAVCNETLRLYPTVPVTIREAIRPTTIPYRSTPSTSAS
GTTDAGAGTSGASEYGDRLYAPIATGTRILLSPWAINRSPDIWGEDASQFKPERWLGTGTDGTDGVA
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DGLK*

>CYP5042E1|8285|Grasr1

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SFVRDFELPEKPESQGFNDQVIFLANTIMSAGSDNMRMTMNAFIMASVCFPTPYARARQEIDSTCG
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>CYP613T1|8614|Grasr1

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>CYP6839C1|8645|Grasr1

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>CYP6001C41|9786|Grasr1

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>CYP51234A1|10738|Grasr1

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>CYP51184A1|11240|Grascr1

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>CYP584AR1|11535|Grascr1

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>CYP52AA12|12097|Grascr1

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>CYP584J7|1995|Grascr1

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>CYP584AT1|2528|Grascr1

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>CYP52P14|4646|Grasr1

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>CYP584AX1|5875|Grasr1

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Umbilicaria pustulata

>CYP5087A4|99251|Umbpus1

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GQELPNYDQLKGLTYLRHV FQEAMRVYPPVPFNARIANKDSTLLYGGGGDGNSSVLVKKGDKVIF
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>CYP6677D1|99316|Umbpus1

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>CYP5105E1|99411|Umbpus1

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>CYP5192G1|99775|Umbpus1

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>CYP5792B1|99987|Umbpus1

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>CYP5128B7|100047|Umbpus1

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>CYP6001A26|100363|Umbpus1

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>CYP5328J1|100378|Umbpus1

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>CYP59W1|100377|Umbpus1

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>CYP617AD1|100379|Umbpus1

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>CYP5077C3|100420|Umbpus1

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>CYP577A28|100791|Umbpus1

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>CYP53A62|100904|Umbpus1

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>CYP5076M1|100984|Umbpus1

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>CYP52K10|101154|Umbpus1

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>CYP540G3|101281|Umbpus1

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>CYP65AU4|101283|Umbpus1

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>CYP6308C1|101476|Umbpus1

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>CYP611B5|101558|Umbpus1

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>CYP548AJ4|101628|Umbpus1

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>CYP6456B2|101820|Umbpus1

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>CYP682AV1|102249|Umbpus1

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>CYP59X3|102303|Umbpus1

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>CYP5077A4|102583|Umbpus1

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>CYP51199B1|102865|Umbpus1

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>CYP5282B8|102882|Umbpus1

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>CYP61A1|102924|Umbpus1

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>CYP527W1|103024|Umbpus1

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>CYP530A43|103132|Umbpus1

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>CYP544C2|103307|Umbpus1

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>CYP677A7|103344|Umbpus1

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>CYP5328G1|103368|Umbpus1

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>CYP51194A2|103370|Umbpus1

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>CYP682AZ1|103907|Umbpus1

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>CYP617G18|103931|Umbpus1

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>CYP5104B12|104243|Umbpus1

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>CYP5472E1|104470|Umbpus1

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>CYP6003F1|104516|Umbpus1

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>CYP682B9|105133|Umbpus1

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>CYP534D7|105170|Umbpus1

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>CYP5328H1|105800|Umbpus1

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>CYP51F1|105802|Umbpus1

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>CYP531N1|105844|Umbpus1

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>CYP676E1|105895|Umbpus1

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>CYP677H1|105927|Umbpus1

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>CYP6001C39|106146|Umbpus1

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>CYP51235A1|106159|Umbpus1

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>CYP6267A2|106265|Umbpus1

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>CYP504A47|106500|Umbpus1

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>CYP532A32|106652|Umbpus1

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>CYP65FF1|106952|Umbpus1

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>CYP539A52|107164|Umbpus1

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>CYP584AS1|101694|Umbpus1

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>CYP51191A1|102665|Umbpus1

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AVVGSRLVDEADITCMPLLRATIFETLRLHSPITYHTRKARTDTRLPRGGGTDGHSVPFLPRGTSITW
STYALNRQAWAYGDDWAFAFKPDRWLRDDGKTVASTETFMFPGSGPRNCLGQQFAMLQVITYIAA
RLLTAFEHFELKEWAVPFQEAASVTHYNGQGTWIKFR*

>CYP584AS2|104412|Umbpus1

MAYLTTLALFALAVLTIYGAYTKTRRYLTIRAFKTHHKCQPPRPLPGSGLIGYRVIKELWTSHRAAN
SLEKHTAHHRSRGDTWELSFHVDLIMTISPENIKALLSTQFADFGLSHRLPVFAPLLTGGIFVSDGP
AWQHSHRALIRPAFTRDRVADLPRLDRLHVQRLISQIPVDGTTTVDLMPLFFRLTLDYVTEFLLGESME
SLVSGPDSEQQRFEAAFDYVQRQLGGWNTSGWGSWVWPNNRCEEGRVHVHGVVDGYVEKARAK
ARAARGREAGKEKDAETEAASGGDAKQGGKGAEEKSGRYIFLDELALSTDDRVEMRNEILNIIAG
RDTTASMLTSTFHALARRPDIWARLRAEIAPLEGQPPDYETLRNLKYLRVVMNEMIRLYPPVPANSR
QAVRDTTLPHGGGLDGTFFIFVAKGQVVGYSPPWSMHLRHATFPDGEALRPERWADGEGEGEKG
IRAGWEFLAFNGGYCLYGIMATEKLRELEKLEAKPTVGLGFLPSTPSLSTATAAVLARDQACTLSGD
SDYMQRAHLCPRNELIWFRKNSMRRYNDRCELSGDNLMDDSANALAMRPDIHQAFDACKFVIVP
KNQRWVVHFLGKTNNLGSSFHNMPVSVLATAKPEFILARLAWAVFPLVKSFMELGPSRLVRVRVE
AEDGAQEVQRTITPVEFSKLESKRSRSHSPKKRKASLPVIPEDTSSAKSRQLDDSSLTDTPSLYYDD
EDGQETQHESLGEHEDDNSEEGRIANLRTHELRKRQPIVILA*

>CYP52AG3|105887|Umbpus1

MPEDPQSPFHAPIITPRSGASHTQLTVLALVLAYCFYRYVQKQMQRSETAFGDAHGCLPMKAKIP
FKWPLSLDLVKQTDWANTDQRLAFYQQFFDNLGNLEQKLLGGIGYVTIDPENIETLLSTKFQDF
GLGSRRPAFMPFLGEGILTQDGSAEERSRDLRRQFVRAQYQNLEGFSEHVDNLLACMSSSSSGAV
DLQPLFFRFTLDTTAFMFGQSIGSLKSDVLESFGSSFNEASLISSMRVRLSDFYWAYTPSRYSRACAVI
KRYTDDYVNLALSEVKGHGADATSNRYVFIKELYEELHDPALVRDQLVNVLMAGRDSTACLSW

AFHLLLRHPQVLERVREITSVVGDEQNLTRAHVRKLPYLKCVLDETLRLFPSAPINIRTSRLRTTSFPR
GGGPDGSSPVLIRKGMGIGYSIYHMHRRRDLYGEDAAIFRPERWEGSKLAHIGWGYPFNGGPRTC
LGKDFAAMEATYGIVRILQTFPNMRLPPGLQLEEVGMEKQALTLTVSIANGCKVQLY*

>CYP52P13|105889|Umbpus1

MVWDFRVLSSQIAPRWVLLLVLGFVALGLLHIHRWLDRVQREKRLEATLISDTRCQDPPRLRYRWP
LALDLLIEAFKADQAGSILQFFLSVVDRTGHTFEQVLLGARGVDNDPKNIESVLSTQFENFGLGAR
SANFRPLLGHGIFTQDGEPWRTSRELLRPQFMQTRSKSFTDIQEQIEKFLINVKASSAGVVLDLQPLFF
RLTLDTTMAVLFGKTLDSMKTKVSGDEAFFARAFDQAQHELARRGRLGDLYWLLDGFTFRRSCRI
VHEFVDKIVVDALNETRPGMASEEPTGRYVFLTALISKTRDQRVLRDQLINVLLAGRDTTACLSSWT
FTLLARHPEIQQLRNECEDLPSFREGGLPTPAEIKGMKFLGHVLQEVRLRFPSPVNSRSALKTTTTL
PTGGGPDGLSPVLVRKGEAVGYCVYAMHRRKDIYGDDAESFRPSRWDPDNKEGPDLDKGVGWGYL
PFNGGPRVCPGQDFALLEASYTIIRLLQSFRHIEKAEPSTAKERQTLTLVVASATGCKVILTPALLEG
TLREAEARF*

>CYP6544B1|101378|Umbpus1

MLSLTKSLDAVHEKCMSQGETTSLIIQLTKATLLDAGTAALYGDQLISISPDFITHFSAFDTNSWMLL
YHYPAPLAAPCNIPKRKVLSAFTAFFSLPHSSRSEVAQFLQTIEAEQRKISLSNADIASSAFIFYWAINS
SPWKLAFWLLCYILYDPQLHANILAETKPAIRPDAPGLVDVQHLVTHCPHLEATFNETLRLVAAS
SIRNVIAPTSIGSKILLPGSRLMPYRPMHFSSKIFGPHTDQFNPSRFVRNPGLSKHPGFRPWGGGSTF
CPGRFLARREICAFVVGLLHRFDVEVVEGETFPRRDEVTPNLRIMEPMKGDDLKVRFRSRHFFSHQE
QIPSSVAVRFPAGEAIMSSEPEHVQARPKVNLNDASGAEKREVNDTATAILKKKKKPNLSLIVTDA
VNDDNSIIALSNNMETLQLFRGDTVLVKGGKRRKDTVLIVLADDELDDGSARMNRVVRHNLRVK
HGDIATVHPCPDIKYAKRIAVLPADTVEGLTGSLFDVFLAPYFREAYRPVRQGDFTVRGGMQRQE
FKVVEVDPPEYGIVAQDVTIHCEGEPIQREDEEGLNNEVGYDDIGGCRKQMAQIRELVELPLRHPQ
LFKSIGIKPPRGILMFGPPGTGKTLMARAVANETGAFFFLINGPEIMSKMAGESESNLKAFEEAEKN
SPAIIFIDEIDSIAPKRDKTNGEVERRVVSQLLTMDGMKARSNVVMAATNRPNSIDPALRRFGRF
DREVDIGIPDPTGRLEILQIHTKNMKLSEDVDLESIAAETHGYVGSVDVASLCEAAMQQIREKMDLI
DLDEDTIDAEVLDLSLGMTMENFRFALGVSNPALREVAVVEVPNVRWDDIGGLDDVKRELIESVQY
PVDHPEKFLKFGLSPSRGVLFYGPPTGKTLAKAVANECAANFISIKPELLSMWFGESNIRDIF
DKARAAAPCVVFLDELDSIAKSRGGSQGDAGGASDRVVNQLLTEMGMTSKKNVVFVIGATNRPE
QLDNALCRPGRDLTLVYVPLPDEAGRASILTAQLRKTPVADDVDIKYIASRTHGFGSADLGFVTQR
AVKLAIKQSIADIERSKEREAAGEDDKMDEDDGLEDDPVPELTKAHFEEAMQAARRSVSDVEVRRY
EAFQKNEWNR*

P450-fragments

>CYP505A-fragment1|118844|Acastr1

MGTPIPTPPGLPLLGNDVDPENSIASLMHLAELYGIVTTTLGYNTDACADRNSPTGPIYRVVLGGQ
ERVIISSHELLDQICDERRFSKAVSGPLGQIRNGVHDGLFTAYPEEHNWGVHRVLMPAFGPLMIRS
MFDGKLTPASARLHR*

>CYP630-fragment2|119576|Acastr1

MLYSKRSHALLQIHQTHPIVQIGPNLSYGDVKTIKDIYAHNTKCLEDTFYTLLSGTHNRLADVVDK
PEHARKRMVWSSAYALKNLEGWEHKVADKTERLINGFDARCTARYRKDIRARKLNS*

>CYP59U-fragment2|119928|Acastr1

MLDRLPRNAHYQYALGDVAREHFSKEGVYFDLWPVSDLFLTVVSPNIANQIHANPEISMGRPSLL
PRFFKPICGGPSMFDLREKDWKPWRAIFSRGFSADHVLVSLVPGMVDETAVYCQTLRSLAVEKTMFY
PDLTTLRFTVDVIGKTLVSVSVSSLSQN*

>CYP682-fragment1|120003|Acastr1

MELPKAFNHIRLSPSDIPLFAICVLLVYTVYGAIYRLFLSPLAKVPGPRLAALTDWYEEYYDAVKKGR
YTWKIAELHEKYGPIVRINPSAVHIHDPNFIDEVYGGGKKVDKPSRYASMFGIKVATFATDLHEKH
RVRRTLINMFFSKRSIAKLEPVIQSVVDKFCNRLEGFRKSGEPLNLRNAYMAMGTDVIHQYCFAAP
NYYLDEPDFQPSLYQALIEASQMAASKAISLKKDWTIREAQIQELMDAGEEARNKTEHATIFHVLL

DEKVPPQERTLFRLGEEAISLIGAGGITTQHTLQTMTHILANPPVLDRLTAELKQAMPDPNIPAPL
QQLEXXXXXXXXXXXXXXXXXXXXXXXXXXV*FV*

>CYP527G2-fragment1|122578|Acastr1

MAILKLTEDTTILLKYSATLVVSWYIISSITTWYKLRHIPGPFLGKFYHLWSIYHQLAGDVGPVHLEL
SKYNSPLVRTGPHYLVTDDPNVWRHVNGARSIYQRDAWWSAGRIDYQRPSLADTLDAASHDKMK
AKLAGGYSGRDVDLERIIDGQIAKFADVMRRKHVDRNKVDFADRSRFFTLDVITRLAYGKEFGWV
EADEDLYGYGAEISKFAALGALISDVTWLHPFVRWSFINSRFPKPTARHGVGKVVGLGREEIQSRF
AEDKKDDRDMIGSFMRHGLTVTEIEDEALIQIFASSDTTAIVIRSVMLHLIATPRVW*

>CYP5328-fragment1|126188|Acastr1

MTNSILLLLLLLPLTFVIHNLCLNYRIARKIGIPVIVLPASPDHPKHFELGDAVVVFTPAHNWVYV
CNAQALKGIFQRRNGFPRPPEMFLVARRAVEAGPQVQLQGLARFDTGKLVVDSCPWSEVAHKVA
PTQDGC SLRGNLAGKISSALCSEPRREWPIQQQLLAPKAQGSEVSLSPKYTAISSFIISRDITQLPLHSS
YALYLLAAHPEIQVLISEEINAAIPDDHSSTWKYNEVYPKLNRLCLAVLLETPLRLWDPPIGIAKSTGAN
PQVLPLDDCEILIPANTRVIPNNNAIHSHPRYRWC*

