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Développement de produits des laitiers et ovoproduits enrichis en bioactifs contre le syndrome métabolique : effet de la matrice alimentaire sur la bioaccessiblité et la biodisponibilité des polyphénols et de l'acide docosahexaénoïque

Carlos Pineda Vadillo

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UNIVERSITE BRETAGNE LOIRE

AGRO CAMPUS OUEST

Carlos PINEDA VADILLO • 25 mai 2016

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sous le label de l'Université Bretagne Loire
pour obtenir le grade de
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Science et Technologie du Lait et de l'Œuf (STLO)

Développement de produits des laitiers et ovoproduits enrichis en bioactifs contre le syndrome métabolique : effet de la matrice alimentaire sur la bioaccessibilité et la biodisponibilité des polyphénols et de l'acide docosahexaénoïque

FRANÇOISE NAU
Professeure, AGROCAMPUS OUEST, UMR INRA-AO STLO / *présidente*

STÉPHANIE KRISA
Maître de conférences HDR, Université de Bordeaux / *rapporteur*

JEAN LOUIS SÉBÉDIO
Directeur de recherche, INRA Clermont Ferrand / *rapporteur*

GÉRARD PIÉRONI
PDG Société Applications Santé des Lipides (ASL), Vichy / *examinateur*

JACQUES MOUROT
Directeur de recherche, INRA-AO PEGASE / *examinateur*

ALESSANDRA BORDONI
Professeure, Université de Bologne, Italie / *examinatrice*

DIDIER DUPONT
Directeur de recherche, INRA-AO STLO / *directeur de thèse*

♕♕♕

! дÅ□IX←⇄⅛oᶜᴇт Iт I□↑↓

! ↺↑т↑Iт от дт ↑↑Ц↑↓↓Ц↑↓д ᵀᴱᴸᴳ ←↺ ᵀᴱᴸ↑↑Gт I□↓ Ч↑т Iт↑дGт↑↑IX↓дт ↺⇒←↺☜от ix↑y↓IX↺от ½XGI☜IXI↑ дIXI↑↑Gт ↺ф Ч½ц↑ф↓↓X↓Gц↑↑IXIот дт ix↑IXᶠᴴ↑♛

/т↑↑т ↑Dy↓т ↓♛I↓д↑Gт оЦI□ ⅛ дЦр↑т о↺ix↑IXᶠᴴ↑9↺IXxтIIt Ц↑Dᴀ⇄Ц←⇌ᴧ♛GI↓X↑Ц½Ц□↓т↓↓IтI↑IXъ↑Dᴀ тыгд↑↓ IXъгGIXЦ↑Gт↓↓IXIDᴀЦ↑Dᴩ↓ЦIЪ ⇄т⅛тGIIᴇ☜GI↑IXI Dᴩ↺IЦIIᶜᴇтIIXIт ↑IXЫXXо GIЪ↺↑↑⇌⅛т↑Цф↑ф↓ЫGIЦIДф ix↑X↺⅛ {тix↑Gy Iт ix↑IX←↑ЦI Iт дЦр↑т от ↑тдDᴀ↑дDᴀ т↑оф↑↓⅛Xxix Iт I↑от ⅓ IIIXI9↺IXxфтIIIг Ct ᴧ♛

9II Ц↑↓ЦI↑□ix↑IXxX↓☜ᵀᴱᴸGIт↑ЦG↓ Цр↑т↓↓т↑ Iт↓ ↑т Iт↑дGт IтI↑↓ Ч VWX½⅛ [фIXIIIᴇ ix↑X↺ I ♛↑↓X↑ Ц↺↑IX↑G↓фт Ч ↑фЦ↑Gт↑ IЦ↑Dy↓т Ц↺↓тGIIо↺⅛ᵀIX↑Ц↑IX↑т от {дGт I↑дт↓т↑↑тдDᴀIIXвX←Gт о↺ЦG↑т↑от ⅛♛ ↺ъ {¤[h、Чwт IIIг↓♛

W↑↑Gт I□↑IX↑о♛ᵀIX↑о Ч Цр↑т↓↓т↑ Iт↓ ↑т Iт↑дGт IтI↑↓ ⅛↓ ix⅛↓↓GIIду↑т↓Ч5GоGт↑5↺xXI↑☜IIXIIоG↑тд↑т↺ от ↑Dy↓т♛9IIixЦ↑↑Gц↺⅛Gт↑☜ᵀᴱᴸ↑↓X↺↑Ц□↑т ↑т Iт↑дGт↑↑IX↑ ix↑X↺⅛ᵀдIXIIGЦI↑дт ←↺ ↑↺I♛↓ Ц↓дIX↑офт т↑⅛ ↑XI⅛ ←↺ ↑↺I♛↓ дIXIIGф Ц↺↑тGIIо↺ix↑IXᶠᴴ↑tЦ↑Dᴀ⇄Ц←⇌ᴧ♛т⅛ᵀцЦ↑ф↑ф↺IIг т←ix↑фGт I↑дт GI↑т I□↑т т↑GI↑дIX←Ц⅛ ←↺☜ᵀᴱᴸII↓↓G↓дт↑↑ЦGIIᵀ☜I♛↓от↑ЦоЦI□ Iт↓ix↑IXᶠᴴ↑↓ъ↺↑↓♛W↓IXDᴀЦ↑т↑Ц□↓фᴇЦ⅛ Iт I↑↑т ↑т Iт↑дGт↑☜Ц↺☐от ½ᵀот ↑т↓дIXI□тG⅛Ц↑↓□↓↓↺⅛ ix⅛Ц↑↓дGт I↑GGᴧ←↺☜ix↑X↺↑IXIIXX↑GI□ Iт от ↑IX↑⅛↓ᵀIX↑↓т↑↑т↓т I↑дIX↑Цᴇт Iт I↑↓ ixтIъЦI↑½ᵀот↑I↓у↑т ⅛ᴇIг о↑IX↑т от IЦ↑Dy↓т♛↑Ц↑↓Ц↑↓д↑IXGЦф↑ф↺IIᶜᴇ↑ЦIЪ ix⅛Ц□↓♛

W↓IXDᴀЦ↑т↑Ц□↓фᴇЦ⅛ Iт I↑↑т Iт↑дGт↑ IЦдIX☐оG↑тд↑↑Gдт от ↑Dy↓т☜C↑ЦIIIXI↑т bЦ↺♛W↓Gц↑↓Ц↑GI Iт I↑Цix↑фдGф ↑IXI↓IX↑↑Gт IIGI Iфо↺Ц↑ ix↑X↺ I♛↓от↑Ч дIXIix↑тIъ↑т ↺IIix↺ix⅛↓ дDᴀЦ←↺ᵀᴱᴸX↺⅛ IIXIът GIдIXIII↺от↓ ЦI↑Dᴀ↓дᴀ⇄IXIGI↓↓т↑от↓ix↑X⅛⇄ix↑Dᴀ IIX↑☜ᵀᴱᴸGI↓↓G←↺ ↑IX↑↑IXIIЦGот ix↑X↺ Iт↓ ix↑↺⅛Gц↑↑IXI↓т↑↑IXIIтьGцЦ↑↑фix↑X↺ ↑ф↓IX↺↑т ⅛↓ ix↑IX⅛ Iт↓♛W↓↺ix↑X↺т ←↺⅛IIIЦix↓Цф↑ф↑IX↺ᵀᴱᴸX↺↓ьЦ↑↑⅛ix↑X↺↑IXGот Iт дIXI ix↑тIъ↑т☜oIXIд ↺IIᶜᴇ↑ЦIЪ Iт↑дGix↑X↺↑Цix↑↑Gт I↑дт т↑↑IXI↓↓т I□↓от ½↺↺IIX↺ ix↑IъЦI↑↑IX↑дт ↑↑т I ix↓ ◄W↓Gц↑↓Ц↑GI Iт I↑Цix↑фдGф ↑IX↓дт↓ IIXI Iт I↑↓

9↑ ix↑X↺ дIXI ix⅛↑↑т↑⅛ц{Ц↑GIIт ¤↑GIIIф от Iт↓ ↑т I↑дЦр↑ЦI↑↓☜ᵀᴱᴸ↑↓X↺↑Ц□↓ ↑т Iт↑дGт↑ фᴇЦ⅛ Iт I↑↑/Ц↑↑Dᴀ↑GIIг D↺ф↑GIIᴧ♛ т↑дGг тЦ↺дIX↺ix↑X↺↑IXIIЦGот☜↑т↓дIX↑↑тд↑GIXI↓↓т↑ix↑X↺ Ц↑↓X↓↑т↓↑↑ф IЦGII↑т↓от Iт↓д↑фЦ↑GIXI↓↓ тI↑↑GцDᴀGт↓↓т IIг GIXЦ↑↑Gц↓↓♛

9I↓↓↺↑↑т☜ᵀᴱᴸ↓↓IXDᴀЦ↑т↑Ц□↓ ↑т Iт↑дGт↑↑IX↑ ⅛↓ Iт Iг↑т↓от ½ф←↺ix . GIXЦ↑↑Gф↑ф т↑b↺↑↑GIXI♛ᴧ т↑дGix↑X↺ ↑↓X↑↑т Цдд↺↺ᴧDᴀ⅛↺↑т↺☜ᴧ♛Ц↓ф↑ф ix↑X↺ IIXG↺IIix⅛Ц↓↓Gот ЦI↑↑т ix↑Ц↑↑Gо♛IIг ф←↺ix Ц↺↓↓G↓↓G↺ix↑т↑↑ᵀᴱᴸ↓↓IX↓ ↓IXDᴀЦ↑↑т ⅛ Iт↓↓⅛↺ix↑X↺ ⅛↓ Ц↓↓↓↓фг↓↓Ч↑↓ I↓↓♛W↓IXDᴀЦ↑т↑Ц□↓ ↑т Iт↑дGт↑т IIix↑Ц↑↑Gц↺☜↑/⅛Ц↓↓т . IX↑⅛ ↺☜←↺ I♛↓Цix↑X↺↑ф↺IIг Ц↺↓от GIIг↓↓↑GI Ц↓ ⅛ ⅛X↓↓ от IIXIIGI Iт↓↓GIXIIGI ix↑IX↑↓↓фт оЦI□ ⅛ IIXIът от↓↓ ⅛ix⅛от↓↓♛W↓IXъ↑Ц□↓ Ц↺↓↓G↓↓т Iт↑дGт↑ h⅛↑↑↓Ц а т I□↓↑о☜W↓↓⅛ IIWᴧ↑оGII☜{ЦI↑↑Ц от h⅛↑↓↑↑Ц☜WЦDᴀ⅓. IX↺↑IX↺☜! I↑↓⅛

5тᶜᴇ½ЦПт т↑ WXLПDЛLП¤Dф↑↕ ПX↑ ix↑X↑ ⅛↺ LПбт дIXПдт↑ПLПП⇔ixL↑ IПoЦ↑↑т↕ дDЛX↑т↕⅛↕ LППL½↕т↕⅛Ц
дIX↑тд↑ПXПот↕ ix5 ½ЦLППXП↕ т↑⅛ ↑↑LП↑т IтIП↕↑LП↑П↑П←5 от↕ oIXППфт↕♕

¤IX↑т ILПᶜᴇ↑LП↑П↺от ↕Ц⇔↑т↕↕т фᶜᴇL⅛ IтIП↑Ч/½Ц↑т t↑ПIX↑½LПЪ a L↑⇄↕IXППт tLП↕дIX♕a т↑дПixX↑ ↑↕X↑т LПбот
←↕X↑бПт ПП↑т LП↺½ЫIXLП↑IX↑т т↑ ПX↑LПI IтIП↑ ix↑ ПЪLП↑⅛ оф↑↺от ILП↑Dу↕т♕a т↑дПЧ¹ L↑ф↑П↑т [тдDЛ↑LП↑
ixX↑ ↑IXПLПбот L↑↕д⅛↕LПL½↕т↕!/t♕
WЦ↑т↕↕т фᶜᴇL⅛ IтIП↑ Iт↕ ↑т Iт↑дП↑т IтIП↑ LП↺⇒↑IX↑ ⅛↕ IтIг↑т↕ o↺tLП↑DЛ↗L↑⇄↗↑LП↑↕д⅛←↺½ ᵀᴴᴱLП↑т↺
½↕XixX↑↑↺П↑ф от ↑↑LП↑LП↑⅛↑LП↑↕д ↑! ⅛↕↕LПЪ↑L. IX↑oIXПП⇔↑LППдт↕дIX/ LixX↑↑П⇔. тLП↑П↑ tф↑т↑⇔[↑бПL¤IXILП⇔
. ½ЦПLП¹ ПLбт½↕a LП↑П↑L{LП↑⇔¤LILП↑¤X↑DЛ↑ LᶜᴇIП↑ ⇄↑LᶜᴇП↑WDЛLП↑{↑П↑ÅX↑↕WLП↑↑a П↑LП↑⅛↕IX↑{↑П↑т½↑LП↑LП↑Å↑↕↕♕
5т ½Ц Ix Iт ILП↑Dу↑т⇔ᵀᴴᴱ↑↕X↑б↑LП↑ oIXПП↑↑↺↑↑ᶜᴇ↑LП↑Ъ Iт↑дПЧ/DЛ↑П↑↑IXXDЛ WLᶜᴇт↑⇔ ½ЦП↑/DЛL↺↑LП↑↑т↑Ч↑IX↑↕
⅛↕ ix↑↕↕IXПП↑↕от ½↕a wtтᶜᴇL↑↕т от ½↕bw! Ч{↑DП↑⅛↕⇔IX↑ᵀᴴᴱLП↑↑фLП↑↑ф½Ц ILП↑↑ixП↑↑П↑↕IXот ILП↑Dу↕т♕ ↑↑фP↑LП↑
↑↕LП↑↑IтIП↑ЫдП↑⅛ от ↑↑LП↑LП↑⅛↑LП↑↕д↑IX↑↕♕

a т↑дПгтL↺↕IX↑xЧ¹ ф↑IXП↑↑↺ /DЛ↑⇄↕П↑ т↑ 9 I ILП↑I↑5 ½⅛ a т↺отд от ½Ц ix↑↑↑т ⇔↕X↑Iт o↕LП↑L½↕т от↕
tIX↑↑ixDЛ↑IX↑↕ tCt、от ½↕bw! a IXП↑ix↑½↑↑ ix↑X↑ ½↕Lбот т↑ ½Ц ↑Lix↑бП↑ф L↑↕д ⅛↕ LП↑L½↕т↕ от
ix↑IXLП↑DЛ↑↕↕П↑бП↑↕т↑½Ц↑ф↑↕↕П↑IXПот IIXПот↺↑↑у Iт ILП↑↕↕д↑П↑♕

9 П↑П↑П⇔o♕↕П ixX↑П↑ от ↑↕↺ ix↑IX↑т↕↕П↑IXПП↑½ᵀᴴᴱ↑↕X↑б↑LП↑ ↑т Iт↑дП↑ ↑IX↑ ⅛↕ ᶜᴇт↕П↑ ←↕П↑IX↑П↑ ↑LП↑П↑↑ф IIXП↑
←↕X↑бПт IIL↺{¤[h от rП↑ IIот↕ ILП↑Dу↑т↕ ↑bLП↑DЛ↑П↑ [т a L↑↑т⇔[L↺↑т↕Iдт CL↺↑↕½5LП↑П↑½⅛ D↺⅛X↑⇔
/DЛ↑↕↑DЛ↑XDЛ DтIП↑↕↑т⇔a L↑П↑П↑ ↑↑½↺от wтIIX↑↕↑o⇔5IXIП↑П↑←↺ ¹ IX⅛↕Ъ⇔W↑↕↕П↑LLa ↺↑↑т↑tL↺⅛↑↑т ! Iт↑♕

5♕↕П ixX↑П↑ от ↑↕↺ ix⅛↕ ix↑↕↕IXПП↑½ᵀᴴᴱL↑↑IX↑↕ф т≠дтix↑↑IXПП↑½от ↑тIДIXП↑↑т↑ ↑т↑⅛ IтIП↑ от ᶜᴇтI↕ от
IL↑↑IXLП↑↑ф↕ oLЫф↑тIП↑↕↕т↺↑↑IixX↑↑т ←↺ ↑↕X↑↕ ↕IX↑↑ ↑т↕↑ф↕ ←↺½←↺↕ ᵀᴴX↑↕⇔←↺½←↺↕ ↕т ILП↑П↑↕⇔IX↺
↑IX↑↑L↺½XПᶜᴇот ILП↑Dу↑т♕a т↑дП↑т½↑LixX↑↑↑Lix↑т↕IIдт ↑IX↑↑L↺½XПᶜᴇот дт↑↑↑т L↑↕IП↑↺т♕a L↑↕ Iт↑дПix⅛↕
ixL↑↑П↑↺↑у↑т IтIП↑ixX↑↑IXПП↑бот ix↑ПЪLП↑⅛↕ix↑т IП↑у↑т↕↕т ILП↑П↑↕♨IX↑↕W IП ½↕X↑½↑LП↑ᵀᴴLIL↑↕♕↺т↕
дIXIix⅛↑т IтIП↑ЫX⅛ o♕↕П ILП↑Dу↑т ЫЫ↺⅛↺т、W↑↑Lix↑ф↕дП↑ гтL↺↕IX↑xIIXП↑[т½↑X♕a т↑дП. IX⅛↕ПП↑DЛL
{LIП↑LixX↑↑IX↑т ↑IXПП↑бот ix↑ПЪLП↑ IIXПt D↕♕a L↑↕↕↺↑IX↑ixX↑↑IX↑↕дт↕ IIXIтIП↑↕тIотDЛX↑↕o↺
½ЫIX↑L↑IX↑т♕IXПIIXI ↕т↑L↑IX↑ᵀᴴX↑↕L↑↕↕IX↑П↑ixX↑ IIX↑Ч⇔ixL↑т≠↕ Iix⅛⇔½Ц/DЛX↑↕Ы⇔ |.⇔IX↺! т↑т↑ILLI⇔
ixL↑↕ IL½↕IXП↑a L↑↕L↑↕↕↑ixX↑↑ IIX↑Чот↕↕⅛ ↕Iбт ILП↑↕↕ix⅛↕ ←↺ oЫ↑П↑⅛↕◢ / ♕↑↑o↺т L↑↕д IIXПLᶜᴇт♕

{LIП↑L↑[т½↑L↑. IX⅛↕↕IX° LПЪт↑↕↕IXП↑⇔D↺⅛↑Iт↑⇔! ↑½↕П↑⇔WLDЛ↑↕↕{IXП↑⇔9½↑↕т↑⇔[П↑↕↕↑⇔D↺⅛↑↕↺Iт↑⇔Cт½↑ix↑⇔W↑⇔
↑↕↑↕↕↑! ↕↕↺П↑LIXот {IX↑↑L↑↕↕Cот↑↕↕П↑IX↑↑↑ oy⅛↑↑ Iб↑т↑L↑↕↑ Iб↑↑ф↑a L↑↕↕↑↕↕↑D↑L↑↕↕↑П↑↕↕↑t↑↕↕↑П↑↕↕↑! IL↑↕a L↑↕oL↑↕↕
a L↑↕т↕↕↑[L↺↑L↑↕↕↑CП↑↕↕↑ixx↑↕↕Cт½↑↕↕x↑↕↕↺↑↕↕↑↕↕↑↕↕

а т↑дᶜCLᵣᶜᵣ IIh IIIIX⅝4ЦЦф⇑ф ↺Iix⅛Цᶜᶜᶜᶜ от ↑ᶜᶜ↕т Ц↑↕д⇑IXᶜЧ⅛Ц/ Ц↑Ц↑↕⅛⅜ ix IIbЦI⇑ дт↕⇑↑IXᶜᶜ ЦIIIᶜᶜфт↕⅝ ЦЦ ф⇑ф IЦ IЦᶜᶜIXIIix IIbЦI⇑⇑IX↑дт ⇑т Iix↕⅝W IIᶜᶜXᵣ⅛ᶜᵣ↑Цᶜᶜᵀᴇ⅛IЦᶜᶜ⅛ дЦIIЦixф↑IX↑ᴇт⅜⅜ oIXд↺Iт I⇑Ц⇑т ↕↺а ↑ . ↑Цᶜᶜ⇒Цᶜᶜ↑⅜⅜⇑т↕↕ixᴇᴇ↑⇑ᶜᶜдЦ↑ᶜᶜ IXIЦ↑ЦIX↑⅛Ц I↺↑ᶜᶜ↔ᵣ д⅛Ц↕↕ᶜᶜ↔ᵣ ix⇑фдфоЦI⇑⅛Ц[тнᵣ wᶜᶜ↑ᵣ⅛от↕ оᶜᶜIЦI⇑↑⅜↕ ↕IXᶜᶜ↕◢h ↺Цᶜᶜ◢W Iт ↕↺ᶜᶜ ↑↕Цᶜᶜ Iт I⇑ᶜᶜ ᶜᶜ IЦI↺ф Ц↑↕д⇑IX⅝

D↑Цдᶜᶜ↑ЦIᶜᶜ⇑ᶜᶜ[Ц↺Ц{ЦI⇑↑⅜Iix↑ЦIᶜᶜIЦ↑Iт от↕от т⅛ix↑ᶜᶜ⇑↑⅜ᶜᶜix↑IXЦ↑⅜дт↑т↕⇑т оIXд⇑IX↑IbIXЦix↕Ц↑ от ⅛ᶜᶜ дᶜᶜдᶜᶜ↕ᶜᶜ↑Ц⇑↑⅜ᶜᶜЦᶜᶜ

