**Supplementary File 1. Amino acid sequences of Hsp104 homologs.**

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| **Species** |  |
| *Galdieria sulphuraria* | MNLDNLTDKAQEAIQASHELALENGHSQLTPLHLAAALFTEDHGLASSVATKAKADPVNVRRELQKAVIRLPSQDPPPTTVPPSQSFLKVIRDAQSLRKKQGDTHLAVDHLLIALCDDKDVIACFSSADLTKHALEEAVKSVRGNRKVDSKAADSTYDALNQYAQDFVALAEEGKLDPVIGRDDEIRRVIRVLCRRRKNNPVLIGDPGVGKTAIVEGLAQRIVRGDVPENLNCRLYALDMGALVAGAKYRGEFEERLKAVLREVKEGEGKIILFIDELHLVLGAGKSDGAMDAANLLKPMLARGELRCIGATTLEEYRKYVEKDAAFERRFQQVFVSEPSVPDTVSILRGLKERYEVHHGVRILDSALVAAAKLSARYITNRFLPDKAIDLVDEACANVRMQLDSQPEVIDTLEHRKLQLEIEIAALEKEKDEASRARLAAVKEELDNVNEKLRPLKARFESERGKMNELKDMMTKLDALKIKLADAERRRDTVQAADLRYYAIPEIEERIRSLKNEIDKEKETDAMETDEESGKLLSDVVGYEQIADVVSRWTGIPTTKLSQSDAERLLSLSASLHQRIIGQDEAVDAVAAAVLRSRAGVSRPTQPLGSFLFLGPTGVGKTELAKALAAELFDDEKHVVRIDCSEYMEQHSVSRLIGAPPGYVGYEEGGQLTEAVLRRPYNVVLFDEVEKAHRNVMNVLLQVLDDGRLTDNQGRTIDFTNTVIILTSNLGAQFLMNIGSKGPAELSEGSDHEGTPVVSIPKEATIDNRTREAVMREVKLHFRPEFLNRLDDIVIFKPLALDELRQIVRLQLDQVAKRLEERDITVSMDNRAADYILREAYDPSFGARPIRRYLEKHVATELSIRLIKGLLTNHSHVQVTRATEGSGLAFQVTPKKRSATDMGNGSVYNKQGIVEEPDEEDM |
| *Monosiga brevicollis* | MAINPNEFTDKVNKTLFEAQNFAIQEGHSQVEPAHVAVILFEDPEGMAKRVVQRAGAALQPVQAALRSLLQRMPRQEPAPLEASLSSDTRRLLQSAAKLQKKNNEAHLAVDHLLGALVQDKQILAKLAESGLAKNHFEETLKRVKGTTTADSKSAEENYDALSKYGVDLVQQAADGKLDPVLGRDEEIRRVIQILARRIKSNPCLVGPPGVGKSAIVEGLAQRIMLGDVPETLKGKLISLDMGALIAGAKYRGEFEERLKAVLEEIKQSEGRIILFVDEVHNVLGAGKTEGSMDAANLLKPLLARGELRMIGATTEDEYRKYVEKDSAFERRFQVVQVREPSVPDTVSILRGLKERYEAHHGVRIADAALVAAAQLSHRYIQGRFLPDKAIDLIDEACANARVQLDSRPEEIDQLERRRLQLQVEATALEKEKDQASKLRLKDVRKELANIEEQLQPLLMKFEMERGRVDELRDLQEKLDSLRSKAQRAERQGDLATAADLKYYAIPDCERRIQQLTLEDEERSAQRSGMDEQEDAPMLSEEVGPEQITDIIARWTGIPVTKLNQSQRERLLALAERIKSRVIGQDHAVDAVAEAVLRSRAGLSRPSQPTGSFLFLGTTGVGKTELAKALAAELFDDDKHIVRIDMSEYMESHAVSRLIGSPPGYVGYEQGGQLTEAVRRRPYNVVLFDEVEKAHPQVLNVLLQVLDDGVLTDGQGRHVDFTNTVIVLTSNIGAHDLLNADVVNGAIDPETEAKVRRQVQQHFRPEFLNRLDEVVMFKPLGQRDLRKICRNMVDLINQRLVDRDIALLVSDDACDLVLDEAYNPAYGARPVRRYVEKHMVTEISRLVLSGELVNHSTVHIDTTKRPDGGRDLSYQVHHSKRPKISEDSA |
