**THE 14-3-3 FAMILY OF PROTEINS** were originally isolated by Moore and Perez in 1967<sup>1</sup>. The name originated from the nomenclature of their systematic analysis of brain proteins, which were identified as a series of acidic proteins that had molecular masses of around 30 000 kDa and an isoelectric point of around 5 in the two-dimensional polyacrylamide gel electrophoresis (PAGE) system. Subsequent studies have indicated that the proteins exist in dimeric form.

High levels of the proteins were shown to exist in brain, particularly neuronal tissue, and it was initially thought that they were neuronal tissue specific. They have now been shown to be very widely distributed and low levels are expressed in most mammalian tissues. Proteins that show a high degree of similarity have been cloned and sequenced from a wide range of other eukaryotic organisms including plants, insects, amphibians and yeast.

Following the initial discovery period, the 14-3-3 field was relatively quiet for about ten years, until two groups unintentionally ran into these proteins. Isobe and his co-workers discovered that the major components of a brain extract that modifies tryptophan and tyrosine hydroxylase were several proteins which corresponded in size and charge to 14-3-3 proteins. The group then went on to purify seven 14-3-3 isoforms and also cloned the first 14-3-3 isoform. Independently, Aitken and coworkers found that brain protein(s) that inhibits phospholipid/Ca2+-dependent protein kinase C (PKC) were mem-

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REVIEWS

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A family of proteins known as 14-3-3 is currently receiving increased attention by investigators studying a broad range of biological systems, including plants and invertebrates. The outstanding feature of this family is the extraordinarily high sequence conservation observed. Current thinking indicates that these proteins may function as regulators in signal transduction/phosphorylation mechanisms.

bers of the 14-3-3 family. This effort led to the cloning of the second 14-3-3 isoform. Comparison of the sequences of these isoforms and fragments of others provided the first indication that isoforms of this family were remarkably similar. Other investigators have subsequently sequenced unknown proteins of special interest to them, only to discover another 14-3-3 isoform. All animal and plant tissues examined to date contain several isoforms.

Each mammalian 14-3-3 isoform has been assigned a Greek letter  $(\alpha - \eta)$ according to its sequential elution position after reverse-phase high-performance liquid chromatography (HPLC)<sup>2</sup>, which is very highly conserved across a range of mammalian species from rat, sheep and cow to humans. On the other hand, each isoform shows distinct differences in discrete regions (Fig. 1). Since the non-mammalian sequences also preserve the highly conserved 'motifs' it would appear that the protein family evolved and diverged before the separation of insects, plants, amphibians and mammals. Indeed, an evolutionary tree of the available sequences shows that the  $\varepsilon$  sequence is closer to the plant and yeast proteins than to the other mammalian isoforms (Fig. 2).

## **Distribution of isoforms**

The pattern of tissue distribution of 14-3-3 isoforms varies. Preliminary

analysis indicates that many isoforms are expressed in most tissues. There are very high levels of many isoforms in brain tissue, particularly in Purkinje cells in the cerebellum ( $\eta$  isoform)<sup>15</sup>. High levels of  $\beta$  and  $\gamma$  isoforms are also found, the latter of which may be brain specific<sup>5</sup>. There are also high levels of some isoforms in adrenal medulla and intestine, platelets and testis<sup>7,16</sup>. Novel isoforms are expressed in spleen. Another isoform is specific to skin, ear and tongue<sup>17</sup>. A subset of the family is expressed in fibroblasts; one of these is down-regulated in proliferating cells compared to SV40 transformed fibroblasts<sup>18</sup>, and two isoforms have been identified in the Golgi<sup>17</sup>. Members of the 14-3-3 family of proteins are thus found in an extremely broad range of organisms and tissues.

# Mammalian 14-3-3

The 14-3-3 family of proteins clearly has important role(s) in mammalian brain, where levels as high as 13.3 µg ml<sup>-1</sup> soluble protein (approximately 1%) have been measured<sup>19</sup>. However, no physiological function had been attributed to 14-3-3 until Ichimura and coworkers<sup>20</sup> showed that it was identical to an activator protein of tyrosine and tryptophan hydroxylases, the rate-limiting enzymes involved in catecholamine and serotonin neurotransmitter biosynthesis, respectively.

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Although tryosine hydroxylase is activated by PKC and cyclic-AMP (cAMP)dependent protein kinase phosphorylation, the 14-3-3 protein was necessary for activation after phosphorylation by Ca<sup>2+</sup>/calmodulin-dependent (CAM) kinase II. All three kinases phosphorylate an identical site on tyrosine hydroxylase<sup>21</sup>, but CAM kinase II phosphorylates an additional unique site. The proposed mechanism for activation involves the acidic carboxyl terminus of 14-3-3 binding to the regulatory domain of the phospho-form of the hydroxylase to induce an active conformation. This is a distinct second step in hydroxylase activation that is not required for the phosphorylation of the enzyme by CAM kinase II. In addition to this function, there are clearly other roles for 14-3-3. since it is found in tissues and cells that do not contain these hydroxylases.

The acidic proteins of 29-33 kDa isolated from sheep brain that are potent inhibitors of PKC (Ref. 22) were called KCIP-1 (kinase C inhibitor protein). A search of the EMBL database revealed that peptides sequenced from the KCIP-1 isoforms had a high degree of sequence identity with bovine brain 14-3-3 protein<sup>23</sup> and subsequent studies showed that they are members of the 14-3-3 family<sup>14</sup>. The inhibitory mechanism of KCIP-1 does not appear to involve competition with PKC, its substrates, ATP or co-factors [Ca<sup>2+</sup> or diacylglycerol (DAG)]. There was also no effect on [3H]phorbol dibutyrate binding, although the presence of the phorbol ester, TPA, could overcome this inhibition<sup>22</sup>.

Examination of the sequences in Fig. 1 suggests a possible mechanism for PKC inhibition. Residues 60-63 are reminiscent of part of the 'pseudosubstrate' domain of protein kinase C<sup>3</sup>. The pseudosubstrate hypothesis has been proposed to account for the inhibitory sequences in the regulatory domains of a wide range of second messengerdependent protein kinases. These sequences contain all the elements necessary for a recognition site for the particular kinase, but the phosphorylatable Ser or Thr is replaced by another residue, usually Ala. Competitive inhibition by this domain is relieved by the conformational change induced by second messenger binding. It should be noted that Ser residues at positions 64 and 65 are potential substrate sites for PKC, while cAMP-dependent kinase and Ca2+/calmodulin kinase could phosphorylate Ser65 and Ser70, respectively. A subset of the KCIP/14-3-3 family is in