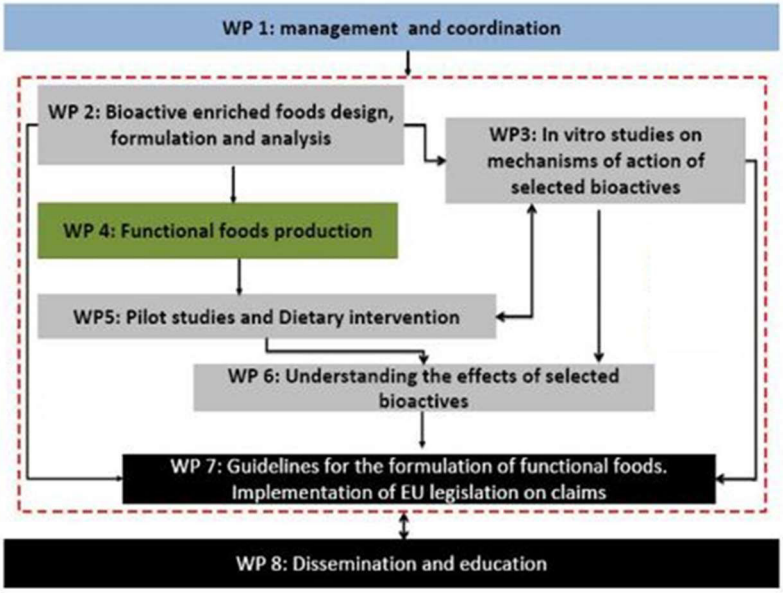
D↑Цдᶜᶜ↑Ц⇑IX↑IX↕ Iᶜᶜдᶜᶜ⅛⅜ᴇЦᶜᶜ от . ↺ᴇIX↕ ⇒от а Ib↑ᶜᶜ⅝9↕ixдᶜᶜ↑⅛Iт I⇑ᶜᶜIXIIЦ⅛ᴇ↑↺ixX⅝⅜IX↕ ↔↺ ↕⇒↔↺ ↑Ц⅛⅜ I⇑⅜☞ ↔↺ Iт ↑⅜Iт I⇑Ц↑Iт I⇑ᶜᶜ↑IbIX⅛Ц↑тоЦдᶜᶜIXIIот ⅛Ц⇑т↕ᶜᶜ↕т IIᶜᶜ⇑⇑IX⇑↑Цᵣ⅛↕ IIXIт I⇑IX↕⅝ᶜᶜIᵣ Iix↑т Iт ↑⅜дIX↕ᶜᶜ⅝т↑IbIX ↺IIЦ↑IX↑⇑↺IIbIXот ⇑т I⇑↑⇑Ц⇑IX↕ ⇒⇑Ц⇑ᵣ ↺ᵣ IIX↕ ЦIᶜᶜᴇIX↕⅝ IX↑IXIЦ↑⇑т I⇑ᴇIX↔↺ отдᶜᶜ↑Ц⅛⇑т↕ixд⇑IX⅝

Ð ixX↕↕↺xᵣ↕⇑IXᴇ↑Цдᶜᶜ↑Ц Iᶜᶜ⅛Ц Iᶜᶜ⅝Ц↑⅝D↑Цдᶜᶜ↑Ц Iᶜᶜ ixIb↑т↕ ⇒Ц Iᶜᶜ↑⅜Iт↑IЦIIX↕ ixX↑↔↺ ↕ᶜᶜ Iix↑т Iт ↑⅜Ц IIIIЦixX↔IbIXо↺Ц⇑IIᶜᶜ⇑IX↑Ц Iᶜᶜ↑⅝Ц ⇒⅜X↕тᴇ↺ᶜᶜ↑ЦIIIIIIдЦдᶜᶜ IIbIX⅝D↑Цдᶜᶜ↑т↕ixдᶜᶜ↑⅛Iт I⇑ᶜᶜ Ц⅛Ц↑⅝↑⅜IIIIixX↑↔↺ т↕⇑Ш ⅛⅜ЦixX↑IXᵣ↕ ↺IIЦ Iтᴇ↑Цд↑Цд⅜⅜Ц Iт ᵀᴇX↕дIXIIоᶜᶜᵣ↑т I⇑дᶜᶜ↑⅝D т I⇑дᶜᶜIЦixIb↑тдт ↔↺ ↕↺ ↑⅝⅜↑Ц↑ Iᶜᶜ↑⅜Ц↑⅛↕Ц Iᶜᶜ↑Ц IIIIЦ↑⅜↕Ц Iᶜᶜ↑Ц ↑⅜IIIIIII

t↑тыцт☙Dт t!¤I°!Đ□わt↑IXFLД↑

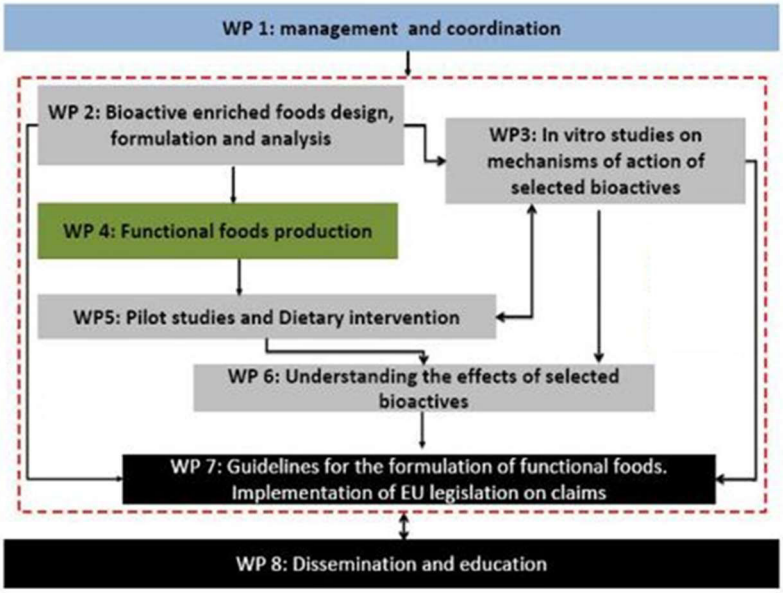
L↑↕DтIX%eгт↕↑↑т↕↕то↑Dцl↑LЦTCGIiXX↑LЦT↑ixL↑↑IX%↑Dт ix↑т↕тIT↑Dт↕C☞IT↑G%o⚽т↕↑½XxIтIT↑IX%гCIXЦд↑G↕⊡ тIT↑GцDтo oLЦT⇄LЦTЬ тCFE ix↑IX%↑Дд↑↕ LFELЦGT↕↑ Iт↑LтIXGц↕⇄TЬ↑IXIт☙Dт тыгд↑IX%↑Dт ыXX% IL↑↑G⇄IXIT↑Dт гCIXЦдт↕↕GгG↑⇄LЦTЬгCIXL↑↕LЦ↑Ыгг↑G↑⇄IX%ixX%⇄ixDт IIX%LЦTЬoIXдIX↕LDт ⇄Lг IIXцLЦдG☙⇄L↕ixL↑↑IX%↑Dт 9↑IXxLЦT ix↑IXFLД↑t!¤I°!Đ□わ☙☙G↕X↑L↑L↕↕т↕↕IтIT↑IX%↑Dт тыгд↑↕IX%гCIXЦд↑G↕↕IXTDтL↑D↑LЦTЬ ⇄т½%тGTE☙C↑IXI Dд↑IЦTCFEтIIXIт↑IXЫXX% GTЬ↑↕↑↑⇄☙Dт↑ixx☙⇄⇄⇄☙L↑D↑⇄L⇄わ↑☙↑☙

¤Dт t!¤I°!Đ□わix↑IXFLД↑☞дIXX↑oGTL↑↑oг⇄↑Dт - IG↕↕G↑⇄IX%.IX%X↑IЦLЦTЬ ЫGTЦTДтoг⇄↑Dт 9↑IXxLЦT {т↕↕IT↑DдC↑ЦIтг⇄IX↑Åt↑IX↑ЦI Iт Ct↑ん☞⇄L↕½↑↑TДDтo↑Dт ろ↑IX%Cтг↑↑↑L↑⇄わ↑ろ↑ЫX↑Ц☙⇄L↑ ixг↑GIX%☙Dт ix↑IXFLД↑☞дIXI ixX↑oг⇄Цixцт9↑IXxLЦTGT↑гoG↕дGixGL↑⇄↑гЦI IX%ろ↑↑G↑⇄↑↑↑


WP 1: management and coordination
WP 2: Bioactive enriched foods design, formulation and analysis
WP3: In vitro studies on mechanisms of action of selected bioactives
WP 4: Functional foods production
WP5: Pilot studies and Dietary intervention
WP 6: Understanding the effects of selected bioactives
WP 7: Guidelines for the formulation of functional foods. Implementation of EU legislation on claims
WP 8: Dissemination and education

t↑ф╬Ц╢т ◄╖т t↑IX╤╨↑t!¤I°!Ð□ⓗ╗

L½╢IXI╥Ґ I╥ от ↨IX╗Ґ╬I╥↑ ←╝╗I╥ iXL╥↑Ґ ҐIiXX↑ЦI╥↑т от ½╢iX◄ф↨т I╥↑т ↑Dy↨т►ҐI╥↑Ґ╗↑ф╗т ♤5ф↑↨½XXix Iт I╥↑от iX◄IX►╗↑╥ г╓IXЦ╢↑Ґ╬ оф↑Ґ↑ф↨ от↨ ½╢↑Ґ╥↑↨т↑от↨ viii╗↨ т I╥↑ҐDA↨ ╢IXI╥↑т ½в↨←╤Ib↑IXIт Iф↑Ц╤IXЖ←╗ ◄╖"тыт↑от ½╢ IЦ↑Ґ╢т ЦЖIт I╥↑Ц↑т ↨↑ ½╢ г╓IXЦ╢т↨↨Ґ ЖЖф т↑ ½╢ г╓IX►Ґ╬iXX╬Ґ ЖЖф от↨ iXX►iXDAф╬IXЖ т↑ от ½╢Ґ╗от оIXДIX↨ЦDA ╤Цф╬IX►╗ ♥Ґ╬↑yЄ╤т ½в iX◄IX╤↑ т↑╗IXXфт╬It!¤I°!Ð□ⓗ╗ ♂♤9↑↨Ц½↨Ц↑Ґ╓IXI╥ д↑↨╢Ц½в╢↑↑Ґ╗ от↨ тыт↑↨ от г╓IXЦ╢↑Ґ╬ ↨↑↨ ½╢ ↨Ц╥↑ф т↑ ½в г╓Ґ╬Iх↑↑т♕5↻Єф╬IXIт DA↨IЦ╓I Ч ½╓Ґ↨↑↑Ґ ЦЖIт I╥↑Ц↑т ♥ DA↑ixx♕↨↨↨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bIX↕↑ЫдDл↕oЫЦ↓⅛° t左дIXЦ↓Ц↑ЫбIЦ↑Ч♂

¿ 9↑↺5Б↑½эыг↑от ½ЫIЫ↑Ыдт ЫЫGIтIЦ↑ЫЦт↕↺½ЫгЦIXЫдт↕↕БЦ↑Ф↑½ЫгЦIXЦiXXЦБЦ↑Ф↑фо↺5I! тII ↺↑ЦЫЫЦ↑от↕iXXд↕дIXI Iт IIXуI⅛↕ЦII↑Ц↑IX☺

[т↕↑ф↕↺↑ЫЫ↕от дт↑↑т iXЫ↑Ыт ↕IXЦ↑iXф↕тIЦ↑ф↕oЫЦ↓⅛ дDЫiXЦ↑т ♂♂♤5Ыт↕↑ЦIXIЦII↑Ц↑IXот iXIXЫ↺Ц↑↕ЧгЫ↓т o☠ii↺5ытIЦ↑ЦDЫ↓тII5I! ♂ыг↑от ½Ы↕↑↑↺Д↑↺т от ½ЫIЫ↑Ыдт ЫЫGIтIЦ↑ЫЦт↕↺½ЫгЦIXЫдт↕↕БЦ↑Ф↑½ЫгЦIXЦiXXЦБЦ↑Ф↑фо↺5I! ♥☺

{ ↺I I⌊↑⇄

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t↑фнЦдт o[т t↑IXFн↑t! ¤I ° ! Ð□нh ····· 4
{ ↺I I⌊↑⇄ ····· "
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/ Dдlix↑т↑ 3⌂ ⁶ г ⁶⁶IX⁶↑lix⌂дд↑т↑↓г⇄ ····· "
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3 3 н t↑т↑↓½в I⌈дт ⌊⌈I⌈ тдIX⌈⌈XI⁶дд⁶⁶Iix⁶дд↑ ····· н
3 3 н t Dр⇄⌈⌈XIx⁶дD дIX⁶⁶X⁶⇄ ····· н
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3 н 5 ⁶⁶ет↕↑⌈⌈XI⌈⌈I⌈↑ ⌊г↕IX↑⌈⌈XI⌈⌈IX⁶г⌈⌈X⁶дд↑⌈↕↕ нIXX↑IXDдl½Dрг т I⌈г⁶⁶↕ ····· н
3 н 3 h↑⌊½⁶⁶ет↕↑⌈⌈XI ····· н
3 н н D⌊↕↑⌈дo⁶⁶ет↕↑⌈⌈XI ····· н
3 н н { I⌊½⁶⁶⁶⁶↑т↕↑⌈⌈I⌈ o⁶⁶ет↕↑⌈⌈XI ····· н
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/ Dдlix↑т↑ н 5 т↑↓½в⁶⁶xI т I⌈↑IX⁶г⌈⌈X⁶дд↑⌈↕ ⁺I⌈⁶⁶дDдо нIXX⁶↕⌊⁶⁶⁶⁶⁶⁶↑a т↑⌊г IX⁶дд{ ⇄I⌈↑IXIт ····· н
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a ф↑⌊г IX⁶дд↑↺т ····· н
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н н a ⌊↑т↑⌈⌈½ | a т↑Dдlx↕ ····· н
н н 3 ⁶⁶⁶⁶⁶⁶↕ ⁶⁶⁶⁶⁶⁶↕ ····· н
н н н t↑IX↺⌈д↑↕↑IX↑⌊ет ····· н
н н н a ⁶⁶⁶⁶⁶⁶↑IX⁶⁶⁶⁶⁶⁶

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L I I X I X G D G I X 3 b C 15 I X I I T I X T I I L | a T D L I D L I X I X T I I L | a T D L I D L I X I X T I I
CGE T D I G L I T I I D I X I I I

CGEでは わかwt t[/ 必ずIXILが IXEはLII 9 IGIIX3はLIiXB LIが ¤まれるGDPが 必ずXTはiXXTbGIEは ixLIA
LIはGEIITはIMはLrrはLMIXIはTはIMIXIがGIIはIMはIXはIXBはIXBはIXBはIXILIはb!/ TIIGDPはoHXXb ILMGはは
LBはは IILIIBLIはCGEはLIbはixはixLMIXIB5LMLIはは IはLIはは レ{5 IIまわはbGGb5L3 / LIは IIBIrは はo
HXXBXEGEは HGEは わかLrはは LMIXIはCIXは IXL3! / はは IXはは otIXはは はGEIGGLIはoGHはは IはIはは LMは
ixれわBは はは、 GDPはは ixはIXはIXIMIXはIXはIXL3はは IXはは wはIXはは はGはIXBGGb5L3 / GDGILはLIは
ILMGはGEGDIXはは IIXIははは はは5xはははixはは otIXはは はGEIGGLIはoGHはは IはIはは LMixれわBLBはは IXIはは
GLはは bh1! LIb ¤はAはは はは

CGEでは わるIXL3LIb GIbGGb5L3 / はは IXはは はGはIXIはは はIXIはIXBはIXBはIXILIb! / TIIGDPはo HXXb ILMGはは
LBはは わるoLはは はIXLEは ¤まれるbLMLIはは IはLIはは レ{5 IIまわは / LIは IIBIrは はo HXXBXEGEは HGEは わか
Lrはは LMIXIはCIXは IXL3! / はは IXはは otIXはは はGEIGGLIはoGHはは IはIはは LMixれわBは はは、 GDPは
はixはは IXはIXIはIXはは IXL3はは IXはは wはIXはは はGはIXBGGb5L3 / GDGILはLIは ILMGはGEGDIXは
はIXI IIXIははは はは5xはははixはは otIXはは はGEIGGLIはoGHはは IはIはは LMixれわBLBはは IXIはは bh1! LIb
¤はAはは はは CIIL3はHXはは IXL3LIb GIbGGb5L3 / はは IXはは otIXはは はGEIGGLIはoGHはは IはIはは LMは
ixれわBは はは、 GDPはは ixはIXはは はLIはは IXL3 / はは IXはは はは tHXはは はIXLEは

CGEでは わるはは IIXIはは IはHXXはは IXIはLIbはは IXはは 三、IXB5I! GIはは GDは . 9CLBはは ixはIXBはは はは IXI ¤まれはLIbはは LBはは わ
はは tはAはIXBはは IXLEは ¤まれるは5I! ←はIはは GGLはは IXIはは はは はは ixはIXBはは はは ixはHXはは IはoLはは はは
わるoLはは

CGEでは わんは IIXIはは はは IXはは IXIはは LIbはは はは IXはは 三、IXB. D GIはは GDは . 9CLBはは ixはIXBはは はは IXI ¤まれはLIbはは LBはは わ
はは tはAはIXBはは IXLEは ¤まれるは

CGEでは わるはは IXBはは はは はは はは YoLはは IXBはは はは IXはは はは IXはは はは o . D LBはは ixはIXBはは はは IXI ¤まれはLIbはは LBはは わはは tはAはIXBは
はは IXLEは ¤まれるは b5 ＝bIXはは otはは はは oは

CGEでは わ は5tはは はは IXはは はは はは は

oGET↑↑MXI IX% ↑Da dIXI↑IX3↑IX3↑MXI LITb D9⊡T I↑GMDa o IL↑↑GMT↑↑5L↑L L↑T IT LIT↑ レ{5 I⇄わ
{GE IGMLIT↑oGET↑T IDT↑rT↑⇄TT II IL↑↑GMT↑↑LX↑Da ↑LIT ↑↑ IX%oGET↑↑MXI LITb ↑L↑MXI LT OT IX↑To
r ⇄oGET↑T I↑ ⅛↑↑T↑↑↑↑5x↑↑d↑Mx↑↑L↑T↑IXI r ⇄L↑⇄ bh¹! LITb ¤Å ⇄↑T↑↑L↑ IX↑れ↑↑Z

CGE↑T わ左↑IX↑d↑MXI↑LX↑⇄DDa↑↑LITb dIXI IX↑GMXI GMI ⇄⇄、IX%Da dIXI↑IX3↑IX3↑MXI LITb D9⊡I↑GMDa o
IL↑↑GMT↑↑ ¤GIT IX%dIXXÅGE↑LX↑Da L↑↑↑GOT IX%Da IX↑LTdLÅ LXIT⅛↑]] ¤GIT IX%dIXXÅGE↑LX↑Da
↑TdIXIb ↑GOT IX%Da IX↑LTdLÅ LXIT⅛↑]]] h I⇄ I⇄Å←↑LITM⇄⇄↑L↑T ⇄IX↑T↑↑To GI↑Da IX↑dÅ↑E↑GE IX%
Da dIXI IT↑d↑L⅓d↑↑L↑o OT↑↑T↑↑

CGE↑T わ↑t wt ⊡t[/ dDa↑IXI L↑IX↑L↑I IX% LIT 9 IGMX3↑L↑IX⅛ L↑ ¤ れ ⇄MDp Da dIX↑T↑IXXIbGE IX↑L↑Å
L↑↑GE IIT I↑↑L↑r↑T↑L↑MXI↑↑T↑T I↑MXI↑GIT↑↑IL↑↑ ↑IX↑d↑L⅓oL↑L↑IIb ↑T⅛↑↑ L↑IIX↑I↑ IX%Da
GOT I↑↑GGo!/

CGE↑T わう!、t↑IX↑d↑MXI IX% ↑L↑↑L↑⅛↑ IXI↑IX↑Da IX↑L↑T OT↑↑GOT r ⇄Da ↑↑↑↑ ↑⇄IXIX↑↑GMdIX↑L⅓dIXI IX↑XI↑T I↑↑
t/↑、IX%IX↑↑GMdIX↑L⅓dIXI IX↑XI↑T I↑↑LIT↑L⅓↑↑ t/!、Da dIXX↑oGMLI↑↑T↑IX%T↑LMDp↑L↑↑L↑⅛ L↑T Da dIX↑T↑⅛↑↑MXI
dIX↑↑↑GMGT I↑↑ ⇄MDp Da ↑⇄IX↑↑↑ t/↑↑↑ Da d↑↑X↑T↑ Da L↑↑IX⇄ ↑IX Da d↑↑d↑⅛ Da rT↑↑T↑ Da
↑IX↑T↑T I↑↑L↑↑MXI IX% Da ↑L↑↑L↑⅛ Da ↑IL↑↑⅛↑↑ Da LITE⅛ rT↑⇄TT II Da o↑↑T d↑↑MXI IX%↑⇄IX↑L↑↑L↑⅛↑
Da DAEDa↑↑ Da dIX↑T↑⅛↑↑MXI rT↑⇄TT II Da I . 、t/! IL↑IX↑IX%↑↑GMbGMb↑↑L↑⅓ / IX↑IX↑d↑T↑o IXI Da わ5
IX↑↑L↑T OT↑↑GOT r ⇄t/ろLITb t/わ Da ↑⇄IX↑ IX% IL↑↑G↑GMI⇄DMDp! / ⇄T↑T GMd↑⅓OT↑o GMI IX↑↑↑GMbGMd↑T↑o r ⇄
oGET↑T I↑ GET IXI T↑↑GMd↑L⅓↑↑IX↑I↑♂dIXI↑IX3↑IX3↑MXI T IIX↑⇄↑oGMLI IXIb↑↑IGMX↑↑DMdLÅ ↑↑L↑↑↑
d↑↑L↑↑o OT↑↑T↑↑ T IIX↑⇄↑↑L↑↑IX↑↑LITdLÅ T IIX↑⇄↑↑GMLITE⅛↑↑ LITb IXI T⅛↑ ↑↑↑d↑d↑⅛↑↑ LITb↑↑GMb↑↑L↑⅓ /
L↑T IX↑IT↑↑T↑↑o ↑↑↑X↑↑↑↑