| *Chlamydomonas reinhardtii* | MSFDTKKATEKVNNVLGEAINLAKEDKHAALTPTHLAVVLFEEPHGLAKVAATKVAGEEVWRSAIRVLRKRLTKLPKVDPAPESVSPGRELSKVLTAAAKLQKDRGDAFLGTDTLLTAVINAAEVSEALGEAGISKAQLETALSEVRQAAGGGPINSETADANFDALAKYGTDLTANAARADPVIGRDDEIRRVVRVLCRRTKNNPVLIGEPGVGKTAIVEGLAQRIVKNDVPETLQGVRLISLDMGSLVAGAKYRGEFEERLKAVLNEVAQQQGKVVLFIDELHLVLGAGKSGDGAMDAANLLKPMLARGELRCIGATTLGEYREHIEKDAAFERRFQQVLVKEPSVPDTIAILRGIKDRYETHHGVHITDRALVVAAELSDRYITTRFLPDKAIDLVDEACANMRVQLDSKPEQLDALERQRQRLQVEAAALAKEKDALSKARAKEVGKELAALEEALRPLQMKYAQEKARLEELRRLGQKRDEILVNIQIAEQHGNLARIADLRYGALPDVEDRIKQVRAAAPSDAMLSEEVGTEEIAVVVSRWTGIPVNRLKQTERDKLLSLRSELQQRVVGQDAAVAAVADAVLRSRAGLAARGRGSSFLFLGPTGVGKTELAKALAQLLFDDEKMMIRIDMGEYMEKHSVSRLIGAPPGYVGHEQGGQLTEAVRRRPYSVVLFDEVEKAHAEVFNVLLSILDDGRVTDSKGRTVNFANTVIILTSNLGAEALLHAAHDVLAHPGKAAAGQDPYKAARESVLAAVRRFFRPEFLNRLDDIVVFEPLRPEQLVDIARLMGNELAARLTPRNITLTFTEPALQFAVSHAYDPAYGARPLRRWMEQKVVTQLSRMVVGGDLPDNSNVEVGLAEGGRDFDYRVWPKPAAEAGGGNGSGAATEALLKKARMYSVEHPDEGEDSMDEGDDVGAMRD |
| *Populus*  *euphratica* | MDPGKFTHKTNEALATAHELTVGAGHAQITPLHLAVALISDPSGIMRQAVANAGDGENTAQAAERVFNQVLKKLPSQSPPPDEVPPSTSLIKVIRRSQALQKSRGDSYLAVDQMILGLLEDSQIRDLFKEVGVSASTVKSEVEKLRGKEGKKVENASGDTNFQALKTYGRDLVEGAGKLDPVIGRDEEIRRVVRILSRRTKNNPVLIGEPGVGKTAVAEGLAQRIVRGDVPSNLADVRLIALDMGALVAGAKYRGEFEERLKAVLKEVEEAEGKVILFIDEIHLVLGAGRTEGSMDAANLFKPMLARGQLRCIGATTLEEYRKYVEKDAAFERRFQQVYVAEPSVPDTISILRGLKEKYEGHHGVRIQDRALVIAAQLSSRYITGRHLPDKAIDLVDEACANVRVQLDSQPEEIDSLERKRMQLEVELHALEKEKDKASKARLAEVVKELDDLRDKLQPLLMKYKKEKERIDEIRRLKQKREEILFSIQEAERRYDLARVADLRYGALEEVEAAIARLEGSTTDENLMLTETVGPEHIAEVVSRWTGIPFTRLGQNEKERLIGLADRLHHRVVGQDQAVTAVAEAVLRSRAGLGRPQQPTGSFLFLGPTGVGKTELAKALAEQLFDDENQLVRIDMSEYMEQHSVARLIGAPPGYVGHEEGGQLTEAVRRRPYSVVLFDEVEKAHISVFNTLLQVLDDGRLTDGQGRTVDFRNTVIIMTSNLGAEHLLSGLLGKCSMQVARDRVMQEVRKQFRPELLNRLDEIVVFDPLSHDQLRKVARLQMKDVASRLAERGIALAVTDAALDYILAESYDPVYGARPIRRWLERKVVTELSRMLVREEIDENSTVYIDAGPDGQNLVYRVEKNGGLVNAATGQKTDVLIQIPKAPRDDAAQKVKKMKIQEIVDNDDDDEMIE |
| *Salpingoeca*  *rosetta* | MALNPNEWTEKVQEMYLEAKNVAINNKNAYMDPIHFAVALFEDEGGLPQRVVQKSGASLDAVEGAMRSLLKAIPQQDPAPVDVSTSHKALRFLQNAQKKQKKNDEAHLAIDHLLLALVQEKDILQALAGCGLAKDRFEEIVKKIKGTTRANTKTAESTYDALGKYGVDLVQRAADGKLDPVIGRDEEIRRVIQILARRTKNNPVLVGPPGTGKTAIVEGLAQRILNGDVPETLKARLVSLDMGALIAGAKYRGEFEERLKSVLDEVKQAEGSIILFVDEIHTVLGAGKTEGSMDAANLLKPMLARGELRMIGATTLDEYRKHVEKDAAFERRFQMVHVSEPSVPDTVSILRGLKERYEAHHGVRIQDAALVTAAQLADRYITQRFLPDKAIDLVDEACAKTRVQLDSRPEEIDALERRKLQLEVEATALGKEKDKMSKQRLKEVKKQLADIEEQLGPLKMKFEMERGRVDEMRELQEKLDNLRNKVQRAERAGDLSTAADLKYYAIPDCEKRLKQLIEEQEKRQQEQQSMDVSDEDKPMLSEEVGPDQVTEIVARWTGIPVNKLSQSQRERLLTLEEKIEQRVVGQTAAVKAVCEAVLRSRAGLSRPNQPVGSFLFLGPTGVGKTELAKALAMELFDDDKHIVRVDMSEYMESHSVARLIGSPPGYVGYEEGGQLTEAVRRRPYNLILLDEVEKAHKDVLNVLLQLLDDGILTDGMGRTVDFTNTVVVLTSNIGAPILLSGKVDPETGDLDENTRTQVMHEVQSYFRPEFLNRLDDVIMFKPLQKHALRTICRNMVEQINERLADRDITLDCTDAACDVILLNSFHPQYGARPVRRYIEKQVVTAMSKKMLSNQVPNGSRVTIDGDKQRQELTYSVQAAKRPRMMMDSTSEE |