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÷	AC. MDUREDLY I QARLAEQAERIDERVESHARVAGHDV EDIVEERVILLEVAI
Š	AC ADREDU ARAMABAGARTIDARACIASVI EGGA
	AC. GDREGELQRARIAEGAER TUDMASAMKAVIELNE. PESNEDRNELSVAT
Oorothoro	AC.MERTELIQRARLAEQAERIDDMATCMRAVTEQGAEESNEERNEESVAY
barlov	MATAF SFREENVILLARLABOAET BENVEFMEN CAAADSEELTVEERNEESVAT
D14 2 2	MSTALATREENVIMARLAE OAERVEEMVEEMVERMERVARTADVGELTVEERNILSVAT
D14-3-3	MSTVDREELVQKAKLAEOSERYDDMAQAMKSVTETGVELSNEERNLLSVAY
Xenopus	AKLSEQAERYDDMAASMKAVI'ELGAELSNEERNLLSVAY
yeast	MSTSREDSVYLAKLAEQAERYEEMVENMKTVASSGQ.ELSVEERNLLSVAY
consensus	mdreelvqkAkLAEQaERYddMaeaMkaVteqgaeLsnEeRNLLSVAY
	56 110
ß	KNVVGARRSSWRVISSIEQKTERNEKKQQMGK.EYREKIEAELQDICNDVLQL
Ŷ	KNVVGARRSSWRVISSIEOKTSADGNEKKIEMVR.AYREKTEKELEAVCODVLSL
Ē	KNVIGARRASWRIISSIEOKEENKGGEDKLKMIR, EVROMVETELKLICCDILDV
ž	KNUVGARRSSWRVVSSLEOKTE, GAEKKOOMAR, FYREKLETELRDICNDVLSL
3 11	KNUVGARESSNRVISSIEGEMADCNEKKI KVVK AVDEKEKKI DUVGADU
T cell	VMR/CCDES.UDUTCCTUCK
Opnothere	WHITCADDACHDTICCARDONDECDCHDDUUCUTD DUCCUTDEL
barlou	ANVIGARASWATISSIEUREESKGNUUHVSTIR. UYKSKIETELSNICGGILKL
Dianey	ANVIGARKASWRIISSIEQKEESRGNEAYVASIK.EYRTRIETELSKICDGILKL
Vitt-3-3	KNVVGARRSSWRVISSIEQKTEASARKQQLAR.EYRERVEKELREICYEVLGL
∧enopus	KNVVGARRSSWRVISSIEQKTEGNDKRQQMAR.EYREKVETELQDICKDVLDL
yeast	KNVIGARRASWRIVSSIEQKEESKEKSEHQVELICSYRSKIETELTKISDDILSV
consensus	KNVvGaRRssWRviSSIEQKteqnekkqqmir.eYRekiEtELrdicndvLsl
psubstrate	RKGALROK
	111 1/5
β	LDAYLIPNATOP. ESKVPYLKMKGDIFRYLSEVASGDNKOTTVSNSQQAYQEAF
Ŷ	LDNYLIKNCSETQIESKVFYLKMKGDYYKYLAEVATGEKRATVVESSEKAYSEAH
e	LDKHLIPAANTGESKVFYYKMKGDYHRYLAEFATGNDRKEAAENSLVAYKAAS
<u>አ</u>	LEKFLIPNRSQP <mark>ESKVFYLKMKGDYYRYLAEVA</mark> AGDDKKGIVDQSQQAYQEAF
η	LDKFLIKNCNDFQY <u>ESKVFYLKMKGD</u> YYRYLAEVASGEKKNSVVEASEAAYKEAF
T cell	LDKYLIANATNPESKVFYLKMKGDYFRYLAEVACGDDRKQTIDNSQGAYQEAF
Oenothera	LDSRLIPSAASGDSKVFYLKMKGDYHRYLAEFKTGAERKEAAESTLSAYKAAQ
harley	
Dancy	DDDIDVFDATAA. BOAVE FERRIAGETAATEAATEAATAATAATAATAATAATAATAA
D14-3-3	LDSHLVF SATAAESKVFYLKMKGDYYRYLAEVATGDARNTVVDDSOTAYODAF
D14-3-3 Xenopus	LDKYLIPKASNPESKVFYLKMKGDYYRYLAEVATGDARNTVVDDSQTAYQDAF LDKYLIPKASNPESKVFYLKMKGDYYRYLAEVATGDARNTVVDDSQTAYQDAF
D14-3-3 Xenopus veast	LDSHLIPSATAR. ESKVFYLKKKGDYHKILAEFAGABAKEAAENTLVAIKSAQ LDKYLIPKASNP. ESKVFYLKKKGDYYRYLAEVATGDARNTVVDDSQTAYQDAF LDRFLVPNATPP. ESKVFYLKKKGDYYRYLSEVASGDSKQETVASSQAYQEAF LDSHLIPSATTG. ESKVFYLKKKGDYHHYLAFFSSGDAREKATNASLEAYKTAS
D14-3-3 Xenopus yeast consensus	LDSHLVFJATAR. ESKVFJLMKGDY HKILAEF KAGAEKKEARDTLVATKSAQ LDKYLIPKASNP. ESKVFYLKMKGDY YRYLAEVATGDARNTVVDDSQTAYQDAF LDRFLVPNATPP. ESKVFYLKMKGDY YRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG. ESKVFYLKMKGDYHHYLAEFSSGDAREKATNASLEAYKTAS LdKvLipnat.p. eSKVFYLKMKGDYUHYLAEVATGddrkeavensggAYkeAf
D14-3-3 Xenopus yeast consensus annexin	LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKAEAAENTLVATKSAQ LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKQETVASSQQAYQEAF LDRFLVPNATPPFSKVFYLKMKGDYHYLSEVASGDKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYYLBEVAtGddrkeavensqQAYkeAf
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus	LDKYLIPKASNPESKVFYLKMKGDYYRYLAEVATGDARNTVVDDSQTAYQDAF LDRFLVPNATPPESKVFYLKMKGDYYRYLAEVATGDARNTVVDDSQTAYQDAF LDRFLVPNATPPESKVFYLKMKGDYYRYLESVASGDSKQETVASSQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYYYLAEVAtGddrkeavensqqAYkeAf SGDYKKALLLL.CGEDD
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus	LDSHLIPKASNPESKVFYLKMKGDYYRYLAEVATGDARNTVVDDSQTAYQDAF LDRYLIPKASNPESKVFYLKMKGDYYRYLAEVATGDARNTVVDDSQTAYQDAF LDRFLVPNATPPESKVFYLKMKGDYYRYLAEVSGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYYRYLAEVSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYYYLAEVGCGdrkeavensqqAYkeAf SGDYKKALLLL.CGEDD 166 220
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus	LDSHLUPATARA. ISKVFILKMKGDYNRYLAEVAGAEKAEAAENTLVATKSAQ LDKYLIPKASNPESKVFYLKMKGDYNRYLAEVATGDARNTVVDDSQTAYQDAF LDRFLVPNATPPPSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LDSHLIPSATTGESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYYYLAEVAtGddrkeavensgqAYkeAf SGDYKKALLL.CGEDD 166 220 EISKKEMOPTHPIRLGLALNESVFYYEILNSPEKACSLAKTAFDEATAFLOTINE
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β	LDKYLIPKASNPESKVFYLKMKGDYRYLAEVAGAEKAEAAENTLVARSAQ LDKYLIPKASNPESKVFYLKMKGDYRYLAEVATGDARNTVVDDSQTAYQDAF LDRFLVPNATPPESKVFYLKMKGDYHYLAEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYYYLAEVAtGdfreavensgqAYkeAf SGDYKKALLL.CGEDD 166 220 EISKKEMQPTHPIRLGLALNFSVFYYEINSPEKACSLAKTAPDEAIAELDINE EISKKEMQPTHPIRLGLALNFSVFYYEINSPEKACSLAKTAPDEAIAELDINE
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D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β γ	LDSHLYLIPKASNPESKVFYLKMKGDYNYLLEVAGAEKAEAAENTLVATKSAQ LDKYLIPKASNPESKVFYLKMKGDYNYLSEVATGDARNTVVDDSQTAYQDAF LDRFLVPNATPPFSKVFYLKMKGDYHYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLAFFSSGDAREKATMASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYYYLIEVGGdrkeavensgqAYkeAf SGDYKKALLL.CGEDD 166 220 EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DIAMTELPFTHPIRLGLALNFSVFYYEILNSPEACRLAKTAFDDAIAELDTINE DIAMTELPFTHPIRLGLALNFSVFYYEILNSPEACRLAKTAFDDAIAELDTINE
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D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β γ ε ε	LDKYLIPKASNP. ESKVFYLKMKGDYRYLAEVAGAEKAEAAENTUVATSAQ LDKYLIPKASNP. ESKVFYLKMKGDYRYLAEVATGDARNTVVDDSQTAYQDAF LDRFLVPNATPP. ESKVFYLKMKGDYRYLAEVATGDARNTVVDDSQTAYQDAF LDSHLIPSATTG. ESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYYYLAEVAGGdrkeavensgqAYkeAf SGDYKKALLL.CGEDD 166 220 EISKKEMQPTHPIRLGLALNFSVFYYEINSPEKACSLAKTAFDEAIAELDTINE EISKEHMQPTHPIRLGLALNFSVFYYEINSPEKACSLAKTAFDEAIAELDTINE DIAMTELPPTHPIRLGLALNFSVFYYEINSPEKACSLAKTAFDEAIAELDTISE EISKKEMQPTHPIRLGLALNFSVFYYEINSPEKACSLAKTAFDEAIAELDTISE EISKKEMQPTHPIRLGLALNFSVFYYEINSPEKACSLAKTAFDEAIAELDTISE EISKKEMQPTHPIRLGLALNFSVFYYEINSPEKACSLAKTAFDEAIAELDTISE
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D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley	LDSUL VARABARA SAVETIKAKGDY KILAEVAGABARABARABARALAAN TAVATASAQ LDKYLIPKASNPESKVFYLKMKGDY KYLAEVAGABARNTVVDDSQTAYQDAF LDRFLVPNATPPFSKVFYLKMKGDY HYLAEFSSGDAREKATNASLEAYKTAS LdKyLipnat.pESKVFYLKMKGDY HYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.pESKVFYLEILNSPEKACSLAKTAFDEAIAELDTI.NE EISKEHMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTI.NE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTI.NE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPERACSLAKTAFDEAIAELDTI.NE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPERACNLAKQAFDEAIAELDTI.NE DIANAELAPTHPIRLGLALNFSVFYYEILNSPERACNLAKQAFDEAIAELDTI.NE DIANAELAPTHPIRLGLALNFSVFYYEILNSPERACNLAKQAFDEAIAELDTI.NE