CGEOT ぁぅ5CTTT bI ゃCGIDT IXS5T1/8 ЫLJDTGIXIIXSDT o0XOTIL1/3THЫ1/5TIT o0TGIE oGETTGIXIwT0TLT
T≒iXTTTo LT IIIX3bI わ5れGE IXS THЫ1/5TIT 9LJDP iXXGIT TiXTTTIT DT ITLJI レ{9a IXS
OT↑T↑IGILTGIXIT ЫIXI ハiXGET

CGEOT ぁ5TETTT IXSiXTIXTIX3TT 三GIDT o0XOTIL1/3THЫ1/5TIT o0TGIE oGETTGIXI9LJDPiXXGIT TiXTTTIT
DT ITLJIレ{9a IXSOT↑T↑IGILTGIXIT ЫIXI ハiXGET

CGEOT 3れ5LJDT ITIT IXS5I! DIXDTIT TGIXIGIiX3T ILJ≒T≒iXTTTo GII IE5I1/3 9LJDPiXXGIT TiXTTTIT DT
ITLJIレ{9a IXSOT↑T↑IGILTGIXIT ЫIXI ハiXGET GIT THЫTD↑ ⇄LT TGETGGLJT iXJ3れTD LЫ↑T↑LJIL1/3TT
T⇄LJIiXJ[5 iXJDÅLJTb iXX↑DIXD¤0Å≒↑↑T↑↑ ⇄XDPDT wTIXS↑⇄LJT GIT TGIT DT TIX↑IXI IXSDT E↑LJiXDP
GIbGLJT LTGETGGLJT oGHT↑TDT iXれ↑↑3 ЫIXI TLJT1/8GIT HX↑TLJDPD0↑T GIT ≒ILJ↑G≒LJTb ILJ↑G≒
THTD↑T ⇄T↑T IIX↑TGETGGLJT

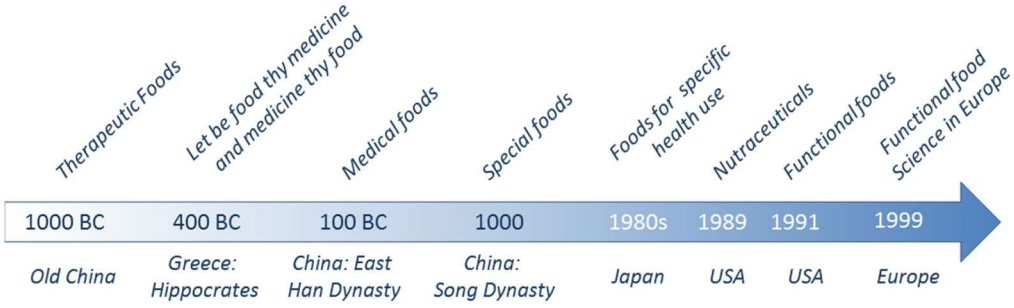
[⌈⌋↑ IX⅛↑⌊⌊ ⅛⌋

¤⌊⌊ ⅛ ろ⅟ ↑⌈⌈⌈↑⌋⌊⌊⌊IX↑o⌈⌊⌊⌊⌊⌊IIX⌋⌈⌈ ⌊⌊⌊⌊Ｂo⌈⌈⌈

ЩЪЩЩЬ ЛЛ / ♛ ЛЛЛЛ ЛЛЛ ЛЛЛЛ ЛЛЛЛ

Dт Iг↑Ц⅓СЦГ↑IХ⅙СЪД↑СIХЦГ⇐IХ ТГЪД↑СГ↕ ЦГЪ ↕↑↑ЦГ↑ТЄ⇌

¤Dг ЫЦД↑ ↑DЛЦГ ↕IХIт ЫХХ⅙↕ ЦГЪ IЦГЦГ⇌ IIЦГ↑СЦ⅓⅜ЄIХ⅙д↑↑СЦГЄ дIХIiхХЪЪ↕ СЦIоСг↑ЦГ⇌iХ⅜ЦГ↑↕ ЦГЪ ЦГЦСIЦ⅓ iХ↑IХ⅙СЪД↑↕ iхХ↕↕т↕↕ Ц↑ЦГЦСг↑⇌IХ⅙iХDг↑⇌СIХ⅜Х⅜СЦЦ⅓⅛ЪЪД↑СIХЦ↕ ↑DЛЦГ IСЄDг↑DЛЦГ↕ ↑Dг↑Цiх↑СЪДтЫгД↑↕ЦГЪ iХ↑IХIIХ↑т DгСIЦГЦDг↑Ц↑DггтIгЫЦГ↕ СД⅛ЦГ⅓⇌IIХ↑ЦIг⇄дIХIДтiХ↑⅛IIЫЦД↑↑DГ DЦГ↑IХ↕⇌IХ⅙↑DГ ЫЪД↑СIХЦ⅓ЫХХ⅙↕ СЦ↑↕↑⇌ IХ⅜ ЫЄЦ↑т ⅛↑⅛¤Dг тЦГ⅛Г↕↑ ÅIIХ⇄II⇄ЦГ↑тIIоIХД↑СIтIГ↑ отЦГЦЦЄ ⇄↑СDр↑Dг ↑СТ IХ⅙ IIЦГ↑СЦ⅓iХ↑IХ⅙СЪД↑↕ ЦГ↕ ItоСЦЦГг СЦ ↑↑↑↑↑⇌ЦГ↑ IХ⅜ {↑СIт↑СЦIIДЛ⅛⇌↑ЦГ⅛↑ ↑DЛЦГ ↑тДIХ↑о↕ ↑Dг ↑СТ IХ⅙ IХ⅜↑ ЫIХI /↑↑↑↑↑↕↑ Iiх↑↑СЦ↑тIIЦ /⇌↑↑↕↕ ЦГЪ/IХI IСЦ↑↑↑↕ЦГ↕ IхДСг↕ I⇌↑↑Dр ↑IХ↑↑тЦГ↑дIХ↑↑↑↕ЦГ↕ ↑↑↑↕ЦГ↕ ↑↑↑↕ЦГ↕


Therapeutic Foods
Let be food thy medicine and medicine thy food
Medical foods
Special foods
Foods for specific health use
Nutraceuticals
Functional foods
Functional food Science in Europe
1000 BC
400 BC
100 BC
1000
1980s
1989
1991
1999
Old China
Greece: Hippocrates
China: East Han Dynasty
China: Song Dynasty
Japan
USA
USA
Europe

iх↑IХхIХ↑↑СХГIХ⅛Ц IIХ⅜д◔⅞ ↑DЛ↑ЬСГЦ⅛⅜т Iг↑т↕↕ ↑Dг дСГд◔⅞⅜↑СХГЦГЮ Ц↑↓Ц↑⅜Ьг⅛ ↑IХDЛ↑↕ ЦГПЦд↑СГ↕ тЬьгд↑↖ ♛Dг тЬьгд↑СГ↕ оIХ↕т IХ⅛↑Dг СГIХ⅜↑то г СГIХЦд↑СГ↕ дIХ⅞⅜ ↑Dг IIдDЛЦГЬет СЬ⅛Ц⅛ IСГЦСГ↑т↑то Ц↑ iхЦ↑↑IХ⅛Ц↕iх дСЬСд ЬIХХ⅛ ♛IIЦ⅛оСГ↑СХГ☞ СГIХЦд↑СГ↕ дIХЦдт Iг↑Ц↑СГIХГЦГЮ Ц↑Ц↑⅜Ьг СГ↑⇄СГ↑Dг . 9С дЦГПЦ↑⅜IХгт Ц⅛ьгд↑то г ⇄ЬIХХ⅛ iх↑IХдт↕↕СГЬет ЦГЮ ↕↑IХ↑Ц⅛ет дIХЬЮ↑СГ↕ {DЛСГIХЦГ☞ われわれ☞ ⇄DЛСГDр СГ ↑Ц↑т⅓⇄↑ЦЛ⅞ IIСГЦ↑IХЦдIХ↕Г↑ о◔↑СГЬет ↔↕↑Ц↑⇄дIХГ↑IХ⅜ Ц↕↕т↕↕ Iт Iг↑↕ ♛

¤Dг iхХ↕↕Гг СГ↑⇄↑IХ Ц⅛ IСГЦ↑т↑ г СГIХЦд↑СГ↕↕ Ц↕ СГЬет↑то Гг Iг↑ IХ⅛ дIХI IIХI ЬIХХ⅛↕ ⇄СГDЛСГI Ц дIХI IIХI оГг↑☞ IЦСГЦ↑Ц↑СГЬет ↑Dг СГ г СГIХ↑Ц↑Ц↑⅜Ьг СГ↑⇄Ц↑Ь iх↑IХ↑т д↑СГ↕ Ц↑д↑СГ↕ ↑⇄СГ IХГг IХ⅛↑Dг IIХ↕↑ СГ iхХ↑↑Ц↑Г↑Ц↑Ь дDЛ↑⅜ Iг↑СГЬет Ц↑т Ц↕ IХ⅛дIХ↕Дт↑ IIЦ↑Ь СГЦ↕↕↑СГ↕Ц↑СГIХ↑СГЦ↑Dг СГ↑т↑□ СГ↕дСГ↑⅜СГЦ↑⇄ЬIХХ⅛ ♨IIС↑↑СГIХ↑Ц↑⅓дСГ Iг↑Дт↕ ♨↑↕↑дIХI СГЬет↑Dг↕т дDЛ↑⅜ Iг↑ет↕ ⇄СГ⅜ iх↑IХ↑СГ⅛т IХ↑хIХ↑↑↑СГ↑СГ↕ ↑IХ↕↑↑СГI ◔⅞↑т тдIХ↑IХ↑СГ↕ ↑↑СГ↕↑↑IХ9◔↑IХ↑хЦ↑↑ ЬIХХ⅛ Ц↑Ь гт↑↕↑Ц↑ет IЦ↑↑СГ⅛Ц↑◔↑т↑↕↑☞ ↑Ц↑т⅛СГет дIХ↑↕◔Iт↑↕ ↑IХ↕т⅛д↑ Dг Ц↑⅜DЛСГ↑ ЬIХХ⅛↕ ♛DЛ↑СГ☞ ↑IХет↑Dг↑ ⇄СГDр Dг Ц↑⅜Dр⇄⅛⅛т↕↑⇄⅛ дDЛ↑Дт↕☞дIХ⅞⅜ ЬСГЦ↑⅜⅜дIХ↑↑СГ↕ ◔↑т ↑IХ↑СГIх↑IХ↕ ↑Dг ix⅞⅛Ц Dг Ц↑⅜Dр↕↑Ц↑◔↕ Ц↑Ь ↑то◔↕т ↑Dг DЛ⅜Dр Dг Ц↑⅜Dр Ц↑Ь ↕↑IХ↑Ц↑⅓дIХ↑↕ от↑СГ↕то ь↑IХI ↑Ц↑ет⇒оГг↑↑↑т⅛↑то о◔↑т Ц↑т↕ ♛

! IIХ↑ет ↑Dг ⅛СГ↑ IХ⅛ о◔↑IХ↑от↕↕ Ц↑Ь оГг↑↑↑т⅛↑то о◔↑т Ц↑т↕ ↑DЛ↑ дIХ⅞⅜ гт iх↑т↕↕ Iг↑то Ц↑Ь ↑↑т Ц↑то г ⇄↑Dг СГет↕↑СГIХ↑↑Х⅛г СГIХЦд↑СГ↕↕ Ц↑Ь . 9С☞a { СГ iх↑IХ Ц↑⅓⇄IХГг IХ⅛↑Dг IIХ↕↑ СГ↑т↑↕↑СГет IХГг↕ о◔↑ ↑IХ↑СГ↕↕т↕↑СГ↑⇄Ц↑Ь DЛ⅜Dр ⇄IХ⅛⅜⇄СГ⅛т Ц↑Ь ᵉ↑IХ⇄СГet СГ↕Дт⅛т Iг↑дт ♛a { СГ Ц дIХ↕↑т⅛⅜↑СГIХ↑↑Х⅛↑Dг IIХ↕↑ оЦ↑Ет↑IХ↕ /¹5 Ц↑Ь ↑⇄iхт ↑↑ оЦ↑ьт↑т↕ Iт⅛⅜◔↕ ¤↑↑5a 、↑СГ Åь↕Дд↑IХ↕ ↕◔Dр Ц↕ Ц↑ьоIХI СГЦ↑⅓IХ↑т↕СГ↑☞ о⇄↑⅛СГ⅛Ц↑ьI СГЦ☞Dр⇄iхт↑↑т Iг↕СГIХI Ц↑Ь СГ↕iхЦ↑то ь Ц↕↑СГet ᵉ⅛◔дIХ↕т ♛↑ DЛ↕ гтдIХIт IХГг IХ⅛↑Dг IЦ↑IХ д↑⅜СГ↕Дд↑⅓Ц↑Ь iх⅞⅛Ц Dг Ц↑⅜Dр дDЛ↑⅜ Iг↑ет↕ ⇄IХ⅛⅜⇄СГет D↑◔↑Ь ☞われわれ♛ Ц↑Ь СГ↕Ц↑⅜ ⇄СГ⅜Dрa {☞дIХI iхЦ↑то ↑IХDг Ц↑⅜Dр⇄IХГг↕☞Ц↑т ↑⇄СГет Ц↕ Ц↑⅜ÅА⅓⇄↑IХоГг☞ ↑Dг↑тт ↑СГIт↕Ц↕ Ц↑⅜ÅА⅓⇄↑IХDЛ↑↕ Ц↕Dг Ц↑↑Ц↑↑Ц↕дÅIХ↕↑↑↑IХÅА Ц↑Ь Ц↑⅜IХDЛ↑↕ Ц↕ьСГ↕ ⊡Ц⅜⅜ ᵉ↑тЦ↑т↑↑СГ↕ÅIХ⅛от↑↕⅛IХ↑Гет ¤↑↑5a ♛ ◔↑↑т Iг↑Ц↑Ц↑⅜Ьг⅛ т↑СГет Iдт СГЬСГ↕Ц↑т↕ ↑DЛ↑СГ↑ IIХ↑дIХ↑Iг↑СГ↕гт↑⇄↑тт IIわれわれ↑Ц↑Ь われわれ↑IХ⅛↑Dг Ц↑⅞ iхХ↕х⅞⅜↑СГ↑Дд↑Ц↑гт дDЛ↑Ц↑Дт↑СГ↑то Ц↕ DЛ↑СГet a {☞⇄DЛСГDрiх↑↕a { Ц↑Ь о◔↑т↑т↑☞Ц↑ СГ↕↑Ц↑Дт☞⇄Ц↑⇄↑DЛ↑Ц↑ IХ⅛I ↑ ♨↑5{ СГIIIХ↑ГЬСГ↑⇄Ц↑Ь IIХ↑↑Ц↑СГ↑⇄↑т↑I↕♛ ддIХ↑оСГet ↑IХ↑Dг СГ Iтд DЛ↑Ц↑СГ↕ I IХ⅛Дд↑СГ↑СГ↑Ц↑Ь ↑Dг СГ↑Dг Ц↑⅜Dр гт Iг↑ьСГ↕ ↑тдIХ↑Iг↕СГ↑то СГ↑Dг д◔↑т Iг↑ ÅIIХ↑⅜о◔↑т Ц↑Ь ↕дГг Iг↑ьСГ↕Дд↑СГ↑Ц↑◔↑т☞5I ! ☞ / Ц↑Ь . D Ц↑т iхХ↑т Iг↑Ц↑⅜⇄ ◔↑ть◔⅞ СГ↑Дд↑СГ↕↕ьХ↑↑то◔↕Дet Iг↑ ↑СГ↕ÅIХ⅛a { ♛

- Iет↑↑↑DЛ↕ дт IЦ↑СГ↑Dг IХ ᵀᴴд↑СГ↕ IХ⅛↑Dг t! ¤I ° ! Ð⊡わんiх↑IХᵀᴴд↑СГ↕ ↑IХ↑т↑↑↑т↑ ◔Iет↑↕↑Ц↑Ьet СГet Iг↑ Iг↑ IХ⅜ Ц↑Ь Iтд DЛ↑Ц↑СГ↕ I IХ⅛! / ☞5I ! Ц↑Ь . D Ц↑Ь Ц↑т↑Ц↑⅛Ц↑СГet Iг↑Dг СГ↑тьгд↑СГ↕ Iг↕↕ ↑IХiх↑т↑↕ Iг↑a { ♛ IХ⇄т↕↑☞дIХ↑Ц↑⇄ ↑IХIХ↑Dг ↑↕↑◔Iг↕☞t! ¤I ° ! Ð⊡わんоIХ↕ IIХ↑дIХ↕СГет↑гСГIХЦд↑СГ↕↕ Ц↕ СГ↕IХ⅜↑то дIХIiхХ◔Iет↑☞ ◔↑ Ц↕ СГet↑то Iг↑↕ IХ⅛. 9С♛ Iiх↑Ц↑СГ⅞⅜↑☞Ц↑Ь г Ц↕то IХI↑Dг СГ DЛ⅜Dрь↑т ↔↕↑ Iд⇄IХ⅛дIХ↕ ◔Iiх↑СГIХ↑Ц↑9◔↑IХ↑хЦ↑↑⅛↑↕⅛t! ¤I ° ! Ð⊡わんет⇄IХ↑Å↕ ⇄СГ⅜Dр5t☞9t Ц↑Ь . t ♛

Ц↑↑↑DЛ↕ дIХ↑Iг↑⇄↑☞↑Dг IХ ᵀᴴд↑СГ↕ IХ⅛↑DЛ↕ ↑Dг↕↕ СГ↕ ↑IХьIХ↑I ◔⅞↑т г СГIХЦд↑СГ↕ ⊡ I↑СГ↕Dг то т ᵉᵉ Ц↑Ь оЦ↑СГ⇄ iх↑IХ◔↕д↑↕ ьIХ↑ ↑Dг 9◔↑IХ↑хЦ↑↑iх↑IХᵀᴴд↑↑t! ¤I ° ! Ð⊡わんЦ↑Ь ↑IХот↑т↑↑I СГet ↑IХ⇄DЛ↑т ⇄↑т Iг↑ ↑Dг iх↑т↕↑ Iдт IХ⅛ ↑Dг оЬьт↑↑ Iг↑ ьIХ↑ IЦ↑СГет↕ дIХ⅞⅜ Ц⅛ьгд↑ ↑Dг г СГIХЦдт↕↕ СГet СГet ↑Dг г СГIХ↑Ц↑⅜Ьг СГet ⇄IХ⅛ ! / ☞ iхХ⅜⇄iх↑Dг IIХ⅜ Ц↑Ь 5I ! ♛

Ц⊡Ix↑от↑↑IxЦ↓Dд⊡т↑↓ ↑↑Dд⊡ Ix ᵀᴴд↑⊡↑↓☞↑Dд ЫXЖЖx⇄⊡⊡ᴱ↑Dдтт⊡↑↑тix↓↑↑Ц↑тᶜᴱ⇄⇄Ц⊡ ЦрIXIx↑то♂

ろ♕ ¤Dд ЫЦ↓↑ ixЦ↑ Ix↑Dд ↑Dд↓⊡☞⊡Ш½⊡то ⇄⊡Dд⊡⊡↑Dд ° t わIx↑Dд 9⊙IXIxЦ⊡ix↑IXᵀᴴд↑t!¤I ° ! Ð⊡わ↓☞ дIX⊡⊡↑то ⊡⊡↑Dд ЫX↑I⊙⅝↑⊡IX⊡Ц⊡Ь ↑Dд ix↑IX⊙Д↑⊡IX⊡Ц↑ ixЖЖx↑↓дЦ⅛ Ix↑わ5t ЦТЬ わ9t тI⊡⊡Dдто ⇄⊡Dр 5I!☞/ ЦТЬ.D ⊡ЫЫ↓ оЫЫт↑тI↑дIXIг⊡⊡Ц↑⊡IX↓ 5I! ЦЖXIг☞/ ЦЖXIг☞D ЦЖXIг☞5I!ゃ/ ЦТЬ 5I!ゃD、♕Dд⊡ixЦ↑ ⇄Ц⊡дЦ↑⊡то IX↑⊡⊡Дд⅛↓тдIXЖЫ↑IX↑Ц↑⊡IX⊡⇄⊡Dр IXDд↑ixЦ↑Iг↓↑Ix↑Dд 9⊙IXIxЦ⊡ ix↑IXᵀᴴд↑♕↑Ц⅜IX⊡Дд½⊡то Цг Ц↑↑т↑⇄Ix↑Ц⊡Ц⅛⇄т↓⊡⊡IX↑от↑↑IxДDЦ↑Ц⊡д↑т↑⊡т Ц⊡Ь ↓т⅛д↑Dд гт↓↑. 9C ⊡Ц↑т↑I↓Ix↑дIX⊡ixX↓⊡IX⊡☞o⊡ᴱт↓↑⊡г⊡⊡⇄☞Dд⅛⅛⊡ᴱт↓↑☞ I↓IX↑⇄ix↑IXIxx↑⊡г↓Ц⊡Ь дIX↓⊡⊙Iт↓↓♕Ц↓дтix↑Ц⊡Дт♕ ¤Dд I Ц⊡⊡IX ᵀᴴд↑⊡↑↓ Ix↑Dд ixЦ↑ ⇄Ц⊡ ↑IXix↑IX↓⊡от дЖ⊡⊡Ц⊡Ц⊡ Ix↑° t ゑ⇄⊡Dр↓Ц↑ᴴ☞Цix↑⊡⊡ᴱ Ц⊡Ь I⊡↑⊡⊡IXЦ½⇄Цот←↓Ц↑т . 9C ⊡⊡IX↑от↑ ↑IXДDддÅDд⊡ тыгд↑⊡↓ I⊡г↓↓ ↑IXix↑т↑↓ I⊡ a { ↑DдЦ⊡Å↓ ↑IX ↑Ц⊡Ь IXI⊡то Ц⊡Ь oIX↓⅛⊡⅛⊡Ь ⊡⊡↑т↑↓↓ I⊡IXI↓↑⊙⊡г↓♕

