

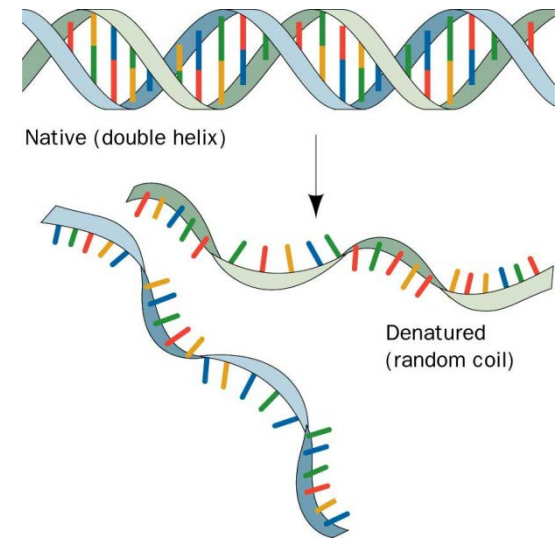
ÚVOD DO KVANTITATIVNÍ REAL-TIME PCR



V. Návrh primerů a sond

Hybridizace

- Úspěšný annealing sondy a primerů je kritický předpoklad úspěšné PCR
- Sekvence
- Koncentrace solí
- Tvorba heterodimerických stabilních struktur
- Párování bazí - nejen Watson a Crick
- Sekundární struktura
- Teplota tání DNA T_m





Melting temperature T_m

- jeden z nejdůležitějších parametrů, determinující annealingovou teplotu
- T_m – teplota, při které je 50% daného oligonukleotidu denaturováno
- „cooperativní melting“ – usnadněná denaturace po disociaci prvního páru bází
- Sekvence: $A=T < G \equiv C$

- Rychlost renaturace (a tedy i T_m) přímo úměrná délce řetězce a jeho koncentraci a nepřímo úměrná komplexitě molekuly (struktura)

- Elektrostatické interakce mezi fosfátovými molekulami
- kationty maskují + náboje fosfátů - vyšší iontová síla vede k vyšší T_m

Oligonukleotidy kratší než 20bp

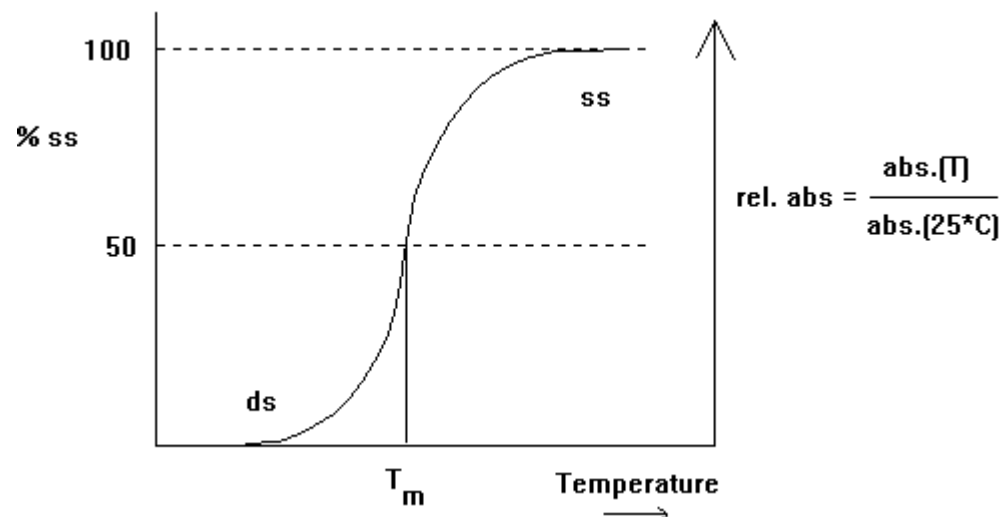
$$T_m = 2 \times (A+T) + 4 \times (G+C)$$

Iontová síla, %GC a délka řetězce (N)

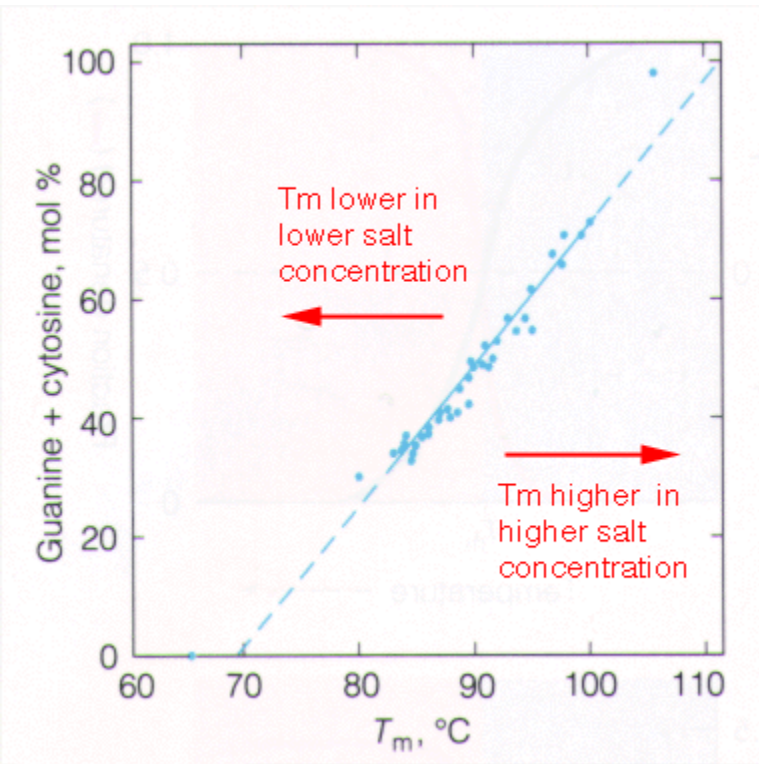
$$T_m = 81,5 + 16,6 (\log_{10}[\text{Na}^+] + 0,41(\%GC) - (625/N))$$

Web-based kalkulátory

<http://insilico.ehu.es/tm.php>



Melting temperature T_m



GCTATTCAACTGAAGAGGGGCACAGC

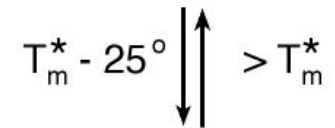
GCTATTCAACTG^GAGAGGGGCACAGC

+

+

CGATAAGTTGACTTCTCCCGTGTCG

CGATAAGTTGACTTCTCCCGTGTCG



GCTATTCAACTGAAGAGGGGCACAGC
CGATAAGTTGACTTCTCCCGTGTCG

GCTATTCAACTG^GAGAGGGGCACAGC
CGATAAGTTGAC_TTCTCCCGTGTCG

note: T_m^* is 4° lower than T_m

(In general, there is a 1° drop for every 1% mismatch)

Gibbsova (volná) energie a její změna (ΔG , ΔG^0)



- Schopnost látek jít do reakce
- Sekundární struktura DNA
- ΔG závisí na změně vnitřní energie a entropie
- Změna volné energie ΔG^0 (množství energie uvolněné nebo absorbované během reakce za stejné teploty a tlaku) - spontánní reakce - $\Delta G < 0$
- Znalost termodynamického příspěvku párování bazí, mismatches, volných konců, vlásenkových struktur a smyček – predikce parametrů hybridizace
- Predice sekundární struktury – *nearest neighbor*
 - *helix initiation factor* (GC/AT)
 - *helix propagation* energie nutná pro vytvoření následujícího hybridizačního páru
 - symetrie sekvence (duplexu)
 - *Loop regions* – smyčky, vlásenky, výdutě atd.