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β γ ε ξ η T cell Oenothera barley D14-3-3	LDSUL VARASAP. ISSVFTUKKKGDY KYLAEVAGGARALAARDI VARASAQ LDKYLIPKASNP. ISSVFTUKKKGDY KYLAEVATGDARNTVVDDSQTAYQDAF LDRFLVPNATPP. SSVFYLKKKGDY HYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.p. SSVFYLKKKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.p. SSVFYLKKKGDYYYLAEVAGGdrkeavensgqAykeAf SGDYKKALLLL.CGEDD 20 EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKEHMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKEHMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKEHMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKEHMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKEHMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKEHMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKEHMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKEMQPTHPIRLGLALNFSVFYYEILNSPERACLAKQAFDEAIAELDTINE DIANAELAPTHPIRLGLALNFSVFYYEILNSPERACNLANEAFDEAIAELDTINE DIALALPTHPIRLGLALNFSVFYYEILNSPERACNLAKCAFDEAIAELDTISE EISKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLAKCAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLAKCAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLAKCAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLAKCAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLAKCAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLAKCAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLAKCAFDEAIAELDTINE
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus	LDSUL VALKARANDAL SKVFYLKNKGDY KYLAEVAGARALAARDI VALKAAQ LDKYLIPKASNPESKVFYLKNKGDY KYLAEVAGARNTVVDDSQTAYQDAF LDRFLVPNATPPFSKVFYLKNKGDY HYLAEFSSGDAREKATNASLEAYKTAS LDSHLIPSATTGESKVFYLKNKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKNKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKNKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKNKGDYHYLAEFSSGDAREKATNASLEAYKTAS SGDYKKALLL.CGEDD 20 EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKEHMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKEHMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKEHMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKEHMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKCAFDEAIAELDTISE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKCAFDEAIAELDTISE DIALADLFTHPIRLGLALNFSVFYYEILNSPDRACNLAKCAFDEAIAELDTISE DISKGKMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKCAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKCAFDEAIAELDTINE DISKSEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKCAFDEAIAELDTINE DISKSEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKCAFDEAIAELDTINE DISKSEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKCAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKCAFDEAIAELDTINE
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast	LDKYLIPKASNPESKVFYLKMKGDY KYLAEVAGAEKALAAENTLVATKSAQ LDKYLIPKASNPESKVFYLKMKGDY KYLAEVAGAEKANTVVDDSQTAYQDAF LDRFLVPNATPPFSKVFYLKMKGDY HYLAEFSSGDAREKATNASLEAYKTAS LDSHLIPSATTGESKVFYLKMKGDY HYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDY HYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDY HYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDY HYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDY HYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDY HYLAEFSSGDAREKATNASLEAYKTAS LGKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEATAELDTINE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEATAELDTI.SE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEATAELDTI.SE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEATAELDTI.SE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEATAELDTI.NE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEATAELDTI.NE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPORACNLANEAFDEATAELDTI.NE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPORACNLANEAFDEATAELDTI.NE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPORACNLANEAFDEATAELDTI.NE DISKGKQPTHPIRLGLALNFSVFYYEILNSPORACNLANEAFDEATAELDTI.NE DISKGKQPTHPIRLGLALNFSVFYYEILNSPORACNLANEAFDEATAELDTI.NE EISKEMQPTHPIRLGLALNFSVFYYEILNSPORACNLANEAFDEATAELDTI.NE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPORACNLANEAFDEATAELDTI.NE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPORACNLAKQAFDEATAELDTI.NE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPORACNLAKQAFDEATAELDTI.NE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPORACNLAKQAFDEATAELDTI.NE
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β γ ε ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus	LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKALAKALTUVATASDQ LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKALTASNTVVDDSQTAYQDAF LDRFLVPNATPPESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYNYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYNYLSEVASGDAREKATMASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYYYLSEVASGDAREKATMASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYYYLSEVASGDAREKATMASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYYYLSEVASGDAREKATMASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYYYLSEVASGDAREKATMASLEAYKTAS 166 220 EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKEHMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLANEAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLAKAFDDAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLAKAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLAKQAFDEAIAELDTINE EISKGKMQPTHPIRLGLALNFSVFYYEILNSPERACNLAKQAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPERACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPERACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPERACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPERACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEINSPERACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEINSPERACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEINSPERACSLAKSAFDEAIAELDTINE EISKEMQPTHPIRLGLALNFSVFYYEINSPERACSLAKSAFDEAIAELDTINE EISKEMQPTHPIRLGLALNFSVFYYEINSPERACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEINSPERACSLAKSAFDEAIAELDTINE EISKEMQPTHPIRLGLALNFSVFYYEINSPERACSLAKSAFDEAIAELDTINE EISKEMQPTHPIRLGLALNFSVFYYEINSPERACSLAKSAFDEAIAELDTINE EISKEMQPTHPIRLGLALNFSVFYYEINSPERACSLAKSAFDEAIAELDTINE EISKEMQPTHPIRLGLALNFSVFYYEINSPERACSLAKSAFDEAIAELDTINE EISKEMQPTHPIRLGLALNFSVFYYEINSPERACSLAKSAFDEAIAELDTINE EISKEMQPTHPIRLGLALNFSVFYYEINSPERACSLAKAFDEAIAELDTINE
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus	LDKYLIPKASNPESKVFYLKMKGDY KYLAEVAGAEKALAARNIVVDSQTAYQDAF LDRYLVPNATPPESKVFYLKMKGDY KYLAEVATGDARNTVVDDSQTAYQDAF LDRFLVPNATPPESKVFYLKMKGDY HYLAEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLAEFSSGDAREKATMASLEAYKTAS LdkyLipnat.pesKVFYLKMKGDYHYLAEFSSGDAREKATMASLEAYKTAS LdkyLipnat.pesKVFYLKMKGDYHYLAEFSSGDAREKATMASLEAYKTAS LdkyLipnat.pesKVFYLKMKGDYYYLAEVAGGdrkeavensgqAYkeAf SGDYKKALLL.CGEDD 166 220 EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DIAMTELPPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE DIAKAELAPTHPIRLGLALNFSVFYYEILNSPDRACNLANEAFDEAIAELDTISE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPDRACNLANEAFDEAIAELDTISE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPDRACNLANEAFDEAIAELDTISE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPDRACNLANEAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPDRACNLAKCAFDEAIAELDTINE DISKGKMQPTHPIRLGLALNFSVFYYEILNSPDRACNLAKCAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPDRACNLAKCAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPDRACNLAKCAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEAIAELDTINE
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus	LDKYLIPKASNPESKVFYLKMKGDY KYLAEVAGDAKALAAKNIVANTAVDAS LDKYLIPKASNPESKVFYLKMKGDY KYLAEVAGDAKNTVVDDSQTAYQDAF LDRFLVPNATPPFSKVFYLKMKGDY HYLAEFSSGDAREKATNASLEAYKTAS LDSHLIPSATTGESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LGKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DIAMTELPPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKGAFDAAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKGAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKGAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKGAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKGAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKGAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKGAFDEAIAELDTINE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKGAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKGAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKGAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKAFDEAIAELDTINE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKAFDEAIAELDTINE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAK.AFDEAIAELDTINE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAK.AFDEAIAELDTINE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAK.AFDEAIAELDTINE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAK.AFDEAIAELDTINE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAK.AFDEAIAELDTINE
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ζ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus	LDKYLIPKASNP ESKVFYLKMKGDY NYLAEVATGDARALMARNTVVDDSQTAYQDAF LDRYLVPNATPP ESKVFYLKMKGDY NYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDY NYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDY NYLAEFSSGDAREKATMASLEAYKTAS LdkyLipnat.p eSKVFYLKMKGDYYYLJEVATGddrkeavensgqAykeAf SGDYKKALLL.CGEDD 166 220 EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKEHMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DIAMTELPPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKQAFDDAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKQAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKQAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKQAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKQAFDEAIAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKQAFDEAIAELDTINE DISKGKMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKQAFDDAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKQAFDDAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKQAFDDAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKQAFDDAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLAKQAFDDAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEINSFNCGLAEGEN
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β γ ε ζ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus	LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKALAKALAKITUVATSAQ LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKQETVASSQQAYQEAF LDRFLVPNATPPESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLAFFSSGDAREKATMASLEAYKTAS LdkyLipnat.pesKVFYLKMKGDYYYLJEFSSGDAREKATMASLEAYKTAS LdkyLipnat.pesKVFYLKMKGDYYYLJEVATGddrkeavensgqAYkeAf SGDYKKALLL.CGEDD 166 220 EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DIAMTELPPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DIAMTELPPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIAELDTINE EISKKEMQPTHPIRLGLALNFSNFYENG
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus	LDKYLIPKASNP ESKVFYLKMKGDY KYLAEVAGDENALAARNIV VDASQAYQDAF LDRYLVPNATPP ESKVFYLKMKGDY KYLAEVAGDAKNTVVDDSQAYQDAF LDRFLVPNATPP ESKVFYLKMKGDY HYLAEFSSGDAREKATNASLEAYKTAS LdKyLipnat.p ESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.p ESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.p ESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.p ESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.p ESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.p ESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.p ESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.p ESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LGKKMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTI.SE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTI.SE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTI.EE DIALADLFTHPIRLGLALNFSVFYYEILNSPERACNLAKQAFDEAIAELDTI.EE DIALADLFTHPIRLGLALNFSVFYYEILNSPERACNLAKQAFDEAIAELDTI.NE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTI.NE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTI.NE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSLAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSLAFDEAIAELDTINE EISKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSLAFDEAIAELDTINE EISKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSLAKSAFDEAIAELDTINE DISKGK
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ζ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus	LDKYLIPKASNPESKVFYLKMKGDY NYLAEVAGDEAKALAARNIVVDSQTAYQDAF LDRYLVPAATPPESKVFYLKMKGDY NYLAEVAGDAKNTVVDDSQTAYQDAF LDRFLVPNATPPESKVFYLKMKGDY NYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.geSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.geSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.geSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEATAFDEATAELDTINE EISKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEATAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEATAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPDRACNLAKQAFDEATAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPDRACNLAKQAFDEATAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEATAELDTINE EISKKEMQDTHVILEDNITLWTSDMCGGEEQNKEALQVEDENQ ES
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β γ ε ζ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus β γ ε ξ	LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKALAKALAKITLVATASAQ LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLAFFSSGDAREKATMASLEAYKTAS LdkyLipnat.pesKVFYLKMKGDYYYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLAFFSSGDAREKATMASLEAYKTAS LdkyLipnat.pesKVFYLKMKGDYYYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLSEVASGDAREKATMASLEAYKTAS LdkyLipnat.pesKVFYLKMKGDYYYLSEVASGDAREKATMASLEAYKTAS LdkyLipnat.pesKVFYLKMKGDYYYLSEVASGDAREKATMASLEAYKTAS LdkyLipnat.pesKVFYLKMKGDYYYLSEVASGDAREKATMASLEAYKTAS LdkyLipnat.pesKVFYLKMKGDYYYLSEVASGDAREKATMASLEAYKTAS LdkyLipnat.pesKVFYLKLANSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLANEAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLANEAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLANEAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIRELDTINE EISKKEMOPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEINSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRTSDQGDEGARGEGEN DSYKDSTLIMQLLRDNLTLWTSDMQGDEGENKEALQDVEDENQ ESYKDSTLIMQLLRDNLTLWTSDMOGDEGENKEALQDVEDENQ ESYKDSTLIMQLLRDNLTLWTSDMOGDEGENKEALDDVENDENCHNENE