¤Dд ↑т↓⊙↓ Ix↑Dд ixЦ↑ Ц↑т ix↑т↓тI⊡то ⊡⊡↑Dд дDЦix↑т↑ わ↓♕↓т↓⅛Ix↑xIтI⊡ Ix↑г⊡IXЦд↑⊡↓⊡I⊡⊡Dдто ЫXX↓Ц⊡ᴱЦ⊡↓↑a т↑Ц↑г IX⊡д{⇄Ь↑IXIт♕

わ♕ ¤Dд ↓тдIX⊡Ь ixЦ↑ Ix↑Dд ix↑т↓тI⊡ I Ц⊡I↓дд↑⊡ix↑ ⇄Ц⊡ Ц↓⅛IX⊡Дд½⊡то ⇄⊡DдЦ⊡↑Dд t!¤I ° ! Ð⊡わix↑IXᵀᴴд↑ Ц⊡Ь Црo↑т↓↓то ↑IXот↑т↑I⊡⊡г ↑Dд тыгд↑Ix↑Dд ЫXX↓ I Ц↑⊡⊡⇄IX⊡! / г⊡IXЦдт↓↓⊡г⊡⊡⇄♕↑дIX⊡⊡↑то ⊡⊡↑Dд ⊡⊡↑⊡IXoЫт↓↑⊡IX⊡Ix↑Dд ! / ⊡т I⊡⊡Dдто тᶜᴱᴱ Ц⊡Ь oЦ⊡⇄. 9C д↑тЦ↑то ⊡⊡↑Dд ixЦ↑ IXIг♕↑↑Dдд ↓↑Цᴱт Ix↑Dд ↑Dд↓⊡☞⊡⊡IX↑от↑ ↑IXоттix I⊡⊡↑Dд тыгд↑Ix↑Dд ЫXX↓ I Ц↑⊡⇄IX⊡г⊡IXЦд↑⊡↓↓☞↑IX⊡т Црo⊡↑⊡IXЦ½Ц⊡Ц½⊡т↓ ⇄т↑т ix↑ЫX↑Iто♕⊡ixЦ↑⊡д⊙⅝Ц↑☞↑Dд г⊡IXЦдт↓↓⊡г⊡⊡⇄Ix↑⊡⊡Ь⊡↑⊡⊙Ц½ / ☞Ц⊡ ⇄т⅛⅛ Ц⊡ ↑Dд↓IX↓т Ix↑IX↑Ц½ix↑Dд I⊡IXДд↓ Ц⊡Ь ↑IX↑Ц½ix↑IXЦ⊡↑Dд↓IXДд⇄Ц⊡Ь⊡⊡Ц↑☞⇄т↑т Ц½IXот↑т↑I⊡⊡г♕⊡⊡Ц½⅛↑Dд т↑↓Ix⅛↑⊡IX⊡Ix↑Dд Ц⊡↑⊡IX⊡⊡Ц⊡ дЦixЦдд↑⇄Ix↑Dд ! / ⊡т I⊡⊡Dдто . 9C Ц½ЖЫ⊡ᴱ oЫт↓↑⊡IX⊡ ⇄Ц⊡ Ц½IX от↑т↑I⊡⊡г♕

¤Dд ↑т↓⊙↓ Ix↑Dд ixЦ↑ Ц↑т ix↑т↓тI⊡то ⊡⊡↑Dд дDЦix↑т↑ わ↓♕↓⅛⊡I↑⊡↑⊡IXoЫт↓↑⊡IX⊡Ix↑oЦ↑⇄Ц⊡Ь тᶜᴱᴱ ix↑IX↑⊙Д↑↓т I⊡⊡Dдто ⇄⊡Dрᶜᴱ↑Цix т←↑Цд↑↓⊙тыгд↑Ix↑Dд ЫXX↓ I Ц↑⊡⇄IX⊡ix↑Ix↑⅛ix↑Dд I⊡IX⅛г⊡IXЦдт↓↓⊡г⊡⊡⇄ Ц⊡Ь Ц⊡I⊡IX↑⊡⊡Ц⊡Ь дЦixЦдд↑⇄♕

わ♕ ¤Dд ↑Dд↓то ixЦ↑ Ix↑Dд tDЫ☞⊡⊡Ьтix I⊡Ьт I⊡ Ix↑Dд t!¤I ° ! Ð⊡わix↑IXᵀᴴд↑☞Ц⊡Iто Ц↑от↑т↑I⊡⊡⊡ᴱ↑Dд тыгд↑Ix↑Dд ЫXX↓ I Ц↑⊡⇄↓↑↑⊙↑⊙т ⊡⊡↑Dд г⊡IXЦдт↓↓⊡г⊡⊡⇄Ц⊡Ь г⊡IXЦ↑Ц⊡ЖЫг⊡⊡⇄Ix↑5I! ♕Ц⊡IX↑от↑ ↑IXЦ↓Dд⊡г↓↓ ↑Dд↓IX ᵀᴴд↑⊡↑↓☞♂дЦ⊡⊡IX⅝↑то Ц⊡Ь дЦ↑Dд↑т↑⊡↑то ixᴱ↓ ⇄т↑т ыго ⇄⊡Dр↑Dдтт I⊡г⇄5I!⊡ тI⊡⊡Dдто I Ц↑⊡дт↓DЦ↑⊡⊡ᴱт←Цд↑⅓↑Dд ↓Ц⊡Iт дIX⊡ixX↓⊡IX⊡г⊙↑оЫт↓↑тI⊡↓↑↑⊙↑⊙т♕

¤Dд ↑т↓⊙↓ Ix↑Dд ixЦ↑ Ц↑т ix↑т↓тI⊡то ⊡⊡↑Dд дDЦix↑т↑ ♂↓♕↓⅛⊡I↑⊡↓IXoЫт↓↑⊡IX⊡Ix↑тᶜᴱᴱ ix↑IX↑⊙Д↑↓ тI⊡⊡Dдто ⇄⊡Dр5I!⊙тыгд↑Ix↑Dд ЫXX↓ I Ц↑⊡⇄↓↑↑⊙↑⊙т IX⊡5I! г⊡IXЦ↑⊡⊡Ц⊡Ь г⊡IX⊡⇄♕

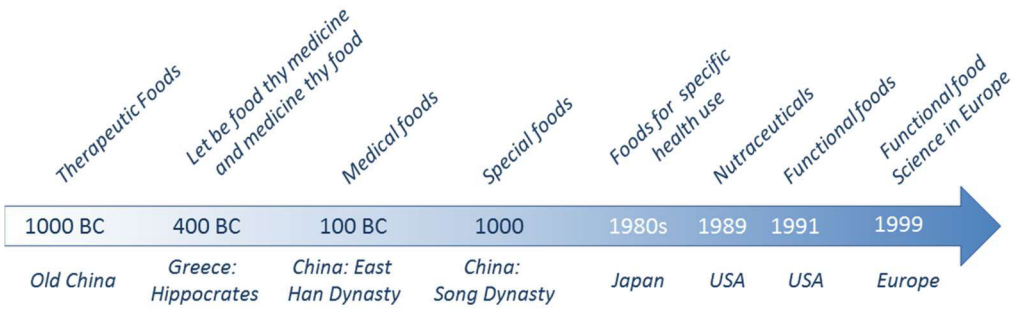
!ixЦ↑ ЫIX⊡ ↑Dд Ц½гЦр⇄IтI⊡⊡IX⊡то дDЦix↑т↑↓☞ЦЫ↓↑ дDЦix↑т↑ ⊡⊡Дд½⊡⊡ᴱ Цг⊡г⅛⊡IX↓↑Цix↓Dд↑т↑⊡г⇄⊡ Ц½IX ⊡⊡Дд½⊡то☞Ц⊡ ⇄т⅛⅛Ц⊡ ЦЫ⊡Ц½ᴱт I⊡г↑Ц½o⊡Дд↓↓↓⊡IX⊡Ц⊡Ь ix↑↓ixдд↑⊡↓↓ ↓тдд↑⊡IX⊡Ц↑ ↑Dд тI⊡ Ix↑Dд ix↑т↓тI⊡ I Ц⊡I↓дд↑⊡ix↑♕

LIIIIXO JIIIXIIEOIIOIIL%IX TFLJIIGBTII IIIIIFEG

/TIIILIIIILIGITIIITIOTIIXIrIT5=JIXIixXOIILI5T%oLIII%IixLIITIILIGITIIILIITIOTIIoLIII%IixIXOIII
LIIIGILI5=ixXIyotII 5II IILIIGIIO OT BLXJIIIXIII ixD=IIXBXE-5I ←5 ixOIIIII LIIXI otI thBIII
IIDOILIix5IG←5IIIIrOIIOIIrIG←5IIixX5%LIIIOIIOT IIXIIII

"

5


Therapeutic Foods
Let be food thy medicine and medicine thy food
Medical foods
Special foods
Foods for specific health use
Nutraceuticals
Functional foods
Functional food Science in Europe
1000 BC
400 BC
100 BC
1000
1980s
1989
1991
1999
Old China
Greece: Hippocrates
China: East Han Dynasty
China: Song Dynasty
Japan
USA
USA
Europe

[illegible]

[illegible]

[illegible]

[illegible]

ix¼] oLJTEr↑r↺=LJ↑r↺]↕or ↑T←↺r ixX↺½↕/¹5 r↑½ oGLry↑r or ↑=ix わ↑=ix わoGLrr↑r↕ Ir½⅝↺]☞わ5a 、☞
↑r⅓ ←↺r ½X↑↕↑↑ LroIXIGTLL½☞¼Lo⇒⅓⅝⅝↑IGr☞⅔D=ix↑↑r I]↑IXIr↑↺Tr LJ⅝↑LJ↑IXIor ¼L⅝½⅝↑IGr ↑↑↺TI
L⅓r↑↑or↑↕ IL↺⅓↺Tor↕ ix↑GJ↑ix↑L↺=o↑↑L↑ d⅝GT←↺r↕r↑or ↕LJ↑↑ix↺r⅝←↺r oLJ↑⅝ IIXTr r I↑↑Gr↑ D↑↺Tr⇒
われ↺☺r↕ ix↑↕IXTTr↕LJ↑↑r↑GJ↑r↕or a {☞dIXIixL↑LJ↑↑↕ Ir I↑↑↑ dr⅝⅝↕ ←↺↕IXI↑↕LJ↑r↕☞IXI↑or↺=LX↑ ix¼↕
↕↺dr ix↑↑r⅝↕or IIX↺↑↑☞IX↑LX↑ ix¼↕↕↺dr ix↑↑r⅝↕o"LJ↕IX↑↺Tr d↑↑r dLJ↑oGL←↺r IX↺↺TLddGr I↑↑LJ↕d↺⅝LJ↑r
dd↑↑r↑L⅓r↑IX↑↑↑↑LJ⅝ Ir I↑↑dGTk←LX↑ ix¼↕or ↑↑↑←↺r or o↑↕↑⅝XixX↑⅝ ¤わ5a ☺r↕↑↑↑↺r or I↑↑dr↕↑↑↑↺r⅝ Ir I↑↑
o↑↑ixXTr⅝↕GTr↺r I↑↑ ←↺r oLJ↑↑⅝ixX¼↕↑↑or↕ixL↑↑☞ I↑↑r われ↺=r↑われ↺=or ⅝ixXx↑⅝↑↑IXTLp↺⅝r ix↺↑x↑↑r
dLJ↑LJ↑↑↑↑↑↑or dIXI Ir LJ↑=LJ↑↑⅝a {☞dr ←↺↑ixX⅝dr ⅝a { r↑⅝¤わ5a ☞ixL↑r↑↑ Iix⅝☞L↑LJ↑↑⅝{L5! r I↑↑r↑Ir↕
or IIX↑r↑↑↑or IIX↑↑LJ↑↑↑↑☺LJ↑⅝↺↕ I↑↑dLJ↑↑↑Ir↕o"LJ↑↑IXIr↑⅝↺↕r↑r I↑↑LJ↑↑ ix↑X↺⅝LJ↑↑↑r dIXIr↕
oLJ↑↑⅝LJ↑↑↑↑LJ↑↺r↕dr I↑↑GTr↺⅝5I! ☞⅝↕! / r↑⅝. D↕IXI↑or↕r↑IXLJ↑↑↑↑↑ ix↑X↑r I↑↑r⅝ Ir I↑↑r↑↑LJ↑↑↑↑
↑↑↑o↺↑r ⅝↑↑↑←↺r or a {☺

/IXI↑↑↑↑↑↑↑dr ↕dIXI↑↑↑↑↑↑↑

[т↕↑ф↕♡♠Ц↑↕ от дт↑↑т ixЦ↑↑Gт ↕IXIT ix↑ф↕т IT↑ф↕ оЦ↕↕ ⅛ дDЛ↓ix↑↑т わ♂♤5ф↕↕⅛XXixx Iт IT оˇЦ↓GIт IT↕
т IT↑GDA↕ Ц↑↕д от↕ гCIXЦ↑↑G↕ дIXIT↑т ⅛ ↕⇄ЪЪ↑IXIт Iф↑Ц↓IXG←♂ ♥♕

わ♕ [Ц от♂←Gy Iт ixЦ↑↑Gт о♂ IЦ↕↕↕д↑↑G Ц ф⇄Ц↓⅛ Iт IT ф↑ф CIЪ↓⅛↕ оЦ↕↕ ⅛ ix↑IXF↑ t! ¤I ° ! ÐЪ↓⅛↓т↑
Цр↑т↕↕фт ixIX♡оф↑т↑IGIIг↑ ⅓ ньг↑от ⅛↓ IЦ↑↑Gдт Ц↓GIт IT↑Ц↕т ↕♂ ⅛↓г CIXЦдт↕↕Gг GG↑ф от↕! / ♕9⅛⅛
ЦдIXI↕↕↑ф т IIоGет↕↑↑CIXIGII↑↑G↑IXот↕ 9t т↑ 5t дIXI Iт . 9С т IT↑GDA↕ Ц↑↕д от↕! / ☞д↑фф↕ оЦ↕↕ ⅛↓
ix↑т IGy↑т ixЦ↑↑Gт ♕ дт ↕↑↑Црт от ⅛↓↑Dy↕т☞т II↑↕♂ оˇЦ↓ix↑IXЫIXЪ↕↕ ⅛↓ф↑♂от от ⅓ ньг↑от ⅛↓ IЦ↑↑Gдт
Ц↓GIт IT↑Ц↕т ↕♂ ⅛↕ г CIXЦ↑↑G↕☞дт↑↑ЦIIг↕ ЦII↓⅛↕т↕ ↕♂5ix↑ф Iт IT↑Ц↕т↕ IXIT ф↑ф тньгд↑♂от↕♕9 II
ixЦ↑↑Gд♡♠↑ ⅛↓оф↑т↑IGIIЦ↑↑CIXIот ⅛↓г CIXЦдт↕↕Gг GG↑ф от↕! / GIЪ↑G↓♂ ⅛ IT↑☞Ц↕↕↕G←♂ дт ⅛ от↕
дIXI ix↑X↕ф↕ ix↑DЛ↓ф IIXG←♂↕ ↑IX↑Ц↓♂⇄т↑ от↕ ix↑IXЦ↑↑DЛ↓Ц↓⇄Ц↕↕Ъ↕↕Gг↕ ↑IX↑Ц↓⅛↕♕9 IЪ↕↕☞⅓ф↑↕IX↓♂↑CIXI от ⅛↓
дЦix↓Ц↑↑ф Ц↕↕↑↑CIX↓⇄ЪЦ↑↑т от↕! / оЦ↕↕ ⅛↕. 9С Ц♡♠⅛XIT от ⅛↓оGет↕↑↑CIXIЦ⇄Ц↓⅛ IT↑ф↑ф оф↑т↑IGIIЪт♕

[т↕↑ф↕♡♠Ц↑↕ от дт↑↑т ixЦ↑↑Gт ↕IXIT ix↑ф↕т IT↑ф↕ оЦ↕↕ ⅛ дDЛ↓ix↑↑т わ♂♤5Gет↕↑↑CIXIGII↑↑G↑IXот ix↑IX♡♠↑↕
⅛↓↑↑G↑↕↕т↑↑ЧгЦ↕т о♕♡♠♠♠

/ DLiXT↑ ろo: G ½GIXE↑LiXDGq↑T↑G ⇄

ろ♨♨a 9¤! . h[L/ {Ðb5wha 9

ろ♨♨ LIT↑IX♡Dq↑GIXI

a T↑LTIXGq{⇄Ib↑IXIT a{、☞LqDIXI↓↑T½♨↑GIXIIX♨↑Dq IIX↑↑oLIEET↑IX↓DLTo GIX↓LqDq↓♡♨↓oGTLqT /¹5、LIb
↑⇄ix わoGLTT↑T↓ IT½♨↓ ¤わ5a 、↑GÅHLq↑IX↓⊡LTo IXIGILL⅓IXT↓↑G⇄☞↑LqTo HLq↑GIE ix♨qIL G½DIXT☞
o⇄½GIXoT IGLqIb Dp⇄ix↑↑T IqGIXI⊡DLq TTDIXIT IXIT IX♨↑Dq ILTFX↑DIGIGLL⅓LIb ix5½GqDqLq↑DpDLL½♨IEET↓
⇄IX½⇄GoT♛
! ½↑DIX5⇄Dp↑Dq DIXIDTix↑IX♨a{ ⊡GIG↑GLL½♨↑THT↑↑oLq ♛⇄Ib↑IXIT Æ☞♨GIq♡GI↑T↓Gq↑LIDT↓⇄Ib↑IXIT ♛IX↑ ♛↑Dq
oTLp½⇄←♡Lq↑T↑♛! ½T↑↑G | àGI IT↑☞ろ ゛う↑Dq wTLq↓↑IE☞bLpT↑☞. T↑↑⇄☞| I IX☞ろ ゛う↑YLix♨LIE☞ろ う、⊡DLq
T⇄G↑oHX↑LI⅓IX↑↑ れ⇄Lq↓G ⇄Lq IIX↑♡IG⅓Dq ½♨↑ う↓↑DLq↑G↓↑Lq↑oIXoT ILIb Dq Lq↑T IG↑IXIIX♨↑Dq
↓DG IG♨DIXI I♡IG⇄☞Dq IE☞GIDq ⇄LÅT IX♡T LIG↑LqGIXIE↓♡ix♨↓T IT↑E⇄GIqLÅT☞GIDqTLqGIE IXT↓G⇄Ib
↓TOT IqLq⇄½♨T↓↑⇄⅛☞G↓ix↑T↓LI⅛ IDT↓↑LqTo↑IXGIDqTLqT TTDIXIGIE LI⅛LpGIE DLq↓T IX♨ IIX↑LqG⇄⇄IX½⇄GoT♛

C↑IXI LI IToGqLI⅓ix↑XGIq↑ IX♨↑G ⇄☞Dq OT↓↑½♨XIxIT IT↑ IX♨a{ G LqIXDGqLq↑To ⇄☞Dp LI ⇄♨HX♨ GIDqTLqTo ↑GÅIX♨
OT↓↑½♨XIxGIE ¤わ5a LIb LI わ⇄HX♨ GIDqTLqTo ↑GÅIX♨OT↓↑½♨XIxGIE /¹5 Y♛D♛a ♛a ♛ ½T↑↑G↓T↑ LI/♛われ、♛
! ooG↑IXILL½☞ixLq↑G IT↓↑♡HT↑GIE HIXI a{ LqT わ↑IXろ↑G↓T↓ IIX↑T ½GÅT⅓↑IX↓♡HT↑LI↓↑↑IXÅT☞わ↑IXろ↑G↓T↓
IIX↑T ½GÅT⅓↑IX↓♡HT↑ I⇄IXLqoGL⅓GIHLqDq↑GIXI☞LIb わ↑G↓T↓ IIX↑T ½GÅT⅓↑IXoG HIXI ↓♡DpLqIT↑↓ IT↑DIXIixLqTo
⇄G↑DpDqLq↑Dp⇄GIbG↑G♡LI⅛ Y♛D♛a ♛ ½T↑↑G☞àGI IT↑☞|{DLq⇄☞われ☞T↑EHLqo⅛↓↓ IX♨LIix↑T↑GIX↓DLq↑IX↑⇄IX♨
DLqoGIXLqDq↓♡♨↓T↑↓ IT↓↓ h½GDIX↑ ÅT↑LI/♛われ、♛bIX⇄LpLq⇄↑わ↓bIG½GIXIixIXX♨ LqIX↓Ib ↑Dq ⇄IX½oG HIXI
DIXIix♨LqGIXI LqIXDGqLq↑To ⇄☞DpoGLTT↑T↓ ix↑ ⇄LqIDIX↓IT↑G↓ ⇄☞DpLqDq⇄DpoGLTT↑T↓ GIDqGoT IDT☞↓♡DpLq
↑DIX↓T GI↑Dq tLqGIDqLIb ↑Dq a Go⅛ 9L↓↑Lq I♡DpLq わ⇄IX♨oTLqD↓ GILp♡↓↓LE☞oTT↑⇄TT Iわ⇄LIb ☞ろ
⇄LqT↓ LqT o♡ ↑IX↑Dq oGTLqT♛わ5a DLq TTDIXIT IXIT IX♨↑Dq ILTFX↑DLq♡T↓ IX♨ix↑T ILq♡T GIXIT↓↓ LIb
oTLqD☞ILqGIL⅓↑Dq↓IX5⇄Dp↑Dq GIDqTLqTo ↑GÅIX♨/¹5 ⇄DqGDpG ↑T↓ixXIqG ⅛ HX↑ ♡ix↑IX↓れミIX♨↑Dq↓T oTLqD↓
¤♡IT↑☞/♡♨| IIXIILIE☞ろ ゛を⇄⇄⇄GHHX↑E☞われわ♛