Faktory ovlivňující stabilitu DNA DNA/RNA duplexu

1. Počet odpovídajících párů bází

- Kombinace vodíkových můstků a hydrofobních interakcí
- Pozice a typ neodpovídajícího páru (*mismatch*)

2. Sekvence – *nearest neighbor*

3. Sekundární struktura

- Charakter cílové sekvence
- Kompetice primeru nebo sondy s komplementárním řetězcem cílového duplexu

4. Volné konce

- Interakce mezi 5' a 3' konci hybridizovaného oligonukleotidu a nejbližší sousedící báze

- Příklad:

ΔG^0 (GC) -0,96kcal/mol

ΔG^0 (AT) -0,50 kcal/mol

ΔG^0 W-C (TA/AT) -0,58kcal/mol

ΔG^0 W-C (GC/CG) -2,24 kcal/mol

GTAGACAATCTCCATCTCCTATCCTGATTAGAG

GTTAGAGGTAGAGGATAGGA

Faktory ovlivňující stabilitu DNA DNA/RNA duplexu

5. Iontová síla

- Koncentrace iontů, zejména Mg^{II+}
- Kationty kompenzují negativní náboj fosfátových skupin a usnadňují formování duplexu
- Stabilita duplexu (T_m) je úměrná koncentraci iontů

6. Teplota

- Se stoupající T je udržení duplexu energicky náročnější, po překročení určité T je preferována ssDNA – vyšší entropie celého systému

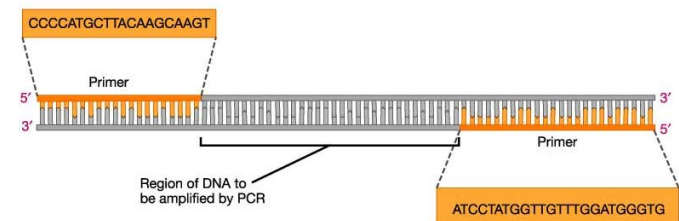
Není tedy nutná shodná T_m , ale shodná účinnost hybridizace obou primerů.

Primery se stejnou T_m , ale rozdílnou ΔG^0 , mohou vykazovat rozdílnou úspěšnost při tvorbě duplexu než primery s odpovídající ΔG^0 .

Design primerů

- Optimálně: primery jejichž 5'konce tvoří stabilní duplex, $\Delta G^0 < 10$ kcal/mol/37°C
- Plynulý přechod ΔG^0 směrem k 3'konci až k cca -6kcal/mol.
- Eliminace misprimingu (vzniklého hybridizací pouze 3'konce)
- Vyloučení repetitivních oblastí, které mohou tvořit sekundární struktury
- Komplementarita primerů – primer dimery
- Specifita – hybridizace k jedinečnému místu v genomu (BLASTn)

Vliv reakčního prostředí – i ideálně navržené primery mohou měnit své vlastnosti v závislosti na použitém PCR pufru a dalších parametrech PCR – vždy je nutná optimalizace jednotlivých PCR

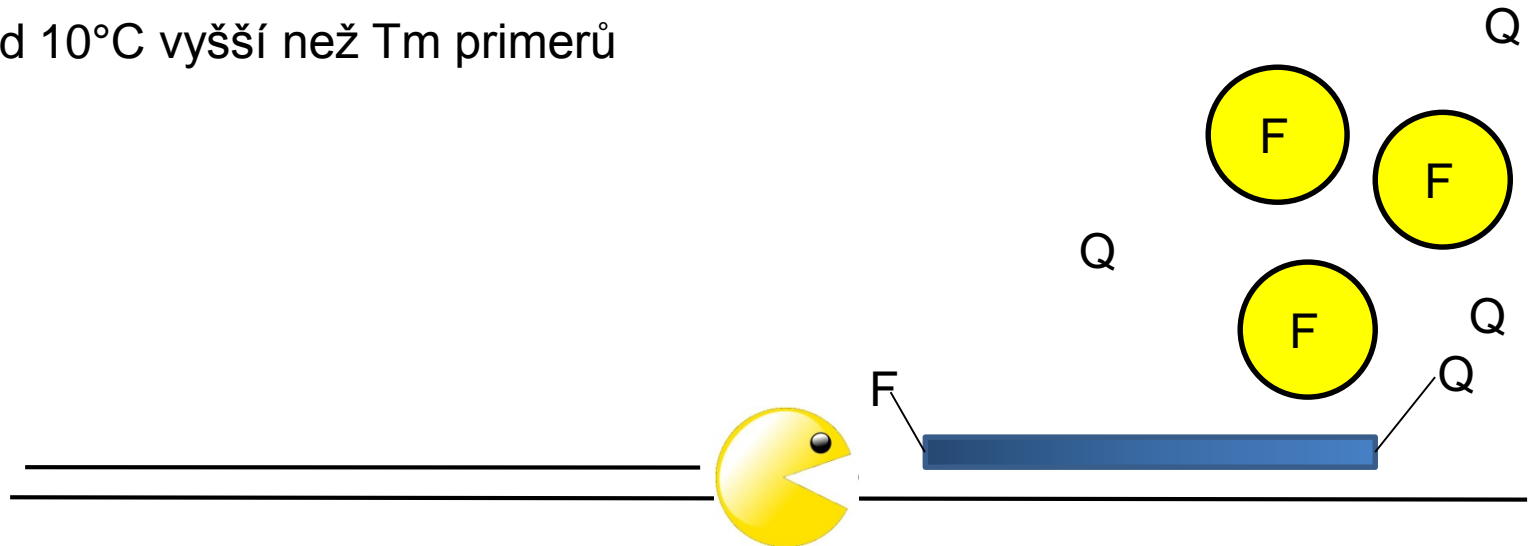


Design sond

- Různý design podle toho, zda je cílem kvantifikace DNA, mRNA nebo provedení alelické diskriminace nebo SNP
- Použitá chemie
- Detekce DNA, RNA nebo obou zároveň? Rozlišení HIV RNA od DNA začleněné do genomu
- Kombinace fluoroforu a zhášeče
- Modifikace sondy – LNA, PNA, MGB atd.
- Multiplex assay