>CYP5328-fragment2|126855|Acastr1

MPSLLAVQTHPEYWQDPLLWQPSRWISVSSLLAVQTHPEYWQDPLLWQPSRWISVSPVPRSSKPEL
DLTSRLRQEVVFTPAQSTFFPWSDGPQNYPGAFAQVELVAVLACLFQDHRVGIIPTPNESFNDARK
CVLDVTEDCDLELLLRMRNADKVRPAWRRV*

>CYP5334-fragment1|127116|Acastr1

MFAFGFGPRKCLGQYLAEHSIKTLIIHLIDQYQLGLRHGQNKEADYKVEEGNWIPLADVEIDLRLR
*

>CYP548W-fragment1|118920|Acastr1

MTAVSFGADYRTMEEPQFRYVVEAIEKSNVRLGVLMQASELTFGGLDRKLFSNAAKAGARFVKFL
RKLLQKRLQQEPADTVKDIFSFLQQLLEEVRTTFSSADEIAFGAKLNSCVFLRACLDEALRITPPGGGP
LWRVVELGGTRIDGEYVPAGCEVGSGIYAMHRSPRNWPNPGNYIPERWLENKEKDKSENQENKN
ARQPYFPNIGPRSCVGKPLALAQVMLTFAHILWEFDLRSANAGEPRLETDDTEPPEYMLQDHVTG
QKEGPILHFRPRF*

>CYP684-fragment1|119584|Acastr1

MLEKGEEDRYTQDLKKNAAYSNIRTELSTLCKMLSVLPLPIMRELQETPLRLLGHARQSLQRYKNLL
ATNPESVTGKMLFSKLFRAKDDGGLTDADMEVEAAAYIIAGSDTTAITLTYLIWVVAQRPDIEKL
GVELAVLSDDFAYDDL RHIPYLDHLIDEALRLYG VATGGLPRIVPPGGHTLAGHFVPGGLTVSTQA
YTLHRDPSIFDEPEAFRPSRWEKATPAMKEAFLPFGAGTRICIGIHLARMELRIAVATFFRSFPRTMV
ADAEGMSEKDMEMENCFLISPKGRRCLISSR*

>CYP59U-fragment1|119927|Acastr1

MDKYIGDELDKRYDEYKADPEGQQTKAVIDLVLQAYLPQDGKTRPERLDPEFRAFAISQIRLFVFG
HDSTSSTICYILHLLATNTDALAQIRAEHDQVFGTDL SAVPSTMKEQPHLTNTLPYTTAVIKEALRLF
APAGCNREGKPTATLVDDQGNHCPTEDAVVFTIHTELHRAPTYWIRPDEFLPERWLVESAPSIRNC
TAHPPTGFDPTSSSRSDGWSSLNTSFTR*

>CYP682-fragment2|120004|Acastr1

MERSYPDRAFKYGDYVLPNTSVSMTTMLIHDDPSIFPEPRKFMPERWLDSEQDQDCHPNPSNNYD
GGEKPLQQEQSQQQRLAKYLLPFGGRSACVGVNLAYAEHLALANIFRKFELELYDVVPERDVD
VLHDFNPNPALGSGVIRAKVVGRVA*

>CYP676-fragment2|120182|Acastr1

MEDSTLQGVQSTVDAKDASRRQRNIGNAYTLSSLLKSEAQIDDVLRKMRECFDKVADTGKAVNLG
EWWAWAAFDVLGELTFSHRFGFLEAGQDIDGAIAS TELMMIYGVTMGYALKLNTLLVDNPIIRKIN
RWFNITDKMHLAKITMSALAKQEENPEASHNMVSQWISNLAKNRDTMSPDEIKAAAIGNVGGGS
ETVSATLQSAIYHLLRTPHALHLALAEIDAAQLSPIPLHTEVAKLPYLQACIKEGLRMHPAGPWNLP
RVVPPTGLTLGGEYFLAGTILSVNPVVIHHHPSLFRKPESFEFERWLDEQQRRVEEPFWIPFGAGYN
RCPGRQLALMEVPKMAALMLRDFEFERVQGGRDWVWRNNFTAVPG

>CYP6798-fragment1|120348|Acastr1

MTNNEFNSQNE DMPLLD SFIKEMARLN PPTINGTHIPAGNWACVPHQAMMQDLANYSEPTIFNG
FRFVNGKDGSAKSDRGS LIPVGS SHTGHL SNKCGQYLLLPLGLTVQRRPSTPMWKPLGQDTEAVKT
ICPARFYVSMVVKMILVQFLTCYEFKLADENVPPAFAWGIQLHAAPTEAALGRRARPTTIKKVSPTC
NTARGSTVEIAVLVAHRRKWRKLRQDIDATSLHEEEAYEMPSPIPNESPVCLPPALEKRSTRAVKA
SSLARELVDHVSRTGGVEVLKELGETLFRGVEVLKELGETLFRRLRAHSGRSQVTCKS*

>CYP65FT-fragment1|120400|Acastr1

MWKGRMPHVARS LHDQYGD TVRISPTGLSFSSQAWKDIYGIRPGKPQLPKDPAFYFPQKEGPSIFIS
GDADHSRMRRLLSYAFSERAMREQAALVSEYHDLLIQKLHEEIQGPAGGKVDVVKWYNCCTFDII
GDLTFGEPPFGSLEKGGYHFWIANIFKALKMTQELHPTSSEARAKHARFSAESA EKRLALNTDRKDF
MSYILQYNDEKGM SVSEIKQNSKILVLAGSETTATLLSGATYFLCTNQDALRKVTA EVRRAFSNSSEII
LTSA AHLPYLQAVIDESLRMYPPVPSTLPRRTLPGGDVVNGQFIPSQVT*

>CYP5148B-fragment1|121990|Acastr1

MELYTRYISDHV VAKTFATTFGFIASAAALCVLFLPPTLSSKKRTDESKIPGPRGWPVIGSFNSLTHYP
ELVLDKWAKAFGNISVWLGNQLFVIVSEASIAKDLMVTNGNVFSSRKEMFLKSQTIFAGRGITATP
YNNRWQAPKYIKRN*

>CYP527G2-fragment2|122577|Acastr1

MPQIAVVVCTGMRTTNYGRLRVYTILTFPPFPDSRLKTDIRNAVSSGKVSIPITLAQAQSLPYLQAVI
WEGFRMRPAVTYGHYKVPPPGD TIAGI WVPGGTAIGHNHFGMMRNERIFGDDVDVFRPERYLD
KPNGDEMQR TVELVFGTGRWMCVGKQVALMELNKVFWETK VWELGSRLMLDEQLLRQFDFQLA
HPDKAGWKETSSVTFTHRDMWIKITETEK*

>CYP653-fragment1|122722|Acastr1

MFPGFLHPLVSKVLPSVWRLKKQLKAVKEELLVSIINERRTAQRSSVLDYEKPDDFLQWMMDLAEN
QTDAEAGNLAHRL LGILSMAVVHTSAMAVVHVLFDLITMPEYLEPLRTEIQHLLPQGWDKATQSE
LLGMSRLDSFLRESQRFNPPGHLSFN RIVKEPMTLS DGLKLPEGTHICMPSPISMDNTVVPNADTF
DGFRWFRENKPTAAFANTSPTNLHFGIGRYACPRFFAVYMIKAILSRLFLDYDFRFHEGQRGRPK
NILIGDKVMPDIYTELLIKRRTV*

>CYP59V-fragment2|122889|Acastr1

MVWTLIQAIHRDPRYWPQPD TFLPERWLTSKDDPLHPVKGVWRAFEFGPRNCIGQELAMLEMKL
ALTMTVRKFDFSARFEWEQINRRKGPKTINGESAYQTL DGTNRPRSGFPCRVTMRGS*

>CYP5104B-fragment1|124265|Acastr1

MHRTMIQLHKKH GK LIRTGPNELSVADLTAIKRIYGPGTKFKKSDWYSVWQGHRKFDLFAERNEGI
HGSQRR LVSRIYSMDSLKDLEIYVDDAVSHFMTKMRELQGGQSVNMGLWVQLFAFDVIGEVTF SKRF
GFMDAGVDDG SFRQIEGALRSAAWIGQVPWLYWMNDFLSPVIGNHLGINARHGSLRTFAASEITK
RRDRGSDHQDILDKLLQVQKEKPEEMNDMAVLSMTTSNIFAGSDTTAISIRSIYYLLKNPEYKRKL
VEIDMRKSQGKLSTPVTLEESKHMPYLQACMYEALRCHPAVGMSLPRVTPSGGIEIDGCFIPEGVRI
DFYSVLRLADPQPTLDNGWSQSLGCPSQQGGLWR*

>CYP5105A-fragment1|124382|Acastr1

MAGTESTAKSIAIVHFHLLANPPLMAKLRAELRTVPENASWPELEQLQYLSAVIAEGNRLSFGVTA
RVCRIAPDEALQYKQHTIPGTPVSM T T LCVHTDETIFDPWTFNPDRLGLPLGAERRKYQMAFNK
GGRNCVGINLAHAEMFLVVA AVVRYDMELFETDISDVEFQHDYHVSFPKLD SKGVRAVVRGKAA
LV*

>CYP676A-fragment1|124880|Acastr1

MFFLTDLRSCVAF AAGTFVRITYNEVSVDPEAVDKLLLTRLRKGDIFYQAFALPDHNYGNQMSEL
PKEHVRKNKNIASGYALS NMKAEPYVD TI EL FERRLDQMSQMGEKVELDRWFNFCAFDVVGEI
TF SKRFGFVDQGRDIGGA IANSRKL TLYISLIGHAYWLHGILLANPIIGWLN LQPSNHVFETCLAAVE
ARKKNDKVRKDM MELWLEQRRTHPDRMQEKEILAAAVSNIGAGADTISTTLQSVFYLLRNPKHL
NRLREELDDAQSHGNLSPIVAHMEAQKL PFLQACIKEAYRFHSAVSFGYPRVAGKEGITIAGRTFPE
GSLLSVNPWVIHRNTDIFGEDAESFNPERWLDQERLRMMMDKHLIHWGAGYNQCPGRNLAHLEISK
ITATLLRDYDIEQVDPKQEWTYESW FVALPSNWPCYVKRRNVAKVE*

>CYP50105-fragment1|127121|Acastr1

MEACTRYATTAFISGVIWNFLPLGPFRRWVYWIGSLKHRMDLHRATSYLLPIVEERMAKESTSDKKP
VDAIQWMIDMPPTSLSELDARRHSYRILHLTFACTGTSISLTQHLLIWQILLFPEYLA PMREEIKGALA
EYGGWISDKALSHMPLLD SFIRETLRMHPPGVCKSDSPVLTITSTEAKSLVGGARTVMQKPYTFHDG
LSLAPGARIAFAVLSTNLD PDNYDDSQKFKGFRFAGPEVSSESQARVSAATIDEKFLS*

>CYP613-fragment1|119548|Acastr1

MELVNL R D P I P E Q V E K Q N F F N L Q V R G Q Y A Q Y R C L S K P E H V Q I Y Y R D S N R H T K A I N N N S G W L F G E V
L G V C V G L V S H A Q W T R L R R H V E K P F S H P S A A S Y T G A I R Q S R E F I D D L P L K A P N F Q Q N H T I N P A D D L
K L F P F F V V A N I F F G N L S P E Q K K S L S E L A P L R E E L F K E V I K G G I N R A A L S R Y L P T R G N R L L S A F Q E R W G
N F T Q N A Y D E A K R K G A D V P I V S L W E A S L E G F I T K R E C L Q T L D E S L Y A N L D V T T S A T S W N Q I L L A Q N P
T A Q D E L R R E V L R F R N D S S D D I Y Q Q Y L N R G D T F L A A C I L E A S R L R P I L P F S N P E S S T E N R E I G G Y V I P R N
K N K T D V I V D S Y A I N I D N P F W V N G S Q Y N P F S A M A N T S D G A N S A D S V A Q L V H L L E S L N G K V E E V L Q Q
L E S P K F T T L L D E K L H N P D H L P D R Q L E V M S S Q V V D S M D K L Q L R L V P S V M L L A D G F F G Y L F S K A L W T V
V D A K V P D V L D E K G P L S A A E V G L L V G I Q P K R L S Q L L D T L I N N G I F L Y D S N T N R Y S S N R T S R L L C R D H W
T Q W H L W A D L Y P N D F F D I S R S M P Q A V K I G E A R N A Y Q I E H D T K K N M F V H L S E Q G K I E K F H N T L G A G
A V A Q A Q G F S I D Y P W D E I G S E H F I D I G G G S G A F L A S I L R E H P K M T G S L L D L Q H V V D A I T P E F R Q P T G K F
F D V G A Q V R N L L V G D F L K H V P P A S V Y T M K W C L H D W S D V D V N I L K N V R R S I V P S A V A R F V I L E S V K
Q Q G R S G R L P R Y G D L I M M I T V N G E E R S R S D W E R L A Q S S G W R V E Q I V Y L R R A W P C A I D L R P T W S *

>CYP630-fragment1|119577|Acastr1

M N E W L A P R S Q L P R M S P C Y G S A V R V G L G L R V V S P A V E D L Q P H V K A V S E D V E A Q P R L E R H C P S P R H A
T P E R Y Q A G E K L D D F F S A L M E D K E G N P N N L E W G E I V A E I A I M M N A G S V R H L P Y L C A C L D E A M R L L P
P S T F G L P R R T P E G T T I F D T F I P G N T S V S I S A Y V A H R D P T V F P D P E T F R P A R W L K E G A K E L Q P Y F I T F S A
R A R G C I G R N I S Y L E Q T V L L A S V L H R C E L R L P Y D G W E H E R W Q A F N L S P R E M P V K V Y N R D F A K V L H I T
Q H V N E A K R A V E G K S T F W L I K Q L Y V V P S N L R A L I A A C G L M A I S Q P G G F N S L M Y Y S S N L F G I V G F S N P
V T V G T L I A G T I F I T W G F L M L V D R I G R R R I L L C T M W A M A L F L A L A A I C F H W I P V H Q D L I F V N A K V S W
P A D V V L V C M A F Y V A F Y S S G M G N T A W L S S E F F P M E T R A L G T M M L T C T C W G S N V I V A S T F V P Q M E N
T T P S G A F G S K P P S A S L A G L S F I S A T P K L R A *