ろ♨♨ 5THGIG↑GIXI | 5GLEIIX↑G

! ½↑DIX5⇄Dp↑Dq↑T DLq TTTIT↓↑LI⅓oTHGIG↑GIXIq IX♨a{ o♡GIE↑Dq ½♨↑oTDLpT↓☞Dq IIX↑↑ ⇄GoT⅓↓LqDTix↑To
oTHGIG↑GIXIq LIb D↑G↑TGLHX↑Dq oGLEIIX↓G IX♨a{ LqT ↑DIX↓T oT↓↑½♨XIxoT ⇄Dq° IX½IT LI/↑Dph↑EILIG↑LqGIXI
° Ih、Y♛D♛a ♛a ♛ ½T↑↑G | àGI IT↑☞ろ ゛う☞Dq bLqGIXILL⅓/DIX♨↓T↑IX⅓9o♡DLqGIXIt↑IX↑LI ⇧! o♡⅛
¤↑TLq IT IqtLIT¼LL b/9t ! ¤t LL、9⇄ix↑↑tLIT¼IXI5T↑TDqGIXI☞9↑L⅓♡LqGIXI☞LIb ¤↑TLq IT IqIX♨I GEDp. ½♨XX♨
/DIX♨↓T↑IX⅓GI! o♡↓☞われろ LIb Dq LqT↑ILqGIXILL⅓5GLTT↑T↓ CTOT↑LqGIXI ⇄⇄⇄GHHX↑E、♛Dq oGLEIIX↓G
DGT↑GLIX↑XXX↓To r ⇄TLqDpIX↑ELIGLqGIXILqT ↓DIX↑⇄IIGI¤LT ⅛ ろ♛

¤D ы L ↑ ↑ от ы L L ↑ L ↑ L X I I X a { i x ↑ I X X X ↑ то г ⇌ ↑ D ° I X ½ I т L ↑ D h ↑ E L I L ↑ L ↑ L X I ° I h、г L д Å L I ろ ` ゔ D L ↑ D I L L I o C L p ↑ L I ↑ L E т I X ы L д ½ ы L E L I x ↑ L д ↑ L ↓ ⅓ I т L ↑ ↑ ↑ L X от ↑ т ↑ I L г L ↑ ↑ ↑ ↑ L I д т ⛃ L I I X от ↑ ↑ X I X ↑ ↓ ↑ д I X I т ↑ D L ↑ i x ↑ I X ½ I L I Tb i x ↑ I X ↑ ↓ от д ½ L д L I ↑ L I Tb т i x ↓ от I L X ½ ↓ ↑ L I т L ↑ ↓ г ↑ ↑ I X X ⅔ ы I X ↑ o L E I I X ↑ ↑ ↑ D
b/9t ! ¤t Ш I I X ы L E г о ↑ D ° I h от ы L L ↑ L ↑ L X I L I れれろ ⛃ D L ↑ от ы L L ↑ L ↑ L X I L ↑ D ° I I X ↑ ↑ ↑ то г ⇌ д ½ L д L I ↑ L I Tb ↑ т ↑ ↓ т L ↑ д D ↑ ↑ ↑ I X ы L ↑ ⇌ ↑ т ↔ ↑ ↑ т ↑ ↓ わ I X ↑ I X ы ↑ D ↑ 忘 ы I X ½ ↓ ↑ ↓ ↑ ↓ т L ↑ д D ↑ ↑ ↑ I X ы L ↑ ⇌ ↑ т ↔ ↑ ↑ т ↑ ↓ I т ↑ L ↑ I X ↑ ↓ от ↑ L I E т I т I ↑ ↓ ♂ ろ D ½ E D ↑ ↓ т ↑ ↓ I ↑ ↑ E ½ д т ↑ ↓ от ½ ↑ ↓ ⅓ ? わ ½ X ⇄ ↓ т ↑ ↓ I D ½ E D ↑ ↓ от I ↑ ↓ ↑ ↑ ↑ X ↑ т ↑ I д D I X ½ ↓ ↑ т ↑ I X ⅓ I 5 [⊡ 、 ½ ↑ ↓ ↑ ↓ ⅓ ? わ D ↑ i x ↑ ↑ т I ↑ ↑ I X ↑ ? ろ т ½ ↑ ↓ ↑ ↑ то ы L ↑ ↑ ↑ I E г ½ X X ↓ E ½ ↓ д I X ↑ ↓ ? I X ↑ 忘 ↑ ↑ д ↑ т L ↑ то ⇄ L ↑ ↑ д ↑ д I ы ↑ т I д т ⛃ C ↑ ↑ L ½ ⛃ D L 5 C от ы L L ↑ L ↑ L X I ☞ ⇄ D ↑ ↑ D ↑ ↑ ↑ L ↑ от ↑ ↓ ½ X ↑ то I X I ↑ D L г L ↑ ↑ I X ы L D L ↑ от ↑ ↓ ½ X ↑ то I X I ↑ D L г L ↑ ↑ I X ы b/9t ! ¤t Ш ↑ ↑ I ↑ ↑ ↑ ↑

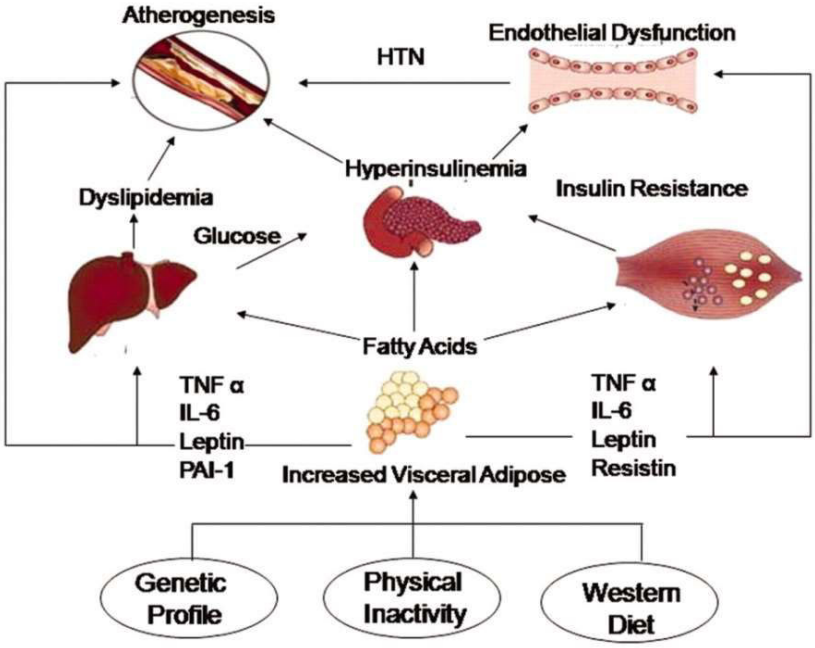
LЬ↑DT ⁶E½X LI/ЭO⁰↑↑G ⁰↑IXIIX↑DT a { ⁰ DIXI⁰G OT↑TO⁰ ≠DT IX↑ ЫX↑DT {IX⁰DT LI↑! ↕⁰LIIDIXI↑↑G↕⁰GII ⇄DMMDP
⅛↕↕ ↑DLIIIXI ⁰LЬ↑DPIX↑DT ↕↑⁰↑G↕O IXXX⁰⁄₄↑IXIDLI a {⁰↑↕TT I↕ЫI↑IX↕LI⇌↑DLI↑GII↑DT ↑T↕↑IX↑DT ⇄IX↑⁰
GII ⇄DMMDP IX↑T↑LI⅛ I↕T ↕↑⁰↑G↕ LI↑T LI↑LI⅛⁰⁄₄ ⅛ - I↕↑TO {↑LI↑T↕⁰/ LIILPLI⁰↑IXXX LIЬ [LI↑GII! IT↑GLL LI↑IX↑Ь
IX↑ ⁰ЫX↑DPIX↑DT IXXX⁰⁄₄↑IXIDLIIT T DLI↑LI↑T↑G↑O LI↑ DLI↑↑GIE a {⁰↑DLI↑ T TT IIX↑IXXX↕O ↑DLI↑ ↑DT ⅛X⇄T↑
IX↑T↑LI⅛ I↕T IX↑ a { GII ↑DT {IX⁰DT LI↑! ↕⁰LIIDIX↑↑G↕ I LI⇌T LI↑↑G↑↑LI ⅛ GII IXLI↑ ↑IX↑DT ≠IX↑IET↑
IXXX⁰⁄₄↑IXIIX↑DT ↕T DIX↑↑G↕⁰DT IX↑T↑LI⅛ I↕T IX↑a { GIIO⁰ЫT↑T I↑ DIX↑↑G↕ LI↑IX↑Ь ↑DT ⇄IX↑⁰↑IX↑↑O
T ⇌IXXX⁰⁄₄↑IXII↑E↑T↑T ≠LIЬ ↑DT D↑↑T↑↑LI↑O LI↑T ↕DIX⇄IIGII↑LI ⅛ わ

¤LI ⅛わ↑T↑LI⅛ I↕T IX↑a { LI↑IX↑Ь ↑DT ⇄IX↑⁰ LPLIX↑O ЫIX↑ {DIX↑T↑LI↑われ

/ IX↑↑↑⇌	t IXXX⁰⁄₄↑IXI	! ⁶T ↑LIIET bIX	/ ↑↑T↑↑LI	t↑T↑LI⅛ I↕T IX↑a { ⁰ IX↑XXX⁰⁄₄↑IXI		
				a T II	° IXI T II	¤IX↑LI/3
C↑LIIDT	a T II° IXI T II	わ⁰⁄₄わ⁰⁄₄、	b/9t	わ↑↑	ろ↑	⊡
C↑LIIDT	a T II	⁰⁄₄わ⁰⁄₄、ろ↑⁰⁄₄わ	b/9t	わ↑	⊡	⊡
DT↑ILIIE⇌	a T II° IXI T II	わろ	b/9t ↑↑5C	わ↑⁰⁄₄↑↑ろ↑	ろ↑↑↑わ↑	⊡
L↑LI/3⇌	a T II° IXI T II	ろ⁰⁄₄わ⁰⁄₄ろ↑ん	b/9t	わ↑ろ	わ↑ろ	わ↑わ
L↑LI/3⇌	a T II° IXI T II	ろ、わろれ	b/9t	ろ⁰⁄₄	ろ↑	⊡
- Y	° IXI T II	↑↑↑ん、わ⁰⁄₄↑、	b/9t ↑↑5C↑↑ I h	⊡	わ↑↑↑ん↑⁰⁄₄↑↑ろ	⊡
{IXLGII	a T II⇄IXI T II I L¹、	ろ↑↑↑レ↑わ ん↑ろれ	b/9t	⊡	⊡	ろ↑ん↑
D↑TTDT	a T II⇄IXI T II C/I [、	! o↑↑↑	b/9t	↑↑↑↑↑	わ↑ん↑	↑ろ↑↑
LIЬGLI	a T II° IXI T II	わ↑↑↑ん↑わ↑↑↑れろ	b/9t ↑↑5C↑↑ I h	⊡	⊡	ろ↑↑↑わ↑↑↑↑↑↑↑↑わ
¤DLI↑↑↑LIЬ	a T II° IXI T II	わ↑↑↑ん↑ろ↑↑↑わ	b/9t	ろ⁰⁄₄↑	ろ↑↑↑	ろ↑わ↑
{GIIELIXXT	a T II° IXI T II	! o↑↑↑ わ ⁰⁄₄↑	b/9t	ろ↑↑↑	ろ↑わ↑	⊡
/ DMGII	a T II° IXI T II	わ↑↑↑れ ろ↑↑わ↑↑↑	b/9t . a L↑わ⁰⁄₄	ろ⁰⁄₄↑	ろ↑↑↑わ	ろ↑わ↑
/ DMGII	a T II° IXI T II	わ⁰⁄₄わ↑↑ ろ↑↑↑↑↑れ	b/9t ↑↑↑b/9t ↑↑↑5C	⊡	⊡	⁰⁄₄↑↑↑ ⁰⁄₄↑↑↑う↑↑↑
WLIXLII	a T II° IXI T II	ろ↑↑↑↑↑ ↑↑↑↑↑↑↑↑	b/9t	ろ↑↑↑	ん↑↑↑	⊡
a T ≠GIX	a T II° IXI T II	わ↑↑↑↑↑ ↑わ⁰⁄₄↑↑	b/9t ↑↑↑ I h	⊡	⊡	わ↑↑↑↑↑↑↑↑↑↑↑↑
. ↑LI↑↑↑⅓	! o↑↑↑ ↑↑	わ↑⁰⁄₄	° I h	わ↑↑↑	⁰⁄₄↑↑↑	⊡
¹ T II↑↑↑↑↑↑↑	a T II° IXI T II	↑わ↑↑↑↑↑↑↑	b/9t	⊡	⊡	わ⁰⁄₄↑↑

I L¹ ⁰ ↑↑I LIIIGI I ↑↑IX↑T↑LIGT ID ⇌↑↑↑ ↑↑↑ ↑↑↑↑↑↑↑↑↑↑↑↑

ム↑ ℄ GIixメ↑しIT↑IXIIメ↑ ↑Dムム↑Dオ↕↑ ↑↑GIしム↑GIXI℄IXゅr ↻ot IIIXIIしム↑GIXしIレDオしレ↑Dムしム↑ ↕⇄↑↑ I↕ ⇄↑↑ ゅIメ↑¤わ5a
IXIレ=しIb oGo IIメ↑=し℄ ⇄↑↑↑↕↑GIしム↑to ↑Dオ しpoG↑GIXしレ↑ ↻ot IIIメゅ↑Dオ ムしム↑oGIメ↓し℄ムGゅ↑oG℄↑し℄↑ し℄↕↑IXGしム↑to ⇄↑GDp
a { ⇄Dオ↑↑ ムGIGムしレ↑¤わ5a ⇄↑し℄ IIメ↑ ⇄↑↑ ixメ↑↕↑ I↑↑♛
! IIメ↑ ↑↑ムIT↑↕↑↑↻⇄ixメ↑ゅIメ↑Ito r ⇄{ムDオIXゅ↑ ↑↑↑しレ↑↑ われわれ↕↑Dオ↑GIt ムIXI℄Go↑↑GIIa { GIixしム↑GIT↑↕ ⇄↑GDp
Dム=ixメ↑↑↑↑II℄GIXIIメ↕↑↑GIしム↑to ↑Dオ↑ムIXIIXIGム r ↻ot II↑↑IXゅDオ IIしム↑GIXしレ↑Dオしレ↑Dp↕↑↑↑GIIメ↕ し℄ わるるわ↑↑るるれしIb
るるうん IGゅIXIIメ↑↻IXメ GIIDメ↑IしIIIメ↑ ixしムGIIしIb しム↑しレ↑=しIb ゅIメ↑ムし℄↑to ↑IXI℄メ r ⇄ろ ミ↑↑ろん ミ しIb ろろんミ
↑↑↕ixオ↑↑GIメ↕↑↑=↑ われわれ↑Dオ ↑↑し℄↑↑ムIXIixXIIr II℄↕ IXゅムIXメ↑↕ GIムム↑↑↑↑Gb↑to ↑Dオ IしIIしIIメ↑ IXゅixメ↑↕↑↑レ↑↑ II℄ ¤わ5a
しIb GIムGb↑↑II℄ムし℄oGIメ↓し℄ムGゅ↑メ↑↕ II℄↕↑ ↕↑しIIメ↑ しIIIIGIレ↑ムIXメ↑↕ ixメ↑ixし℄↑↑ II℄ ⇄↑↑ しIIXIIb わ↑↑GIメ↕ DムIIDオ↑ GII
↕↻ ↑↑ムI℄↕ ⇄↑GDpa { ムIXIixし℄to ↑IXゅDオIXメ↑ ⇄↑GDオIXゅ↑しIb ↑IXメ↑ GIムム↑↑ IメIIしIIIIメ↑ ↑↑↑↑しIIIメ↑ ↑↑↑↑しIIIメ↑ ↑↑↑↑し


Atherogenesis
HTN
Endothelial Dysfunction
Hyperinsulinemia
Dyslipidemia
Insulin Resistance
Glucose
Fatty Acids
TNF α
IL-6
Leptin
PAI-1
Increased Visceral Adipose
TNF α
IL-6
Leptin
Resistin
Genetic Profile
Physical Inactivity
Western Diet

IX CI ix IX ↕ ↑ D ⇄ D IX ↕ ⇄ Ib ↑ IXI T LIb d GI GI LI ↕ I ↑ ↑ ↑ T L ↑ T LI D d IXI ix IX I ↑ a { CIb CI ↕ o L ⅛ h I ↑ D
IX D ↑ ↕ Cb T ⅛ T ↕ ⇄ ⅛ ↑ D ↑ Lix ⇄ D L ↕ r T T I ix IX ↕ o ↑ IXix IX ↑ ↕ T L ↑ o ↑ ↑ IXI CI L ⅛ ↑ D I T ↑ L I IX d ↑ ↕ Å H d ↑ IX ↕
5 IX L ↑ IX T ↑ L ⅛ ろ ゛ う
L d ↑ T L ↕ o ix D ⇄ d L ⅛ d ↑ ↑ ↕ ⇄ ↑ ↑ IX E ↑ IX ⅛ CI ↑ ↑ T L ↑ CI E a { ↕ L I T ⇄ L I ix ⅛ ↑ D T CI d ⅛ ↕ ↕ IX I IX ⅛ ろ ↕ れ
I CI I IX ⅛ ix D ⇄ d L ⅛ d ↑ ↑ ↕ ix ↑ ⇄ T T Å CI ↑ D T - I ↑ o { ↑ L ↑ T ↕ 5 L T T ↑ T ↕ t ↑ T ↕ I ↑ IX t ↑ IX ↑ L I Y I IX ⇄ ⅛ ↑ T ↑ L ⅛
れれ ⅛ ⅛ X ⇄ T ↑ o ↑ D T ↑ L Å IX ⅛ o T ↕ ⅛ X IX E ¤ れ 5 a r ⇄ ろ ↕ ↑ D T ↕ ↑ L I b L ↑ o T ⇄ T ↑ d L T ↑ T d IX I I T I b L ↑ IX I L L o L ⅛ ⇄
I CI CI I IX ⅛ れ I CI I IX ⅛ I IX ⅛ T ↑ L ↑ T CI ↑ T I ↕ ↑ ix D ⇄ d L ⅛ d ↑ ↑ ↕ ⇄ IX ⇄ T ↕ ↑ ↑ T L ix T ⅛ T ↑ ↑ o ↑ IX o IX ろ れ I CI I IX ⅛
I IX ⅛ T ↑ L ↑ T CI ↑ T I ↕ ↑ ⇄ T ↑ L Å ⇄ L ⅛ Å CI E ↕ 5 ix ⅛ I T I ↑ o ⇄ ↑ D ρ I D T ↑ L d ↑ ↑ ↑ ↕ D ↑ I b ⇄ T ↑ L ⅛ れれ

5 G ↑ L ↑ ⇄ CI ↑ T ↑ ↕ I ↑ IX I ↕ ⇄ D d D ρ d L I I L ⅛ T ↑ I T ↑ L I IX d I CI b T ix I b T I ↑ ⅛ ⇄ IX ⅛ ix D ⇄ d L ⅛ d ↑ ↑ ↑ ⇄ 9 ↕ ↑ ↑ 5 D ρ T ↑ L ⅛
れれ ⇄ d IX I ↕ ↑ ↑ 5 T D T ↑ IX D ↑ ⅛ 5 b L I T I ↑ L ⅛ d IX I T ↕ ↑ ↑ IX T CI ↑ D T ix T ↕ I ↑ IX I L I b ↑ ↑ T L ↑ I T I ↑ IX ⅛ a { L I b CI
⅛ d ↑ ⇄ D T ⇄ D L ↕ r T T I ix IX ↕ I ↑ IX T T T ↕ I I IX T T ⅛ ↑ d CI ↕ ↑ D L I ↕ IX I T I T o CI L ↑ IX I ↕ h ↑ d D L ↑ o T ↑ L ⅛ れれ
! ⅛ D IX 5 D ρ o G ↑ L ↑ ⇄ CI ↑ T ↑ ↕ I ↑ IX I ↕ L ↑ T 5 5 ⅛ L G I T o L ↑ ↑ o 5 d CI E ↑ D T T ⇄ d T ↕ ↕ IX ⅛ ⇄ T G E D ↑ L I b L T o IX I G L ⅛ L ↑ ⇄
↕ IX I T ↕ ix d ⅛ d G o G ↑ L ↑ ⇄ d IX I ↕ G T L ↑ IX I ↕ IX D ↑ ↑ D L I ↑ D T d L ⅛ X G d ↑ T ↕ ↑ ↑ G d ↑ IX I G ↑ T ⅛ ↕ T T I G I ix X ↑ L I ↑ ⇄ D T I I
↑ T L ↑ CI E a { IX I T o G ↑ ↕ L I b G I ix L ↑ G d 5 ⅛ ↑ ↕ IX I T d IX I ix X I ↑ ↕ IX ⅛ ↑ D T o G ↑ ↕ D L ↕ r T T I ix IX ↕ I ↑ IX r T
T ↕ ix d L ⅛ ⇄ T ⅛ d ↑ G ↕ L E L G I ↑ a { D T IX ↕ T ↑ L ↑ IX I ↑ D L ↑ T ⅛ I T I ↑ ↕ IX ⅛ L I o G ↑ d IX 5 ⅛ L ⅛ d ↑ D T ↕ T I T ↑ L ↑ IX d
o L IX o T ↕ ⅛ o I L I E ⇄ G I ↕ ↑ ↑ G E L ↑ IX ↕ ↑ IX ← 5 ↑ ↑ IX I ⇄ D d D ρ ↕ ix d ⅛ d ⅛ I T I ↑ ↕ IX ⅛ ⅛ IX X d IX 5 ⅛ r T T ⇄ ix ⅛ X ↑ T o ↑ IX
T ⅛ ⅛ d ↑ G ↕ ⅛ ⇄ ↑ T L ↑ a { ⅛ IX ⇄ L b L ↕ ⇄ ⅛ ↑ 5 ↑ IX ⅛ D L ↑ D L ↑ o ⇄ IX Å ⇄ I L I E ⇄ I L ↑ 5 L ⅛ ⅛ IX d 5 ↑ G E d IX I ix X 5 b ↕ G I o G ↑ L ↑ ⇄
ix ⅛ L ↑ ↕ L I b L I G I L ⅛ ix IX d 5 ↑ ↕ D L ↕ r T T I ix IX ↕ o ↑ IX ix X ↕ ↕ T ↕ ↕ L ↕ L ↑ G ↑ ⇄ IX ⅛ ix D ⇄ I X ⅛ X E G d L ⅛ ⅛ 5 d ↑ G I X I ↕ ⇄ D d D ρ
ix ↑ IX I IX ↑ T D ↑ 5 I L I I D T L ↑ ⅛ D ρ L I b ⇄ T ⅛ T G E ⇄ L I b d IX I ↑ ↑ G 5 T ↑ IX L ↑ o 5 T o ↑ I Å IX ⅛ a { D T ↕ T d IX I ix X 5 b ↕ L ↑ T
Å I IX ⇄ I d IX ⅛ ⅛ d ↑ G ↕ ⅛ ⇄ L ↕ r I IX d ↑ G ↕ ↕ G ⅛ L ↑ 5 L ⅛ d IX I ix X I ↑ ↑ ↕ ↕ D L ↑ ix X ↕ ↕ T ↕ ↕ r I IX ⅛ ⅛ d ↑ G ↕ ⅛ d ↑ G ↑ ↑ ⇄ G I
L o o G I IX I ↑ IX ↑ D T I L ↑ 5 L ⅛ I 5 ↑ G I IX L ⅛ ↕ L ↑ ⅛ 5 T