Design hydrolyzačních sond

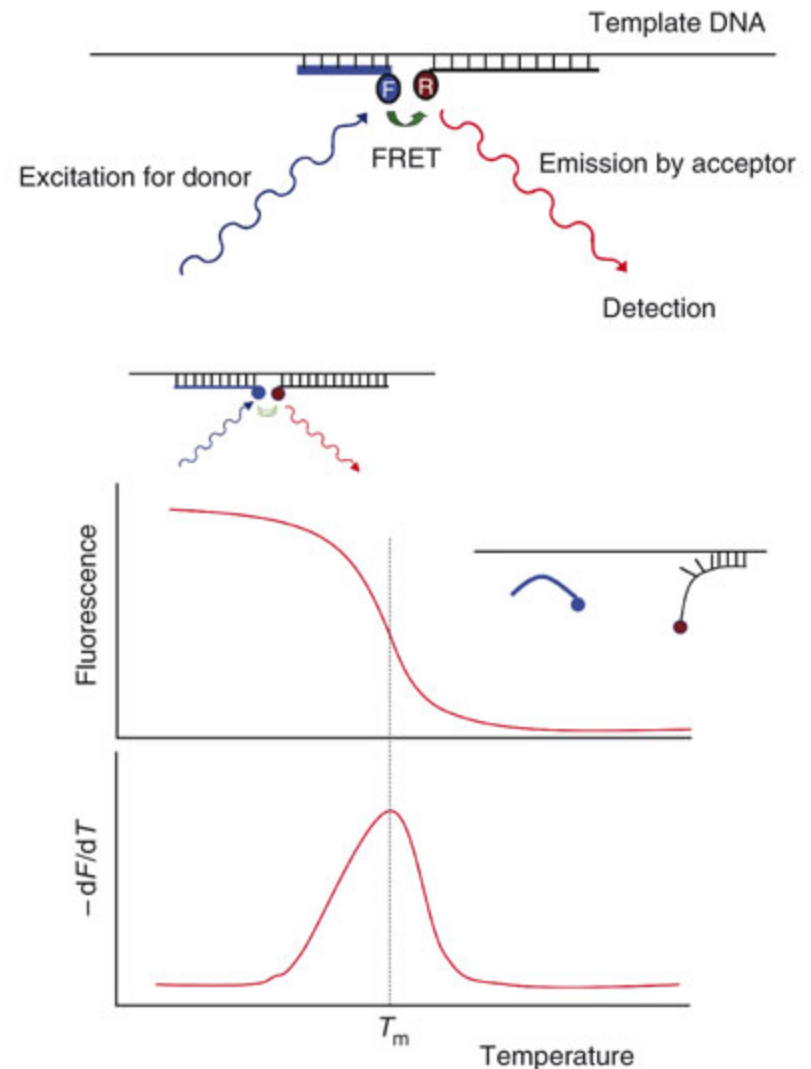
- qPCR TaqMan - dvoukrokový proces – denaturace a annealing/extension
- Co nejnižší Ct a nejvyšší ΔR (ΔR_n)
- Umístění 5' konce sondy v rámci stanovované sekvence co nejbližže 3' konci jednoho z primerů – účinné štěpení sondy
- Optimální délka do 30 nukleotidů, obsah GC do 30%
- AT bohaté sekvence – začlenění LNA, PNA nebo MGP
- G – účinný quencher
- Minimum repeticí, zejména GGGG, začlenění inosinu do repetice řeší tento problém
- T_m probe od 10°C vyšší než T_m primerů



Design hybridizačních sond

(Lightcycler probes)

- Sondy by měly být umístěny co nejdál od primeru 5' – odečet fluorescence v annealingové fázi
- GC 50%
- Každá sonda má délku 23-35bp
- Sondy o stejné T_m – musí se vázat současně ; T_m sond o 5-10°C vyšší než T_m primerů
- 3' konec akceptorové sondy fosforylován
- Donor FAM, akceptor Cy5 nebo Lightcycler Red 640/705
- Vzdálenost mezi sondami 1-5 bází (zajištění FRET)



Design molekulárních majáků

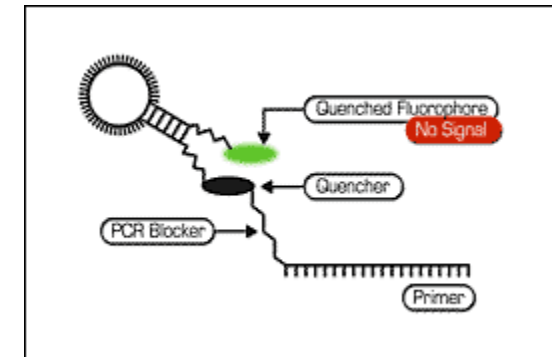
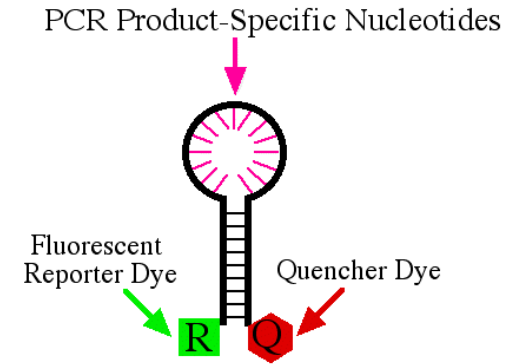
- Vazba majáku ideálně uprostřed ampliconu
- T_m komplementárních ramen o 7-10°C vyšší než T_m primerů
- Délka do 39 bp - omezení sekundárních struktur

Design scorpion primers

Sonda připojena k 5' konci primeru a je komplementární k nově syntetizovanému řetězci

- vlastní hybridizace sondy je intramolekulární událost
- 17-27bp; T_m sondy $< T_m$ primeru
- Cíl sondy – 0-20bp od 3' konce primeru
- Hairpin struktura
- výpočet ΔG pro uzavřenou i hybridizovanou formu

– MFold <http://www.bioinfo.rpi.edu/applications/mfold>



Design primerů

- Délka amplikonu, T_m , účinnost amplifikace i výtěžek
- Správná sekvence – BLASTn
- Sestřih – rozhraní exon/intron
- 3' konec – klíčový pro eventuální mispriming G/C
- Repetice (zejména GC)
- Sekundární struktura, intraprimer homology
- Obsah GC 35-65%
- Délka 15-25bp
- T_m 55-60°C
- ΔG do -10kcal/mol
- V případě převažujících AT – vhodné začlenění LNA
- Eventuální modifikace - na 5'konci

Design primerů a sond

Design primerů – web resources

Nový pár primerů

Nízká komplexita
sekvence (repetice)

Tm mimo rozsah

GC% mimo rozsah

Ne

Vysoká stabilita 3' konce

Ano

Vnitřní nebo vzájemná
komplementarita

Vysoké BLAST skóre

Primer – dimery

OK

Sequences producing significant alignments:
(Click headers to sort columns)

Accession	Description	Max score	Total score	Query coverage	E value	Max ident
Transcripts						
NM_005252.2	Homo sapiens v-fos FBJ murine osteosarcoma viral oncogene homolog (FOS), mRNA	40.1	40.1	100%	0.014	100%
XM_001718466.1	PREDICTED: Homo sapiens hypothetical protein LOC100128918 (LOC100128918), mRNA	32.2	32.2	80%	3.5	100%
XM_001717510.1	PREDICTED: Homo sapiens hypothetical protein LOC100128918 (LOC100128918), mRNA	32.2	32.2	80%	3.5	100%
XM_001716725.1	PREDICTED: Homo sapiens hypothetical protein LOC100128918 (LOC100128918), mRNA	32.2	32.2	80%	3.5	100%
NM_017780.2	Homo sapiens chromodomain helicase DNA binding protein 7 (CHD7), mRNA	30.2	30.2	75%	14	100%
NM_182923.3	Homo sapiens kinesin light chain 1 (KLC1), transcript variant 2, mRNA	30.2	30.2	75%	14	100%
NM_005552.4	Homo sapiens kinesin light chain 1 (KLC1), transcript variant 1, mRNA	30.2	30.2	75%	14	100%
XM_001726819.1	PREDICTED: Homo sapiens hypothetical protein LOC100131402 (LOC100131402), mRNA	28.2	28.2	70%	55	100%
XM_001725069.1	PREDICTED: Homo sapiens hypothetical protein LOC100131402 (LOC100131402), mRNA	28.2	28.2	70%	55	100%
Genomic sequences [show first]						
NW_001838113.2	Homo sapiens chromosome 14 genomic contig, alternate assembly (based on HuRef SCAF_11	40.1	901	100%	0.014	100%
NT_026437.11	Homo sapiens chromosome 14 genomic contig, reference assembly	40.1	3647	100%	0.014	100%
NW_001838847.2	Homo sapiens chromosome 2 genomic contig, alternate assembly (based on HuRef SCAF_110	34.2	258	100%	0.89	100%

Design primeru a sond

Design primeru – web resources

- Primer Bank

<http://pga.mgh.harvard.edu/primerbank/>

- RTPrimerDB

<http://medgen.ugent.be/rtpprimerdb/>

- Real Time PCR Primer Set

<http://www.realtimeprimers.org/>

- QPPD

<http://web.ncifcrf.gov/rtp/gel/primerdb/default.asp>

Primer Bank

PCR Primers for Gene Expression Detection and Quantification

Home/Search PCR Protocol Primer Statistics Comments Links Citation Policy Help/FAQ

Primer Search

Search for PCR Primers

Search where: GenBank Accession

Species: All Species

For text:

You can blast your sequence against the primerbank sequence DB [here](#).