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus β Υ ϵ ξ η	LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKALAKALMANTLVATKSAQ LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKALTANSUDSQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLSEVASGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLSEVASGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYYLILCGEDD 166 220 EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DIAMTELPPTHPIRLGLALNFSVFYYEILNSPDRACHLAKTAFDEAIAELDTI.SE EISKEHMOPTHPIRLGLALNFSVFYYEILNSPDRACHLAKTAFDEAIAELDTI.SE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPDRACHLAKTAFDEAIAELDTI.SE EISKKEMOPTHPIRLGLALNFSVFYYEILNSPDRACHLAKTAFDEAIAELDTI.SE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPDRACHLAKTAFDEAIAELDTI.SE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPDRACHLAKTAFDEAIAELDTI.SE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPDRACHLAKQAFDDAIAELDTINE DISKGKMOPTHPIRLGLALNFSVFYYEILNSPDRACHLAKQAFDDAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSLAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSLAFDEAIAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEINSPEKACSLAKSLAKSTING DSYKDSTLIMOLLRDNLTLWTSDQQDGEEQNKEALQDVEDENQ ESYKDSTLIMOLLFDNLTLWTSDQQ OBERPENA DSYNDSTLIMOLLFDNITLWTSDQQDEFFONAB
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus β Υ ϵ ξ η T cell	LDKYLIPKASNP ESKVFYLKMKGDY KYLAEVAGDAKALAKALAKITLVATKSAQ LDKYLIPKASNP ESKVFYLKMKGDY KYLAEVAGDAKNTVVDDSQTAYQDAF LDRFLVPNATPP FSKVFYLKMKGDY HYLAEFSSGDAREKATNASLEAYKTAS LDSHLIPSATTG ESKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.p
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β γ ε ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus β γ ε ξ η T cell Oenothera consensus	LDKYLIPKASNP ESKVFYLKMKGDYRYLSEVASGDKALAKALMANTLVATKSAQ LDKYLIPKASNP ESKVFYLKMKGDYRYLSEVASGDKACTVASSQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTK ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTK ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTK ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTK ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF 166 220 EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKQAFDDAIAELDTINE DIALADLPTHPIRLGLALNFSVFYYEILNSPEKACSLAKQAFDDAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMDTHNULLRDNLTLWTSDQGDEGDAGEGEN DSYKDSTLIMQLLRDNLTLWTSDQQDDGG. GEGN BSYKDSTLIMQLLRDNLTLWTSDTQGDEAEAGEGGEN DSYKDSTLIMQLLRDNLTLWTSDNAGCDGEECDAAEGGEN DSYKDSTLIMQLLRDNLTLWTSDNAGEDCDCTDATAFDATAFDATI
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus β Υ ϵ ξ η T cell Oenothera η τ cell Oenothera	LDKYLIPKASNPESKVFYLKMKGDY YRYLSEVASGDKALAARNIVVADSQTAYQDAF LDRYLVPAATPPESKVFYLKMKGDY YRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLAFFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAFFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAFFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAFFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAFFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAFFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAFFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAFFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAFFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAFFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKMKGDYHYLAFFSSGDAREKATNASLEAYKTAS LdkyLipnat.peSKVFYLKLASPFSKACSLAKTAFDEATAELDTINE EISKEMOPTHPIRLGLALNFSVFYYEILNSPCACCLAKTAFDEATAELDTINE DIAMELAPTHPIRLGLALNFSVFYYEILNSPCACLAKTAFDEATAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPCACNLAKTAFDEATAELDTINE DISKKEMOPTHPIRLGLALNFSVFYYEILNSPCACNLAKGAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRLGLALNFSVFYYEILNSPCKACSLAKSAFDEATAELDTINE EISKSEMOPTHPIRTSDACESCACKES DSYKDSTIMULLRDNLTUTSSDAGE
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus β Υ ϵ ξ η T cell Oenothera barley D14-3-3	LDSULVFARAK. USKVFILKNKGDY KYLAEVAGDAKALAKALAKALAKALAKALAKALAKALAKALAKALAKA
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus β Υ ϵ ξ η T cell Oenothera δ arley D14-3-3 Xenopus	LDKYLIPKASNP ESKVFYLKMKGDYRYLSEVASGDKALAKALAKNILVATASAQ LDRYLVPNATPP ESKVFYLKMKGDYRYLSEVASGDKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG ESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF 166 220 EISKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DIAMTELPPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLANEAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLAKQAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPERACNLAKQAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIRELDTINE EISKSEMSTIMQLLRONLTLWTSDNQGDGEGAGEGEN DSYKDSTLIMQLLRONLTLWTSDTGDEAEAGEGGEN DSYKDSTLIMQLLRONLTLWTSDTGDEAEAGEGEN DSYKDSTLIMQLLRONLTLWTSDNAEGGDEIKEAASKPEGEGH DSYKDSTLIMQLLRONLTLWTSDNAEGGDEIKEAASKPEGEGH DSYKDSTLIMQLLRONLTLWTSDNAEGGDEIKEAASKPEGEGH DSYKDSTLIMQLLRONLTLWTSDNAEGGDEIKEAASKPEGEGH DSYKDSTLIMQLLRONLTLWTSDNAEGGDEIKEAASKPEGEGN ESYKDSTLIMQLLRONLTLWTSDNAEGGDEIKEAASKPEGEGN ESYKDSTLIMQLLRONLTLWTSDNAEGGDEIKEAASKPEGEGN ESYKDSTLIMQLLRONLTLWTSDNAEGGDEIKEAASKPEGEGN
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast	LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKALAKALMANTLVATSDAQ LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKALTASNTVVDDSQTAYQDAF LDRFLVPNATPPESKVFYLKMKGDYRYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTKESKVFYLKMKGDYHYLSEVASGDSKQETVASSQQAYQEAF LDSHLOTSTANSLE .ESKVFYLKMKGDYHYLSEVASGDSKQETVASSQQAYQEAF LDSHLOTSTANSLE .ESKVFYLKMKGDYHYLSEVASGDSKACSLAKTASLEATKAS 166 220 EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE EISKEHMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKEHMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTISE EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DIANAELAPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE DISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKSAFDEAIAELDTINE EISKSEMQPTHPIRLGLALNFSVFYYEILNSPE
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ϵ ζ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus	LDSULVEDATAK. USKVETIKNKGDY KILLAER KAGARAKALAKNELVATSAQ LDRFLVPNATPP ESKVETIKNKGDY KYLAEVATGDARNTVVDDSQTAYQDAF LDRFLVPNATPP ESKVETIKNKGDY KYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.p eSKVFYLKMKGDYHYLAEFSSGDAREKATNASLEAYKTAS LdkyLipnat.p
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus β Υ τ cell Oenothera barley D14-3-3 Xenopus yeast consensus	DSULUY JARAK. JSKVF JIKNKGDY KILLET KAGARAKALAKNI VARAY ODA LDRYLYPAATPP. ESKVFYIKNKGDY KYLLEVATGDARNTVVDDSQTAYQDAF LDRFLVPNATPP. ESKVFYIKNKGDY KYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG. ESKVFYIKNKGDY KYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG. ESKVFYIKNKGDY KYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG. ESKVFYIKNKGDY KYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG. ESKVFYIKNKGDY KYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTG. ESKVFYIKNKGDY KYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTK. ESKVFYIKNKGDY KYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTK. ESKVFYIKNKGDY KYLSEVASGDSKQETVASSQQAYQEAF LDSHLIPSATTK. ESKVFYIKNKGDY KYLSEVASGDSKQETVASSQQAYQEAF LDSKKEMOPTHPIRIGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMOPTHPIRIGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKQAFDDAIAELDTINE DISKKEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKQAFDDAIAELDTINE DISKKEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKQAFDDAIAELDTINE DISKKEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKQAFDDAIAELDTINE DISKKEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKSAFDEAIRELDTINE DISKKEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKSAFDEAIRELDTINE EISKKEMOPTHPIRIGLALNFSVFYYEILNSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEINGNSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEINSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEINSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEINSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLALNFSVFYYEINSPERACSLAKSAFDEAIRELDTINE EISKSEMOPTHPIRIGLANNITHTSDMSEGGDESCLARASKPEGGEN DSYKDSTIIMQLLRDNLTHTSDNAEGGGDEIKEAAPKDEQY ESYKDSTIIMQLLRD