| *Thielavia*  *terrestris* | MEFTDRAKKALEDAMALAEQYSHSQLVPVHLAVALLDPLPDQSKDQQNAPPGTTSSLFRQVVERANGDPQLFDRALKKSLVRLPSQEPPPESVSMAPSLNTVLRKAMELQKVQKDTYIAVDHLITALSEDPSIQVALKEANIPKSKLVQDAVTAIRGTRRVDSRNADTEQENENLSKFTIDMTAMAREGKIDPVIGREEEIRRVIRILSRRTKNNPVLIGEPGVGKTTIVEGLAQRIVNADVPDNLAACKLLSLDVGALVAGSKYRGEFEERMKGVLKEIQESKETIVLFVDEIHLLMGAGATGEGGMDAANLLKPMLARGQLHCIGATTLGEYRKYIEKDAAFERRFQQVLVKEPSIPETISILRGLKEKYEVHHGVTIADAAIVAAANLAARYLTSRRLPDSAVDLIDEAAAAVRVARESQPEIIDSLERRLRQLKIEIHALSREKDDASKARLAQAKQDAQNVEEELRPLREKYERERQRGKDIQEAKLKLENLRVKAEDASRMGDHGRAADLQYYAIPEQEQVIKRLEKEKAAADAALNANGADVGGSMVTDVVGPEQINEIVARWTGIPVTRLKTSEKEKLLHMERALSKIVVGQKEAVQSVSNAIRLQRSGLSNPNQPPSFLFCGPSGTGKTLLTKALAEFLFDDAKAMIRFDMSEYQERHSLSRMIGAPPGYVGHDAGGQLTEALRRKPFSILLFDEVEKAAKEVLTVLLQLMDDGRITDGQGRVVDAKNCIVVMTSNLGAEYLSRPNGKDGQIDPTTKELVMNTLRNYFLPEFLNRISSIVIFNRLTRREIRKIVDLRIAEIQRRLYDNDRNVQIAVSEAAKDKLGAAGYSPAYGARPLQRLLEKEVLNRLAILILRGNIRDGEVAHVDLVDGKVTVQPNHPDSEGEDEEMMVDEDEALEEIAPDSMDEDDIYSG |
| *Thermomyces*  *lanuginosus* | MSSAQFTDRANKALLDSNQLAEQYSHTQILPVHLAVSLLNPPRDDEREGAEGASVPLFKQVVERAHGDPQLLERSLMKMLVRQPSQDPPPEHVSVSPALAKVIRSATELSKMQKDSFVAIDHLICALAQDSQIQRALADANIPNVKLIDNAVQQIRGTKRVDSKTADSEEDHENLKRFTVDMTALAREGKIDPVIGREEEIRRVIRILTRRTKNNPVLIGEPGVGKTTIVEGLARRIVNADVPANLAHCKLLSLDVGSLVAGSKYRGEFEERMKGVLKEIEESRDMVVLFVDEIHLLMGAGTSGEGGMDAANLLKPMLARGQLHCIGATTLAEYRKYIEKDQAFERRFQQVFVKEPSVSETISILRGLKEKYEVHHGVNILDAAIVASAELAARYLTARRLPDSAVDLIDEAAAAVRVTRESEPEALDNLERRLRQLQIEIHALEREKDPASKSRLEAAKQEAANVTEELRPLREKYEQEKQRSKAIQDAKVKLDALKVKRDEALRSGDTATAADLEYYAIPETQSLIQKLEAERAKADAEERARAHENGTETLVPDAVGPDQINEIVARWTGIPVTRLKTSEKDRLLQMEKHLGKIVVGQKEAVQTVSNAIRLQRSGLANPNAPPSFLFCGPSGTGKTLLTKALAEFLFDDPKAMVRFDMSEYQERHSLSRMIGAPPGYVGHDAGGQLTEHLRRRPFSILLFDEVEKAAKEVLTVLLQLMDDGRITDGQGRVVDAKNCIVVMTSNLGAEYLSRPTGKNGRIEPQTRELVMGALRDYFLPEFLNRISSIVIFNRLTKREIRQIVELRLDEVQRRLEANGRDVKIECADEVKDYLGEAGYSPAYGARPLSRLIEKEVLNKLAILLLRGNIRDGEVAHCVLKDGRVDVIPNHPSDEMEDDEDMIDPNEALEQVEDTSADMDLYE |