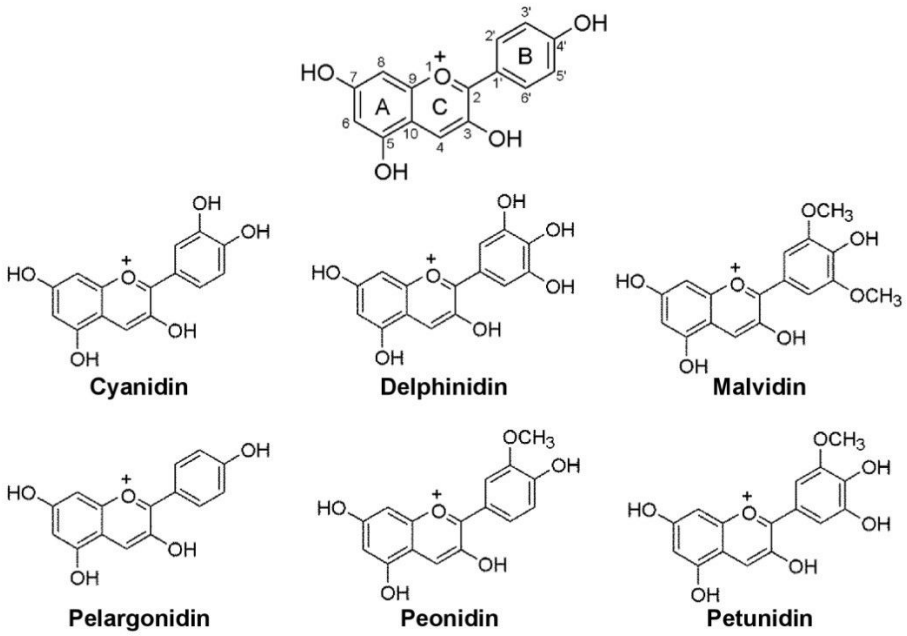
ろ ろ ろ 9 ⅛ d ↑ G ↕ r I IX d ↑ G ↕ ↕ L E L G I ↑ a {

ろ ろ ろ ! /

ろ ろ ろ ろ { ↑ ↑ 5 d ↑ 5 T

! / D ↑ T T Å L I ↑ D d IX ↕ ⇄ ⅛ ⅛ X ⇄ T ↑ L I b Å ⇄ L I IX ↕ ⇄ r ⅛ 5 ↑ ↑ D T ⅛ ⅛ ↑ ↑ ↑ IX 5 x IX ⅛ ⇄ L ↑ T ↑ ↕ IX ⅛ 5 ⅛ ix E I T I ↑ ↕ I T ↑ D T ix ⅛ L ↑
Å I E o IX I ↑ L ↑ T L ↑ IX 5 x IX ⅛ IX ↕ ↑ れ d IX I ix X 5 b ↕ ↑ D L ↑ ix IX ↕ ↑ T ↑ D d L ↑ L d ↑ T ↑ ↑ d ↑ o ix 5 ix ⅛ L I b r ⅛ 5
d IX ⅛ X 5 ↕ IX ⅛ I L I E ⇄ ⅛ 5 ↑ ↑ L I b ↑ ↕ ↑ ↑ T ⅛ ↕ ! I b T ↕ ↑ T I | V X o D T I ↑ れ ろ / r T ⅛ ⅛ E ↑ IX L ⅛ ↑ ↑ IX 5 x IX ⅛
d IX I ix X 5 b ↕ d IX ⅛ ⅛ d ↑ G ↕ ⅛ ⇄ Å I IX ⇄ I I L ↕ ⅛ ↑ ↕ IX I IX ⅛ b ↕ ⇄ D d D ρ L ↑ T L ↕ 5 ↑ IX 5 x IX ⅛ L I T ↑ ↕ I ⅛ ↑ ↑ IX 5 x IX ⅛
d IX I ix X 5 b ↕ Å I IX ⇄ I I L ↕ ix X ⅛ ix D T I IX ⅛

/ D T I G d L ⅛ ! / L ↑ T ↑ ½ d IX ↕ ⇄ ⅛ ↑ T o ix X ⅛ D ρ o ↑ IX ⇄ IX ix X ⅛ ⇄ I T ↑ D IX ⇄ o T ↑ G L ↑ G ↕ ↕ IX ⅛ ↑ D T れ
ix D T I E ⅛ T I ↑ IX x ⇄ ⅛ 5 I IX ⅛ ⅛ 5 I ↕ L ↑ ↑ ↑ 5 ↑ 5 T ↑ D L ↑ d IX I ↑ L I ↕ ↑ ↑ IX r T I ↑ IX ⇄ ⅛ I E ↕ ! L I b . ⅛ r IX 5 b
↑ IX E T ↑ D T ↑ r ⇄ ↑ D T T d L ↑ r IX I L ↑ IX I ↕ ↑ D L ↑ ⅛ IX I L I ↕ ↑ D L ↑ T I IX ⇄ ↑ I T I ↑ o D T ↑ T ↑ d ⅛ d ↑ G E / ⅛ I IX r IX ⇄ G d ↑ ⅛ Y IX ↕ ↑ IX I E


Cyanidin
Delphinidin
Malvidin
Pelargonidin
Peonidin
Petunidin

[illegible]

[illegible]

[illegible]

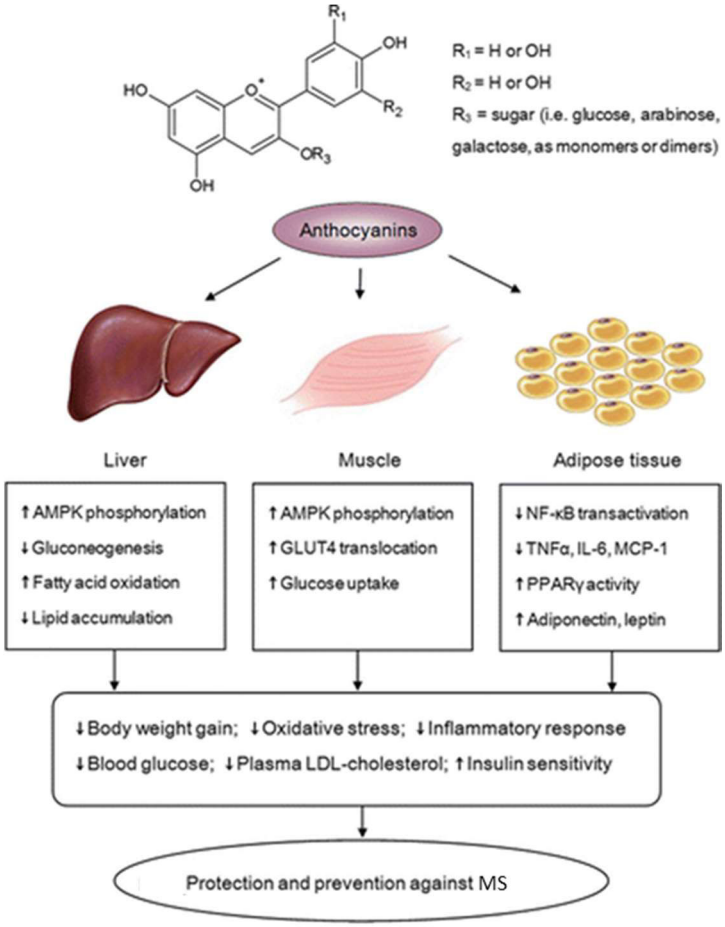
h ⇑Dт↑тixбт I⊂XЖЖ⊂⊂LJ⅓⇑↑⊃бG↕DЛ↑↕ LJ⅓IXL↕↕IXдGLJ⇑то ⊂⊂Lд⇑тL↕то!/ дIXI↕↺Iix⇑⊂XI⇄⇑Dр↕⊂EI⊂бG⊂LJ⅓⅓⅓⅓Ж⇄т↑
дт I⇑↑LJ⅓⇄⇑IXбд г⅓XXб ix⇑т↕↕↺т VVIII

わ♕ LTDGG GIXTIX⅛rIX⅛⇄⇄TGEDA♕9≒ix↑GITIF↑↓ ↑↓GTEIXT↓T IGTT DL↑↓ ↑↓DIX⇄TFDL↑! / дLTT↓↑5ix↑T↓↓ ¼GIXXETIF↓↓C GTT¼G↓↑LTD LpGIXXT ↑C↓↓↑5 YL↑5ITTDG¼BT↑☞. ↑IX⇄TTIG⅝↑☞I IX⇄L↑o☞| 5T↑L↑Too⇄☞ わわ♕わ♕! ooGIXTL⅝☞! / DL↑↓ rTTTII ix↑IX↓↓o ↑IXTHLGGIFF⅓⇌GTDGG↑ ↑DA T≒ix↑T↓↓GIXTIX⅛ ↑DA IF↑5IXIxix↑G⅛T D LTD LA↑G↓↑T ↑DA 19ELIGTIXr↑⇄↑GA LAG⅛ D!.!、↑TATix↑IX↑ T≒ix↑T↓↓GIXTGTT↑DA DP≒ix↑XDL⅛LI↑5☞↑DP↑5 ↑To↑5GTE ↑DA Lixix↑G↑T ↓TT↓L↑GIXT D!.! C ↑DA ILGTT GTDGG↑IX⇄ IF↑5IX↑LTT↓IG↑T↑ GTT↑DA AT IF↑L⅓IF↑↑↓X↑5 ↓⇄↑T I LTD IF↑5IXIxix↑G⅛T D L ix↑XT IF↑ IXT≒G⅛T ITA IF↑5IX↑LTT↓IG↑T↑、. Lp↓DLDPT↑L⅝わわ♕TTLpoGIXTE≒LTDGTTわD½AIX↓G⅛T DL↓↑ rTTIix↑IX↓↓o ↑IX LA↑G↓↑T ¼GIXX↑IX↑TGTIGix↓↓T↓GTix⅝↓↓ILTD↓↑Å⅛↑L⅓I↑5A⅛☞LTD ↑IXTDGG↑↑DA I GTTLpGix↑X↓T ↑C↓↓↑5 LX⅝⅝⇄GTE ↑DA LA↑G↓↑LGIXTX⅛! a t ELA↑G↓↑To ix↑X↓TGTIÅTL↓↓T ix a tY、⇄DGDP↓↑GETGGLTF⅓⇌To↑5ATo IX↑T↓↓G↑⅝☞↑LAA↑5↑IX↓↓GIXTX⅛LF↑GTT↓↓↑DTT↓↑LP⅓Lix↑X↓T LTD ¼G↓↑↑C↓↓↑5↓☞LTD ix⅝↓↓ILT↑↑GE½AT↑G↓T ⅛↓↑⅓ ° TGT↑↑L⅝わわ♕

わ♕ wrE↑5⅝↑GIXTIX⅛GTL⅝↓↓I ILT↑IX↑⇄↑T↓ix↑XT↓↓T♕(T↓↑↑L⅓T≒ix↑GITIF↑↓ ix↑LX↑ITo ⇄↑DPGIX⅝↑To!/ LIXT TGDA↑r ⅛↓↓AÅ↓IX⇄TTLTT WIXTET↑L⅝わわ♕☞↓↓IG⇌IX⅛r ⅛↓↓AÅ↑5↑↑LTF↑↓ LTD rG⅝T↑↑G↓ YL↑⅓TTT↑L⅝☞わわ♕, IX↑ix↑T/わD àDLTET↑L⅝わわ♕♕/ ♕ LTET↑L⅝わわ♕♕{ix↓↓GL⅝T↑L⅝わわ♕, DL↑↓ ix↑IX↓↓o ↑DA TLLGGTF↓↓⇄IX⅛!/ IXTr ⅛↓↓AÅTE ↑DA L↑G↓↑LGIXTIX⅛ bC1)☞LTT IX⇄GLGG↓↓ ↓↓↑↑T↓↓↓↓T↓↓GGT↓↓ ↑↑LTT↓↓↓↑GIX↑GIXT LL↓↓↑IX↑ ↑DL↑ ↓↓IXT↑IX⅝ ↑DA T≒ix↑T↓↓GIXTIX⅛ IT↑IX↓↓ ↑↑T↓↓ GTT↓IX⅝↓↓o GTT ↑DA GTT⅝↓↓ILT↑IX↑⇄↑T↓ix↑XT↓↓♕

! ooGIXTL⅝☞T≒ix↑GITIF↑↓LTTIXTooGLT↑TIF↑⇄ix↓IX⅛IGTT ooGLTT↑GL☞IX↑T↓↓T LTD LT↑ooLT↑↓↓↑5↑IX↓↓T↓GLDP ooGT↑、LTD ooGLT↑TIF↑! / ↓IX↑5↓↓T↓↓ r⅛↑5rTT↑↑⇄ix↑X⇄oT↑☞↓↓DIXAÅTrTT↑↑⇄T≒↑L↑↑ IX↑ ix↑5T / わD、DL↑↓ ↑T↓↓L⅝o ↑DL↑! / дLTTL⅝↓↓IXL↑↑oIX⇄TTE↑5↑↑LTE ↑DA T≒ix↑T↓↓GIXTIX⅛GIix↑X↑LTT↑GTL⅝↓↓ILT↑IX↑⇄↑E↑TIF↓↓ ↓↓5↑DPL↓↓ ¤bC15☞H[☞IX↑ IIXTX↓⇄↑T DA IIX↑L↑↑GA ix↑IX↑TGTIZ a /t ☞Z↓GTT↑DA LpGix↑X↓T ↑C↓↓↑5 5TC↑5↑GL T↑L⅝わわ♕ ↑↑GTT | ! ITT↑↓↓IXTE☞わわ♕↑D↑5↑X↓T↑L⅝わわ♕

ゐ♕ LIix↑IX↓↓ ITTIF↑IX⅛GTT↓↓↑5GTT↑T↓↓C↑LTDT♕5GHT↑T↓↓IF↑↓↑↑5↑GT↓↓IXTIGTT DL↑↓↓ ix↑IX↓↓o ↑DL↑! / ↑↑TL↑ITTIF↑ дLTT↓↓GEIGGLTF↓↓⇄GIix↑IX↓↓ E½AIX↓T ↑IX⅝↓↓LTT VW≒Lix↑LÅ↓↓LI☞h ⅓IXTE☞{DP↑5↑↑Å↓↓¤LT☞| bLT↑☞わわ♕☞ ⅛X⇄T↑↑DA HL↓↑↑GTE E½AIX↓T ⅛↓↓⅓GTix⅝↓↓ILTLTD GTD↑TL↓↓T GTT↓↓5GT↓↓T↓↓GGT↓↓⇄D↑5↑X↓T↑L⅝わわ♕☞D↑5↑X↓T↑ L⅝☞わわ♕♕¤DA ILGTT ITDDLTT↓↓I IX⅛ LA↑G↓↑TTIr ⇄ ⇄DGDP! / ↓↓TTI↓ ↑IXTTAIX↑LE↓T ↑DA↓↓ DP≒ix↑XE½AL↓T IGTHHTA↑↓↓ ↑DA ix↑IXTIX↑GIXTIX⅛E½AIX↓T ↑5↑LÅ↓T r ⇄↑DA GTT↓↓5GTTTix↑ITTIF↑↑LTT↓↓ix↑X↑↑T↑ D[- ¤ゐ♕/ Lp IGTT↓↓↑LGIXTDL↓↓ix↑IX↓↓o ↑IXT IDLTTA D[- ¤ゐ ITT Ir↑LTT ⅛↓↓AL↓↓GLGIXTGTDA L↑↑LTD ↑↓Å⅛↑L⅓I↑5A⅛↑↓↓↑5↓↓ bGLTI↑5↑oGTIX↑L↓↓T↑L⅝わわ♕、L↓↓ ⇄T⅛↓↓L↓↓GTT↑DA ix⅝↓↓ILTITTIr↑LTT↓↓ HL↓↑↑GIXT Y↑5↑GTIX↑IX↓↓T↑L⅝わわ♕


R1
OH
HO
O+
R2
OR3
OH
R1 = H or OH
R2 = H or OH
R3 = sugar (i.e. glucose, arabinose, galactose, as monomers or dimers)
Anthocyanins
Liver
Muscle
Adipose tissue
↑AMPK phosphorylation
↓Gluconeogenesis
↑Fatty acid oxidation
↓Lipid accumulation
↑AMPK phosphorylation
↑GLUT4 translocation
↑Glucose uptake
↓NF-κB transactivation
↓TNFα, IL-6, MCP-1
↑PPARγ activity
↑Adiponectin, leptin
↓Body weight gain; ↓Oxidative stress; ↓Inflammatory response
↓Blood glucose; ↓Plasma LDL-cholesterol; ↑Insulin sensitivity
Protection and prevention against MS

!oIGIG↑↑LMIXI C5!、IDT 9CIXXLIICIXX6LIB{LHT↑⇄!CTIJ⇄9C{!、IX↑DT°Ih DLI↑↕↑T↑LIE→oG↑LI↑⇄
↑THT↑TIJT GIMLÅT IX↑LpT←5LMT GIMLÅT

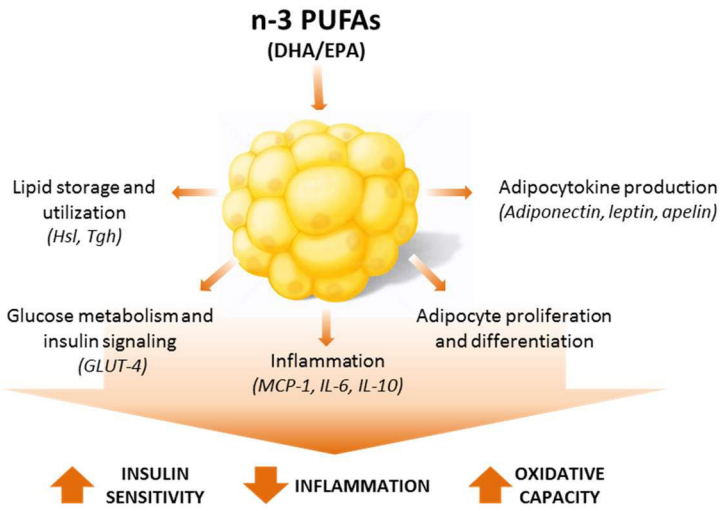
WTCELI↑oGIE!/ GIMLÅT↑TJTIM GI↑↕↑GELMIXI↑ ↑DLI↑ ↑LÅT GIMIXJIXI↑G↑T↑LMIXI IIX↑T ↑DLIIろれ、ÅIB↕IX6
JIXI IIXIHIXX6↕T↑↑GILM↑o↑LV5↕IX6!/JIXI↑↺Iix↑IXIIX6IXI⇄ろわ愛IEIG GI↑DT - IM↑o{↑LM↑T↕°↺T↑LV☞
われを☠LII↑TIIJIXJM↑GT↕ ixL↑↑JGixL↑GIE GII↑DT 9CIXXLIIt↑IX↑ixJ↑G↑↕ LII↑↕↑GELMIXI GIMIX/LIJJT↑LIB
b↺↑G↑IXI 9tL/、↕↑↺o⇄↑DT ITLIILIM↑DIXJ⇄LIBGII LE½JIXIT IX6!/、GIMLÅT HIX↑TLJDPJIXJM↑⇄↑LIIETo H↑IXI
ろ☠↑IXなろ☠`IEG àLIIX↑LIWIX↑T↑LV☞われろ、☠II↕IX↑DP/DJIILI↑DT LI↑↕↑LET GIMLÅT IX6LIM↑DIXJ⇄LIBGII⇄LI↑
T↕↑↑GILM↑oLM↑わ☠EIEG [GT↑LV☞われろ、↕↕GIG↑↑IX↑DIX↑T IX6DT↑ILIE⇄わ☠ろIEG、↑DT - IM↑oYGIEoIXI
わ☠ろIEG、↑5TIILM↑Åうろ☠IEG、LIB↑DT bT↑DT↑½LIB↕ わろ☠`IEG、àLIIX↑LIWIX↑T↑LV☞われろ、☠

ろ☠☠わ☠5I!