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β γ ε ζ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus β γ ε ζ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus	LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKALAKALAKTIVATASAQ LDKYLIPKASNPESKVFYLKMKGDYRYLSEVASGDKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYHYLSEVASGDKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYRYLSEVASGDKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYRYLSEVASGDKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYRYLSEVASGDKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYRYLSEVASGDKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYRYLSEVASGDKQETVASSQQAYQEAF LDSHLOTTASLEAT LDSHLOTTASLEAT LDSHLIPSATTGESKVFYLKMKGDYRYLSEVASGDKQETVASSQQAYQEAF LDSHLIPSATTGESKVFYLKMKGDYRYLSEVASGDAREKATNASLEAYKTAS LdkyLipnat.peskvFYLKMKGDYRYLSEVASGDAREKATNASLEAYKTAS LdkyLipnat.peskvFYLKLMSPEKACSLAKTAFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTIME DIAMTELPPTHPIRLGLALNFSVFYYEILNSPEKACSLAKTAFDEAIAELDTIME DISKKEMQPTHPIRLGLALNFSVFYYEILNSPDRACNLANEAFDEAIAELDTIME DIALADLPTHPIRLGLALNFSVFYYEILNSPDRACNLANEAFDEAIAELDTIME DISKGKMQPTHPIRLGLALNFSVFYYEILNSPDRACNLANEAFDEAIAELDTIME EISKSEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLANCAFDEAIAELDTIME EISKSEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLANCAFDEAIAELDTIME EISKSEMOPTHPIRLGLALNFSVFYYEILNSPDRACNLANCAFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPDRACNLANCAFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPDRACNLANCAFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPDKACLAKCAFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPDKACLAKCAFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPDKACLAKCAFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAK.AFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKAFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKAFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKAFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKAFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKAFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKAFDEAIAELDTIME EISKKEMQPTHPIRLGLALNFSVFYYEILNSPEKACSLAKAFDEAIAELDTIME EISKKEMQPTHPIRTUGLANNTIWTSDNGCDGAGEGEN DSYKDSTIMQLLRDNLTIWTSDNGEGEDAEGEN DSYKDSTIMQLLRDNLTIWTSDNGEGEDAEGEN DSYKDSTIMQLLRDNLTIWTSDNAEGGDEIKEAASKPEGEGH DS
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus	LDKILVIPKASNP. ISKVFTIKMKGDVKILGEVALGARALAARNTVVDDSQTAYQDAF LDRYLVPAATPP. SKVFTIKMKGDVKILGEVALGARANTVVDDSQTAYQDAF LDRFLVPNATPP. SKVFTIKMKGDVKILGEVALGARANTVVDDSQTAYQDAF LDSHLIPSATTG. ISKVFTIKMKGDVKILGEVALGARANTVVDDSQTAYQDAF LDSHLIPSATTG. SKVFTIKMKGDVKILGEVALGARANTVVDDSQTAYQDAF LDSHLIPSATTG. SKVFYKMKGDVKILGEVALGARANTVVDDSQTAYQDAF LDSHLIPSATTG. SKVFYKMKGDVKILGEVALGARANTVVDDSQTAYQDAF LDSHLIPSATTG. SKVFYKMKGDVKILGEVALGARANTVVDDSQTAYQDAF LDSHLOVENSQQAYQEAF LDSHLIPSATTK. SKVFYKMKGDVKILGEVALGARANTVDDSQTAYQDAF LDSHLOVENSQQAYQEAF LDSHLIPSATTK. SKVFYKMKGDVKILGEVALGARANTVDDSQTAYQDAF LDSKLEMQPTHPIRIGLALNFSVFYYHILNSPEKACSLAKTAPDEAIAELDTINE EISKKEMQPTHPIRIGLALNFSVFYYHILNSPDRACHLAKTAFDDAIAELDTINE DIAMTELPPTHPIRIGLALNFSVFYYHILNSPDRACHLAKTAFDDAIAELDTINE EISKKEMQPTHPIRIGLALNFSVFYYHILNSPDRACHLAKTAFDDAIAELDTINE DISKKEMQPTHPIRIGLALNFSVFYYHILNSPDRACHLAKTAFDDAIAELDTINE DISKKEMQPTHPIRIGLALNFSVFYYHILNSPDRACHLAKTAFDDAIAELDTINE EISKSEMQPTHPIRIGLALNFSVFYYHILNSPDRACHLAKQAFDDAIAELDTINE EISKGKMQPTHPIRIGLALNFSVFYYHILNSPDRACHLAKQAFDDAIAELDTINE EISKGKMQPTHPIRIGLALNFSVFYYHILNSPDRACHLAKQAFDDAIAELDTINE EISKSEMQPTHPIRIGLALNFSVFYYHILNSPDRACHLAKQAFDDAIAELDTINE EISKSEMQPTHPIRIGLALNFSVFYYHILNSPDRACHLAKQAFDDAIAELDTINE EISKSEMQPTHPIRIGLALNFSVFYYHILNSPEKACSLAKSAPDEAIRELDTINE EISKSEMQPTHPIRIGLALNFSVFYYHILNSPEKACSLAKSAPDEAIRELDTINE EISKSEMQPTHPIRIGLALNFSVFYYHILNSPEKACSLAKSAPDEAIRELDTINE EISKSEMQTHNDIKTUTSDQQDDGG. GEGN DSYKDSTLIMQLLRDNLTLWTSDQQDDGG. GEGN DSYKDSTLIMQLLRDNLTLWTSDTQGDEAAEGEGEN DSYKDSTLIMQLLRDNLTLWTSDAGEBCDAAEGAEN DSYKDSTLIMQLLRDNLTLWTSDAGEBCDAAEGAEN DSYKDSTLIMQLLRDNLTLWTSDAGEBCDAAEGAEN SSYKDSTLIMQLLRDNLTLWTSDNAEEGGDEIKEAAPKPDEQY SSYKDSTLIMQLLRDNLTLWTSDNAEEGGDEIKEAAPKPDEQY SSYKDSTLIMQLLRDNLTLWTSDNAEEGGDEIKEAAPKPDEQY SSYKDSTLIMQLLRDNLTLWTSDNAEEGGDEIKEAAPKPDEQN SSYKDSTLIMQLLRDNLTLWTSDNAEEGGDEIKEAAPKPDEQN SSYKDSTLIMQLLRDNLTLWTSDNAEEGGDEIKEAAPKPDEQN SSYKDSTLIMQLLRDNLTLWTSDNAEEGGDEIKEAAPKPDEQN SSYKDSTLIMQLLRDNLTLWTSDNAESCQAEQQQQPAQAQPAAAEVKHQSK eSYKDSTLIMQLLRDNLTLWTSDNAESCQAEQQQQPAAAEVKHQSK eSYKDSTLIMQLLRDNLTLW
D14-3-3 Xenopus yeast consensus annexin carboxyl terminus β Υ ϵ ζ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus β Υ ϵ ξ η T cell Oenothera barley D14-3-3 Xenopus yeast consensus	LDSULVENTRANDEL SKYFTIKKKGDE KALLAGERALAARNET VAR SAG LDSULVENATED . ESKYFTIKKKGDE KALLAGERANTE VAR SQAT SQAT LDRFLVPNATED . ESKYFTIKKKGDE KALLAGERANTE VAR SQAT SQAT LDRFLVPNATED . ESKYFTIKKKGDE KALLAGERANTE VAR SQAT SQAT LDSULVENATED . ESKYFTIKKKGDE KALLAGERANTE VAR SQAT SQAT SGDYKKALLIL CGEDD TAKEN STATIK. SATAT SATAT SATAT SQAT 166 220 EISKKEMOPTHPIRIGALNESVFYFTILNSPEKACSLAKTAFDEAIAELDTINE EISKEHMOPTHPIRIGALNESVFYFTILNSPEKACSLAKTAFDEAIAELDTINE DIAMTELPPTHPIRIGALNESVFYFTILNSPEKACSLAKTAFDEAIAELDTINE DISKKEMOPTHPIRIGALNESVFYFTILNSPERACSLAKGAFDAIAELDTINE DISKEMOPTHPIRIGALNESVFYFTILNSPERACSLAKGAFDAIAELDTINE DISKEMOPTHPIRIGALNESVFYFTILNSPERACSLAKGAFDAIAELDTINE DISKEMOPTHPIRIGALNESVFYFTILNSPERACSLAKGAFDAIAELDTINE EISKEMOPTHPIRIGALNESVFYFTILNSPERACSLAKGAFDAIAELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKGAFDAIAELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKGAFDAIAELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKGAFDAIAELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKGAFDAIAELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKGAFDAIAELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKAFDEAIRELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKAFDEAIRELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKAFDEAIRELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKAFDEAIRELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKAFDEAIRELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKAFDEAIRELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKAFDEAIRELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKAFDEAIRELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKAFDEAIRELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKAFDEAIRELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKAFDEAIRELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKASAFDEAIRELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACSLAKASAFDEAIRELDTINE EISKSEMOPTHPIRIGALNESVFYFTILNSPERACS