Order Oligos

You can have primers synthesized and PCR reaction products sequenced at:

DNA Core Facility
Center for Computational and Integrative Biology

Quicksearch - Filter settings

RTPrimerDB is a public database for primer and probe sequences used in real-time PCR assays employing popular chemistries (RT-PCR, TaqMan, Hybridization Probes, Molecular Beacons) to provide time-consuming primer design and experimental optimization. RTPrimerDB introduces a certain level of uniformity and standardization among different laboratories. We strongly encourage researchers to submit their validated primer and probe sequences, so that other users can benefit from their expertise. The database can be [queried](#) using the official gene name or symbol, [accession](#) or [accession](#) Gene identifier, [SIC](#) identifier, or [oligonucleotide](#) sequence.

Different options make it possible to restrict a query to a particular application (Gene Expression Quantification/Detection, DNA Copy Number Quantification/Detection, SNP Detection, Mutation Analysis, Fusion Gene Quantification/Detection, Chromatin Immunoprecipitation (ChIP), Organism/Human, Mouse, Rat, and others) or [detect](#) [chemically](#). User permission is allowed after [free registration](#) where you obtain a login name and password.

Currently, [7756 real-time PCR assays](#) for 5397 genes are available, submitted by 164 people.

Last submission list

Publications

- PATTIN F, SPELDMAN F, DE PAERE A & VANDESCHAEPELE J (2003) RTPrimerDB: the Real-Time PCR primer and probe database. *Nucleic Acids Research*, 31(1): 120-123 [PubMed]
- PATTIN F, ROBBERSCHOT P, SPELDMAN F, DE PAERE A & VANDESCHAEPELE J (2004) RTPrimerDB: the Real-Time PCR primer and probe database, high update 2005. *Nucleic Acids Research*, 32(Database issue): D84-D88 [PubMed]
- LEFVERER S, VANDESCHAEPELE J, SPELDMAN F, PATTIN F (2006) RTPrimerDB: the portal for real-time PCR primers and probes. *Nucleic Acids Research*, Oct 23. [Epub ahead of print] [PubMed]

Real Time PCR Primer Sets

Validated Primer Sets for Quantitative Real Time PCR

Are you normalizing gene expression to just one housekeeping gene?

Set of 10 Validated Housekeeping Gene Primer Sets - **Only \$79.95**

Available at www.realtimeprimers.com

Real Time PCR Primer
Configure Sequence Detection Primers Online To Fit Your Needs.
www.AppliedBiosystems.com

Real-Time PCR Training
For students and professionals in Europe, USA and Asia.
www.tataa.com

Real Time PCR Assays
Custom designed for any gene. Highest quality validation process.
www.primersdesign.co.uk

QPCR MasterMix
QPCR MasterMix for Real-time PCR, TaqMan and SYBRgreen based assays.
www.biochain.com

As by Google

SYBR Green Primers | Hybridization Probes | Hydrolysis Probes

Molecular Beacons | Submit Primers/Probes | Links

Quantitative PCR Primer Database

Q P P D

QPPD Home | Search Primer | Submit Primer

Design primerů a sond

Design primerů a sond– web resources

- Primer 3

http://biotools.umassmed.edu/bioapps/primer3_www.cgi

The screenshot shows the 'Primer3: WWW primer tool' web interface. It includes a text input field for the 'Primer source sequence' and a 'Submit' button. Below the input field are several checkboxes for selecting primer types: 'Pick left primer on one left primer below', 'Pick both primers on one left primer below', 'Pick right primer on one right primer below', and 'Pick both primers on one right primer below'. There are also fields for 'Product Size' (Min, Opt, Max) and 'Number To Return'. A 'General Primer Picking Conditions' section contains various parameters like 'Primer Size', 'Primer Tm', 'Primer GC', 'Min Self-Complementarity', 'Max Self-Complementarity', 'Min GC', 'Max GC', 'GC Content', and 'GC Skew'. The interface is designed for users to input a DNA sequence and specify parameters for primer design.

- Primer Express

<http://www.appliedbiosystems.com>

- Premier Biosoft International

<http://www.premierbiosoft.com>

The screenshot shows the homepage of Premier Biosoft International. The header features the company logo and the tagline 'Software to Accelerate Research in Life Sciences'. Below the header is a navigation menu with links for 'HOME', 'COMPANY', 'PRODUCTS', 'SERVICES', 'DOWNLOAD', and 'ORDERING'. The main content area lists several software products, each with a small icon and a brief description of its capabilities:

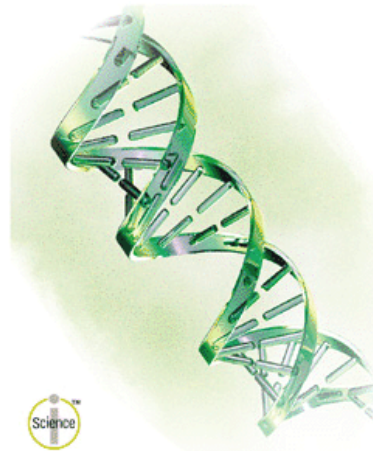
- AlleleID®** - Real Time PCR & Microarrays
- Array Designer** - Microarrays
- Beacon Designer™** - Real Time PCR Oligo Design
- PrimerPlex** - Oligo Design for xMAP® Based Multiplex Systems
- Primer Premier** - PCR Primer Design
- SimGlycan™** - MS/MS Data Analysis
- SimVector** - Draw Plasmid Maps & Plan Cloning Experiments
- TMA Foresight** - Tissue Microarray Data Analysis
- Xpression Primer** - Tagged Primer Design

Design primerů a sond

Návrh primerů a TaqMan sond – Primer Express

```
STS      /db_xref="UniSTS:47/415"  
1090..1143  
/gene="FOS"  
/gene_synonym="AP-1"  
/gene_synonym="C-FOS"  
/standard_name="BF250015A10G9"  
/db_xref="UniSTS:519218"  
  
ORIGIN  
1 atgatgttct cgggcttcaa cgcagactac gaggcgtcat cctcccgtg cagcagcgcg  
61 tcccggcgcg gggatagcct ctcttactac cactcaaccg cagactccct ctcceagatg  
121 ggctcgctcg tcaacgcgca ggaactctcg acggaactag ccgtctccag tgcgaacttc  
181 attcccacgg tcactgcat ctgcaccagt cgggaactgc agtggctgtg ggaagccgcg  
241 ctgctctctc ctgtggccc atcgcagacc agagccctc accctctcgg agtcccgcg  
301 cctcccgtg gggcttactc cagggtggc gttgtgaaga ccatgacagg aggcagcgcg  
361 cagagcattg gcaggagggg caaggtgaa cayttatctc cagaagaaga aganaaaagg  
421 agaattccgaa gggaaaggaa taagatggct gcagccaaat gccgcaaccg gagagggag  
481 ctgactgata cactccaagc ggagacagac caactagaag atgcaagtc tgccttgag  
541 accgagattg ccaactcgtc gaaggagaag gaaaaactag agtctatctc ggcagctcac  
601 cgacctcctc gcaagatccc tgatgacctg ggcttcccag aagagatgc tgtggcttcc  
661 cttgatctga ctgggggccc gccagaggtt gccaccggg agtctgagga ggccttcaac  
721 ctgctctctc tcaatgccc tgagcccaag cctcagtggg aacctgcaa gagcatcagc  
781 agcatggagc tgaagaccga gccctttgat gacttctgt tcccagatc atccaggccc  
841 agtggctctg agacagcccg ctcccggcca gacatggacc tatctgggtc cttctatgca  
901 gcagactggg agcctctgca cagtggctcc ctggggatgg ggcctatggc cacagagctg  
961 gagccccctg gcaactcggg ggtcactctg actcccagct gcaactgta cacgtcttcc  
1021 ttctgtctca cctaccgga ggcctactcc tccccagct gtgcagctgc ccaccgcaag  
1081 ggcagcagca gcaatgagcc ttctctgac tgcctcagct caccacagct gctggcctct  
1141 tga
```

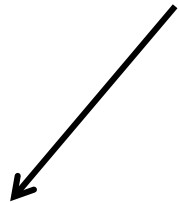
[Disclaimer](#) | [Write to the Help Desk](#)
[NCBI](#) | [NLM](#) | [NIH](#)



**Primer Express®
Software
for Real-Time PCR**

Version 3.0

©Copyright 2004, Applied Biosystems.
All rights reserved.