| *Saccharomyces*  *cerevisiae* | MNDQTQFTERALTILTLAQKLASDHQHPQLQPIHILAAFIETPEDGSVPYLQNLIEKGRYDYDLFKKVVNRNLVRIPQQQPAPAEITPSYALGKVLQDAAKIQKQQKDSFIAQDHILFALFNDSSIQQIFKEAQVDIEAIKQQALELRGNTRIDSRGADTNTPLEYLSKYAIDMTEQARQGKLDPVIGREEEIRSTIRVLARRIKSNPCLIGEPGIGKTAIIEGVAQRIIDDDVPTILQGAKLFSLDLAALTAGAKYKGDFEERFKGVLKEIEESKTLIVLFIDEIHMLMGNGKDDAANILKPALSRGQLKVIGATTNNEYRSIVEKDGAFERRFQKIEVAEPSVRQTVAILRGLQPKYEIHHGVRILDSALVTAAQLAKRYLPYRRLPDSALDLVDISCAGVAVARDSKPEELDSKERQLQLIQVEIKALERDEDADSTTKDRLKLARQKEASLQEELEPLRQRYNEEKHGHEELTQAKKKLDELENKALDAERRYDTATAADLRYFAIPDIKKQIEKLEDQVAEEERRAGANSMIQNVVDSDTISETAARLTGIPVKKLSESENEKLIHMERDLSSEVVGQMDAIKAVSNAVRLSRSGLANPRQPASFLFLGLSGSGKTELAKKVAGFLFNDEDMMIRVDCSELSEKYAVSKLLGTTAGYVGYDEGGFLTNQLQYKPYSVLLFDEVEKAHPDVLTVMLQMLDDGRITSGQGKTIDCSNCIVIMTSNLGAEFINSQQGSKIQESTKNLVMGAVRQHFRPEFLNRISSIVIFNKLSRKAIHKIVDIRLKEIEERFEQNDKHYKLNLTQEAKDFLAKYGYSDDMGARPLNRLIQNEILNKLALRILKNEIKDKETVNVVLKKGKSRDENVPEEAEECLEVLPNHEATIGADTLGDDDNEDSMEIDDDLD |
| *Dictyostelium*  *discoideum* | MSFNPEEFTDKTNTILLRTQELAREKSNVQLAPIHLAVTLLNDEDNLAKSIFEKAGGDVPKIDAGFKRLLAKQPVQNPVPPEISPNSLFLQVLRSAARHQKNNGDSHLAVDHLILGLLDDRDILSVLGDAGATKEQVIQAVKEIRGNKKITSKTAESTYEALSKYGYDLVSQAQEGKLDPVIGRDEEIRRVIRVLSRRTKNNPVLIGEPGVGKTAVVEGLAQRIVRGDIPDNLNARVIALDMGALIAGAKYRGDFEERLKAVLKEVKDSNGGIILFIDEIHLVLGAGKTDGAMDAANLLKPMLARGELRCIGATTLDEYRQYVEKDPAFERRFQQVFVNEPTVNDTISILRGLKERYETHHGVRITDNALVVAAQLSHRYITNRFLPDKAIDLVDEACANTRVQLNSQPEAIDNLERRRLQLEVESAALEKEEDDASKQRLKAVQEELNQIKDELQPLEAKYQKERSRVDKIRELRKKLEDIKVKLSDAERRYDTSAAADYRYFVIPDLEKQIEVCDKERKENKKDAMVSEVVTPEQIADVVSRWTGIPVSKLSQTEKQRLLSLADHLHNRVVGQDEAVDAVADAVLRSKSGLARENQPLGSFLFLGPTGVGKTELAKALALELFDDESHMVRIDMSEYMEQHSVSRLIGAPPGYVGYDQGGQLTEAVRRRPYSVVLFDEVEKAHQQVWNVLLQVLDEGRLTDGQGRTVDFSNVVIIMTSNLGSQYILGEQANKEGGNNSLSQACKDKVIDEVRKHFRPEFLNRLDDIIVFTPLSKENLHSIITLQLRSVEKRLEDQNMSLKISNDALDSIINAAYDPIFGGRPLKRYIEKNIVTELSKLILGGKLKENQGVVVNEKDHHLNFDIIDLKQQQQRPASPTKKQKTIK |
| ClpGGI, from *Pseudomonas aeruginosa* | MAQELCAICHERPAVARVSLVQNGQRRELALCELHYRQLMRQQRMRSPLESLFGGGSPFDEIFSGFGEQSPVTPVRAREPEAVDIAEYFSKQTTEYLQRAAQVAAEFGKREVDTEHLLYALADADVVQAVLKQFGLSPADLKQYIEANAVRGASKGEASEDMTISPRVKSALQHAFALSRELGHSYVGPEHLLLGLAAVPDSFAGTLLKKYGLTEQALRQKAVKVVGKGAEDGRVDGPSNTPQLDKFSRDLTRLAREGKLDPVIGRSKEVETTIEVLARRKKNNPVLIGEPGVGKTAIVEGLAQRMVQGEVPEVLRDKRLVELNINAMVAGAKYRGEFEERLKQVMDELQAAQSEIILFIDEVHTIVGAGQGGGEGGLDVANVLKPAMARGEMNLIGATTLNEYQKYIEKDAALERRFQPVFVPEPTVEQTISILRGLRDKLEGHHKVTIRDEAFVAAAELSDRYIGNRFLPDKAIDLIDQAAARVRIASTSRPAEIQELEAELAQLKREQDYAASRKWYDEAKVFEKRIQERKEHLEQITERWQQTQGSKTEEVRVEDIAEIISRLTGIPVTELTAEEREKLLQMEERLHQRVIGQQEAITAVSDAVRLARAGLRQGSRPIATFLFLGPTGVGKTELAKALAEVVFGDEDAMIRIDMSEYMERHAVSRLIGAPPGYVGYDEGGQLTERVRRRPYSVILLDEIEKAHADVNNILLQVFDDGRLTDGKGRVVDFTNTIIIATSNLGSELIMKNAQAGEFAQPPEKLKRELMTTLRGHFRPEFLNRLDEVIVFESLSKAQIEDIVRLQLERVKRAAHAQDIYLHIDDSLVGHLAEEAYQPEFGARELKRQIRQQLETRLATAMLKGEVKEGETVTFFYDAKDGVGYRKGAAPKPAARKKSGAGETPKGRATAARKPAAKKGAAAKGKADKPKAK |
| ClpB, from *Escherichia coli* | MRLDRLTNKFQLALADAQSLALGHDNQFIEPLHLMSALLNQEGGSVSPLLTSAGINAGQLRTDINQALNRLPQVEGTGGDVQPSQDLVRVLNLCDKLAQKRGDNFISSELFVLAALESRGTLADILKAAGATTANITQAIEQMRGGESVNDQGAEDQRQALKKYTIDLTERAEQGKLDPVIGRDEEIRRTIQVLQRRTKNNPVLIGEPGVGKTAIVEGLAQRIINGEVPEGLKGRRVLALDMGALVAGAKYRGEFEERLKGVLNDLAKQEGNVILFIDELHTMVGAGKADGAMDAGNMLKPALARGELHCVGATTLDEYRQYIEKDAALERRFQKVFVAEPSVEDTIAILRGLKERYELHHHVQITDPAIVAAATLSHRYIADRQLPDKAIDLIDEAASSIRMQIDSKPEELDRLDRRIIQLKLEQQALMKESDEASKKRLDMLNEELSDKERQYSELEEEWKAEKASLSGTQTIKAELEQAKIAIEQARRVGDLARMSELQYGKIPELEKQLEAATQLEGKTMRLLRNKVTDAEIAEVLARWTGIPVSRMMESEREKLLRMEQELHHRVIGQNEAVDAVSNAIRRSRAGLADPNRPIGSFLFLGPTGVGKTELCKALANFMFDSDEAMVRIDMSEFMEKHSVSRLVGAPPGYVGYEEGGYLTEAVRRRPYSVILLDEVEKAHPDVFNILLQVLDDGRLTDGQGRTVDFRNTVVIMTSNLGSDLIQERFGELDYAHMKELVLGVVSHNFRPEFINRIDEVVVFHPLGEQHIASIAQIQLKRLYKRLEERGYEIHISDEALKLLSENGYDPVYGARPLKRAIQQQIENPLAQQILSGELVPGKVIRLEVNEDRIVAVQ |
| *Chaetomium*  *thermophilum* | MNSKMEFTDRAKKALEDAMALAEQYQHLQLQPVHLAVALLDPTPDPSKDQSIAPGTTSTLFRQVVERAHGDAQAFDRALKKKLVRLPSQDPPPDQVSMSAGCSNVLRKANELQKVQKDSYIAVDHLIAALAEDHAIQEALKEANIPKPKLIQDAIQAIRGNKRVDSRNADTEQENENLSKFCIDMTAMAREGKIDPVIGREEEIRRVIRILSRRTKNNPVLIGEPGVGKTTIVEGLAQRIVNADVPDNLAACKLLSLDVGALVAGSKYRGEFEERMKGVLKEIQESKETIILFVDEIHLLMGAGSSGEGGMDAANLLKPMLARGQLHCIGATTLAEYRKYIEKDAAFERRFQQVLVKEPSISETISILRGLKEKYEVHHGVNIADAAIVAAANLAARYLTSRRLPDSAVDLIDEAAAAVRVARESQPEIIDSLERRLRQLKIEIHALSREKDEASKARLAQAKQDAQNVEEELRPLREKYERERQRGKAIQEAKMKLEALRVKAEDASRMGDHSRAADLQYYAIPEQEAIIKRLEAEKAAADAALNANGADVGGSMITDVVGPDQINEIVARWTGIPVTRLKTSEKEKLLHMEQALSKIVVGQKEAVQSVSNAIRLQRSGLSNPNQPPSFLFCGPSGTGKTLLTKALAEFLFDDPKSMIRFDMSEYQERHSLSRMIGAPPGYVGHDAGGQLTEALRRRPFSILLFDEVEKAAKEVLTVLLQLMDDGRITDGQGRVVDAKNCIVVMTSNLGAEYLSRANNGKDGKIDPTTRELVMNTLRNYFLPEFLNRISSVVIFNRLTRREIRKIVDLRIAEIQKRLTDNDRNVIIKVSEEAKDKLGAQGYSPVYGARPLQRLLEKEVLNRLAILILRGQIREGEVAHVELVDGKVQVLPNHPDSEPEDVDVDMDSDDAVDEVAPDSMDEDIYND |