## Figure 1

Sequence alignments of 14-3-3 family members. The sequence around the 'pseudosubstrate' Ala residue and the similarity with the carboxyl terminus of the annexin family is shown. Note that the  $\zeta$  isoform of PKC has the sequence GARR (Ref. 3). The actual sequence of the carboxyl terminus is that of human annexin V, although some members of this family contain a conserved Lys residue at the position of the lower case Ser<sup>4</sup>. The sequences of 14-3-3 are bovine  $\beta$  and  $\gamma$  (Ref. 5); sheep  $\epsilon$  (Ref. 6); rat  $\zeta$  (Ref. 7); bovine  $\eta^2$ ; a human 14-3-3 T-cell sequence<sup>8</sup>; sequence deduced from a *Drosophila* clone (*D*14-3-3)<sup>9</sup>; yeast<sup>10</sup>; plant, *Oenothera hookeri*<sup>11</sup> and barley<sup>12</sup> 14-3-3 homologues and the consensus sequence. The *Xenopus* sequence<sup>13</sup> is not completely full length. It is not known whether the non-mammalian proteins are *N*-acetylated. Circular dichroism has confirmed the high degree 64% of  $\alpha$ -helical structure predicted<sup>14</sup>. These regions are shown as a bar underneath the alignment. The invariant (or very highly conserved) regions are boxed.





#### Figure 2

Computer-generated line-up of sequences. Note that the *Drosophila* sequence is closer to the  $\beta$ ,  $\zeta$  and human sequences and that the plant and yeast sequences are closer to the  $\epsilon$  isoform. Similarly, the *Drosophila, Xenopus* and three of the mammalian 14-3-3 sequences are closer to each other. This suggests that the divergence of the isoforms was an early event in evolution and that the sequences have subsequently remained highly conserved. The sequence comparison was generated using the program 'pileup' in the GCG sequence analysis package. This generates a multiple sequence alignment to show relations between sequences, but is not a phylogenetic tree.

fact phosphorylated by PKC itself but not by a wide range of other protein kinases<sup>14</sup>.