>CYP51188A-fragment1|120821|Acastr1

M L T S H Y L P H W T D R F V V P G I L A L G G A M K K L S S Y L T L E V E Q R L R D M Q E G R K D I P R D G I T W V I E A S T T E
D Q R A V R R I V Q Q V I S V F F A S A H Q L P V L L M F S I Y R L C E H P E Y T K F L L N E I E A M L K L P T T D H Y K H L P L M E S
F L R E A A R H D P L D S L S V Q R K V L K D F K F S N G S Y V P A G N V I C V P Q Q A V M R D P K Y Y D R P D E F L P F R F V R E
H G D G Q D D G P V Q K F T D L K P H F Y L W G A A A K P C P G R W Y A S A V M Q Q F F A H L L T K Y N F K L A D P N A S L T
F T Y T T I V F P R P R L E I L L Q E R *

>CYP5148B-fragment2|121991|Acastr1

M V P V N P Q L I P T T M Q R R G K K L H Q D L V K T Y G G L V N G I K Q R L D G G A A V E D C L A K S M L H D A G E E G L D
D L D M S I L A S A F M V G G V E T T A A I M Q W F S A I I P A Y P D I Q R K A Q E E L D R V V G R S R L P G I E D E K N L P Y C H A
I I K E V R I P I T T L S V T L V E R C R N P F W L G T P H F T T E D S I Y N G H F I P K D T V V V L N T W T M H H N S E R Y P D P K A
F N P D R Y I N D P L T S A D S A N L A N P N D R D H W M F G A G R R I C P G M L V A E R E I W L T I A R M L W A F D M T E V P
G E R I D L N E Y D G L S G R S P M P F R I N I K P R D A E V E K V L K R E S G R W A V C A *

>CYP5082-fragment1|127117|Acastr1

M S C G G N M D G L D A G E A L N S L S W Q N S A G V M L S E M M E M A G Y H L Q S Q R S H L D F F A R H V A P A L G S H P
E I D R K P P P W R S F M T D D G S P I E L S W S W S V Q E P A P I V R Y S I E P I G D R A G L C P D Y F N T H T S N E L V H I I Q R S Y
Q G V D L T G Y A H F F K E L V V C G E G T F V P K I T K E D G S N S Q I F L A F D L L D E K I M L K V Y F L P A L R A R E T G Q C K
L S M V E K A I S T L S P H G Q S L S G A F S L V C E Y I R S L K V G N R P E I E I I A V D C V N P T L S R V K V Y L R S R E T S F A S V V
S M M T L G G R L K E L S K E G F A T L E E L W R L V L S L D P T I S T E P L H L N N R R T A G I L Y Y F E L Q P S R S Y P K P K V Y I
P V K H Y G K S D L K V A N G L S S Y L K E K G K R L N G M D Y R D A L Q R L C K H R P L D Q G S G L H T Y V A C A I E D I S L A
V T A Y I N P E I Y H R P R A G P Q T G H Q H I A Q G T S T S R N V A H E S V T V L K L K A K E F Q H G F K I D A G L Q A R T K S
A N G G W Y F H Q L L G E C M G L V N G T R W R N L K S E F D L S F S H R A V L Q R S V D I E G E A C R F L R K L E I H H G Q E P
F T L N A S N A F M T F P F F C T S H L L Y G P M T E S E R D R L W S I G Q T R L A L M R H V I K G G I M R Y K A C K W L T S T A V
T E L S L F Q K E W A V F N R D M Y R S R M E L D P P P P I V S L K R S E T E G K L S K V E S L G K I L Q T L D E M L F A N L D V T T

HVLTWLITLLADKESTQQKLRDEIRNVQGRPDVYCNRKDTFLHFCLMEAIRLRPPAGIGFLLTQSDG
ER*

>CYP65-fragment2|1800|Clagr3

MPQGHRSAAARTGWFERDPNLHPTLPGRAHSLIHVLRCAHLSAEKALREQESLIQSHIDLLIARLHTE
INSPNNGVVDMVQWLTFTITFDIISDLAFGKSFNCVKEGPHPWVELILDFMRKVAYLAALGYLPTPIF
KMIISTLQYFMLEEIQKGNEYVDRSVAIRLEQGTSRKDFVSPILELVSHGRNSSKQSG*

>CYP51164A-fragment1|3613|Clagr3

MSLRDALHDPTIYSSPLSFDPSRWLTTPDAEKKLMDMAFLPFNKGPRIKPMPHSYVPPTYPLHSDGS
PSAIPFNNLGSRRGSEIQLTDGSLAFANIYHVLSALFRRFDLELVDTIRERDVMARDKFISKPVKES
KGVCVRVVGAEI*

>CYP5069-fragment1|6212|Clagr3

MPTQAMRTKTITPSERVENGLFLAVANLIWGYDFRLPLGKDGKESSMDLSDEAFLDGAIRIPKPYEV
RIIRNPERLALVKSTWKRAKEEGYVMRGLTVTESEGIAVNEKLKLDGTDKRTLNAFQEDVRLPTG
VLYCSYQVPT*

>CYP682AZ-fragment1|10834|Clagr3

MCSVVSLLLYTAYGVYIRLYFSPIAQFPGPKLAALTFWYEFYFEVFWSIHLISPTGPIVHINPYKLHVT
DPTFANMLYPTSAKNVERWSWSAGMFGSTEMTFGTGVGHMLHRRRRRGAFFSHFFSKASVRRLEPLIQ
TLVDKLCEKLSQYTDTREPVNMVHAYSALTQDVITEYCFSECRNVLEMENFLPWYYDLVQKPCELC
QMFVPSSIAITRSS*

>CYP548-fragment1|1786|Clagr3

MRRIRLLCCLTCYLPDYSAPSREVPRPTSRSDDGAISTVAVNCRGPTPDVLETKDDIWLQGECSEIELV
PRVSSEGRMERLDMHRQSSPCSRTLAHAFSDTALRDIEHYVTSNVQIFCDQLFSKDAKHQTEWGH
ALNMSSMSNYLNFIDILAEFCFGKGSFRMLTESNHRHVVDLMLHSAWRGMICGTLPPVHDLRLDK
LFFPTLARDRQRYKNFSKSLAVERTKQGEDDDRKDFFHYFLNARDPETGLGFSTPELWAESNLSIIA
GNIPTGTTVGTGFYSLHQNPQYFHGPFYSYKPERWIVGSSAEVTAESAELAQCFFPFSGPRGCIGRN
LAYMELRSVIARTVWLYEMGLAPGSMVGNVEAGAEDRRRQEFRLDRWQAEKDGPMMQFKWRV
RQKHRMMFSGKQVKM*

>CYP65-fragment4|1799|Clagr3

GSATTNTLLSGALYHLLTHDSILQSLLAELHSAFPSTGVSMAAVGSLPYLNAVLEESLRVYPPSAH
GHQRIVPHGGATICGKVVPEGTSVGVATLAASLSERNWTEPLAFKPERWLGEAWAGDDYKSFQPF
LVGPRNCLGKNLAYAEMRLILARLLLEFDFELCEESREWYKDQKFHFLWAMPPLKLRLRERAF*

>CYP5570-fragment1|4546|Clagr3

MGDITFSRNPVLRHDENRHVVEELPKGVVGIHLTEQTGHMPWLLKCGLDRLLFNDFIRGITPLKF
LSEFAEWRVTQGDSDLGRDLFAALLDAKVSQTGRGLDLKDLISEAALFIVEGSDTTITANTTTISYLL
HYPNTLERLQRELRTKFKDAEDIRMGTDLASCTYLPACIDESMRLANPIGSLLPRETLPGGLKIDGE
WFPPGIDVGVPHYTLHHNEEFFPDPEFRPERWLPMDKRSQTRAESFTTSTTAKEATLDMDLEVAQ
SAFMPFSIGRTSCIGKYLAYQEISLIARTVWQYDMRIQPGSTVGEHSGLEWGRKRKNEFQLQDRF
GNPKIGPLFCHAWKPWHLWRYEAHLCVMGLSTD*

>CYP5406A-fragment1|7175|Clagr3

MGWGVTRKKVFNILLWITSQTLENKVSDEKPVQTQGHITQWTAEMTRLRDAAAVAKITLGILFASA
FQVPMLAQFCIYNFCKHPEFYERLRAEAVECKDTSFGSLNQETPYLDSFMKETARLSPGPILSAPRTV
MVPYTSPDCYHIPTGNWLAIPQLSLMRDESIWSHAFAFDGFRFVNEKDGTSKSRLTHPSYEFPPWGS
IRHACPARFYVSVVMKMILSHLLIDYEIKLADPTARPFLTLSKMRLPSLFMTILLRRRGVTGDDKSDQ
AATEKAD*

>CYP6789A-fragment1|8063|Clagr3

MPYFMACVHETLRLSPPIALPRHPPTGGIYVNGEWISEKAKLGANPYVIHRSTKIFGSDADTFRPE
RWLGDHEQVRLMHKFSLAFGYGSRKCLGKNIALFESQKFCACLPRDFDTRSCSPERPFEAQNWGV
NVYSGQYLKLTTRTKRSDGTSQ*

>CYP5042-fragment1|8898|Clagr3

MYLALSTISAGNEDAMYLALSTISAGSDSTRIPMNALVAAAALCHLDAMRKAREEADAVCGNSAGR
LPGTGDMHKMPFTCALLKEVLRWRPPIPLVPPHQLTQDLEFEGYYFPAGTEFVINSFPVAHDIDAPE
AFYPERWMGDNEASIIQGLWVCGGGRICVGYKLAQTQLFVAYARLLYCFDYAAAGEFNMRIGYT
SLEEPISSEGHGP*

>CYP65-fragment5|10067|Clagr3

MEITRPDFMSFIMRHQDEKGMSEIKIQRTLNSLMVAESETSATTLSSTTALLIKHPEKMKKLMNEGR
GAFKRDETTFEAVYNCPYLI AVLKESLLLYPLVPTGFPPLVDPEGGNVISGYWVSGKEHPRSSRQAM
QVITHDTMFRSGPQIVLAVTLSFQILSLRSAGLATHDMPMTTSLCSTHDHIGRGIVLPAFETRLFMAK
VNWNFDVEVHMDAASNWFDQNGFTL*

>CYP682AZ-fragment2|10833|Clagr3

MHDDPSIFPEPRMFDPRRWIGPERDIRQKYLNFNFRGARQCVGMNLAEAEMHMALAAVFRKLGR
QMELYDTERERDVRHDFVTNPNLDSRGVVTSA GDERFARSLMRMEFERARHKPTTEPNAARD
EL*

>CYP52-fragment1|10873|Clagr3

MLSWQVGIQLHVFFRRPLPINMRQACKDTVLLVSGSPDRKAPILVRKGVAVSYCVYAMQRRRDLY
GEDVNEFRPDRWDANEASERDLRNKNLGYLPFNNGGPRSALEFAILEASYTIVRPLQPYQTISVGEE
ETEDEQTHPRHTITLVVASAKGYNVRLGV*

>CYP-fragment1|11111|Clagr3

MSQSACIKEAIRMTSPVSSRLPFTLPTLVYTFSAVKDDMGRSQTYEIPPETNMGMSPRLMLYNAEV
YPDPECFGHSRWLNENISPSKAQGDGRMLKPARQTDLKAMEHSFKAFCGGGPRRCIGMNLAYASL
YYILAAVVRFDLEITDAVRARDVDMNRDNFSSVIARGREAVRVRVVGDEAENVQ*

>CYP5095-fragment2|5456|Clagr3

MTSMFTSTPPAPFLTSHKGKIVRIKPRDVBHIDDPEDFETIYTPSAPYSKLEFFENRFNMPQATFATADF
HLHKL LPDSHAYKPERWLDNPKAPDGVKSLSRYMVAFGRGSRMCLGMPMAYAGVCITLATLMRR
FKFSLFETGSENVFVWQDFVMPQPKLGS LGVRVLIN*

>CYP5168-fragment2|298|Dibbae1

MDTLEQDKLMLNGDDVTMIAGGILNAHRSSKRTSGLDQAESTDNFYELKKLPRLNGIVNETLRLH
PAVPTGGLRDTPNKALKFLVYLHQEISRYVLQSTP*

>CYP5095-fragment1|1169|Dibbae1

MDKLCEPLEKEYAGTGKILTINDMWGYWTPDIIVGYCFERFYEFIWQPNFRAFFTAMIDLLETVHF
VTQFPSIIHMNRMPASWIKFLQSGMASVIQFNKQMEDQIAEILRCPNAGEEMVSQDTVFSAILQSDL
PPEEVS LVLLQHEAISVVGAGIETT LRLSVAGFH*

>CYP631C-fragment1|6185|Dibbae1

MHVFRKAPAYIHHLRFPLSRRTGKYLSSVTVLGHYLPAGTVVGGSPYVANRHKPTFGQDAEFWRFE
RWLEKDAAHKKELE*

>CYP5129-fragment1|6190|Dibbae1

MANPTRFTRVIPDSSRGLHIGPIHVPPGTPIGCAAYTLHHGASIFADPSAFRLERWLEDDRLDMEK
SMMPFKG*

>CYP5369-fragment1|6630|Dibbae1

MIKEGSTLPKKLPKDGVPQELPKFTKLKFSMDGLAGGWIPYGGGPFMCPRHF AKQESIGSFAVF
WANYEAE LQTPSGFCPEPGMKFFVLGALPPKDRTPFRVTRPSAWKA*

>CYP682-fragment3|7518|Dibbae1

MFTLINIVQSYCLALAVIALSYATGAVVYRLYKSITVSSNRALQGDCKDAPELARDMAETRPVVEMI
YDELYSGPGTRRDKSVFMFRALGSTRSMHLTAKHDVHRIRRAGSNSYFSKRLINHLEPVFQLLASKL
QSRVQEFRHSKQPPILNHAF AAPSTDGIITLYSFGKSYNELEKPEFADGDVQDYSRFGWDDS*

>CYP65-fragment9|9026|Dibbae1

MEEVLRTFGAGSSHISKAVATLGLLLLTSTRLAFVRS LRKGYLAHDIQKVHKRYGHIVRIAPDDISFA
RADAWNGIHAHRPGHSPFPKNPVWFAPTPEQPSSLIANITDHARKRRILKHSVTEKALRAQTPIIN
SYVDLLI IKLTEKIAASDAKKSQHCAGHSAMVQLYDI*

>CYP65-fragment6|10330|Dibbae1

MPGKDIYVQKPGQATFPKYPSRYGKWMWIKGALDIFSAENEADHAQLRRLIPAFSDIAIGELEAL
VQKNVDILVRKRVTDSAVKGRVDMSA*

>CYP542-fragment1|10990|Dibbae1

MKSQVQEIHENKTSIKQQLDTRSTIFEELVFSKELPEREKSIDRLFQEGQTVVAAGTETTAWASSVIIF
YLLTNRDKLLKLYAELFQLMPSPEKILPPTSVEHLPYLIRLPLRKDRF*

>CYP50334-fragment1|11141|Dibbae1

MITAEALRLYLPLVRRIEREVGEDGLGEPIIATLNPYSEPSWVWGDEALHLRPSRWINLSREALQHYM
AFGGKPYTCPAIDNFGPKMIGLLVAALWKSLEEWNPNLQRTTRLILDWQVESFWDDFRDEAQLQ
REGMLIIP*