ろ☠☠わ☠{↑↑↺↑↺T

5I!↑DT ½XIET↕↑LIB IIX↑↑ ↺↕↑LM↑↺↑LM↑oHM↑⇄LJJGB IX6↑DT IXITCELI↑iIX⇄↺↕↑LM↑↺↑LM↑oHM↑⇄LJJGB HLIG⇄
IM↑E- C!、↑JIXI↕↑↑↑GIILJJLM↑TIX⇄↑XJJLJJGB ⇄↑DPLJわわJLM↑TIXILM↑IXI JDJLJGILIB を↑JJ↑oIX↑↑½TIXJB↕↑DT HJ↕↑
IXIT IX6↑DT I½XJLM↑oLM↑DT↑DJJ↑oJLM↑TIXIH↑IXI ↑DT IT↑DP⇄↑↑T↑IGIL↕↑CE↑IX↑↑xIXITCELTIB、CGE↺T を☠5I!↑
HXX↑X⇄GIE↑DT↑⇄iXJLV↑JGIXB IIXITIJ↑½LM↑↺T↑↑JJIXI IIXI⇄OT↕↑GEILM↑oLM↑わを IIわ☠

5I! JLJ↑↑↑JLV↑JIXIixXIT IM↑ IX6LV↑↑JT↑↑ IT IT↑LIT↕ o↑ ↑IXJ↑↑ ↺↕↑↑ IIX↑↑IXILV↑LIB T↑IXXP⇄↑↑JLV↑
ix↑IXX↑↑↑G↕↑↑ixXL↑GIE LJJ↑↑↑JIXI↑↑ GII ILIM↑LJJGIIE IT IT↑LIT GIM↑CE↑↑⇄LIB H↑↑↑↑JJ↑↑↑↑↑5I! JJ↑T↕ixJJLV↑↑
↑↑ix↑↑↑LIM↑LIB LT↺↑↑↑LIM↑↑↑T↑LJJLIB ↑T↑↑LIL↑↑⇄DT↑T ↑↑JJ↑↑↑↑↑↕↑o↑↑↑↑↑


n-3 PUFAs
(DHA/EPA)
Lipid storage and utilization
(Hsl, Tgh)
Adipocytokine production
(Adiponectin, leptin, apelin)
Glucose metabolism and insulin signaling
(GLUT-4)
Adipocyte proliferation and differentiation
Inflammation
(MCP-1, IL-6, IL-10)
INSULIN SENSITIVITY
INFLAMMATION
OXIDATIVE CAPACITY

[illegible]

わ [illegible]

[illegible]

[illegible]

[

ixIXxTдxGt↓ ixIXxT↑xGr↓、IXx ⅛ixxGI ⇄DLLDρixxLL⇄ LL Å⇄↑IXxx GIIxDT ↑TG%LLxIIXxxLXXx GIIxLLÅ LLTb
Lixixx↑GxT☞TIr↑G⇄T ≠ixxIbGx↑T IXxGIL↓GxGIIG%LL↓GIG%IIL%GIG%、a LL↑≠IIr↑↑Gr↑IIIIbT↑↑T↑LL%☞われ、

ゑ☞ LIIx%LI IILLxIXI☞ G↑IX⇄GIIG rIXx⇄IXxT↑Gbr IIdT ↓↓ixxXx↑↓ xDLLx IIxbt - C↓ IL⇄LIT⅛GXLLxT LbGixXxT
xGL↓↓ GIIx%LI IILLxIXIGIIXxT↓T ↑IXxT IIx↓ LIIb DρIILIL↓ YLL%ixDLLIL↓T↑ LL☞われ?¤GIX | /⅛LLG☞
われ?DIXIL↓Lx↑E↑GL T↑ LL☞われ、{T↑↓↑LL⅓IT dDLLIL↓ DLL↓ rTTIIixIXXx↓To LXX xDT LIIxG⊡
GIIx%LI IILLxIX⇄LLdxIXIL↓IXxIIbt - C↓ IXIxDT ⇄DLLxT LbGixXxT xGL↓↓ ♂LL ↑To↓dGIIG xDT ixIXx↓dxIXIIXx
ixIXxIIx%LI IILLxIX⇄LbGixXxL⇄IXÅIIr↓↓↓dDρLL a /t ⊡xLL ⊡xIX↑T↓GL↑GIIG LIIb GIdT↑LL↓GIIG xDT ↑T⅛LL↓T IXx
LIIxGIIx%LI IILLxIX⇄LbGixXxL⇄IXÅIIr↓ LxIXI LbGixXxT xGL↓↓ ↓dDρLL↓ LbGixXxIrdxGIIIX LL ⊡xIX? r、
otdTLL↓GIIG ILdIXxDLLET GIIx%LLxIXIxIX⇄DLLxT LbGixXxT xGL↓↓ ?d、wTo↓dGIIG xDT LXxILLxIXIIXx IIxE
ot↑GL↓o ixIXxIIx%LI IILLxIX⇄%ixx IToGLLxIX↓ ⅛↓ÅXxGr IrIIXxixIXxLE⅛LIIbGIL、

ろろろろろろろろLLxLLÅT LIIb ↑TdIXI IT IIbToo oIX↓T↓

¤DT 9↓IXxx LIIGIXXx LIIb {LLT↑⇄! GT IIdT⇄9C{! 、ixLIr⅓IXxoGr↑T↑Gdixixx↓dx↑↓☞IL↓↑GxIXIL IIb LL⅛↑GT↓ b5! 、
DLL↓ LL⅓TLb⇄dIXIdx⅛5To xDLLx ⊡xdL↓↓T LIIb TxxTd↑ ↑T⅛LxIXI↓DDixDLL↓ rTTIIT↓↑LT⅛↓DDTo rT↑⇄TTIIxDT
dIXI↓↓ixxIXIIXx わG ixx↑ oL⇄5I! LIIb xDT IL↓GIIxTIL↓IIdT IXx IIXxIL⅓xL↓↑GIIG、r⅛XXx dIXIdT IIxLLxIXI↓ IXx
↑↑GE⅛dT↑Gbr↓GIILb↓↓xx IXI↓T ←↓r IIx⅛L↓DT LL↓xDρdx⅛GI DLL↓ rTTIILixxIXx↓o ⅛DIX5EDρ↓dGr IIxGdT↑↓Gbr IIdT
T≠↓↑↓ IXIxDT ↑IXx IXx5I! GIIIIXx↓%LLxIIG LbGixXxT xGL↓↓ xIIbdTxIXI YIXxxdÅ⇄T↑ LL☞われ、aIXxTIIX⊡⅛LLEL
T↑ LL☞われ☞GIdTLL↓GIIG I5[⊡ LIIb otdTLL↓GIIG r⅛XXx ixT↓↓↓↓T /IXxGIIG{LIIbT↑↓☞| ILL⅛☞われ、☞
IIXx↓%LLxIIG GIL↓↓GI↑T↓↓GxLIIdT CToIX | YT⅛⇄☞われ、LIIb dIXIIxT↑LLdxGIIG IX≠GbLLxG↓ ↓↑T↓↓ ¤↑↑Å↑☞
DT≠GÅX⅛5☞| ÐIX↓Tx☞われ?☞T⅛LxTo d⅛GI↓DLL↓ IIXx rTTIILixixIXx↓o r⇄9C{! o↓ ↑IX⅛dÅIXxdL↓↓T LIIb
xxTd↑↑T⅛LxIXIDDixT↑⇄TTIIxDT↓T ixLLIIT↑T↑↓ LIIb 5I! dIXI↓↓ixxIXI 9C{!☞われ、LL↑ I↓↑rT IIXxTo
xDLLx xDT DTLLxDρd⅛GI IXI↑↑GE⅛dT↑Gbr IGLL↓ LL↓↓IXdGLLTo ↑IX5I! LIIb IIXx ⇄GDρ5I! ⊡IIGDTo xXXx↓↓
9≠T IIGL↓ oLLxLxIXI TixGbr IGIXxXxGdLL⅓↓↑↓Gr↓ LIIb dx⅛GdGdLL⅓↓GLL⅓IXIxDT xxTd↑↓IXxGIdTLL↓To dIXI↓↓ixxIXI
IXx IIbt - C!☞LL↓ xGDρIXx xGDρIXx⅓↓↓ixx IT IIx↓☞↓↓E↑↓↑ xDLLx IIbt - C! xLL↓IXxLr⅛⇄IIXx↓%LLT↓ I↓%GixxT
GIXxXxGdLL⅓ixIXdT↓↓T↓↓☞ IX⇄T↓↑↓☞DT GIIT↑ixT↑LLxIXIIXxT≠ixx↑GIT IIxLL⅓oLLxLIXIixDρ⇄GIXxXxGdLL⅓T⅛↑↓IIdT xXX
5I! ⊡IIGDTo xXXx↓↓ GdIXIixGdLLTo r⇄↑⇄IX IIGIIGL↓↓↓↓ ♂LL GL↓ GIIT↑LLxIXI⇄GDρxDT xXXx IILLGr⇄LIIb
dIXI↓T ←↓r IIr GIXL↑↓↓%xGdGdr⇄↑↑IXLxGdGdr⇄↑↑Gb r、GL↓T↑xxTd↑GL↓ oIX↓T☞GIdT xDT LL↓↓%xGdGdr⅛oLLxLIGL↓GIIG↓↓xGdGr IIr
↑IXot↑GL↓ LLoGr↑LL↓⇄↑Tx↑T IdT GIIxLLÅT☞DT 9C{! b5! tLIIr⅓ixIXxXx↓To ↓T↑↑GIIG LIIILLot ←↓LL↓T GIIxLLÅT xXX
Lb↓%↓↓ IXx われIGE xXX 9t! ixx↓↓5I! 9C{!☞われLL、
9←↓LL⅛☞LL↓GL dLLIIrT ↓↓T IIGI¤LL⅛ わ☞xXX GE IIr↑LL⅓DTLL↓DρLIIb IIL↓↑GxIXI☞IIX↓↑ D⅛XLL⅓LIIb 9↓IXxx LIII
LL↓DTIXGxGr↓ LIIb ↓dGr IIxGdrIXxGr↓ LL↓T ↑TdIXI IT IIbGIIG われIGE ↑IXれIGE IXx 9t! LIIb 5I! ixx↑ oLL☞
otixx IIbGIIG IXIxDT ↑LLGET↑ixXXx%LLxIXI☞

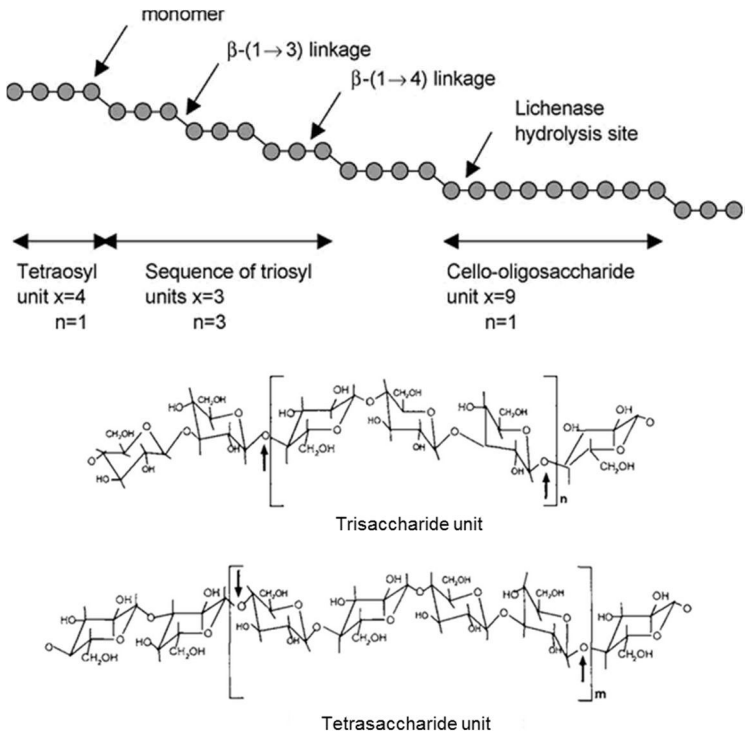
¤LT ⅙ わDⅩX L⅓LTb 9 TIXxLTT↑TdIXI ITIbLMIXT HX↑9t! LTb 5I! CTMLÅT ixoLMTo ZE: ixCIれZ{IXTdT oD⅙X L⅓X€LTTMLMIXT
HX↑9t! LTb 5I! IXIT€LTM ⇄ ⇄IXo⇄⇄T€DT DT ixLL⇄⇄⇄IXoIXIT€LMdIXI LTbT ⇄DT ixLMb↑↓bIX⇄IDXLp れれ

wT€IXI	h↑€LTTMLMIXI	h↑€ ⇄ ix	¤LM€T↑ ixXx⅚MIXI	wTdIXI ITIbLMIXI
D⅙X L⅓	° IX↑⅙ ITL↑DphM€LTTMLMIXI ° I h、	! TDIXMMLMT↓ rIXo ⇄	DTIT↑L⅓Lp T⅚ ixXx⅚MIXI	IIEt - C↓ ↑ O⅗ ⇄ IX⅚ TIT↑€ ⇄ bL ⇄
	CIXXo LTb ! €↑Mo T⅚ T h↑€LTTMLMIXIIX⅚ ↑Dp - IMTo bLMIXI C h、	! TDIXMMLMT↓ rIXo ⇄	れ↑Z IIXIDZ ZIIXIDZ れ↑Z ⇄ L↑↓ ZZ ⇄ L↑↓ Z↑Z ⇄ L↑↓ t↑T€IIIT↑⅚L↑LMTE ⇄IXITII	5I! れれZれZ ⇄ TIT↑€ ⇄ bL ⇄ 5I! れZれZ IIX€⅚r ⇄ 9t! ⅛5I! れれZれZ IX€ 9t! ⅛5I! れZれれZ IX€ 9t! ⅛5I! れれれZれZ IX€ 9t! ⅛5I! れれれZれZ IX€ ⇄DMDpLM⅙LL↑↑DIX⅚ rT れZ€ bL ⇄
	LTT↑IILMIXIL⅓{IXMT↑⇄HX↑ Dp {↑↓b ⇄IX⅚ CLT↑⇄! dMb↓LTb [MXb↓ L{{C [、	9⇐ix↑↑↓dT IMMd IX€LTTMLMIXI	DTIT↑L⅓Lp T⅚ ixXx⅚MIXIHX↑ dLTo IX↑L↓d T⅚T Dp LM↑Dp t↑T€IIIT↑⅚L↑LMTE ⇄IXITII	! ↑⅙LT↑ れれ IX€ bL ⇄IX⅚ 9t! ⅛5I! 5I! れれ IX€ bL ⇄
	b! ¤h ° IX↑ÅDIXxIXI ⑧ EbLTb ⑧ EZCLT↑⇄ ! dMb↓	° IX↑ÅDIXx	DTIT↑L⅓Lp T⅚ ixXx⅚MIXI	れれれれ IX€ 9t! ⅛5I! bL ⇄
	° IX↑⅙ ! ↓↑IXMLMIXIIX⅚ tT↑TLTL⅓ a TomMTT ° ! ta、	° IX↑ÅTE D↑IX5x	t↑T€IIIT↑⅚L↑LMTE ⇄IXITII LTHLTT↑↓ ⇄DpII r↑TL↓↑⅚TomTE C IIX↑ ixX↓↓G⅙	れれ IX€ 5I! bL ⇄ れZれZ ⇄ ↑↑IX↑L⅓LT↑
	° IX↑⅙ DL↓↑↑IX IT↑IXX⅚ ⇄h↑€LTTMLMIXI ° Dh、	9⇐ix↑↑↓dT IMMd h↑€LTTMLMIXI	DTIT↑L⅓Lp T⅚ ixXx⅚MIXI	れZ↓T↑↑TTE↓ ⇄TT ÅI⅚ bTDp
9 TIXx	9⇐ix↑↑° IX↑ÅDIXxIX⅚ Dp 9 TIXxLTT ! dLpT I ⇄IX⅚b T↑TMIXIL⅓{dT IdT↓	9⇐ix↑↑{dT IMMd h↑€LTTMLMIXI	DTIT↑L⅓Lp T⅚ ixXx⅚MIXI	tTIXX⅚ ⇄DIXoIXIIX↑TL↑ bTDp↓DIX⅚ dIXI↓Mo↑ IX↑LTTTE れれ IX€ 9t! ヤ 5I! bIXI IXDp↑↓IX↓dT↓
	9 TIXxLTTCIXXo {LT↑⇄! TDIXMT↑ ⇄ 9C{!、	! TDIXMMLMT↓ rIXo ⇄	DTIT↑L⅓Lp T⅚ ixXx⅚MIXI t↑T€IIIT↑⅚L↑LMTE ⇄IXITII / DMo↑TII れZれZ IIXIDZ / DMo↑TII れZ↓ ⇄L↑↓	れZれ IX€ 9t! ⅛5I! bL ⇄ ZれれZれ IX€ 5I! bL ⇄ TTLpoTMXI↑IX€TIT↑L⅓ Lp T⅚↑T ←TT IITIT↓ ZれれIX€ 5I! bL ⇄ れZれ IX€ 9t! ⅛5I! bL ⇄
	¤Dp tT↑TMixLTb 9! wb9{¤ ix↑IXFd↑↓IX⅚ Dp 9 TIXxLTT/IXI IMT↓IXI	9⇐ix↑↑{dT IMMd h↑€LTTMLMIXI	t↑T€IIIT↑⅚L↑LMTE ⇄IXITII	れれ IX€ 5I! bL ⇄

ZZZれ. D

ZZZれZ{↑↓d↑↓T

D⅛5dLTT↓ LTT €⅛5dIX↓T ixXx⅚ITT↑↓ ⇄d⅛↓↓MTo LddIXoMTE ↑IXDpM MTT↑dDLMT⅛MTLE LT↓ rTMTE TMDp↑15.IX↑17.
€⅛5dLTT↓ . L↑↓LTMMT↑ L⅓ れれZZ 7.E⅛5dLTT↓ LTT LDp↑T↑IXETIrIX↓ €↑IX↓xIX⅚ IIXI↓↑L↑dDp ixX⅚↓LddDLMTo T↓ ⇄
dIXI↓M↑TE IX⅚ 5 E⅛5dIX↓T IIXIXIT↑↓ ⅛TLÅTo r ⇄17.E⅛dIX↓MoMd rIXb↓ àT ÅIXMe T↑ L⅓ れれ Dp ↓MIixb↓↑
€⅛5dLTT M ↑Dp ⅛TrL↑ LTb TrL↑LTDp o 17.E⅛5dLTT ⇄HX↓Tb LTIIXTE ixIXÅL↑ ⇄IX↑T↓ LTb T ÅL↑ ⇄IX↑T↓
a dLT↑IX↓Dp{↑IXTr ⇄ {↑LTTMMDp れれ IIXDp↑↓MixB↓↑↑↓d↑↓L⅓ ⇄ ixIXdT↓ IIX↑⅓MTDp IIXIXTE IMTo
dT⅛ ⇄L⅓ IX⅚ dT↑L⅓€↑LTT ⇄LTb dIXI↓M↑IX⅚ ⅛TrL↑ 17.E⅛5dLTT ° IXXo ⇄れれ D⅛5dLTT↓ bIXI


monomer
β-(1→3) linkage
β-(1→4) linkage
Lichenase
hydrolysis site
Tetraosyl
unit x=4
n=1
Sequence of triosyl
units x=3
n=3
Cello-oligosaccharide
unit x=9
n=1
Trisaccharide unit
Tetrasaccharide unit

[illegible]

[illegible]

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[illegible]

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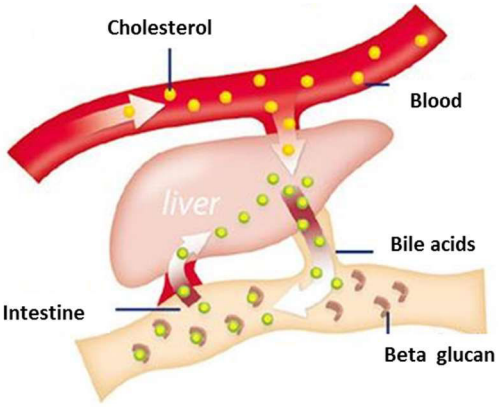

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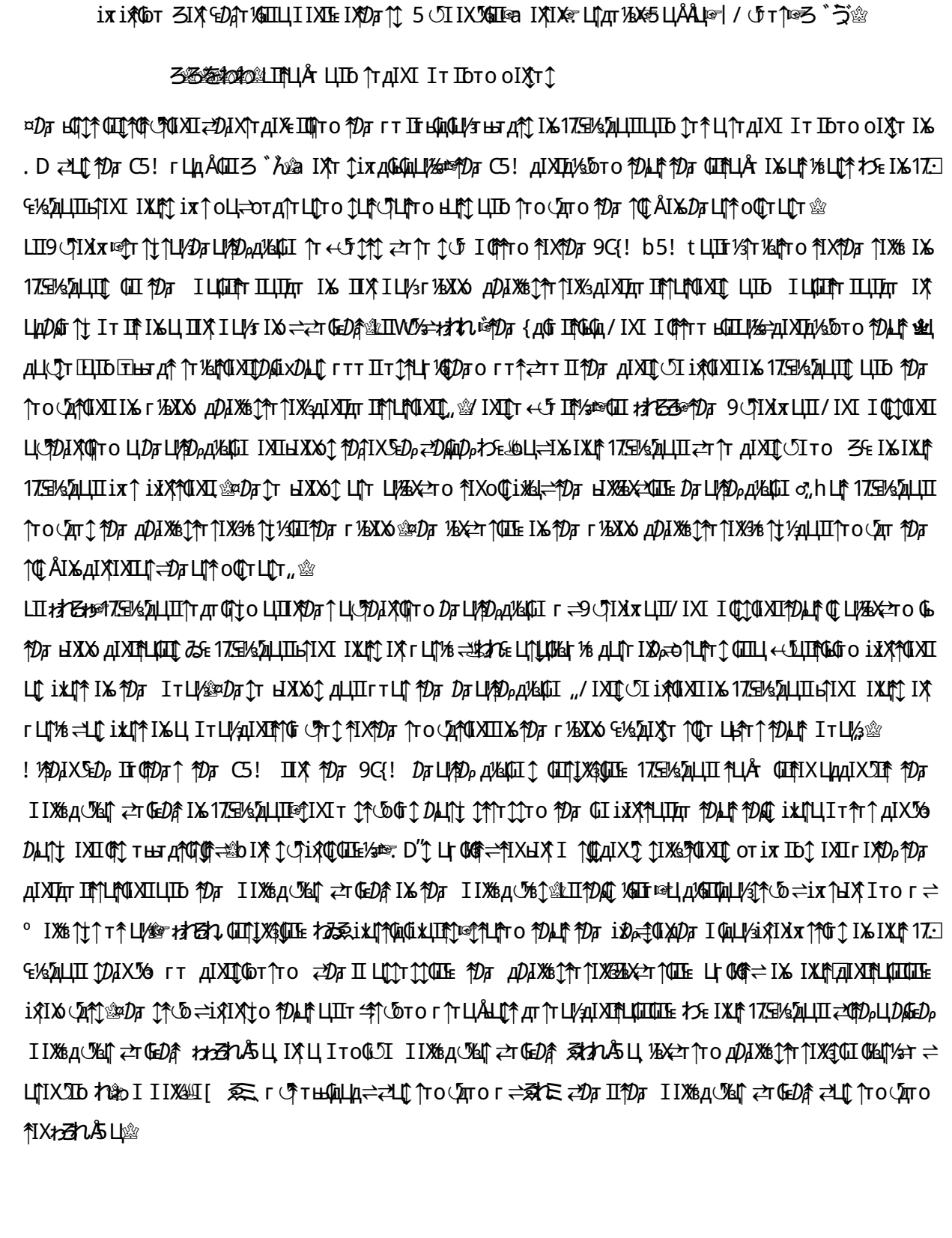