| *Lachancea*  *thermotolerans* | MNDETQFTERALTILTLAQKLAQDHQHAQLQPVHILGAFVETPEDGSIPYLQNLIEKARYDYDTFRRTVNKHVVRIPQQNPAPAQVTPSYATGQVLQEAMKIQKQQKDSFVAQDHILFALFKDSTIQQIFKEAQVDVEAVKQQALELRGNQKIDSRGADTSSSLEYLSKYAIDMTEQARMGKLDPVIGREEEIRSTIRVLARRIKSNPCLIGEPGIGKTAIIEGVAQRIIDDDVPSILFGSKLFSLDLAALTAGAKYKGDYEERLKGVLKEVEESKTLIILFIDEIHMLMGNGKDDAANILKPALSRGHLKVIGATTNNEYRSIVEKDGAFERRFQKIDVQEPTTRQTVAILRGLQQKYEIHHGVRILDSALVTASQLAKRYLPYRRLPDSALDLVDISCAGVAVARDSKPEELDSKERALQLLQVEIKALERDEEADPTTKERLQQARQREASLQEELEPLRQRYNEERKGHEELTKAKKKLEELENKAADAERRYDTATAADLRYFAIPDLKNQIEVLENQVLEEESRAGSGAMVQNVVDSDTIAETAARLTGIPVNKLTESENEKLIHMERELSSEVVGQSEAIKAVSNAVRLSRSGLSNPRQPASFLFLGLSGSGKTELAKRIAAFLFNDSDAMIRVDCSELSEKYSVSKLLGTTAGYVGYEEGGFLTNQLQRRPYSVLLFDEVEKAHPDVLTVMLQMLDDGRLTSGQGKTIDCSNCIIIMTSNLGATFISSQSGSRIEESTKNLVMGAVKQHFRPEFLNRISSIVVFNKLSPKAIHRIVDIRLKEIEDRFEENDKHYKLDLTPEAKNYLARNGYSEDMGARPLNRLIQNEILNRMAMRILKGQIKDKETVRVVLKHNENPDMEEPDQLDVLPNHQSSDADMDVDNDWDEDLDDSVTDATPLD |
| *Myceliophthora*  *thermophila* | MNSKMEFTDRAKKALEDAMALAEQYAHSQLLPVHLAVALLDPLPDPSRDQQNAAPGTTSTLFRQVIERAHGDPQQFDRALKKTLVRLPSQDPPPDQVSMAPSFNTVLRKAMELQKVQKDTYIAVDHLITALAEDHTIQTALKEANIPKPKLIQDAISAIRGTKRVDSRNADAEEENENLAKFTVDMTAMAREGKLDPVIGREEEIRRVIRILSRRTKNNPVLIGEPGVGKTTVVEGLAQRIVNADVPDNLAACKLLSLDVGALVAGSKYRGEFEERMKSVLKEIEESKDMIVLFVDEIHLLMGAGSSGEGGMDAANLLKPMLARGQLHCIGATTLAEYRKYIEKDAAFERRFQQVIVKEPSIPETISILRGLKEKYEVHHGVNIADGAIVAAANLAARYLTSRRLPDSAVDLIDEAAAAVRVARESQPEIIDSLERRLRQLKIEIHALSREKDEASKARLAQAKQDAQNVEEELRPLREKYERERQRGKDIQEARLKLENLRVKAEDASRMGDHSRAADLQYYAIPEQEQIIKRLEKEKAAADAALNESGPDTGGAMVTDVVGPDQINEIVARWTGIPVTRLKTSEKERLLHMEQALSKIVVGQKEAVQSVSNAIRLQRSGLANPNQPPSFLFCGPSGTGKTLLTKALAEFLFDDPKAMIRFDMSEYQERHSLSRMIGAPPGYVGHDAGGQLTEALRRKPFSILLFDEVEKAAKEVLTVLLQLMDDGRITDGQGRIVDAKNCIVVMTSNLGAEYLSRPNGKDGKVDPTTKELVMNALRNYFLPEFLNRISSIVIFNRLTRREIRKIVDLRIAEIQKRLQDNDRNVTIRVSDAAKDKLGAAGYSPVYGARPLQRLLEKEVLNRMAILILRGSIRDGEVANVDLVDGKVTVIPNHPDSEGEDEDMMVDEDEALDEVAPDSMDEDIYD |