>CYP6716-fragment1|12561|Dibbae1

MVLFLKAYLATLLGVLSHLGFHLHGEHLYAPRIFRLYASLPPIAVLLQIGAGTSIRDASVKSLLLVL
YAVGLFGSILLYRIMFHPLRNFPGPMAKTTKLWNTVHTFNSKNYLLMDGLYRQYGDFIGPNEITLF
RAEAVRALDGLGSKCSKAPWYDIMKPRVSVATTRDKTVHSKRRKIWQKAFSTQGEWS*

>CYP573-fragment1|1691|Dibbae1

MKRSPKKSRTDILHFLETRTWEEDLLHLTFVKVEAVLIVIAGADTTATSKWKTEIDDVTAAGNLSAI
TQYDGVLEHCSYYVPRIRKTRRLYSPVNTFPRLVSKGGITLGGKLVragMEVTIHAWVVRDAAL
YDPDANAFEPERWLNDSVSTVKQFNKYDITFEYGNRRLGEGYGVYGVV*

>CYP540-fragment1|3289|Dibbae1

MFSQSFAGFTTTSSLMSWVIYCLATHEGMQDRLLQELIDQRHQWRHRLHTRIITLFLSLISSRKKS
GAYIIPHSSLPALQKPTASFPIPAGSVLTAALHHIHNPNALWDNPTQFNPDRWDTEKVKNRHKHS
HIPFAAGPRSCIAFNFALQEVKILIAELAYRYQFEKTGEELVDLMRPMNLYVWAKNDQTGLMEPKV
QKEFGFALL*

>CYP5472C-fragment1|3550|Dibbae1

MSDLHKLKYIKMVIKETLRDHHPCKESMVTDLPEAKYLTVGFNARVPIKDITLPRGGGPDGKSPIAV
LKGTQIYGLLSLQHRSDLGVEDVNVWRPERWETWKPNSQWEYVPFNHGPICIGQQFANFQMEY
FLARLCQEFESVTLLPESPSQEGLVKLELNTKMAHPVYAKCVRRAV*

>CYP5042B-fragment3|5583|Dibbae1

MVSPSLSIFQLDSTNSIGISSIVDFPQLASIPILFQLWRRHWEETGQFHDAFQTRWKPVKRAIAHG
IAPPSFLRDVLLHKDTKYSGDDEEAMYMATSIIAAGGDNTRMAMNTFVMAALCYPDVFERRAKDEI
DKVCSPIGKAKRLLRLVDMAKLPYICAMVKETLRWRPSVPLIPERQLTQDLEFERYWFPKGTNFVIN
CVAVSRECEEPDIFKPERWLDGTESSIIHGLWQFGGGRAYLAWL*

>CYP5091-fragment1|5965|Dibbae1

MPIVEKRLTSRHRDTYNSPTDKSMDCMQWLIETSPLSNPWTAEARMISEILAIWFSSVHQLAMSTVFA
IEDLCAFFEYSDTLRREAAAMQSVTPDGLPLDSFLKESARFTSVDAVTCRRKALTSFKFSGLSIAQG
DWVCIPQQAMMHDPLHFRDPLKFDGFRFVQERGGEDIVAHSSKASLFTDTSLDWLWVGLGKTVW
YDH*

>CYP5947-fragment1|6921|Dibbae1

MTFCKAAIDPTIFPEPYAFRPQRWIDGSQKQFDYERYVLPFGRGSRICIGHCVLSLSYAQLYILLAGI
FRRVDMELFETIRERDIEIRGGGPLGEPSRKTKGVRVRVIGIVP*

>CYP65-fragment10|7702|Dibbae1

MTYLLLTQPSAYQKVENEVNRAFQMIEEINGTTLLELPYLQACINESFRMHSPAMIGSARRISQSGGI
AGHWVPAGTGVQMNVYACGRSSLHWRDPDSFLSERWLGDEKYKDDRRDALQPFSYGGLGTALE
DSKFSIHNDVSALGVPEFSPTLVFLLALLWPRFA*

>CYP6389-fragment1|7805|Dibbae1

MTSLPIREKYYSSVKVDCLQWIIDSSPRKRTWTTEKIIQEFLALWFGSVHQMAMSFVYALYDLCAHP
EYIEPLRYEVEKQVQNQWVDSLENMPVLDSFLRESSRMNPSDAISVRRKVMKTFAFSDGSQIPIGNW
ACVPQKVMMRDPQIYVEPDTFNGFRFISTDNDNNEGKLERSSSTLFTKADAEEFPFWGLGSHTCPR
FYASAAIKLLMAHILLTYDIKFANEQQKRTFSWRTAIVPVSTVAILFKKR*

>CYP5127A-fragment1|8623|Dibbae1

MHSALDYIEDTLKTAEVVRLLPKFITPFVGEALAAARLSSHAAYVNGLLPIAEQRLQEKTLEKLGQKV
EKHHDCIQWIMETSPKQNPWSAQRIVHELMAIWFGSVHALSTTISFAIHDLC LHPEYVEPIRKELESP

QYTAFEQTAQGLPLLDSEFIKESARLTPVESMSTRRHTLQPFSLSDGTKVDVGDWLCTPVRAMMQNS
EHYPQPLEFNGFRFANPALLDNATSPAFKFPQLDSPSKLTDVSESWHVWGTGRMAW*

>CYP65-fragment1|9025|Dibbae1

MKVALEHFQLAIDRVNQRVNSESRRDEFMTNVLKFNESEGKGINDNGGDTRNEIRSFakeEELTLD
SIQNLTYNFNAVLEQGLRLCPPVAAGIPRVVPPGGDTVCGKWLPENQFQSTNGLYPLLLDGSQAQRN
LKPGRWLRDPPPEFASDQREASQPFVGVGPRSYIGKRLACAEMRLVFARLLWNFDISIPLEEQSVLSW
ASQKTCVLVEKQPFVRLKNIRERSWEP*

>CYP5042B-fragment1|9198|Dibbae1

MFVVGASLILFLLCGFVIRERLKPVDKRWLRGRRWKLPHGPGVPILGNMLQFFEARDTGGLTL
YLQSLRSYGEMTTLHMGSHTWVLLNTGYVASEIIAKRAKVTNERPYMPIAGGLVSNKRAVIRQA
AEWAEGRRVIHLLSGSALKLYGEWQELESVQLLSYLNENPENWYAHHFRYSTAIFYRIVMGERLF
KSQEQLDNYQKVTMEFLFSLFRSPIDFFPTMDDLPIQLQFWR*

>CYP5042B-fragment2|9199|Dibbae1

MGRFHRRIFQEWWTPIRAAVVDGTAGASFVRDVLLHPDVRFVGDDEEAMYLATSVMAAGDNT
PCAIRQSTTRARAEIESVVEVGDTTRLNMEHMASMPYLCAVIKEILRWRTVPLIPPHQLTEELEYG
DYIFPPGTDLINTVAICSECEAADEFKPERWLDGNEGNIHNFWGFGGGRRIYVGHKVQVQALFM
AIGRLIYCYDITPNHFPSKAYGARDMRAQYLQRLQNVD*

>CYP5571B1-fragment1|9922|Dibbae1

MAITKPASKFIKDATYYVVGIGFPEATFGMIDPVQHRIRKQVLTAFSAAHVQEIAPIGARVESMCK
AFDKHAVTSEPLNIAAALKAFALDVISEEVAGQDYGALQYPCFRHPKLGVMRECIEGAWICRAFPT
ASRISLALPTAVTSPFFKIPMVEVIKTARSGLDQYLQDRDEGLLEGMNISNAKVTNTQKTMVSSRRK
VSIPIERLLDPTSADHKVPDASHSLNLEILMLLGGGNDSTSNMIFGVYICKYTEVQKRLEELRAA
YPIPGQTISYTTVKHLPYLKGNFYRREYIY*

>CYP5042B-fragment4|10072|Dibbae1

MGVDHYKVFWWWDPVMQDMAGGVAPPSFTRDVILQSNNGKYATNSDEAMYLATSIVAAGSDNV
RMAHNVFMMAAVCHPEVMAKARTEIDSVCGPDANRLPNLADMESLPYISAILKECLRWRPVPLI
PQHSTKEIHFDGDFVFPAGTDFVINSLAVCGEVDDPADFKPERWGNREMNITDGL*

>CYP676-fragment1|10380|Dibbae1

MPDSSWANQMSELQAQKFSVTQKKIAGGYALSNVIKAEPELDQAIQCFQYQIDRLIGAGRFINLDV
WFTYFAFDVVGQITFSQEFGLQQGKDVGKCIATSHILVPYLSIMAHFYQYHDLIMSNTIMAWLDL
QPMKHVMETTVAIQERERNNGNSRIDMIEHWKSHSEPLTDKEILSTASANVAAGADTVASELQAF
VYLLLRHPDCLRLCLRAELDAAALNHRISVPAQYNAVQDLPYFQACVSYSVERYMKRVSDIASFQLK
ETYRFHPVSATSYPRVTPKEGIEIAGRYFPGSVRKSTSFGLAQALLDCY*

>CYP6544-fragment1|10725|Dibbae1

MNAQHVLINAGTTAFFGETFLKSDPNLLRNFIHFDNNDNMVWYKWLDATLMRTPKAKVLKTL
RLTSLWNEVLRLTNSSAAVRTILQPTCVGGKILKAGHKVMSFPRQLHFNEEVFGKNINDCDPDRFF
RNRSLAKDASFPGGGSTFCPGRFIARQEVFVFIALLVHRFDVEMAPVGDVEKGRQAFPKLESKKP
TTRIMSPQTGEDLILKVRKASVI*

>CYP51200A-fragment1|12560|Dibbae1

MLNILALSEYEGRLLYFADQLQQWVLRNNGATVNVSSLFYLYSFDVMSDLAFGEPLKMLECSDPHY
AVYLLHSGMAFLGPFSSVPWLARIGFSIPGVAKDFKKLLGWSAKKLEYRLKIMSWLIEASRENGTM
QEDQHWLRGDCFAIVVAGRSSDTVASTLTSIFYYIAASSEHAYKLRAEIDSLTSLTDIHALEQMHHL
NGMINEALRLHPALPSRGLRVTPSDGLTIGGRYIPGGVTVAPRYSIGRLESSYEQGDKFIPERWYSK
PEMVKDDSGFSPFSMGIEFSIYLENAVNKTCDATIA*

>CYP52-fragment2|12644|Dibbae1

MGDLYWLFDNKEFRENCETHRFVDQFVDVALKRDKSTQKNQKFLHSLLEQTSRVEIRSELINLL
LAGRDTTAGFLGWLFYILVRHQDIQSKLRSIILQDFGPYSHPKETLASLRECKYLQYCLHETRLRYPP
VPVNFRQAVRDTTLPRGGGPDGTGKVVFVEGTQVNYTVYVLHRRKDIWGEDADEFRPEGWAERK
FGWEYLPFNGGPRVCLGHPMLVTNDGVEQFAMTEVAYVAVRLLQRFDRMENRGDSGVVVKHNL
SLNSSPFGVNVILHKAVERN*

>CYP52-fragment3|12645|Dibbae1

MDSKLIIGVALTTFFFYLFHKLKRSQRLAAAAERLGCQPLRILHYRLLGAVDLIYELFNADRQKVLP
QYLKERFARADATTFGHIFLDSKDIFTIDPRNLQAMLSTQFQDFCLGPTRRNSFVPFLGHGIFTEDGD
AWERSRAMLRPHFSRSQISDLTLEETHVRNLTRALSVDDSGWTAPLDLQIFFFRFTLDLLLSSYLANL
STLRVRV*

>CYP6259-fragment2|12690|Dibbae1

MDLYSLQRDPKIWGTDAAEFPRPARWSDGRPLWEAKWQYELFFGGIRMCPAQQTQLLTQVAYLLVRF
AQEFQSVEDWEEVFGYLERIAMMVESRNGIKIAVVPVEKK*

>CYP5472C-fragment2|3549|Dibbae1

MLEEYNHTMELRMLGTRLIMTDDPENIKAIQDTQFWEVAKSEEQHQIFKHILGDAIFAMNGEEWK
QEVALLYRAHMSRVRDSDFAVTERHLLNAFDLLAKEGNDGFDIIDRLQLDIVTEVFCGESTDSLTSQ
QPFERNAMETLQKIASFRQLLGQVGVYLDKWIAPQAVKFIDDYQDAFAGKAFARTDANPVSGSIC
LIDDLIQKGKTREDIKNAVSTLLAGKDPSTTTMAFGFYEIARHPDVYAKMKAEEVEEQ*

>CYP52P-fragment1|4302|Dibbae1

MAILFGRPLERIQAKRGADEKQFAKDFDFAQHMLALRGRLGDLYWLLGGAEFKYSCKTVDHDFVD
KIVLDALEEKKSTPEASNERYVFLNALIESKEIDPIAIRDQLVNILLAGRDTTACLLSWTFHLLARHQ
DVQRELRSCLALPSFKESKLPTQAEIDGMKYLVHVVLRVLRLYPSVPINSREAFQATTLPGGGPDG
QSPILIRKGEAVGYCPYVLRHRTDIYGADALSFRPSRWYEPSLKKVHRFAYIPFNEGPRICPGQKFAL
LEASYTVIRLLQSYQHIEPAVDSLVDKQTVTLVVQNANGCRVRLTPYSK*

>CYP680-fragment1|6558|Dibbae1

MFNYESNKAHRIRRAVFDPLFSRRTVLLLESVVQSHVSKLLNKVKALKTKGETISLHRAYACVSVDV
ITEYATNQCWNVMDKEDFGDEFFRMIDTLGKGIWLLKQFPFLKFMTALPPNIARLLSKEAGGVGDL
IEDCKREVRRIAATWSKEEKEKLEHKTIFHQLLDPEAETGHVVPVSNEMAAEAFVVAASGTTGN
ALEMTTMGILEDPKIYKRVMEELTSAPFDGEAMAWQEIEKCEYLTACINEGLRLTYGVIGRLPRKVP
DEGVVFYNYHLPKGSVISLSTIFIHNDESIYPDNKKFNPDRWINPTRPNLKKYLVFSPRASPGANYMS
HWDDSYATVT*