Primer Express 3.0

TaqMan® MGB Quantification # 1

Sequence Parameters Primers / Probes Order

File Name

Length 1143 bp. Selection 1144 to 1144 Double Stranded

ATGATGTTCT	CGGGCTTCAA	CGCAGACTAC	GAGGCCTCAT	CCTCCCCTG	50
CAGCAGCGCG	TCCCCGGCCG	GGGATAGCCT	CTCTTACTAC	CACCTACCCG	100
CAGACTCCTT	CTCCAGCATG	GGCTCGCCTG	TCAACCGCCA	GGAATCTTGC	150
ACGGACTTGG	CGGTCTCCAG	TGCCAACTTC	ATTCCCACGG	TCACTGCCAT	200
CTCGACCACT	CGGACCTGCG	AGTGGCTGGT	GCAGCCCGCC	CTGCTCTCCT	250
CTGTGGCCCC	ATCGCAGACC	AGAGCCCTTC	ACCCTTTCGG	AGTCCCCTGG	300
CCCTCGCTG	GGGCTTACTC	CAGGGCTGGC	GTGTGAAGA	CAATGACAGG	350
AGGCCGAGCG	CAGAGCATTG	GCAGGAGGGG	CAAGTGGAA	CAGTTATCTC	400
CAGAAGAAGA	AGAGAAAAGG	AGAATCCGAA	GGGAAAAGAA	TAAGATGGCT	450
GCAGCCAAAT	GCCCAACCGG	GAGGAGGGAG	CTGACTGATA	CACCTCAAGC	500
GGAGACAGAC	CAACTAGAAG	ATGAGAAGTC	TGCTTTGCGA	ACCGAGATTG	550
CCAACCTGCT	GAAAGGAAAG	GAAAAACTAG	AGTTCATCCT	GGCAGCTCAC	600
CGACTCGCCT	GCAAGATCCC	TGATGACCTG	GGCTTCCCAG	AAGAGATGTC	650
TGTGGCTTCC	CTTGATCTGA	CTGGGGCCCT	GCCAGAGGTT	GCCACCCCGG	700
AGTCTGAGGA	GGCCTTCAAC	CTGGCTTCTC	TCAATGACCC	TGAGCCCAAG	750
CCCTCAGTGG	AACCTGTCAA	GAGCATCAGC	AGCATGGAGC	TGAAAGCCGA	800
GGCCTTTGAT	GACTTCTGTG	TCCCAGATC	ATCCAGGCC	AGTGGCTCTG	850
AGACAGCCCG	CTCCGTGCCA	GACATGGACC	TATCTGGGTC	CTTCTATGCA	900
GCAGACTGGG	AGCCTCTGCA	CAGTGGCTCC	CTGGGGATGG	GGCCCATGGC	950

To find Primers & Probes, click the "Find Primers/Probes" button

Design primeru a sond

TaqMan® MGB Quantification # 1	
Sequence	Parameters / Primers / Probes / Order
Parameter	Value
<input type="checkbox"/> Primer Tm	
Min Primer Tm	58
Max Primer Tm	60
Max Difference in Tm of Two Primers	2
<input type="checkbox"/> Primer GC Content	
Min Primer %GC Content	30
Max Primer %GC Content	80
Max Primer 3' GC's	2
Primer 3' End Length	5
Primer 3' GC Clamp Residues	0
<input type="checkbox"/> Primer Length	
Min Primer Length	9
Max Primer Length	40
Optimal Primer Length	20
<input type="checkbox"/> Primer Composition	
Max Primer G Repeats	3
Max Num Ambig Residues in Primer	0
<input type="checkbox"/> Primer Secondary Structure	
Max Primer Consec Base Pair	4
Max Primer Total Base Pair	8
<input type="checkbox"/> Primer Site Uniqueness	
Max % Match in Primer	75
Max Consec Match in Primer	9
Max 3' Consec Match in Primer	7
<input type="checkbox"/> Probe Tm	
Min Probe Tm	68
Max Probe Tm	70
<input type="checkbox"/> Probe GC Content	
Min Probe %GC Content	30
Max Probe %GC Content	80
<input type="checkbox"/> Probe Length	
Min Probe Length	13
Max Probe Length	25
<input type="checkbox"/> Probe Composition	
Max Probe G Repeats	3
Max Num Ambig Residues in Probe	0
No G at 5' End in Probe	<input checked="" type="checkbox"/>
Select Probe with more C's than G's	<input type="checkbox"/>
<input type="checkbox"/> Probe Secondary Structure	
Max Probe Consec Base Pair	4
Max Probe Total Base Pair	8
<input type="checkbox"/> Amplicon	
Min Amplified Region Tm	0
Max Amplified Region Tm	85
Min Amplified Region Length	50
Max Amplified Region Length	150
<input type="checkbox"/> General	
Max Primers / Probes	50