| *Scytalidium*  *thermophilum* | MNSKMEFTDRAKKALEDAMVLAEQYAHSQLVPVHLAISLLDPLPDPSKDQQNQAPGTTSSLFRQVVERANGDPQAFDRALKRTLVRLPSQDPPPEQVSMSPSFNKVLRQAMELQKVQKDTYIAVDHLISALSEDNTIQAALKEANIPKPKLIQEAISTIRGTRRVDSRSADTESENENLAKFTIDMTAQAREGKIDPVIGREEEIRRVIRILSRRTKNNPVLIGEPGVGKTTVVEGLAQRIVNADVPDNLANCKLLSLDVGALVAGSKYRGEFEERMKGVLKEIQESKDTIILFVDEIHLLMGAGASGEGGMDAANLLKPMLARGQLHCIGATTLAEYRKYIEKDAAFERRFQQVLVKEPTIPETISILRGLKEKYEVHHGVTIADAAIVAAANLAARYLTQRRLPDSAVDLIDEAAAAVRVARESQPEIIDSLERRLRQLKIEIHALSREKDEASKARLAQAKQDAQNVEEELRPLREKYERERQRGKAIQEAKLKLENLRVKAEEASRMGDHSRAADLQYYAIPEQEQIIKRLEREKAAADAALNESGADVGGSMITDVVGPDQINEIVARWTGIPVTRLRTSEKEKLLHMEKHLAKIVVGQKEAVQSVSNAIRLQRSGLANPNQPPSFLFCGPSGTGKTLLTKALAEFLFDDPKSMIRFDMSEYQERHSLSRMIGAPPGYVGHDAGGQLTEALRRKPFSILLFDEVEKAAKEVLTVLLQLMDDGRITDGQGRIVDAKNCIVVMTSNLGAEYLARPSGKDGKIDPTTKELVMNALRNYFLPEFLNRISSIVIFNRLTRREIRKIVDLRIAEIQKRLRDNDRNVTIIVSDAAKDKLGAAGYSPAYGARPLQRLLEKEVLNRLAILILRGNIRDGEVARVDVVDGKVTVLPNHEDEMSDEEMLVDEEDAVEEVAPDSMDEDIYD |
| *Thermoascus*  *aurantiacus* | MNGTQFTDRANKALLDSNNLAEQYAHSQILPLHLAISLLTPPQDEMEKQPAGHPSHEGAAAPLFRQVVERAHGDPQLLERNLMKMLVRQPSQDPPPERVAVSPALAKVIRQATELSKTQKDSYVAIDHLILAVVQDSQIQRALADANIPNVKLIDSAVQQIRGNKRVDSKTADAEGDNENLKKFTIDMTAMAREGKIDPVIGREEEIRRVIRILSRRTKNNPVLIGEPGVGKTTVVEGLARRIVNADVPANLAQCRLLSLDVGSLVAGSKYRGEFEERMKGVLKEIEDSKDMIVLFVDEIHLLMGAGSSGEGGMDAANLLKPMLARGQLHCIGATTLGEYRKYIEKDQAFERRFQQVLVKEPTVNETISILRGLKEKYEVHHGVNILDAAIVAAANLAARYLTARRLPDSAVDLIDEAAAAVRVTRESEPEALDNLERKLRQLQIEIHALEREQDPASKQRLEAAKQEAANVTEELRPLREKYESEKKRSKDIQDAKIKLDSLKVKRDEAERSGDTQTAADLEYYAIPETKALIERLEADRARADAEARARQGEAGETLLADAVGPDQINEIVARWTGIPVTRLKTTEKDKLLNMEKHLHRIVVGQKEAVTSVSNAIRLQRSGLSNPNSPPSFLFCGPSGTGKTLLTKALAEFLFDDPKAMIRFDMSEYQERHSLSRMIGAPPGYVGHDAGGQLTENLRRRPFSILLFDEVEKAAKEVLTVLLQLMDDGRITDGQGRIVDARNCIVVMTSNLGAEYLSRPTTKDGKIEPQTRELVMGALRDYFLPEFLNRISSIIIFNRLTKREIRKIVELRLSEVQRRLEQNDRNVKIECTEEVKDYLGDAGYSPAYGARPLSRLIEREVLNRLAVLILRGAIRDGEVARVVMREGRVEVLPNHIEPMEDEEMLDEEEALAEIEENAGGDMDLYE |
| *Arabidopsis*  *thaliana* | MNPEKFTHKTNETIATAHELAVNAGHAQFTPLHLAGALISDPTGIFPQAISSAGGENAAQSAERVINQALKKLPSQSPPPDDIPASSSLIKVIRRAQAAQKSRGDTHLAVDQLIMGLLEDSQIRDLLNEVGVATARVKSEVEKLRGKEGKKVESASGDTNFQALKTYGRDLVEQAGKLDPVIGRDEEIRRVVRILSRRTKNNPVLIGEPGVGKTAVVEGLAQRIVKGDVPNSLTDVRLISLDMGALVAGAKYRGEFEERLKSVLKEVEDAEGKVILFIDEIHLVLGAGKTEGSMDAANLFKPMLARGQLRCIGATTLEEYRKYVEKDAAFERRFQQVYVAEPSVPDTISILRGLKEKYEGHHGVRIQDRALINAAQLSARYITGRHLPDKAIDLVDEACANVRVQLDSQPEEIDNLERKRMQLEIELHALEREKDKASKARLIEVRKELDDLRDKLQPLTMKYRKEKERIDEIRRLKQKREELMFSLQEAERRYDLARAADLRYGAIQEVESAIAQLEGTSSEENVMLTENVGPEHIAEVVSRWTGIPVTRLGQNEKERLIGLADRLHKRVVGQNQAVNAVSEAILRSRAGLGRAQQPTGSFLFLGPTGVGKTELAKALAEQLFDDENLLVRIDMSEYMEQHSVSRLIGAPPGYVGHEEGGQLTEAVRRRPYCVILFDEVEKAHVAVFNTLLQVLDDGRLTDGQGRTVDFRNSVIIMTSNLGAEHLLAGLTGKVTMEVARDCVMREVRKHFRPELLNRLDEIVVFDPLSHDQLRKVARLQMKDVAVRLAERGVALAVTDAALDYILAESYDPVYGARPIRRWMEKKVVTELSKMVVREEIDENSTVYIDAGAGDLVYRVESGGLVDASTGKKSDVLIHIANGPKRSDAAQAVKKMRIEEIEDDDNEEMIED |
| *Calcarisporiella*  *thermophila* | MSSMQFTDKATETLNAAAKYAAENSHVQLHPSHVAVVMLDEENSLFRSILEKAGGDVVSIERGFKKIMVRQPSQDPPPTEMGHSPELAKLLHYAHEHMKKQRDLYIAQDHLILALADLPSMAQVLKEGGVTKKSLENAVTHVRGNRRVESKSAEEAYEALSKYCIDLTELAASGKLDPVIGRDEIISRVIRVLSRRTKNNPCLVGEPGVGKTAIAEGLANRIVKGDIPSSLQKKVYSLDIGSLLAGAKYRGEFEERLKAVLKELKEAQAIVFIDEIHTVLGAGKSEGAIDAANLLKPMLARGELRCIGATTLTEYRQYVEKDPAFERRFQLVMVEEPSVTDTISILRGLKERYETHHGVRIADAAIVAAAQLAARYITQRFMPDKAIDLIDEACANTRVQLDSQPEAIDKLERRHLQLEVEATALEKEKDAASKQRLQEVRAEMARIQEELRPLKMKYESEKGRLDEIRNLSQRLDELKAKAEDAERRYDLARAADIRYYAIPDLEKRLAQLQAEKSQADAERADGLLAEVVGPDQIMEVVSRWTGIPVSNLQRSEKEKLLHMEEYMKQHVVGQDEAIKAICDAIRLSRTGLQNRNRPLASFLFLGPTGCGKTLCVKELAAFLFNDPGAIVRIDMSEYMEKHAVSRLVGAPPGYIGHDEGGQLTEAVRRRPYTVVLFDEMEKAHKDVSNLLLQILDDGHCTDSKGRRVDFKNTIIVMTSNLGADLFELDEGDKVSQATKNAVLATARRHFANEFINRIDELIVFNRLTPSNIRKIVDVRLKEVQERLDEKQITLDVDDKAKDLLAQQGFDPVYGARPLNRLIQHALLTQLSRLLLDGGVRPGEIAKVTVDQEGEIIVIRNHGIESPAPWADEDMVEDEDMEI |
| *Plasmodium*  *falciparum* | MAPDNKQEQGKYLNRTINILNAGKNIAKSYGHNKLKPIHILSALAKSDYGSTLFKENNVNAANLKEYIDIALEQTRAGAPLDNKSKIVNSAEVKETLALAEAAANKYKSPKVDVEHLLSGLSNDELVNEIFNEVYLTDEAIKAILKRKFEKTKKDKDGKTGTLYIEQFGSNMNEKVRNGKLQGIYGRDEEIRAIIESLLRYNKNSPVLVGNPGTGKTTIVEGLVYRIEKGDVPKELQGYTVISLNFRKFTSGTSYRGEFETRMKNIIKELKNKKNKIILFVDEIHLLLGAGKAEGGTDAANLLKPVLSKGEIKLIGATTIAEYRKFIESCSAFERRFEKILVEPPSVDMTVKILRSLKSKYENFYGINITDKALVAAAKISDRFIKDRYLPDKAIDLLNKACSFLQVQLSGKPRIIDVTERDIERLSYEISTLEKDVDKVSKKKYNKLIKEFEEKKEQLKKYYEEYVITGERLKRKKEIEKKLNDLKELTQNYVYSNKEPPIELQNSLKEAQQKYLELYKETVAYVEAKTHNAMNVDAVYQEHVSYIYLRDSGMPLGSLSFESSKGALKLYNSLSKSIIGNEDIIKSLSDAVVKAATGMKDPEKPIGTFLFLGPTGVGKTELAKTLAIELFNSKDNLIRVNMSEFTEAHSVSKITGSPPGYVGFSDSGQLTEAVREKPHSVVLFDELEKAHADVFKVLLQILGDGYINDNHRRNIDFSNTIIIMTSNLGAELFKKKLFFDADNSGTPEYKRVMEDVRLSLIKKCKKVFKPEFVNRIDKIGVFEPLNKKNLHKIVALRFKKLEKRLEEKNIQVSVSEKAIDYIIDQSYDPELGARPTLIFIESVIMTKFAIMYLKKELVDDMDVFVDYNSKAKNLVINLSKT |