>CYP52K-fragment2|9168|Dibbae1

MSSAKGRAVDLQPLFFRLTLDTTTAFLFGESVLSLKASDREERFEGAFNTAQRYVAKRFRLLDLYWL
IGGKEFDKACRDIHNFADAILDRSLKPTNGNKSRSRYSYVFLDAIVKDCPDRMALRHQMMNILVAG
RDTTACLLSWTFLLVRHPRVMDKVRKEIAAGIGDAENLHRTHLKSLEYLNNVIKETRLRYPSVPV
NQKTSKTTTFPTGGGPDRQSPVLIPRGTSAYSVYSLHRRKDLYGEDAEDFRPERWEEELGLFRDE
VTKTWGYLPFNGGPRICLGMDFALTEAAYTIVRMIQRFVPIKLPPNEPVVKTGKEKQIITLVISIKDGC
NVVLE*

>CYP6170-fragment1|1601|Grasr1

MQAASSGEAKKRSVDPSAFRGFGGGSTLCPGRHFSTTEILAVVIMFVIRYELRPAGGKWVFPITNKS
NIASAVMEPDFDIEVEVRPTETHEGDWAFSLADSEMVFVVVAEDQAGRDS*

>CYP6456-fragment1|5963|Grasr1

MDSLLLPIITFCTILFTYLLLDHLYIPKHLQPPEPLLRPKVPYIGHILGLLSHGSKYLQLTRHTLPLPPS
PLPNIPPSSSQSNLYPIYTLPLVSTKIYIITSPDLISAVNRNSKTAFNPFIAQIGRRMTGHDEATSKIVQ
HNLNGENGPYVTDVHDRTVAALAPGPDLEAMILPMVRGVGDGYLSGLKKEKERGNEVYLFARIR
RLVTMCSTDAIYGVGNPFERDEGLGEMFW*

>CYP548-fragment3|6661|Grasr1

MPSFYHAAEGDRRIWLWQNFQTYGDRVRVAPRTVVFNSSSEAYKDIYGYKANVTRAKPCGLNKL
NAITPPNVKVYYRFIERSISKPWESLKQTKNRTKRRKPREDMFHYLCQAEHPNTGGPAYSEQELIAE
GNLLFIAGSDTASLNRCGFFFCITHNERIYQKGPLRRFVAPSHLPARSSKASS*

>CYP552-fragment2|7094|Grasr1

MSIQEFTATAMDYAARSYLITAVCIFGIYQIARCFYNLFLHPLRHIPGPKLAAATYIPEFYHDVVRYG
RYTNRIKEMHDRVYRISPDETHCCDSRFIDEIYATGNRKRDKPIHQVRGSGTVETAIFSTVNNDIHR
MRRNALAKYFSRAQIVKLEPRLHGLAERLCDKILSLGEKAPFNVTAYSLSSDVISGYCFGESIGLV
AQQGWEPSSLREPLYALLGAMYLLRFIPPLKYIGLAMSE*

>CYP5180F-fragment2|7697|Grascr1

MKALDYESIAEMPILDSFIKESVRLNPLDKMSIRRKALKPYTFVNGGYQVALGEIACAPAWELMHN
EAKYPNANSFDGLRFVKQAENVTKSGTQDETMTGTTFTDASKDFPIWGLGSKVWYANCSTFLRER
RFAARTLLTETQSRPMACVTSHEDGDRASSGKL*

>CYP50112A-fragment1|8029|Grascr1

MTVTKQSRMEMTKSLYDKYGRTWQSSSFGKAIINTIDPLNIQSVMAHDFDSWGLESRMYPAAAPF
MGRGVFTSDAPFWQHARAQVKPI*

>CYP5285-fragment1|8876|Grascr1

MRRFILRPMTLSDGTTLSGCSVAAPTQAVNLDPVWDKPHEFDGFRFEKLRESEGKNAFQFSSSR
EIKFAGDRSERPVNQCNGLNGPDPAVMALFKSRKGDSE*

>CYP5285-fragment2|8877|Grascr1

MDAMGSISSLNKKQDQALALSFIALLSGLAAILVWRTPSQSRKKVPVFGQGTEDLTHPLLDGYN
KHPHSVFELATSDFTLIVPRRIIREIGSMPEKSLSLDREVYERLMGKYTRLVKSSHFTNFVKLRILKNP
KKAVKLLQEEAEWALDVSVGDVDDWKPNGVSQIVLKVVSLQLGHSFVGYPLCRDQNWMLAIQ
YAMKTVAVANKMMSYHWLQRPFIWFTPEIAQLRSQFKEASVLEHFLKKRLEQCSDPGFEKPDD
LMQWLIESILEQRGDLQLHTGIQMEAVQAGTFNLSFQVCLSR*

>CYP5105E-fragment1|9549|Grascr1

MTSAINNPSKWELLPTLLFEPANIVIA TEIWHELSIGLMLXXXXXXXXXXXXXXXXXXXXXXXXXGLSPL
AKIPGPKLAALTSWYEIYYDIILPAQYVWIKEMHTKYGPVIRVTPWEIHSDPTFLDEIYAGASNR
GKYEFLRLTPVPMMSGGARTHDLHRRRREALNLFFSQKRNVNLESNIKTGGQLAEVFETHRKA
RTIVNLYNIYYAFANEYNPLPLPKRNRDSLMAAASSCNIASDKTTISGNPVFRVTFRDPLQR*

>CYP5168-fragment3|11212|Grascr1

MIRDKRAFSPSSQGTIFPRIPIDSNSETQTLTVNGTGRYNCVGKQLAMMELRYVVALLVRRFHVAF
PGEDGHRVEAEMKDQFAAAPGHVQLTFTRRKDKVNIGPCIP*

>CYP503-fragment1|11214|Grascr1

MLERKNAENKRSRNDMLQWMLDSARGEDADPDMLIRRMFLNMA SIDTTTTLTATNVILDLLDRP
EYMESLRSELLESIEANKGINQ GALNQA HKTDSFMKEA*

>CYP548-fragment2|11878|Grascr1

RWIVSSSGFDVAGGTDIGNAASVTLDRSAFCASFSSGPWGCAGKGIA YKEIGLIVARLVWLYEWRIAE
GTHVGEGNPALGETTLRNHV KELQGKDRFVLCTDGPIVQFKARK

>CYP65V-fragment2|12099|Grascr1

MLDLHNKYGEVVRIGPDELAFSNPAAWKDVYGHRTTGDDFAKQMRFYRPVEAEKINIVNAGRE
EHSMLRRQLAHGFSDKSMHDQESLIGSYIDLLIKRLHENCAGGSKPADLNAWYNFTTDFDIIGDLAF
GEPFGCLSSSDYHPWVKMIFATAQIGTFLQSAGYYPRLKSLLLRMPNSMKEKRKHHLDTKAKLL
RRMEAGSRPDLIEGLLKKKDEWVSNKSCTTLRT*

>CYP611B-fragment1|1600|Grascr1

MSFYKILQPSLAPGPALDAMNRIMIQNVAASLEKLSDANSRLHRIELSKWLRHKVTMATTNAVY
GPMNPFKDPEIENAFWDFEDFTMILMNNMPSITAKKGHRARELMAAAFDSYFRQKHHEKGSILVQ
NRYKNSAENKIPINDIARYEVGGSIAILVNITPAAFWSLLYYAHEDVLSAVREETASILTTSSSSAGKP
VRSLDITKVKTHCRLLTSVFIEVLRQKTSGISVRKVMHDTMLDGKLLKAGKTLLMPARVLHTDANV
*

>CYP596B-fragment1|1637|Grascr1

MAFTDVP SGFTLVSDIRTNHSMATAWHTIKLKPEITHLVARLSSRVFLGKDL CRNERWLEITKGYTIDS
FAGAYILRLFP AITRPVHWFIPHLRRLKA IKDAHN LIDPEVERRRARVQKALDAGQKPKVSDTI
GWMHEVSRGRKVDYVAGQLSLSLAAIHTTTEVTQALFDICEHPEVVQPLRDEIIQVISEHGWAKTS
LYKLKFMDSFLKESQRINSMSEGS MNRSVEEDLELSDGT VLPKGSRLVASKFMDPQTYPEPGKFDA
ERFLKKRQEPGQENNFQFVSTSPEHILFGHGMHACPRFFAANEIKIALCHLLLKYDWSFPLGVTKP
KYRLFETVLSATQDSEVLLRRRQEITL*

>CYP6702-fragment1|3803|Grascr1

MNKLMOPLITERMAAMKAGKDVPSDMTTWNIQNARPHVKFDPEWQAHAQLLVSLAAIHSTTTMT
SSHTFLDLAAHPECITELRAEIEEVLKSEPEGILGKTSMPKLLKLSFIKESQRINPLGMTTFDRKVTSD
LTLPGDTLLPKGTIITVATDEIAHDPNHFKDPYTFDPFRFSKLRTEPGNGNKYQFVTTGVESMHFGH
GKHSCPGRFFAANEIKLFLVHLIMGFDVKLPEGEGRPRNIEGMSGNRPDHSPILLRRRDVKW*

>CYP65-fragment8|3919|Grasr1

MSRQMSRREILTNSNLIVAGSETTASALAGVTYLLKHPEKMAKAVSEVRSTFSIEKEITMLRINGLE
YIAACCEETLRMYPTVPIGLPREVPSPGATVCGQFVPAKTAVAMTHLATYRSATNFKDPDSFVPER
WMNDAHLAYTELKWILTRVLWNFDLKLMEGEDWMDQSHFMTWQRGPLMIQLSSRSIQ*

>CYP51200A-fragment2|3921|Grasr1

MAATGITTGQSFTVLLHVYFSSVLASTFVYRTFFHPLKNFPGPFGAKVSKFWNVLKAYDSSNFRLMD
SLYHEYGDFVRTGPNEIAVFRPEVIRVLDGPGTKCSKAPWYDILQPRVSLATTRDKILHDQRRKTWE
QALAVYSFQDYEQRLLRFTEGLHAHIASRVMEGVDSKMFYYYSFDVMSDLAFGESLHMLVEDKN
HFALRDTVASTLVISFWHLIDDAQQLAKLRRELDCEPDLASPTALQSLQHLNAINALRLHPALPS
VESCETHAEKFIPERWYSKPDLIKDRSAFAPFSIGRYNCIGKRIALLQVRSVVARLIMHFDVAFAPDE
DGIWVRDLKDQFNHSGQLKLVTARK*

>CYP6259-fragment3|5938|Grasr1

MRLFLLAAPLTNPAQFLDTSTGFLFGKSTNSLAPQGDPEFNEFMAAFDRSLLGLALLITGPIRWPLY
LDPIWKAAYTKVHTFVDSRIQAALVRKQKATDNGSTAHSGKYILLDEMASMSQDPYELRNQILNV
FFPARDTAAIGFADIMFELARHPQEWKKLRQESLKYTKAIINETLRLHPAASRIGKCALRDTVLPKG
GGIDEQSPLFVPKGRVIELDLYCVQRDPISWGHDADEFVPDRWIGDRPLWESK*

>CYP655-fragment1|6199|Grasr1

MENCVLPSGGGESSKQPLFVEKGTEINMAFRSTHRACNIWGEDAAEFRPERWESDKWSVWQYAPF
SAGARPCPAQQVALVDCGYVLARLAQTFMRIENRDLELKFIEERMAMQSRNGVLVALI*

>CYP552-fragment1|7093|Grasr1

MPNRVKKAQAEKEAGIMQEDRTIFESVLASDLPPSEKSLRRLTDEATSLFAAGTETISWALAVITFHV
LSKPDMLAKLTAEVTQAIDGSGQMPNWAEELEKLPYLTSTIYEGLRLSYGVASRTSRIPTGEDLVYRQ
DWKPKGTLRIRSAERIRDRHVLCHNASR*

>CYP5328-fragment3|7408|Grasr1

MVMNNSIFMMVAPPRLLSLPFVPKRWAQVGQATNDFRDYMMMSMLNEERRLSDEGKPGTGGLMT
SLLRASESHKKSDMDGPKPLSVSEILGNVFVINFAQDQTANTLAYAIMLLPAHPEIQALIKVQSSET
WEYDSLFPRLKRCQAVLTLNNGRMVSIHPSYVVPSSLAFHTHPRYWTPDPLTWPRPIRWITCPATE
SINFSLDQRLEREEIVPMKGTYPWSDGSQYCLGKKFAQVEFVALPQSPGTAIA*

>CYP5415-fragment1|7901|Grasr1

MHLRVAFKDITLPLGGGPSCTSPIFIPAGTRFEANFVALHRRKEIFGANVNSFRPSRWSEISPKPWEFI
PFGGGPRVCVGKPKALAEAYFLCTLVRKFIEPRDWREWNGQVMITAKNVNGCLVGMIPAK*

>CYP6334-fragment1|8006|Grasr1

MISFLRHQPQQRHRYPSDKSQVEKLREEQRNVLEDFFQQLQSLPHLNGVINETLRLYPVPTGGFR
ETPSEGAMIGDYKIPGNVKICAPRWSIGRLESCFEEPEKFIPER*

>CYP65-fragment3|8617|Grasr1

MKDPSSGTCVDIVQWLNSTTFDIVGDLGFGESFNCLNSCYHPWVALIFNHFKASALVASVRFYPL
VESLLMSMLPKSVMKIQKDHFFQQVVDKVVHRRMNLEVQRPDFMSHVIRHNDKGMSLSEIEATFNI
VTVAGSETTATVLSGTLNLTANPSTLEKLVDEVRTSFSKDEDIKFDKLRSLPYLNAVLNEGMRCLP
PIPAGLPRLAPEGGDTVSGIPVPGGTHVSVHARSLSRDPEAFNGPLEFVPERWLDSEKCKASSPFAKD
QLQAVQVFSVGPRQCIGKNLAWAELRLVLARLVRTFDIDSVEPKGRSNPKWDDQKTWMLVEKQP
LHLRLKVH*

>CYP65-fragment7|9616|Grasr1

MLKDLKKDQNFISIERVHERIAQGVIRNDFMSPVLNGQVTLPIVNRKWLIELGSETAAVTISCALYH
LALNPAAMQKLVEEICTTFTADQVTMAATQDLPWLNAVIEESLRIHPPSAFNQARIVPPGGAVIC
NESLPAGTAVGVGTYYAFLSPANWIKPNSFMPERWLGEFGPDDRSMQAFIIFDQIDKGDSLAYA
ELRLILTLILNFEWELCEESRDWKYQRFYLLWERPPLMFKISKRGLW*

>CYP6174-fragment1|9742|Grasr1

MVGSELCRNDTFIRESAAYNQSMFLFGFALLKLPLGPLRERLIKPLSYFQRRRQAKVIKMPVAPEVAK
RLDERNKGTTPKLPRHDFIEWTLNILDEHPPSPNHTPEPQRISHEAMLVGLALNQNPSTVTVQMLF
QILEEPQYLQSLRQEAENALQEYGWTDKLTSAALPLQDSFIREIHRLYPTLTHINKVSSQRTVVGNPYT
FSDGMVLPESTRICFPASPLQTDPTHFPNPLSFHGYRFLKLAESKNNSNDSNTLHKGVNTWAAHH
PSPTNMTFGYGNHVCPRFLAIRLIKIFTKVVTEYDFWWDREAGKGQPSRFEFEGTKIPCPRQRIWL
RKRGEVEEER*