Although the kinase inhibitor and 14-3-3 are apparently not Ca<sup>2+</sup>-binding proteins<sup>19</sup> and there is no evidence of similarity with any putative Ca<sup>2+</sup>-binding domains, one region (residues 134 to 150) shows close similarity with the conserved carboxyl terminus of the family of Ca<sup>2+</sup>- and lipid-binding proteins, the annexins<sup>4</sup> (Fig. 1). This could be the binding site for the regulatory domain of PKC (the proteins do not inhibit PKM, the catalytic domain of PKC<sup>14</sup>). Annexin V has been shown to inhibit PKC<sup>24</sup> Mochly-Rosen and colleagues<sup>25</sup> have shown that PKC binds to cytoskeletal or cytoskeletal-associated proteins when the cytosolic enzyme is activated by the second messenger DAG, in the presence of elevated levels of Ca<sup>2+</sup>. She has named these RACKs (receptors for activated C kinase). Following her observation that members of the annexin family could act as RACKs, combined with the report that a particular region on 14-3-3/KCIP-1 had close similarity with the carboxyl terminus of lipocortin/annexins<sup>23</sup>, she has tested

member of the 14-3-3 family<sup>27</sup>. This is presumably the human  $\zeta$  isoform since there are only two conserved amino acid changes from rat  $\zeta$  14-3-3. This PLA<sub>2</sub> has been purified as at least three chromatographically distinct isoforms from sheep platelets. The activity(ies) was highly selective for the release of arachidonic acid from choline and ethanolamine glycerophospholipids. A stable acyl-enzyme intermediate was formed and a role in the cellular trafficking of the arachidonyl moiety was

the ability of the carboxyterminal region of annexins to prevent PKC association with the plasma membrane. A synthetic peptide based on this region in 14-3-3/KCIP-1 that is similar to the annexins has also been shown to prevent PKC binding to RACKs. These observations point to a potential physiological role for an isoform(s) of 14-3-3 as mediators of PKC translocation. Thus, members of this protein family may regulate the subclass of PKC isoforms ( $\alpha$ ,  $\beta$  and  $\gamma$ ) that are Ca<sup>2+</sup> dependent and translocate to the plasma membrane as part of their activation mechanisms.

The  $\varepsilon$  and  $\zeta$  isoforms of the 14-3-3 family co-purify with the ovine pineal serotonin *N*-acetyltransferase and may be involved in the regulation of the enzyme, the ratecontrolling step in the conversion of serotonin to melatonin<sup>6</sup>. Recently, two proteins named Exol

and Exo2 have been isolated from brain

cytosol by Burgoyne et al.26 These pro-

teins stimulate Ca2+-dependent exocyto-

sis in permeabilized adrenal chromaffin

cells. Exo1 protein(s) migrate on SDS-

PAGE as a group of polypeptides of

approximately 30 kDa, and peptide

sequencing has revealed these to be

members of the 14-3-3 family. The ability

of Exo1 to reactivate exocytosis is

potentiated by PKC, which suggests a

role for Exo1 in the PKC-mediated con-

trol of Ca<sup>2+</sup>-dependent exocvtosis. A

protein with phospholipase  $A_2$  (PLA<sub>2</sub>)

activity, distinct from extracellular

PLA<sub>2</sub>, has recently been shown to be a

proposed. Arachidonic acid stimulates secretion from many cell types, which may be relevant to the role of Exo1.

### 14-3-3 in other organisms

The partial clone from Drosophila was initially thought to be a domain of an alternatively spliced form of EGF receptor but was later shown to be a cloning artefact<sup>28</sup>. The function of this protein(s) in insects remains unknown. However, the recent cloning of the intact gene from Drosophila9 has enabled the study of the expression of the gene during development. The level of one of three mRNA species peaked between 12 and 15 h of embryogenesis. The levels of all three mRNA species dropped to almost basal level in larvae and pupae, then rose again in the adult stage. There are high levels in embryo ventral nerve cord and in neural tissues.

The yeast homologue of 14-3-3 (Ref. 10) may have a function in growth regulation. Yeast strains with the gene on multicopy plasmids and disruption mutants showed no loss of cell viability but showed a 30% reduction in growth rate using glucose as the carbon source. However, by contrast to the wild-type and disruption mutants, the strains with the gene on a multicopy plasmid hardly grew with acetate or glycerol as carbon source.

A plant 14-3-3 homologue has been isolated from pea and has been shown to be inhibitory in the PKC assay<sup>11</sup>. Subsequently, cDNA coding for plant 14-3-3 was cloned and sequenced from spinach and Oenothera. A role for 14-3-3 in the regulation of protein kinases in plants has also been proposed, although a plant protein kinase that is Ca<sup>2+</sup>, phospholipid and DAG dependent, with similarity to mammalian PKC has not yet been described<sup>11</sup>. Protein kinases are involved in the regulation of light harvesting in the chloroplast thylakoid membrane and it is interesting that a protein encoded by a gene upstream of a gene that responds to changes in light intensity, cloned from a cyanobacterium<sup>29</sup>, has sequence similarity with another PKC inhibitor protein, called PKCI-1, isolated by Walsh and colleagues<sup>30</sup>. Cyanobacteria have the oxygen-evolving plant chloroplast type of photosynthetic apparatus. 14-3-3 protein-like cDNAs from barley leaves have been identified on the basis of sequence similarity and serological similarity to the mammalian sequences<sup>12</sup>. The level of mRNA corresponding to at least two of the three different se-



Figure 3

This figure summarizes the current state of knowledge of the biological roles of the 14-3-3 family of proteins. Full lines indicate that a link has been established between a 14-3-3 protein, an enzyme activity or regulatory function and the physiological process. The dashed lines indicate that the connection is tentative.

quences identified increased following inoculation with fungal pathogen Erysiphe graminis, the powdery mildew fungus; this rise was concomitant with increased levels of other mRNAs believed to encode products involved in defence. The role of 14-3-3 protein in defence, if any, is unknown; however, various possibilities are raised from its functions in other systems. For example, signal transduction is central to the activation of defences since elicitors, produced by pathogens, induce defence responses in the host following recognition. It has been shown that the protein phosphorylation state can be affected by elicitor action. 14-3-3 protein might act as a regulator of these processes. In the interaction between barley and Erysiphe graminis the enhanced transcription of defence-related genes, including the 14-3-3 homologue, is correlated with the development of papillae (extracellular local reinforcement to the inner side of the cell wall comprising callose, phenolic compounds and proteins). Cytoplasmic activity increases adjacent to the nascent papilla, presumably indicating enhanced exocytosis. Thus the possibility that 14-3-3 protein has a role in Ca<sup>2+</sup>mediated exocytosis might indicate that this is the major role during defence. In analogy with the role of 14-3-3 in regulating tryptophan and tyrosine hydroxylases, it is also conceivable that this protein acts to regulate the biosynthesis of phenolic compounds produced in the papillae.

A 14-3-3 homologue has also been cloned and sequenced from *Xenopus*<sup>13</sup>.

It was identified as a gene coordinately expressed with the prohormone proopiomelanocortin (POMC) in the melanotrope cells of *Xenopus* pituitary gland. Transcription of the POMC gene increased 20–30 times when the toad was placed on a black background. This 14-3-3 homologue may therefore be involved in secretion from the pituitary gland during background adaptation<sup>13</sup>.

The known functions of this novel class of protein are illustrated in Fig. 3. These include a wide range of cell-signalling processes as well as development and growth regulation. However, much work remains to elucidate the exact physiological role(s) of each mammalian isoform (there may be 10–12 distinct gene products) and their counterparts in other organisms.

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