Design primerů a sond

TaqMan® MGB Quantification # 1



Sequence Parameters Primers / Probes Order

Candidate Primers & Probes

#	Fwd Start	Fwd Stop	Fwd Len...	Fwd Tm	Fwd %GC	Fwd Seq	Rev Start	Rev Stop	Rev Len...	Rev Tm	Rev %GC	Rev Seq	Probe
1	162	181	20	58	55	CGTCTCCA...	217	199	19	58	63	GGTCCGGA...	183
2	161	180	20	59	60	CCGTCTCC...	217	199	19	58	63	GGTCCGGA...	182
3	161	180	20	59	60	CCGTCTCC...	217	199	19	58	63	GGTCCGGA...	183
4	745	762	18	58	61	CCCAAGCC...	809	790	20	59	55	TCAAAGGG...	765
5	745	762	18	58	61	CCCAAGCC...	809	790	20	59	55	TCAAAGGG...	765
6	745	762	18	58	61	CCCAAGCC...	809	790	20	59	55	TCAAAGGG...	765
7	800	822	23	60	48	AGCCCTTT...	864	847	18	59	67	GGAGCGGG...	827
8	800	822	23	60	48	AGCCCTTT...	864	847	18	59	67	GGAGCGGG...	828
9	800	822	23	60	48	AGCCCTTT...	864	847	18	59	67	GGAGCGGG...	829
10	745	762	18	58	61	CCCAAGCC...	810	791	20	58	50	ATCAAAGG...	765
11	745	762	18	58	61	CCCAAGCC...	810	791	20	58	50	ATCAAAGG...	765
12	745	762	18	58	61	CCCAAGCC...	810	791	20	58	50	ATCAAAGG...	765
13	745	762	18	58	61	CCCAAGCC...	810	790	21	59	52	ATCAAAGG...	765
14	745	762	18	58	61	CCCAAGCC...	810	790	21	59	52	ATCAAAGG...	765
15	745	762	18	58	61	CCCAAGCC...	810	790	21	59	52	ATCAAAGG...	765
16	799	821	23	60	48	GAGCCCTT...	864	847	18	59	67	GGAGCGGG...	827
17	799	821	23	60	48	GAGCCCTT...	864	847	18	59	67	GGAGCGGG...	828
18	799	821	23	60	48	GAGCCCTT...	864	847	18	59	67	GGAGCGGG...	829
19	745	762	18	58	61	CCCAAGCC...	811	792	20	58	55	CATCAAAG...	765
20	745	762	18	58	61	CCCAAGCC...	811	792	20	58	55	CATCAAAG...	765
21	745	762	18	58	61	CCCAAGCC...	811	792	20	58	55	CATCAAAG...	765
22	798	818	21	59	52	CGAGCCCT...	864	847	18	59	67	GGAGCGGG...	820
23	798	818	21	59	52	CGAGCCCT...	864	847	18	59	67	GGAGCGGG...	820
24	798	818	21	59	52	CGAGCCCT...	864	847	18	59	67	GGAGCGGG...	821
25	798	818	21	59	52	CGAGCCCT...	864	847	18	59	67	GGAGCGGG...	821
26	798	818	21	59	52	CGAGCCCT...	864	847	18	59	67	GGAGCGGG...	822
27	798	818	21	59	52	CGAGCCCT...	864	847	18	59	67	GGAGCGGG...	827
28	798	818	21	59	52	CGAGCCCT...	864	847	18	59	67	GGAGCGGG...	828
29	798	818	21	59	52	CGAGCCCT...	864	847	18	59	67	GGAGCGGG...	829
30	745	762	18	58	61	CCCAAGCC...	812	793	20	58	50	TCATCAA...	765
31	745	762	18	58	61	CCCAAGCC...	812	793	20	58	50	TCATCAA...	765

- Click to show Locations
- Click to show Secondary Structures

Design primerů a sond

Name	Value
<input type="checkbox"/> Forward Primers	
Total primers tested:	35792
GC test passed:	35149
Ambiguity test passed:	963
Clamp test passed:	963
Tm test passed:	963
Avoid Excluded regions test passed:	963
Repeat test passed:	900
Self compare test passed:	741
Limit GC test passed:	214
Sequence compare passed:	84
Reverse sequence compare passed:	83

<input type="checkbox"/> Reverse Primers	
Total primers tested:	35296
GC test passed:	34657
Ambiguity test passed:	946
Clamp test passed:	946
Tm test passed:	946
Avoid Excluded regions test passed:	946
Repeat test passed:	861
Self compare test passed:	703
Limit GC test passed:	205
Sequence compare passed:	95
Reverse sequence compare passed:	95
<input type="checkbox"/> Primer Pairs	
Total pairs tested:	7885
Amplicon Length test passed:	691
Avoid Excluded regions test passed:	691
Tm Difference test passed:	691
Amplicon Tm test passed:	630

<input type="checkbox"/> TaqMan Probes	
Total probes tested:	14450
GC test passed:	14128
Ambiguity test passed:	1178
Tm test passed:	1178
Avoid Excluded regions test passed:	1178
Repeat test passed:	1126
Self compare test passed:	1076
Sequence compare passed:	475
Reverse sequence compare passed:	458
Probe start test passed:	351