>CYP6259-fragment1|9869|Grasr1

MDVYCVQHDAIWGEDADEFNPQRWLREDRPAYETKWQYEPFLGGIRMCPAQNQVVTQLAYLL
VRWALCFERMECRDQVEGYFEREVDYDC*

>CYP5168-fragment1|11213|Grasr1

MNVRVESKNHPSDTIALTLVFIFYELALHPEVQYRLFSELCEGPLNDFNALRSLPYLTAVINEALRLH
PAVPSGGYRVTGPGGLLVAGEHIPPETTISGPRWSLARHS*

>CYP65V-fragment1|12098|Grasr1

MILIIGGETTATLLSGATYYLLSNPAKLAKLMEEVRSTFSSEKDITINSVSRNLNYMLACLNEALRMYP
PVPIGLPRIVPKGGARIAGHFVPENTTVAIHHWATYHVAENFSHPFEFHPERFLDDPEFAEDRLDTL
QPFVSGGRNCLGRNLAYTEMLILARVIFNFDLKLAEESKGWAEKQKIFNMWQRGPLNIYLTASP
RGGAN*

>CYP65-fragment1|12318|Grasr1

MEAVIANITWSKTIWAVGIACFVYSLGIAFYNAFLHPLSKVPGPKLRAAFYFPEYWNIIRENTVPAWK
ALHDQYGPVVRLSPEAVSFVTPQAWKESNDEDHARIRKLLSHAFSETALREQESLLKEYFDLLVHQ
LRRQVDGPESGEVDLNKFMKLITYDVVADLALGESFDALQSGQYHPWMQAFKLSFRMLRFARLG
HQYPSFGLLLKIMSKNPRVARMRNMIFGFTQAKTEKRLESPTQRKDFMSYIQGYNDERGMTKAEIL
PTAAILVNAGGGTTSDSLAAALLFFVLSNPSVHSRLKKEIRDTFQSEQDINLSSVGQLEYLKAVIEETFRI
HPPAAGVFERRTDTASELIDGWVMPCNTSLGVHQWSINHSPDYWHRPDEFIPERWLSNTPKEYQK
DVKAAMQPFSTGPRNCIGKNLAYFNIRSIARLFWNFDMELMAQSLDWDKRGTFGTVWEHPPLY
AKLSHRKI*

>CYP52J-fragment1|12675|Grasr1

MARLRHEINEVIGDSDQPTREDIRKMPFLSYVIKESLRLYPPVPLNNRTAVKTTVLPTGGGPDGNP
MLVRKGEMVTFSPYLNSRRKNIYGADVDDFRPERWETGELAKIGWAYFPFNGGPRQCLGEDFAIM
EISYTIIVRLQAFPIKLPKGAIVEPVGTERQRLTLVLSSADGCKVTVAQS*

>CYP5987-fragment1|6198|Grasr1

MADEFAVGPIRHDALAPLLGDGVFLTDPDHTSRNLLKGIFGNVYSRDAAQLKKHVQRLINQIP
CDGNTIDMQPLLQVATHESSDRANETSRLDAFNKALQMAGLRMFLGKFAFLGSGKSMRSCGQ
VHRVVDKLIDEALDPRGLKSESQSKRKSFVQDLAKEVPDRVKLRYELLNVLFPARDTTFIALSDVLF
QIARHPRVWTKLKLEVLALNEPLSFQAVKSLVYLRCVMNEGEDPIPIPKVEVADVLLRSPLDPSFW
*

>CYP52K-fragment1|6707|Grasr1

MFGDGIFTQGDEAWRHSREMLRPQFHFQYADLEVFRQSVDDLIGDIPQKGGVIDLQPLFFLNTFG
QSIQSLKTPESAGEDTFAASFNLAQEYVVKRFRLQDFYWLIGWKRFRNACKHVYDFADQIIDRNLS
KESNDTADDKRYVFLRTLGNIPSWDVLRGQIINILAAGRDTTACLLSWTFFSLVRYPRVMEKLRAE
ISKNVLKEILRLYSPVPVNTRLVRRITLPAGGGPDRKSPVLIPKGTAVAYSVYTMQWRPDLFGMDA
EIFRPERRDEEDLPLNRNETYAKWGYPFNGGPRICLGLDFALTEAAYTVSSSQE*

>CYP52P-fragment2|10180|Grasr1

MVVLCGKSLEELQLTESDDGEAFAGAFSYARHLHETVDRIVASALHQHNTSKSVQQDSDRYVSLDS
LISSTQDPTVLRDQLINILLAGRDITASLLSWTFKCLARHQHTQSALRRECLNLPSTRTNSLPTASEIK
RMRLNNVLSETLRLYSPVPLNSRAALKTTTTLPVGGGADGRSRIIVRKGEAVGYSLHSMHRHRDIYG
EDAEFRPERWDCEDEGDEGDGGGGGGGGGGKFAKKLGWAYLPFHGGPRACPGREFALLEAGY
AVVRMLQVFERVEEVEDEPQWDRHTLTLVLAPKNGCRVRLGR*

>CYP5042-fragment2|7370|Grasr1

MNSMVPNSNPDAFAFIKAFDYAMIGLGQVRVRLGRLRFLHRDPKWHASIHVVHRQVDRYIDNAFA
QIDAEGYHYAEKIQAEQRYILLHEMAKQTRDKEDLRSQILAVFMPGRDSVGFALS NVFHALARR
PEVYKKLRDEVTTYAPASTPITFELLKSMKYTQWVINEGHRVHPTTAQAPRVCLRD TVLPTGGGPSE
TSPIYVRKGDHLMVSMWGLHQDTSIWGPDAAEFRPERWESTRPIW TYIPFLGGPRTC PAQQMVL T
QEAYVLVRLVQA FERI SRDPHPWTEARRIGFLSKYGVKVA VTPADGGLEGKREEMV*

>CYP65U-fragment1|99289|Umbpus1

MVTQVASFTCLASRKWLKTIKQAWSVALALRFAFFILTGCLDQDPKNTDFNSIRWIRSTKSSTTYFH
PLAQFPGPRSWASRLPFIPSLLSGTLVKDIEKLHREYGPILHIAPNEITFAKAGTWADIFSPRPGYLHF
PKDPLWWARQPKQPELLLSVPTAEGHARMRKLTPRFAECALNTQEPVVQKYVCLLLERLERSA
APNMAGSEEGVVLDPWFYDTTFDIFGDLGYGESFNCLESSRFHPWIALLFNSVKVASFVIAARYY
PLIDFLMKCILKSTMTITDGPLSADRGQGATPPQLGG*

>CYP631-fragment1|99305|Umbpus1

MKHCTQRPATAWTFSKATAGSDFVSSVMRTVIVNLLVQPHTPEKLYDKLRSVDVSHPCYKYNELH
KLAYACVREWWACIHCLCCRLSASYQREPSRSSGVYLPATLLLEVYAINRHKLTFGQDAEFSRPER
WLENDDEHQKKLEQSM LTVSVMELFLSPFYIHSPLTFANALISCLAPAGAPLWAGTSGL*

>CYP59V-fragment1|102032|Umbpus1

MAYHILDGHYRLYLAIIVVAVSVLARFLVSLYKTRRAFLRLKQQGLCMPYPYNPLFGHLLVQSILSK
IPSDAHPYLPDQLRRKYPDMGRVFYLDMPWFSTPILFAESPSAAYQLIQEHQHPKADPVRKFMYP
TKNKDLVTMEGQSWKDWRAVFNPGFSANHLTKLVPRLLKAVSTYS DILAEHAQAKDMFYLERITI
GEGYLFYPNKSQNWYYLSKMRPNEVFLMKQSDSRKERAFAVHAAVVDPSAPESVIPHKMSHSLQG
LGQIVKLKGAENYEA WYKSTRAIARLNGVWELFTGQTVKPTPPAKPTVPVDDPKYGP KYEDRQDL
YEQKLDKYNTKYGRTRLRLKMTLEEAPKDQLGELILESSKEQMDFLKQKYEVTGYTAVYQALGKIW
KNRTAKDYSTPIEFANKIKKAKT*

>CYP50334-fragment2|100088|Umbpus1

MDDVLTLLSRAGPNHRLVRAFEIDNAFTTTDKSFYRKFM SKARRLVAKDEPTWKLMSDLMRDHV
SFESQSTTSNQSLPLVPLVQAAVLKITMYTLFKSPA EKLEAAKIRLIAERINRLWIDSKSTHEPERFQED
RRELRETVHTILSVTRVDMDRNNPLNLILPAYETLWRVVLRGFLEVTFRGAEAGTEWRQLLKTFLA
DPTLSTFKRTNDLTGISVAFIVAETLRLYPPTRRIRYDTKPKVKDDPPAHFAADIEFLHRDAKIWGED
SLSFNPSRWKDVSKKCQDAYMPFGWKPFCTCKDDFGPRMIGLAVAALVAEFEHGW TWRAARSE
DQIDVDGPLEAERDSYVTLQLAKRE*

>CYP682-fragment4|101500|Umbpus1

MRLSRIDPEKPVIIYTDKATDKQYIIAPGTPMSMTGVLIHF DENIFPNPLAFKPERWLPSPD PWSNDIVE
NRKKYLVPFTRGTRQCLGMNLARDVRMDGDRGYLELFEFDYERDLKIVGDGALPLYGVE

>CYP6421-fragment1|102031|Umbpus1

MLSYSISLLAAHPEVQEWVAEEVHYVLQGGQGTSETWEYSLFPRLKRCLTVMLETLRLYPSVGSIPKY
TNDRAQSLNINGEVHIIPPKTLVFLNSFAMHKMPRYWGSDSLVWRPSRWILPSCPGTVSNGASLSSG
IIFDKETLLEPKKGT FMPWSDGPRVCPGKKFAQVEFVAVLSTLLRNHRVRPVARDGEKEEDAQQRIL
DVVADSGIHFTLQMRHPTRVTVSWVSV*

>CYP5076M-fragment1|102735|Umbpus1

MFIAADVAFRVQH SVIRLFVHKRLESIGYQDRQLAQLATIGRQP VNVTKWFNLYSFDIMGDLAFAT
SFNMLESTEEHF AVKVLDKGLEPVGWMLPTWMFRLLVAIPGLANDFVRFENTMTVNTPDVIATLL
GPWKEKTPTAGSDTTSATLTHLFYELAKNPDHVLKLRDELASHLSSGSDLSHQQIKNL DHLNAVIN
ETLRLYPVAPMGIARLTPREGIEIEETYIPGNMKVSCPYVIGRREFSENIYADAEAFIPERWSKPEMIK
DNSAFAPFSTGT YDCICKQLALLSLRTVIAKLIMDFDV SFAPGDNGKYFAKN TTQHFTWGLAELNL
VLTKR*

>CYP5180F-fragment1|103830|Umbpus1

MVARLSLAIIPSKSGWEEDDELKSITLPYNMIKSSEGSSYWTPTTLTQAIAGSWFAGSHQPWINLHFV
FLELCNRDPDYADLLRREIAAHSSLDVTTTTLLPLLD SFIKECLRLNPLDEMGI RRKALEPFTFSNGG PSL
AVGDIACVSAYDILHNTAKYSPHDFDGMRFVQNSTEAPATSEGMRGTYLTDASKDWPIWGLGSR
VCPGRWHAALVLKMAVVKLLANYEFRLKDEKARHKWWWET FQLPSGGTEVLFRKRGESE*

>CYP51F-fragment1|106667|Umbpus1

MVIGMLIAGQDTSSSIGGWILLRLASRPDVQEELYQEQLRVLGPDLPLPTQQACGRFSLHRMVVRET
LRLHAPIHSIMRAVKSPALFPTRASGTFSE*

>CYP548AJ-fragment1|107345|Umbpus1

MGEFGFATTNKAGVYVQYPELANLKLEKLLYQRGLGMRERYLQMSNLVRSRNSKEKDAKNDLL
YFLADAKDPETSLGFTEDIWAESRFLLIAGADTTSTALTAFCYLSAYPACYEKLVEIRNTFSSGSEI
RSGPKLAQCQYLACIDVSLRMSPPISGTLWREVCAGGYVIDNEYVPAGYDVSVNPNYAVHHNEDC
FPDSFTFKPERWIPADNPEKDIERARRAFSVYSIGSRACAGRNMAYTELGD SIARTMWWGRNICNT
RGPNI FVTAGFKICEASALLSIINTAAISSKAIISIASKYKDAREQIQAFGCEVSILGKLLDQLHRRLSNP
SWTVEEYVKLLTDQIIDECINIFTQLDTFKDNLYAKPADLEPSRVSLKGTTKWVFKSTELEFLRARM
SMKINMVLIMAMAMPQRQEQPSAESNSEKREHV KQIQMLTAQSNTCLERLESLEQRLTVDDNFGS
DDTNSVATFQTTRTSQTIRDNLLQLSRAMPCALELGLTDNLPKTAIGIDDSLNTSDLVERFLQQQE
EAASACAENDLVKRFLHQQDEATTTCSENDLVERLLDQQDEAATACSENEQACSRPEREVDLSTE
DDKTSSSVGPYRLKADSIAREDLQKGNKSKLRFIFCNPEAGILEAKSSIWYHKKLATRMADAGDQQ
YGIFPIPPRTLIDFQLYRRGAPVENGRVQLYRYYSVDLSKLGAYAIAWRRYVGQIKHLVVEDERPGDL
PVKSIFIATFS*

Partial P450s

>CYP50334C1-partial|121516|Acastr1

MHLLLALLTPVIFCIAVWLIQTLEYITIWKHANGSSKASARPKIFPTTQDISNSARKPLKSRAIPNQRL
VRAFGIDNAFTTTDGDYIRAFRRRVELLLKINDEQWTHLAHTATDLARSLQACTPEYDGT EILLV
PFVQKMVLKFSMHVLFVSPVDELDDDVVATIAEKINSLWISSKSAQPTKSMRSDQKELRAALQRIFP
RVGKTARENPLNLILPAYETMWRVVLRCFLEVAFRPHNHQNTPVFRQILARFLADPSRATFGSTTPE
TGGLSAAFIVDEALRLYPTRRIYRQQSIAGRPPALVAADIEHLHRDPRIWGEQSSSFHPSRWIDVSD
ECRRAFLPFGSKPFTCPAKGDTGPRMIGVLVAALLAVFGDDWVCGAEHPEDVIPCWEALSAGRDC
YGTLVNLNGPFT*