Design primeru a sond

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
#	Fwd Start	Fwd Stop	Fwd Length	Fwd Tm	Fwd %GC	Fwd Seq	Rev Start	Rev Stop	Rev Length	Rev Tm	Rev %GC	Rev Seq	Probe Start	Probe Stop	Probe Length	Probe Tm	Probe %GC	Probe Seq	Amp Tm	Amp %GC	Amp Ta	Amp Len	Penalty		
2	1	162	181	20	58	55 CGTCTCCAGTGGCCAACTTCA	217	199	19	58	63 GGTCGGACTGGTGCAGAT	183	197	15	69	67 TCCCAAGGTCACCTG	84	61	62	56	31				
3	2	161	180	20	59	60 CCGTCTCCAGTGGCCAACTTC	217	199	19	58	63 GGTCGGACTGGTGCAGAT	182	197	16	69	63 TTCCCAAGGTCATCGC	85	61	62	57	36				
4	3	161	180	20	59	60 CCGTCTCCAGTGGCCAACTTC	217	199	19	58	63 GGTCGGACTGGTGCAGAT	183	197	15	69	67 TCCCAAGGTCACCTG	85	61	62	57	36				
5	4	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	809	790	20	59	55 TCAAAGGGCTCGGTCTTCAG	765	780	16	68	50 TGTCAGAGCATCAGC	83	57	61	65	77				
6	5	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	809	790	20	59	55 TCAAAGGGCTCGGTCTTCAG	765	781	17	69	47 TGTCAGAGCATCAGCA	83	57	61	65	77				
7	6	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	809	790	20	59	55 TCAAAGGGCTCGGTCTTCAG	765	782	18	69	50 TGTCAGAGCATCAGCAG	83	57	61	65	77				
8	7	800	822	23	60	48 AGCCCTTTGATGACTTCTGTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	827	844	18	70	61 CATCATCAGGCCAGTGG	84	60	62	65	80				
9	8	800	822	23	60	48 AGCCCTTTGATGACTTCTGTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	828	845	18	70	61 ATCATCCAGGCCAGTGG	84	60	62	65	80				
10	9	800	822	23	60	48 AGCCCTTTGATGACTTCTGTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	829	845	17	69	65 TCATCCAGGCCAGTGG	84	60	62	65	80				
11	10	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	810	791	20	58	50 ATCAAAGGGCTCGGTCTTCA	765	780	16	68	50 TGTCAGAGCATCAGC	83	56	60	66	82				
12	11	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	810	791	20	58	50 ATCAAAGGGCTCGGTCTTCA	765	781	17	69	47 TGTCAGAGCATCAGCA	83	56	60	66	82				
13	12	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	810	791	20	58	50 ATCAAAGGGCTCGGTCTTCA	765	782	18	69	50 TGTCAGAGCATCAGCAG	83	56	60	66	82				
14	13	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	810	790	21	59	52 ATCAAAGGGCTCGGTCTTCAG	765	780	16	68	50 TGTCAGAGCATCAGC	83	56	60	66	83				
15	14	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	810	790	21	59	52 ATCAAAGGGCTCGGTCTTCAG	765	781	17	69	47 TGTCAGAGCATCAGCA	83	56	60	66	83				
16	15	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	810	790	21	59	52 ATCAAAGGGCTCGGTCTTCAG	765	782	18	69	50 TGTCAGAGCATCAGCAG	83	56	60	66	83				
17	16	799	821	23	60	48 GAGCCCTTTGATGACTTCTGTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	827	844	18	70	61 CATCATCAGGCCAGTGG	84	61	62	66	85				
18	17	799	821	23	60	48 GAGCCCTTTGATGACTTCTGTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	828	845	18	70	61 ATCATCCAGGCCAGTGG	84	61	62	66	85				
19	18	799	821	23	60	48 GAGCCCTTTGATGACTTCTGTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	829	845	17	69	65 TCATCCAGGCCAGTGG	84	61	62	66	85				
20	19	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	811	792	20	58	55 CATCAAAGGGCTCGGTCTTC	765	780	16	68	50 TGTCAGAGCATCAGC	83	57	61	67	87				
21	20	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	811	792	20	58	55 CATCAAAGGGCTCGGTCTTC	765	781	17	69	47 TGTCAGAGCATCAGCA	83	57	61	67	87				
22	21	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	811	792	20	58	55 CATCAAAGGGCTCGGTCTTC	765	782	18	69	50 TGTCAGAGCATCAGCAG	83	57	61	67	87				
23	22	798	818	21	59	52 CGAGCCCTTTGATGACTTCT	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	820	835	16	69	50 TTCCAGCATCATCCA	85	61	62	67	88				
24	23	798	818	21	59	52 CGAGCCCTTTGATGACTTCT	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	820	836	17	69	53 TTCCAGCATCATCCA	85	61	62	67	88				
25	24	798	818	21	59	52 CGAGCCCTTTGATGACTTCT	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	821	835	15	69	53 TCCAGCATCATCCA	85	61	62	67	88				
26	25	798	818	21	59	52 CGAGCCCTTTGATGACTTCT	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	821	836	16	69	56 TCCAGCATCATCCA	85	61	62	67	88				
27	26	798	818	21	59	52 CGAGCCCTTTGATGACTTCT	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	822	834	13	69	62 CCGAGCATCATCC	85	61	62	67	88				
28	27	798	818	21	59	52 CGAGCCCTTTGATGACTTCT	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	827	844	18	70	61 CATCATCAGGCCAGTGG	85	61	62	67	88				
29	28	798	818	21	59	52 CGAGCCCTTTGATGACTTCT	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	828	845	18	70	61 ATCATCCAGGCCAGTGG	85	61	62	67	88				
30	29	798	818	21	59	52 CGAGCCCTTTGATGACTTCT	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	829	845	17	69	65 TCATCCAGGCCAGTGG	85	61	62	67	88				
31	30	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	812	793	20	58	50 TCATCAAAGGGCTCGGTCTT	765	780	16	68	50 TGTCAGAGCATCAGC	82	56	60	68	92				
32	31	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	812	793	20	58	50 TCATCAAAGGGCTCGGTCTT	765	781	17	69	47 TGTCAGAGCATCAGCA	82	56	60	68	92				
33	32	745	762	18	58	61 CCCAAGCCCTCAGTGGAA	812	793	20	58	50 TCATCAAAGGGCTCGGTCTT	765	782	18	69	50 TGTCAGAGCATCAGCAG	82	56	60	68	92				
34	33	797	816	20	58	55 CCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	820	835	16	69	50 TTCCAGCATCATCCA	85	62	62	68	92				
35	34	797	816	20	58	55 CCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	820	836	17	69	53 TTCCAGCATCATCCA	85	62	62	68	92				
36	35	797	816	20	58	55 CCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	821	835	15	69	53 TCCAGCATCATCCA	85	62	62	68	92				
37	36	797	816	20	58	55 CCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	821	836	16	69	56 TCCAGCATCATCCA	85	62	62	68	92				
38	37	797	816	20	58	55 CCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	822	834	13	69	62 CCGAGCATCATCC	85	62	62	68	92				
39	38	797	816	20	58	55 CCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	822	836	15	68	60 CCGAGCATCATCCA	85	62	62	68	92				
40	39	797	816	20	58	55 CCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	823	837	15	68	60 CCAGCATCATCCAGG	85	62	62	68	92				
41	40	797	816	20	58	55 CCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	827	840	14	68	64 CATCATCAGGGCC	85	62	62	68	92				
42	41	797	816	20	58	55 CCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	827	842	16	68	63 CATCATCAGGCCAGTGG	85	62	62	68	92				
43	42	797	816	20	58	55 CCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	827	844	18	70	61 CATCATCAGGCCAGTGG	85	62	62	68	92				
44	43	797	816	20	58	55 CCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	828	845	18	70	61 ATCATCCAGGCCAGTGG	85	62	62	68	92				
45	44	797	816	20	58	55 CCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	829	845	17	69	65 TCATCCAGGCCAGTGG	85	62	62	68	92				
46	45	797	816	20	58	55 CCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	830	845	16	68	69 CATCCAGGCCAGTGG	85	62	62	68	92				
47	46	800	822	23	60	48 AGCCCTTTGATGACTTCTGTTC	867	851	17	59	71 CACGAGCGGGCTGTCT	827	844	18	70	61 CATCATCAGGCCAGTGG	84	60	62	68	96				
48	47	800	822	23	60	48 AGCCCTTTGATGACTTCTGTTC	867	851	17	59	71 CACGAGCGGGCTGTCT	828	845	18	70	61 ATCATCCAGGCCAGTGG	84	60	62	68	96				
49	48	800	822	23	60	48 AGCCCTTTGATGACTTCTGTTC	867	851	17	59	71 CACGAGCGGGCTGTCT	829	845	17	69	65 TCATCCAGGCCAGTGG	84	60	62	68	96				
50	49	796	816	21	59	52 ACCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	820	835	16	69	50 TTCCAGCATCATCCA	85	61	62	69	98				
51	50	796	816	21	59	52 ACCGAGCCCTTTGATGACTTC	864	847	18	59	67 GGAGCGGGCTGTCTCAGA	820	836	17	69	53 TTCCAGCATCATCCA	85	61	62	69	98				

Design primeru a sond

www.appliedbiosystems.com

Home Products Applications & Technologies Services Support Learning & Events Store Help

Log In or Register to see your product prices & to place orders. Enter search term All Categories

Products > Real-Time PCR > Gene Expression Assays, Plates & Arrays > Assays > TaqMan® Gene Expression Assays

TaqMan® Gene Expression Assays

Click a tab below to learn more about TaqMan Gene Expression Assays. To find and order assays, click the Search tab.

Ordering Information **Assay Search** Product Description Specifications Literature/Support Related Products

To begin, select a search method below

- Keyword:** Search by gene symbol, gene name, public accession number, biological process, or molecular function.
- Batch ID:** Search by uploading a file containing multiple assay IDs, RefSeq accession numbers, GenBank GI #s, LocusLink IDs, gene symbols, IMAGE Clone IDs, or species.

Search Help

Keyword Search | Batch ID Search

Search for in

Disable wildcard search

[Advanced Keyword Search](#)

Search Reset

Choose Species

Filter by Amplicon Lengths

- H. sapiens
- R. norvegicus
- M. musculus
- M. mulatta (Rhesus)
- D. rerio (Zebrafish)
- G. gallus (Chicken)
- S. scrofa (Pig)
- A. thaliana
- D. melanogaster
- C. elegans
- C. familiaris (Canine)
- B. taurus (Cow)
- O. cuniculus (Rabbit)
- Amplicon length less than 70
- Amplicon length between 71 and 85
- Amplicon length between 86 and 100
- Amplicon length greater than or equal to 101

Choose Set Membership

- Search All Assays (excludes Gene Copy Number Assays)
- Search Gene Copy Number Assays
- Limit Assay Sets to:

TARGET CLASS	ASSAY ATTRIBUTE	MICROARRAY VALIDATION	COLLABORATOR SETS
<input type="checkbox"/> Apoptosis	<input type="checkbox"/> Ambion siRNA	<input type="checkbox"/> 1700	<input type="checkbox"/> Immune Tolerance Network
<input type="checkbox"/> Fusion Transcripts	<input type="checkbox"/> Endogenous Controls	<input type="checkbox"/> 3' Most	<input type="checkbox"/> Mammalian Gene Collection

Ordering Information **Assay Search** Product Description Specifications Literature/Support Related Products

Your search for **C-Fos** in **All Text** returned **27 results**. (Species: Homo sapiens Amplicon Length: ALL Set Membership: ALL) If you wish to refine your search results by product availability, click a radio button below, and then click Filter Results. To filter your results by other criteria, select from the categories list to the left of your results.

Search Again

Previous | 1 | 2 | Next

View Results by Category

All Results/

Panther Classification:

- Panther Function (26)
- Panther Process (26)

Filter Results by availability

Inventoried Assays Made to order Assays Inventoried and Made to order Assays [Filter Results](#)

Please Log In to add products to your Shopping Basket/Favorites, configure a product, or to view products available for purchase in your country.



[Export Results](#) 25 items/page

Assay ID	Availability	Gene Symbol	Gene Name	Alias	RefSeq	GenBank mRNA	Species	Amplicon Length
1. Assay ID Details: Hs00170630_m1 Alignment Map siRNAs & Related Products	Inventoried	FOS	v-fos FBJ murine osteosarcoma viral oncogene homolog	AP-1 C-FOS	NM_005252.2	5 GenBank mRNAs	Homo sapiens	77
2. Assay ID Details: Hs99999140_m1	Inventoried	FOS	v-fos FBJ murine	AP-1 C-FOS	NM_005252.2	5 GenBank mRNAs	Homo sapiens	77

[Give us your Feedback](#)

Assay ID	Availability	Gene Symbol	Gene Name	Alias	RefSeq	GenBank mRNA	Species	Amplicon Length
1. Assay ID Details: Hs00170630_m1 Alignment Map siRNAs & Related Products	Inventoried	FOS	v-fos FBJ murine osteosarcoma viral oncogene homolog	AP-1 C-FOS	NM_005252.2	5 GenBank mRNAs	Homo sapiens	78
							Homo sapiens	67

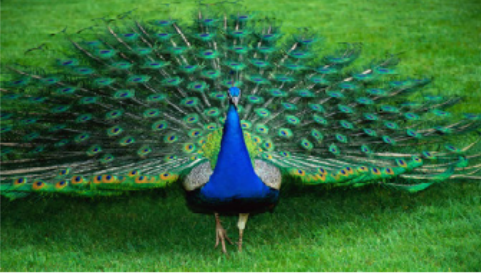
Design primerů a sond

Roche Applied Science  Czech Republic [Login](#) [Quick Order](#) [Shopping Cart](#) [Help](#) [Contact Us](#) 

[Home](#) [Products](#) [Special Interest Sites](#) [Support & Resources](#) [News](#)

[Home](#) > [Special Interest Sites](#) > [Genomic Systems](#) > [Real-Time PCR Systems](#) > **Universal ProbeLibrary System**

Universal ProbeLibrary



- ▼ Real-Time PCR Systems
 - ▶ LightCycler® Carousel-Based System
 - ▶ LightCycler® 480 System
 - ▼ **Universal ProbeLibrary System**
 - ▶ System Description
 - ▶ Technology
 - ▶ Assay Design Center
 - ▶ User Statements and Application
 - ▶ Assay List
 - ▶ Performance
 - ▶ Product List
 - ▶ Support
 - ▶ Literature and References
 - ▶ Multimedia Presentations
 - ▶ Product Information and Pack Inserts

Gene Expression Quantification with Real-Time PCR - Simple and Fast

- ◆ Design real-time qPCR assays online in seconds.
- ◆ Rely on just **165 prevalidated probes** for over five million qPCR assays for a large variety of organisms.
- ◆ Reduce the cost of gene expression analysis by performing **multiplex qPCR assays** with Universal ProbeLibrary Reference Gene Assays.

Universal ProbeLibrary for Human

Roche Applied Science

Specify your target(s):

[Advanced primer3 settings](#)

By sequence ID, gene name or keyword

e.g. ENST00000331789, NM_001101 or X00351 or beta-actin

or

By sequence

e.g.
>part of X00351 Human mRNA for beta-actin
CACGGCATCGTCACCAACTGGGACGACATGGAGAAAATCTGGCACCACACCTTCTACAAT
GAGCTGCGTGTGGCTCCCGAGGAGCACCCCGTGTGCTGACCGAGGCCCCCTGAACCCC
AAGGCCAACCGGAGAAAGATGACCCAGATCATGTTTGAGACCTTCAACACCCGACCATG
TACGTTGCTATCCAGGCTGTGCTATCCCTGTACGCCCTTGCCCGTACCCTGGCATCGTG
ATGGACTCCGGTGACGGGGTACCCACACTGTGCCATCTACGAGGGGTATGCCCTCCC

Automatically select an intron spanning assay. Design multiplex PCR with reference gene.

www.universalprobelibrary.com

Design primerü a sond

Please choose the sequence(s) you would like to continue with. You can select up to 10 sequences.

- ▼ Real-Time PCR Systems
 - ▶ LightCycler® Carousel-Based System
 - ▶ LightCycler® 480 System
- ▼ Universal ProbeLibrary System
 - ▶ System Description
 - ▶ Technology
- ▼ Assay Design Center
 - ▶ Pack Inserts
 - ▶ Assay Design Guide
 - ▶ Quick Reference
 - ▶ Probe No. Conversion
 - ▶ Need Help?
- ▶ User Statements and Application
- ▶ Assay List
- ▶ Performance
- ▶ Product List
- ▶ Support
- ▶ Literature and References
- ▶ Multimedia Presentations
- ▶ Product Information and Pack Inserts

	Name	Length	Description
<input type="checkbox"/>	ENST00000400991.1	2669	AL139130.28-201 Clone_based_ensembl_transcri Transcriptional activator of the c-fos promoter CROC4 (CROC-4). [Source:Uniprot/SPTREMBL;Acc:Q8N964]
<input type="checkbox"/>	ENST00000303562.2	2103	FOS-201 HGNC_automated_transcript Proto-oncog fos) (G0/G1 [Source:Uni
<input type="checkbox"/>	ENST00000297904.2	2110	FIGF-001 HG endothelial g (c-fos-induc [Source:Uni
<input type="checkbox"/>	NM_003367.2	1732	Homo sapie c-fos interac
<input type="checkbox"/>	NM_207291.1	1531	Homo sapie c-fos interac
<input type="checkbox"/>	NM_003131.2	4343	Homo sapie response el (SRF), mRN
<input type="checkbox"/>	NM_004469.2	2128	Homo sapie (vascular en mRNA.
<input type="checkbox"/>	AB022275.1	300	Homo sapie partial cds.
<input type="checkbox"/>	AB022276.1	700	Homo sapie partial cds.
<input type="checkbox"/>	AB209128.1	5672	Homo sapie (c-fos serum transcription
<input type="checkbox"/>	AF126533.1	238	Homo sapie

ProbeFinder has designed the optimal real-time PCR assay for:

[NM_003367.2](#) Homo sapiens upstream transcription factor 2, c-fos interacting (USF2), transcript variant 1, mRNA.

Assay details:

Use Universal ProbeLibrary probe: #26, cat.no. 04687574001

Primer	Length	Position	Tm	%GC	Sequence
Left Primer	18	449 - 466	60	67	gtgaccacaggtgggtgtg
Right Primer	21	540 - 560	59	43	tgaagggttttgatcacag

Amplicon (112 nt)

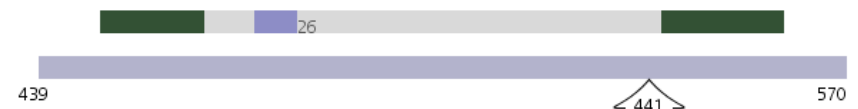
```
gtgaccacaggtgggtgtggaagggaagccagcagccgggccccgcctctgtg
ccccaggtcctgcagcgccttcccgtggtgtgatccaaaatccctca
```

[Download pack insert](#) [PDF report](#) [Text report](#) [Order probes or set](#)

Transcript overview:



Detailed view:



Design primerů a sond



Po dnešní přednášce:

- Rozumíte vlastnostem primerů i základních typů sond a znáte faktory, které ovlivňují jejich hybridizaci a účinnost
- Umíte navrhnout optimální sekvenci primerů i hydrolyzační sondy pomocí dostupných programů a rozumíte parametrům designu