>CYP5334A2-partial|125949|Acastr1

MELLQGFPTVMQNVLSTFKSGTLSQGRRISGPKWQFPNGQILDKFVNNGRAKSDREWREKYGDVYRV
WGGPSPEIVITTPEDLRTFSLDGEKHGKHSNLGWFLDQLLGRICGFLEGDEWKQKRQIFYPAFSDHG
TATRIDLTESAARKFIEDLPSMHSDGLGTNGGGKTISFHIVNGFRKFPLYVTASVIYGAMTNAEKDD
LWALAEKRLALWPYAVIGGPYRFSWGSWFDRTTYNLLNEYTTEWRNYNDRMVQTRRARGIKTPL
VLFYDAYEAEDVTLENLMHSLDEIILTNLDVMVHAITWVITLIADNKQVQQELHDEVDASWDRHLH
DYLKSDTHLHRSFMETIRLRPPASEDILYILFNIGESSPSVKNFNGILVKPSTMVLVDVLGINVRNPF
WGSDS

>CYP51183A2-partial|6920|Dibbae1

MGDLIWLMLLIGVLVYLFPGPKLAALTDYWELYQDFFREESGYLFIELDNLHEEYGILPWNTSIDFR
MHFYNVHAGPVVRIRPNEVHVKDSNWMDVLYTGPSDPRDRDPLVAIGTGPHELHRIRKAAINPVF
STRSIVEMEPDVQAHAAARLFEDLEKRVGEVLDMRIYFFAWTTDFITNTIFRNSIRIFWEPERATRWFM
IVWDFSGKFPLMKHMPWLVTGLGLPLTVWKVLFPSLVPIYSIKDLLVMATKAFSDYSEEANRKL
MPQEATTKDIFETILSSSLPFKEKQPKRMANEVFNLLIAGSLTTSKTAVVAMYHILDNPEVYKCLKAE
LLSEIRDKHALPNVKTQLKPLMLVMRCYPFERPIF*

>CYP5105E3-partial|1062|Dibbae1

MGGTLNFDLHRKRREALNPFFSKKGVLELEFMIGQKVQQVCQLLESHIKSRTPVNLSDVYYAYAND
FGHDNNLLEDEATSSTQRNNLSRLLLGKVNQHFPWFLDLDVIPFPIAKHIMPPGAIDMTHFVEM
CIILKITQNIIRREVGQVLQDKDNKKTDRRSIFYELRDNP NLPPSEKSLSRLEQEGTLLVMAGTESTAKS
IAIAHFHLLNNPTCMVRLRAELRTLPSDATWSQLEQLPYLSGVIAEGNRLSFGVTARACRIAPDEAL
QYGYKTIPAGTPVSMTTLSVHTDESIFDPWKFDPERWIGPEGTERRKYQMAFNKGGRICGTNLAN
AEMFLVLAABAQYDMELFRDLSDVQFKHDFHIAYPELDSKGARVMVRGKAQMA*

>CYP6712B1-partial|5873|Dibbae1

MASVRRQLQPIQERIDVLLRRMKGYKDSGEVLNASCMFAALTNADIVQPDVVM TYSFARCDYRLE
APDFDPSSRDASLAGATSGAFLKHAPWFNDLMQALPESVASMLNPAIATFVAQKRNSRAQVLEIV

KGQNEKWKDREHPTIFHSVLGSNLPDEEKSMARLSDDAQMLVMAGTLTTSATLELIMFWLLSQPA
TLQKLKEELTAAIPNLEAVGSIPLPTLEGLPYLTAVIKEGLRLSYGVSCRLARIDPDNAIIFTDKDTGK
KWVIPAGTPVGSTSVLIHHDENIFPDSKKFSPERWLDGKGRELERYLVSFCVGSRKCLGVNLAYAE
YLALSAVWRQWGSQVDGIRGNDDMGVMSLWETGLRDVEIESDAFVPQPKGSKGIRVLVQG*

>CYP676D1-partial|9763|Dibbae1

MDKGPWYDIMAIPDSRFPNQMSERNAKRHIQKQKNLAAGYSLSNIIKSEPYIDALLHLFRCRLSALA
STHSPVDWDYWL DYLAFDVVGEVTFQKQFGFLAEGRDIASAIANQTVLTIYLAVMAYFPWAHNYL
LANPLIEKLGLQPAMHILDTCTAAIKHRSSNDNVRKDMIEQWLDQHRAHPDRMPASEIFA VVIT
VGAGADTVSAALQALLYLLRTPDALALLRDELDAANLSDIPSFAETSTLPVLQACIKETLRIHAPIA
VSLPRVAPPGGITICDRYFPAGTILSVHPYALHNLP AIYGPDFATFRPQRWLPKDALKDASETLKAM
DACLIPFGTGYNGCPGQHLARIELCKTAALIVRDFEWQQVVPGRPFRCAYHF AA VPHGWPCFVRR
RQGGGRAVDDGEGMNGNAVMGNGSGGMGKS*

>CYP570H5-partial|10012|Dibbae1

MSLLPKVALFFDAAVQRSFQSPTISCMILLFCVAFYRLSTRRFLHLRKIPGPWWAPYTRLWLFKTLAS
EDSPNRYIQVNEQYGPLARIGNHLLTNDPSVFRKILAARSNYLRGPWFDSLRLDPNKANLITEKDL
LAHNTLRQQMATSYDGKDIEGFEEGINESLQEWIQFVGEHGVSYPGSPRGEFEIGRSIQYLITDMICR
LCFGRPFQFVAKHADCYDFLKTLEERLPIVEKFSIYTEVSTLLSIYSIPLLNRLVPSVRDRNGIGKII
REVIDERFANGIHTKNDMLGSFLKHGLDRRQAELEITISL FAGSDTTATSIRAILLHIVTNPLIYNRLRL
EIDTHIANGTLSSPAREEQVRNLPYLQACIREGLRIFPPITYLRERVTPPAGDTLSGFDIPGGVNIGFNL
PGLLLNRVFNPDPTVFRPERWLDGVEPGHLREMERVMELVFGWGSTRCLGIRMANTNQSKFFVEV
SYLTRAGGSRGVD*

>CYP51159A1-partial|10280|Dibbae1

MLAGPEVSRNEDWIMLQLDFAKEFVAAASQLLQYPIPLRPLITPFLASVRQTWKYQATMVSFLEEY
KLKTEAAVKGGAPPNTLAQWLAEEHNDGDKQASVQHQAANLMLITGLDCIYTVSQLCTQTLAPP
VTETRKDLDLTHILTA AFQRKALRPVTLSDGTTLTPTGTLFFVPNCAYSTDPSAWESPSTFKGRHISS
TDNTTSSQAQSQSKEATDSQQHGQHFGVPHLRELTFGIGRHACPGRFYAVAEIKMVLAMLIRDYD
VKLVEGKTEAPKATADGWL VFVDESEELLFRNVVPN*

>CYP51156A1-partial|10704|Dibbae1

MVENEDKPASFGWISRLSEISVLVWVPLLLCFWIFIQLSLIVYSVYFGPLSDIPGPKFAALTDLYESYA
GYRPDFYWRDVQELHKRYGPIVRISPNEIHLDDVGFSEGIYPTIKDLDKDRKSGLLLRDVGQSAA
RRLHRRVGNVSSQNTRNKAASHDTETLWQMMWEFSRRKEAVLSTVVSKALARNIGAITDETVT
VIENVLHHVFHNHTVLH KIETELVESVELADHALLDDEKLDQLPYLSAVISESLRSIPMCVTEITTVL
D TDMIYKEIIPTGVTISMTLADVHFDDQQYFPAPRTFHPERWIGPDVILSREFDPKHCLGMLDLEFAR
PGISVLRLLLKDIILGLCIRSFLLSEQ*

>CYP6845B1-partial|12083|Dibbae1

MSLEMFGHSWANFIGFAILFVAFKIFYCITLVAYPVVSDDITHARIRKLLAHAFSEAALQEQA PLLK
TRVKELIDQLDLHLSIAKVNVDLNMWYTLLAFDVVTDLSFGEPLHAVKRAQRHPFIEDFFASCRM
YPMIPLSHAYVSMGLLMLKMLKIPAFKKVQDKGYMATKERVEKRIASHSPDRKDFMTYILRHND
RGMTKKEIIGSTAVLVNGGGESVAVCMTAATFYMLKNPAILTKAQMEVRNAFSEQDQITLRTAAR
LVYLN AIIIEALRIHPPTPGNFSRRTGPSGDMIDGHFVPPNTSVGVHQWSANHSPINFLKPDEFVPER
WLAKPPEEYRSDSRAASQPWSIGPRNCLGKNVAYAEIRSTLAYMLWNFDMELCSESKNWATNQRF
DITWDRPPMYVKLSRRQTA*

>CYP5589B2-partial|12084|Dibbae1

MYASDRMVDIVKKGINPQLPQLTPILMNEINYAFQKELGDFSGWKEITAMSFFGSAHRTASRILIG
EELCRDEKFIRLSMDFVMSIFVTALVIVKLPLGPFRGLLAWPLSLLHRWKLNRVLTILLPIVKARMGA
RAATAEKDIAPPLDAIEWTLAFSKPDSPNNTPEYVTKELLHNLWAGSSAPGGLMTEMVYQLLLEPQ
YLEPLREEASNALKAHGWSEKTLDSL YLQDSFIREVNRLYPTGSVTCRITLDPFRFSDGLTLPIGSR
FGFPIKALQNDPDNFPNPDTFDGF RFARSSTSENHIDQNSRRWGAASMGTTNLAWGYGNHVC
PG RFYAVREVKMVFTKLILEYEIKWASPVAVRPPPVHVEGQFIPNMGQKIALRRRVE*

>CYP6267B1-partial|9134|Dibbae1

MHSGPIQLNKSIGTVSHSLHKTRRTALNPFFSKRSVVELVPFIQKLNDKLCGRFADAAKNREQVNL
KYAYAALTMDVMSEYCFSRDLKTVEKSDFGRKSFDDVDFLEMSLIDWFSRLTSPAMAGILDLRDG
LAHQVEAIRAGKDRSYENSGHRTIFHDLLSEKLPPEEMTRDRLRDEAFSLMTAGSGTSAFVLKSLSY
HISANPTIQETLHREICTVMPHPTSHADLSDLEKLPYLTACIQEGLRITHPVSHRISRAFPEKDLHYKQ
YTIPRGTIVHMTAMLIHENEDIFPEPKTFRPERWLSPPPTKYLVSFSRGTRACVGINLSYAEMYLILA
SVYRRFEFDVSRVSRERDVEVHRDVIMAVARADSEGIVVGVKEITD*

>CYP6456C1-partial|5964|Grasr1

MSSXXXXXXXXXXXXXXXXSLLAPRGSHARSTLAAAFEKYFEAYEPTTSSSSAMIRARHHSATTYGITPL
NQGKLEVGTLLGILANTIPSSFYMLVHIYSDDLLADVRAELERKCVEIEKYADEDAEKKEGENKRG
DGREKGIGSDSGPEEGSGSISESTRGKADGRDSPTRITSMRANKRLLNMLSLRDKTPLLYSVWQELL
RVHAQGTSSRFVREDTLLDNGRYLLRKNIVQMPMAVMHSDPKIWGDDAGVFRARRFLRGEGBA
GAGGGRGKEARKGGGGGGGGGGGGKVGREGGKGRAGGSGGAAAGKIGSGKISAAAYRPFGGG
ASMCPRFFVAWEVMALVAYLVLRFDMPVPLKDHLKGGEREKGWEVPRQKQESLATNVFPPERD
FRVRVLERKKGWEGVEWGFVKR*

>CYP5238C3-partial|1146|Grasr1

MGKVIVPEYMCMDMGMISIVPEYMFLTPGVAAEIDFGFARSWGHDLEWKEVRVWTSALRIVAG
AANGAFCGPPLLYSLALGRDVAFLDKMKDHAMVIFAGALVLNSFPDSLHPLFGPVLSWASGFMG
KRAIENSLPIVEARLARTARWKAEPDCGWTTPNDALQWIIDECYASKVPAAQQEPKRNFILNLFST
DPTLGYYVDVLRHECEEALSGSQGAWTYAAVKEMRLVDPAIRGSMRMNPFGTLSLPREVVHPAGIK
VPGFDSFIPNGTRVALPAEAIQYDGSYEDAHRYNPFRFARTWDPESNQMKSTVTLDDSFALFGVVG
RWACPGHFFALLELKIFVAEMLMKYDVAYIKTKAKTALFNVG*

>CYP5295A6- partial|9684|Grasr1

MPAPIGDDVLSRGMRMFTLPYGPKWRTYRNIVHQLVSSTMTATFIPAQEFETKQLIYDLSAGDDNQ
LAFIQHIRRFSFSIIMTSTYGNRVNSWDHPDVEFSGRSSRILGRLTRAGAFIVDELPLANLPHWLQPG
RKQAEKIAVELLDIKMKFWQRLRDQVDAGKAPVCYAREILENSASWRKQGLTDEDAAWIAGGIVE
VGSHTSSTLLHLIKHLAAYPEAQQAHHDELMRVVGPDRTPTYEDIKNLPYIRSCLKEVLRCLPTPIL
GIKHYSDADVQYKDYAIPKGTVLLANTSFMHYDPDRYPDAHAFKPDRYLAHTKYSADYAAGGDP
YERDHFSGGGRRVCPGTRLAENTINISLANLLWAYEIRPPLVHGVEAKGMARRSCMVWKLRGWI
SVMTRTRRLVFVGRSLMLFALWRGARSGWGLLGGSGRRLVGRDTC*

>CYP51190A2-partial|9772|Grasr1

MVSISPKDLSTVYDYSRKLKSDLYGVFRPYSRGKVLTMGMVALQDESYLQMLRQPFASIYSYHSLTL
VESHTSTVRAFFVARLQNFARRGKQDFGFWLQLFVFDALCEATFSKRLGFLDEGKDVGDMLALV
WKQFHDGAPSNAMDGQYLEKESAHTSALAEFPDDTNSTICIGALITWTLGGIGAGGDTSVNVIRAL
FHNLLTHPLTMDLLRKDIHLGIERKGRDLTWQEARNLPLYLSACLLEAARIHPSIGLHLERIVPPGGV
TVSEVYLPPTIVGANAWVVNRNIEVFGTDADIWSPSRGVHRDG*

>CYP51162A1-partial|10339|Grasr1

MAAQFKEEFEHNRVSNFALHARRFMLGSLSLFGDNYFVQEGRYDPDTLLAAARGAAIPFCLTA
VFPYICVPLMRIHILKRLIPHEEDARGFGVMAHFDRSIKAHNKQSGECILTNILSAHNPTKELPVT
PADIKAESLLMSASPDTSPLASALLASLIQNPPSKTKVQSELNQALKSNTIQPNIPPIPIPWTSLSHF
PYFTACLYETARLFPPVVSILPFSAPDSGLHLPDGRFVPGGTAIGAAAGVINRNKTVFGVDADMWR
PERWLGGREEVAEMHRYLFTWGFGARRCTGQKITVMLCGKLVQLMLRELEIEPAVGDLDAVRKE
GMGFALYDGFYVKCRPR*

>CYP5168M1-partial|10359|Grasr1

MLYAKRLESQVTAHTGRVIDASRLAYEFSFDLMGDFAFGRSIEDSEQQEWQRQAIVALKQGMAMLG
PWSPVPWLVRGLFALFPFVDPIRSFNRELDWCKDRMKERLQRTVDKPDISHYLIEGALKHGLASLDD
HHWQGDAMIVAGSDTVAPTIIMSLYLLATNPPIEQIKLRQELRTVENPYEPPELLRSLNHLNGCIEET
LRLYPPVPTGGYRKTGPEGLTIGQTHIPAHTTIVAPRYNLGRLRSCYKRPYDFVPERWYSSPEMIRDR
RGHVFPNRRGRYSCVKGELALTEMRLVLALLVSRFKFKLADHSDGSNVLVEMKDYFTIQPGKLDLIF
EKI*

>CYP51169A1-partial|12959|Grasr1

MLKIVGQLTSRIFVGEELCRNDEWLKFLVEYAELAIIGTTALQKYPSTWTHPFMAPFVPEIQDIHRAV
KAGKGMLWPVLRERQDRMTNEPDWVPPEDFLTWWAKSSKDGWDPSKHIQAQMIGGLASLHTTT
TVLTNTLFDLCVNPMSMLREEYTSVQNSGQDMKHMFTGMRKMDSVIRESMRMHPPLVLSIQRH
VSTDIRLSDGNVIPKNSFIGVPTYVMNFDPPQVYDKPEVYDGLRFEKIRDEANQAGNAQKDTRAQLT
STSPEFLGFGHGKHACPGRFFAANEIKMIIGHLLTEYDFKLEHPEAGRPKSSTTKANISPDHKKARLLF
RKRRETSF*

>CYP548AJ5-partial|13026|Grasr1

MVPSPGAYNIFTVVDKSMHRHHRKVLSQLGFSRDCIRAFEPTILKHVDIFVEKLFARPSPLSPAUGLPF
ASKDDEGWSAPVDMTLACRHLGYDIMGAFGFGQSFDLQGSCKNRFLIEAVTATSRKAGVYVLYPA
LQKLQLEKLFYKGLVMREKYLMLAGLVKNRKQQEVKGAETRDLLGLKDAKDAETGVGFSESE
LWAESRFLLIAGADTTSTALSAIFFYLTLPSPPTPCPSPLARLTYEIRSTFPTHASINSSHLSSCPYLR
ACIDESLRMSPPISGTLWRTLTPSPDSSSITSQAHSPSLPHFCHPQNNSTHITIDNQPLPPNIDIGVSPY
ALHHNESLFPDHGSFRPERWLSDLAHTPEQKQQLARARQALI*

>CYP51183B1-partial|2704|Grasr1

MRKAAINPFFNAASVQRMEDIIYQHAELFENLENSIEAVIDIRIYFFAWTTDFIINTIFRDNTEIFWD
PIQASAWFQIVWNFSGKFPLMKHTPWLQLFGLARKAYADNEAEDGGDPKTEAEGSKDIFQTILTSN
LPEIEKLPKRMAAEVFNLLIAGSLTTSKTSIAIVFHILNNPEVLQSLQEELKQAIPDRQAIPSYRELQK
LPMLSAIIKETMRIADIVTTRFPMIAKDKVLEYKGAIIIPAGVGASRKARSKMALTPGMYSLPSA*

>CYP51185A1-partial|3341|Grasr1

MPKPSATPRRRLMSPLLTKSTIQSSTSLNHLLSRILGARLLPLLRSSSTQSQPLNLLRQFRNLAMDLS
TWTFGLNNGTDFLTDTAASDRYFRLFDESAYNAFWRTEFPWLTWKVVGVGTGLFAPPKVAEMARRET
VGWSRGLCERAGGERAGEKEKNLEGGNGGGEKSEKGGREEKETLYLRMRDGLKGIYAGSGKSEY
VKQELAVELLDQLGAGHEPMGTLLSWVVMELSQRKEWQERLRREIRENPEVLSFLKVGEESLSE
EGKATQAARALDALPVLDAVLQETLRVYSVNPGPQPRLLVPKGGYRLSMPSKLAIEFGRVGYEGSVFT
GGHSGHGIELLLA*

>CYP5042F1-partial|4578|Grasr1

MTTLRMGESTWVLLNSDRVVHEIISKRASITHERPHLPVASGLMSQYQGTILRQSKGWADGRRLMH
RMLTGTAMKDYARIQESSEVRLLTNYIQRPGAWYSHHYEFYPSIIHRIVAGDNVPRLDKQREEFARI
TKEFIRGINASLLDFFPTLTLLPEALQPGRRNWEKIGQNHQRMESWWTSVKDNLTSNPSAHSFITD
ILLKDAKFANDDREAMYLATAIIAAGSDNIRMTLNVMMVMAALSYPVVSQKARAEIDNICGSSDNL
HLPISLEDLPHLPYISAMIKELRWRPVLPPLIPQHRLTQDLNFEGHFFPAGTDFVVPFAGTDFVVQFT
GGEFRIRGSWGFQAGTMAGWPSA*

>CYP6259C1-partial|9868|Grasr1

MTNMQALVYAAFAALAIYLIWQYWSFQVRRNRLVRLKGCEPATRYPHKEPFLGLDFFYNLQVAD
AAGHRSPAYLDLHKKYGSTFEVKAFTKQVETAHAENIQAICTTQFEDFGVEPFRGNVAAPFMDR
GVFMNDGEYWKQSRALIRPIFNKAGIADLDYFELHVARFLKLMATDGETFDVLPFAKRLFVDSASE
FIFGRSTNTLVPNPPKELIDFMAAFDRALLGTALTFMLGPLRWVYIDPYWIQAYKTVHRFVDSRIQ
QILQERKACLSSNPENKPSAIAIDEKKTKAERYVLLNQLVEQTQDPRELNRNIIINIFSPTRDTTALAFC
NILFYLSRNPWSYNKVRSEAVPLRHTHLTYDVVRSLKTIKAIIVTEANRLHPAVSRLGRAALKDITLP
RGGGAPP*

>CYP51186A2-partial|4571|Grasr1

MITPLFKKAKVRSAAIFKRHVDRFISQIPRDGSTIDVQPLLKKTNFDSTAKFIFATANFIEAFNYANDG
SLKRRRTGRLAFRYCFDSEYTRTISEVHAFVDKEVARLLNSPPPPPPSTAEKTTKPRRYVLLTELASQIH
DPLALRSECLNLFAGGRDGVAAPLRTVALTIPEGADPDLDISKILRLFRNVIFETIRSTGPSATVTRTAF
KDTLLPRDGGRDGDIPCFVRKGDQVSVIGWGRNHIESVWGRDCYEFKPERWEGGERSERMLGGRI
PAEFVPPFGGGRMCPCGYGQVYL*

>CYP584AW1-partial|10870|Grasr1

IRWSKQLLKPISTLTDPPQHIQAIYSTDFHSYGVGPLRHFPFEPLIGSGTMNTDGAWEAPRALLRPIL
TRSQVNDLAMLERHVQNLIRKIPKDSSTVDLQPLFACMDLDYSTEFIFGESVASLTSESTLDAKTFL
AYNTAQVGIAIRASIPYWNIFHRDKVFWYCCRIVHDYVNRVAQAALLNHKSGTRRPNLDTKHIL
VSSDPLQLRNQLMNVFLPGHDSTAILISNVFFALARHPATCSRLRDEVLSLDPSAAITADALKRSLYL

QAVINETLRLYPVVTAMSHAALRNVQLPTGSGPANAAPVLLPRGSVVQISYKALHRRRDLWGADA
DVFKPERRLADAGMDEKKPVPASWTFIPFSGGPRTCPGQQRALAECAVVARLLRTFRAVENRDP
VWEYHDLYKLVTESKNGVKVALEWA*

P450s from the Literature

Grayanic Acid

>CYP682BG1 (ADM79460.1) *Cladonia grayi*

MLGVIQYSILTIFWLPIAAAXLYGAGLAIYRLFSLPLAKFPGPCLKAALTRKYESYYEAYQNYEYYWKIKE
LHKQYGELFTPLTASFRRXGPIVRVNPHELHIDDKDFYKLNLSFQGAWNKPYPYTAHQFANPGSIVGTIDH
DIHRKRRAAIMPFFFSKQKIYALESVIQGMVDKLCYRIEEYGKTGQPVNLRNASKCFAADVGEYCFAESG
GLXDKPDFAIEEMNQOQGLKAGLRARYLPSWWMPVVRGAPAWIRASIDPAAKHFEVWHRVSDSLFVRLY
DARKXGVPGRMEKRKNDEFYEKAGHRTIFHELINSPHLPPEEKGTGRI IQEAGAMVGAGGESTSQVITAF
VYCLLANPQVLSRLREELRSVIPNADSPAPTLRQLEALPYLVGPPLLXSTYKYVGYLTLVARLRTGKIAR
HQRVPRDRPLYFNEWEIPAGVSXHEDNIPMASTBTAQTICSMTPIFLQIDPEVYPNPHAFMPERWLNLD
XQRQRLEHNLVPYSKGTGRCAGLTLANAELYMLIPALVTRFDLELFDSDAWDTEMAVDSHHHSRPRDSKG
VKVFVKKSTF

Atranorin

> CYP65FQ2 (A0A8F4SN83.1) *Stereocaulon alpinum*

MALLDTIELFSNFSLSGVFAGLVLASLLTTTYCIWNIFYNIYLHPLKGYPGPKFLTTSRLPYLKWMFSGT
LVPNPFQRLHEQYGPVVRVAPNELSYINPEALKTIYGHRQPGEGFRKNPAFFQPATNGVHSILTSEGDAHS
SVRRKILPAFSDKALAEQQDILQHFTDLLIRKLRRERVEASKSSEPVDMEFYIWTTFDLIGDLAFGEFPN
CLEAASFTEWVALVFNAFKTFAFINISKQLAPLDKLVRLMIPKSMKARQDKVFSNLVAKVDRRIASKADR
PDFLSYIIKKGKDGAMALPELYANSTLLVLAGESESTASGLAGITFELLKHREAQKKAVEEIRSAFKTEDE
IVPESVKRLPYLAAMVSEGLRMYPPFPPEGLPRLTPRQGAQICGQWVPGGTYYVQFSTHAAHRASANFTDPN
VFAPERWLGDTKFASDIKEASQPFISGPRSCIGRNLAYLEMRLILARMLWSFDMQLTPECEDWDDQNSWI
QWDKKPLMVKLSLVKR

usnic acid

>CYP6309A2 (A0A0R8YXT5.1) *Cladonia uncialis*

MISPVSILASIWDNSKLLLDHTSVLSIALIGVACAISIRSILYVRLACANYSILLTLTHAQRRLRAYSTP
LRHVPGPWYAKFTALGLRANDVAGNRWYYVQGLHKKYGSIVRIAPEEVAISDPKVVSKVHALGTEFRKRQ
QPGTPFNIFSI SDPKAHRTRQRFYAKAFSDETLKASTEPAVRQLIKTAVASIKRDAALRKDHTADVYKWC
MLFGSDVAFQVIYGNSTNTEGLMATQKTTDEVIMGAYLQRMNAWAQFCFPVFLGRWLSPLSPTLHNI FRV
EEKYGDWFQEGQRQREIAARTVFVQNTKYSKNDGVFSVSDEVKLSVDVIAHDITTFLGAGGEPVGASLVF
LIWQVLRMPDLQRELEAEVAGLTEPITDATTAAQLPILNGVIYETLRLYGGGVTPMPRYAPIATELGGYVI
PPGTAVTTHTGALHRNPAAWDDPEK

> CYP6309A3 (WBO01282.1) *Cladonia rangiferina* isolate MI-R-4

MVSAVASSLASIWDSGKVYLERTSLLSIASIGVICALFIRSTIYVRLFCAGRSILLIHRQRLRLAYWTT
LRHVPGPWYAKFTGLVLKAHDVAGNRWYYVQALHKKYGCTVRIAPEEVAISDPKVVVRKHAFGTEFRKRQ
QPGTAFNIFSMSDPKLHRTRQRFYANVFSYETLKSCTEPDLRKLVEMAVAARRDATESKDHTADMFKWC
MLFGNDAAFQVIYGNINGLIANNGTTDEVIMGKYLQMTSWANFCLPIFLLGRWLSPPFSQYLRDTFCLHP
IYVDLWEEGQRQORDIAGRTVFVQNTKYTKDDGYFRVSDEVKLSDVEIAHDITTFLGAGGEAVGATLVFLI
WQVLQMPDLQRELEAEVAGLTEPLTDATAAQLPILNAVIYEALRLYGGGATLLPRYAPVATDLGGYIIPP
GTAVTTHTGALHRNPAAWDDPET

Physodic acid

>CYP682BG2_Pseudevernia_furfuracea

MLGLLKGIFTILWLPLVAVGFYALALAVYRLFSLPLAKFPGPCLKAALTRKYEFYEAIEENYEYLWKIKQMHEKY
GPIIRISPHELVHVGDEFFDRLNSFQGKWNKPYPYTAHQFANPGSIVGTLDHDIHRKRRAAILPFFFSKQKIYALEP
VITSMVDKFCDRVEEYRKSGEVMPLRNGFHCFAADVADIYCFAESGGLLDKPGFALSNNMQQKHGHLKSGLRARYF
PSWYMPVVRGAPEWITQSVDPAAKHFEVWHREVDGPVRRMEERKNDDFFKKAGHRTIFHEVINSPLHPPEEKQTI
RVIQEAGAMVGAGGESTTQALITMAYCLIASPEKLARLRDELRTIMPNAKSPLPSLRQLEQLPYLTGCVKEGLRR

LRTGKIARHQRLPRDRPLYYKEWEIPAGTIISMTPIFHQVDPDVFPSPHAFLPERWIDIEEEQRFRMEHHFMPYS
KGSRQCAGLSLANAELMCI PALMTRFD FDLFETDEWDVDM AVDSHHHSPRADTQGV RVFAKASTF*

The above sequence is retrieved from genome accession number: JAIUPS010000069.1
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Region: 29836-31974 (+) strand