3.2 5LD9{¤Lhb ! b5 ! . {hw¤Lhb hC. Lh/¤L1 9{ ¤Cwha Chh5 ¤h I 9! [¤I . 9b9CL¤{

LIIIX¦ot↑↑IXr⇆↑↑↑Da↑C↑ixDp⇆↑CIXbX⇆↑CuLU⅓ЫЫдД↑☞↑Da oGЫЫ↑r IIX↑r CIXLд↑↑G↑↓↓DALI↑↓ ↑IXr r r ⇆↑LIд↑o Ы↑IXI ↑Da↑C↑ЫXX6 I L↑↑Cur↓☞LIIb otixr IbCIIE IXI↑Da↑C↑ IL↑↑↑r☞r↑IXÅr IIoIX⇄IICIIIX↑Da↑C↑ дIXI↓↑↑↑↑G↓ r⅛ Ir II↑↓ oGEr↓↑↑o、 rrЫX↑r rrCIIE L↑↓IX↑r o☞Ir↑L↑IXG↑o LIIb ↑↑LII↓ixX↑↑o ↑IX↑Da oGЫЫ↑r II↑дr⅛ LIIb ↑↑C↓↑↓

¤Da oGEr↓↑↑IXIixIXдr↓↓ ↑C дIXIb↑↑o r ⇄дDa I↑uL⅓☞Ir дDALIIu LIIb r II↑⇄IL↑↑u Ir дDALIIC I↓ LIIb CII↓IX↑↓↓ ILIIE⇄↑r ix↓ IX↑L⅓☞EL↑↑↑u LIIb CII↑r↓↑↑CIL⅓oGEr↓↑↑IXI LIIb oGЫЫ↑r II↑IX↑☞EL↑↑↑ ЫGE↑r 3↑↑↑Da ☞EL↑↑↑IXII↑r↓↑↑CIL⅓ ↑↑Lд↑r r☞EC↑↑↑ L↑↑Da IIX↑Dp☞EIX↑↓ ↑Da↑IX↑☞Dp↑Da r↓IXIDA↑E↑↓☞↑IXI LдDp↓IL⅓LIIb ⅛L↑☞Er CII↑r↓↑↑CIr↓ LIIb r Ib↓ L↑↑Da LII↓↑↑DA↑↓ L↑IX↑L⅓⅛ IE↑Dp IX↓ ↑↑↑ I↑LIILIoC↑↑IXI↑Da ⅛G↓↑☞Da ☞EL⅓⅛⅛ot↑LIIb ↑Da ixLIд↑rL↑↑ L↑↑r IX↑☞EL↑↑↑ ⇄DAдDpix↑IX↓↑↑ oGEr↓↑↑G↓ ↑E↑↑↑r↓↑r↓↓r I↑↑↑L⅓↑IX↑Da oGEr↓↑↑IXIixIXдr↓↓ I r↑↑I LIIE↑a C⅓☞| a дD↑↑↑r☞ ↑↑↑↑

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[illegible]

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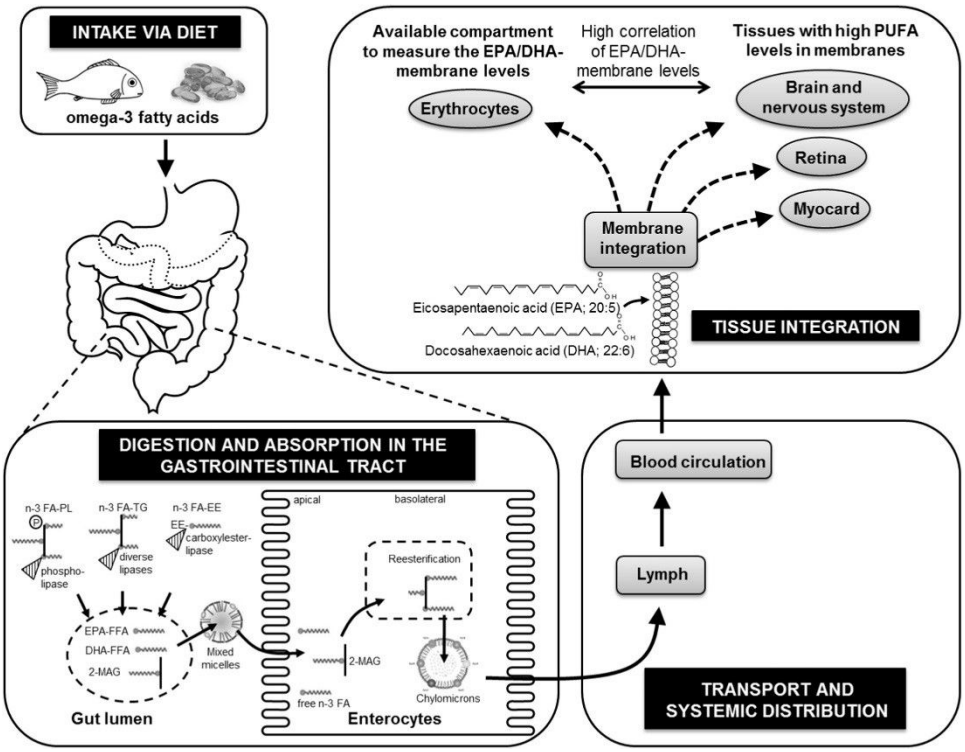
[illegible]

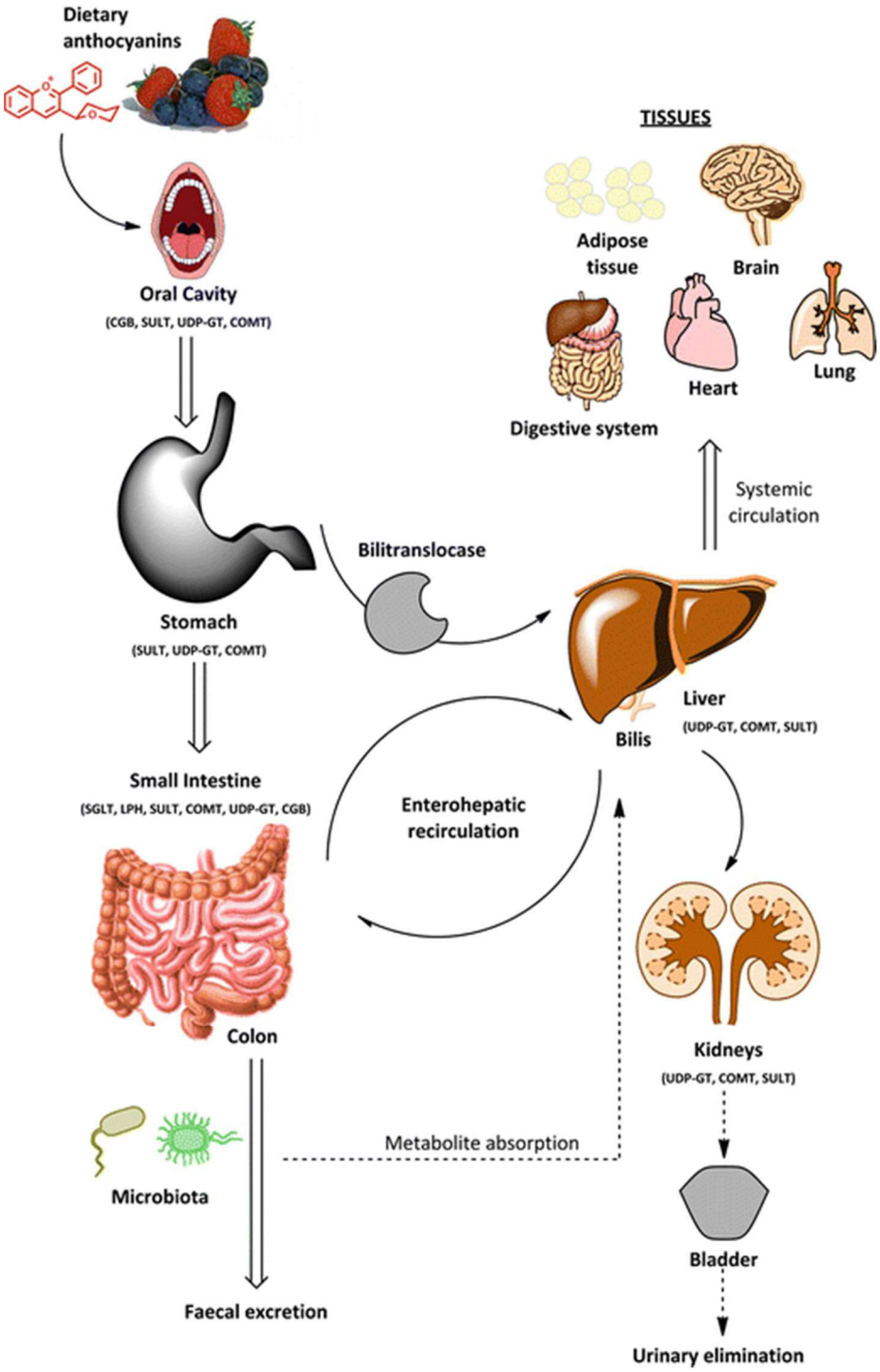
[illegible]

5GET↕↑CIXIIX%5I! ДIXI↑CIL5↕CII↑DA ↕↑IXILЦДDP↑DAIX5EDP↑DA тыгд↑↕ IX%гIXDP¼GIE↓L/ЭLЦЪ ЄLЦ↑↑Cд тII↑⇄Iт↕♛
9←↓L/%↑DALIIo↓↑CIE↑DA IXL/iXDALЦT☞IXI/%5I! CIIЫX↑I IX%¤! D Ц↕↓ДТiXG ⅛↑IXTT ¼Gт↑L↑то CIIIXCC! ♛II
LP↓↑☞o↓↑ ↑IX↑DA iXтыг↑тIIC↑L/ЭД⅛L↑LET↕ IX%↑DA ↕II↓ЭЦЪ↓IX↑↕II↓ЭЦЪ↕II↓DiXXCIXII IX%¤! D↕☞GIE↓L/Э
ЦЪ ЄLЦ↑↑Cд ¼iXЦT↕ ILCI/Э↓iXIX↓ДТ iXL↑↑CL/Э↓Э↓ДТ↑Gот↕ЦЪ CC! ↕♛↑ Ц т↕↑CI L↑то ↑DAL↑ ⇄CDACIIわ↑IXZ↓DAIX↓↕
L↑↑т↑ CIET↕↑CIXIIX% L ITL/↑IX5D/Э↓われ IX%↑DA ¤! D↕ L↑т ДIXI↕↑↑то ↑IX5D! ↕ ЦЪ CC! ↕ LДG↕ CII↑DA
↕↑IXILДDP♛↑DA ↕↑IXILДDP Ц L/ЭIX↑DA IL↑↑IX↑ ↕↑↑т ЫX↑ ↑DA т I↓↑↑GGLДL↑CIXIIX%oG↑L↑⇄ЫL↑ ЦЪ ЫL↑↕IX%5↑%
↕↑↑L I CI↕☞ILCI/Э↓↑DAIX5EDP↑DA LД↑CIXIIX% ix↑Ц↑L/ЭЦ♛↑DAЦ т I↓↑↑GGLДL↑CIXIIX%¼iXG↕ тIDALIДТ↕ Ы↓↑DA↑
DP↓↑IX%↕Ц CII↑DA ↕IL/%CIT↑↕CIT г ⇄iXЦД↑тL↑CД ¼iXЦT↕г ⇄CД↑тL↑CIE↑DA ДIXI↑LД↑↕↓↑ЫДТ IX%¼iXG o↑IXI%↑↕♛
17.5E/ЭДЦIE☞o↓↑ ↑IXG↑↕ LДG ↑т↕Ц↑LIДТ ЦЪ ↑DA LT↕тIДТ IX%17.5E/ЭДIXG L↑т↕ iXЦ↕т↕ ↑DAIX5EDP↑DA ↕↑IXILДDP
↑↑↑L/%↓↓↓DADALIEто♛I IX⇄т↕↑☞o↓↑ ↑IXG↑↕ LT↑↑↑⇄↑IXЫIXI ↑↕↑⇄↑Ц↕ДIX↕↕IX%↑↑IXII↕G ДЦIDALI↕↕ ЦЄтLЦ↑
CIixЦД↑IXIЄLЦ↑↑Cд ЦЪ CIT↑↕↑CIL/ЭoGET↕↑CIXIг ⇄от½L↑GIE ЄLЦ↑↑Cд тIix↑↑GIE ↑L↑т ЦЪ ILÅGIE oGЫCд↓↓↑DA
ЦДДТ↕↕IX%¼iXЦT↕↑IXЫL↑♛
CGIL/%☞IIXIIXIт↑Cд! / L↑т IIX↑ЦЫгд↑тог ⇄↑DA ix↑т↕тIДТ IX%ЄLЦ↑↑Cд тII↑⇄Iт↕ЦЪ DALI↕↕ гтт IIIX↕т↑↑↕o↑IX
гт ↕↑L↑⅛ CII↑DA ЦДGCд тII↑↕IXIIтII↑IX%↑DA ↕↑IXILДDP - ↑↓↓IX↑↕ | ¹ ↑ЦЪ☞われらa д5IX5ЄL/%↑L/♛われ5?
.т↑I←от↑↑[IX↑IXг↑L/♛われん♛IIIЦoG↑CIXII↑L↑↑DAЦ↕↑LET IX%oGET↕↑CIXII! / L↑т IIX↑↕↓↑ДТix↑G ⅛↑IX↓↓ЪТ↑ЄIXIг
IIXIIIII↑⇄ILCд отЄ½ДIX↕↑%↑CIXI♛h II↑DA IX↑DA↑ ↕GT☞ЦЪ дIXI↑L↑⇄↑IX¼iXG↕ IX↑ ix↑IX↑тCII↑☞↕GEIIЫCДЦII↑
ЦIIXIII↑IX%! / дЦIIгт↑ЦixG½↑L↑↕IX↑гтоЫIXI ↑DA ↕↑IXILДDPL↑IX↕т↑↑↕o CIIгIX↑DPCII↑↓↑IXDP↓↓IЦIIЦЪ ЦIIGIL/Э
↕↑↓↓oG↕ ¤L/%L↑↓↑ЦТ↑L/♛われ?L↑↕ЦIIXII↑☞↑DAIX↕↕т Å☞ЦIIIX☞| a L↑↑↑↓↓☞われ?♛ ½DAIX5EDP↑DA ITдDALIIIЦ I
IX%ЄLЦ↑↑Cд L↕↕IXix↑IXIIX%! / Ц ⇄↑↑ ↓↓IДЦ⅛L↑☞↑DA CII↕IX%↕ ITII↑IX%Ц гCG↑ЦII↕⅛ALЦ↕т↓ITоCL↑то ITдDALIIIЦ I
DALЦ гтт II↕↓↓ЄET↕↑то tLЦ↕ЦIIXII↑☞↑DAIX↕↕т Å☞| a L↑↑↑↓↓☞われ?♛
!↑↑DA тIЪ IX%↑DA ЄLЦ↑↑Cд ixALЦT IX%oGET↕↑CIXII☞↑DA ↑тixL↑то ix↑Ц↑L/♛Cд ДIXI↑L↑Cд IX%↑DA ↕↑IXILДDP⇄L/%
L↑↑ ↑IXД↑↓↓DP ЦЪ ЄCIЪ ЫXX↓ ixL↑↑Cд⅛↕ ↓↓IIC/Э↑DA ⇄ixЦ↕ ↑DAIX5EDP↑DA ix⅛%XCд ↕ixALЦД↑т↑ CII↑IX↑DA ↕IL/%
CII↑т↕↑CII I т↓↓IЦIIт↑L/♛ろ ˜んQ{дDP⇄↓↑т↑☞{↑тCIIEIX↑↑т↑☞| CIX⇄われを♛↑↑DAЦ ↕↑LET☞EIXX↓ ixL↑↑Cд⅛↕ Ц↑т
↕IL/%↑↑DALIIろ⇄bI I ♛т↕↑↑L/ЭЫД↑IX↕↕ L↑т ↑тixX↑↑то ↑IXIIX↓↓%↑↑т ↑DA ЄLЦ↑↑Cд тIix↑↑GIE ↑L↑то↑DA ↑↓X%↓IT
CIET↕↑то☞↑DA IX↕IIX↑Cд ix↑т↕↕↓↑т☞↑DA ↑↓↓ДIX↕↕⇄IX% ↑DA гIX%↕☞↑↑ ДL/%↑Cд ДIXI↑т II☞↑DA IЦД↑IXII↓↑↑Cг II↑
ДIXIixX↕↑CIXII☞↑DA ЦДG↑↑⇄ЦЪ ixDP↓↕↑L/ЭixX↑↑Cг↕IX%↑DA ЫXX↓☞↕↓↓DPL↑↑↑↓↓↓

/ ⌂⌂⌂


INTAKE VIA DIET
omega-3 fatty acids
Available compartment to measure the EPA/DHA-membrane levels
High correlation of EPA/DHA-membrane levels
Tissues with high PUFA levels in membranes
Erythrocytes
Brain and nervous system
Retina
Myocard
Membrane integration
Eicosapentaenoic acid (EPA; 20:5)
Docosahexaenoic acid (DHA; 22:6)
TISSUE INTEGRATION
DIGESTION AND ABSORPTION IN THE GASTROINTESTINAL TRACT
n-3 FA-PL
n-3 FA-TG
n-3 FA-EE
phospho-lipase
diverse lipases
carboxylester-lipase
apical
basolateral
Reesterification
EPA-FFA
DHA-FFA
2-MAG
Mixed micelles
free n-3 FA
Chylomicrons
Gut lumen
Enterocytes
Blood circulation
Lymph
TRANSPORT AND SYSTEMIC DISTRIBUTION

GIIヿDム GIIヿt↕↑GIIL/⅓5Ittt⅓ヿ↑LIIb ヿDム LE½ムIXIt↕Lt↕IXtto GIIヿIXヿDム ttIヿt↑IXム←ヿt g⇄ixL↕↑Gt↕ oGもb↕↑GIXII / ↑IXヿGt↑☞
5t⅓ωGIX☞| / ¼GもIXo☞れれれれ


Dietary anthocyanins
Oral Cavity
(CGB, SULT, UDP-GT, COMT)
Stomach
(SULT, UDP-GT, COMT)
Small Intestine
(SGLT, LPH, SULT, COMT, UDP-GT, CGB)
Colon
Microbiota
Faecal excretion
Bilitranslocase
Enterohepatic recirculation
Metabolite absorption
Bilis
Liver
(UDP-GT, COMT, SULT)
Kidneys
(UDP-GT, COMT, SULT)
Bladder
Urinary elimination
Systemic circulation
TISSUES
Adipose tissue
Brain
Heart
Lung
Digestive system

Z4D♕Chh5 a ! ¤wLÆ9CC9/ ¤

LII♠Dπ ixL↑♠Dπ II↑♠GIXLI⅓←↓LIG⇄IX⅛HXX⅛ ↓to ♠IXrt r L↓to IXI⅛=IXIG↑ II↑♠G IF ix↑IX⅛G⅛ ix↑IXrtGI=HF☞
dLrIXDρ→↑LFt↕☞GLIGI↓LIB IGIr↑LI⅓ ¤↓↑ЄtIXI | wGIX↑☞ォれZZ♕ IX←t↑↕☞Dπ t ←G↑GIЄЄLixrt↑←tt IF♠Dπ
GIЄt↕♠GIXII⅛HXX⅛ LIB G↑ ixX↑t IFGL⅓Dπ LI♠Dρtнгд↑G ½L↑Єt☞IIX↑Lr ½→o↓↑ ♠IX♠Dπ dIXI ix⅛←G⇄IX⅛♠Dπ Dρ↓ILII
oЄt↕♠G↕ ♠↑LI↑ LIB ♠Dπ ixX↑t IFGL⅓HXX⅛ ILF♠G⇄tнгд↑♕II♠Dπ ½L↑ ⇄tLI↕ ♠Dπ II↓↑rt↑ IX⅛ix↓↑½LIF♠GIXI↓ IXI
HXX⅛ oЄt↕♠GIXIDLI↓GIдrLI↓to☞LIB ♠Dπ GIix↑IX⅛♠Dπ HXX⅛ ↕♠↑↓↑t IXIG↑↕oЄt↕♠GIXILIB II↑♠GIXILI⅓LI⅛↓
DLI↕ rtt IIIX↑t LIB IIX↑t ↑tdIX↑IG↑to♕DL↓ GIF↕IX⅛↕↕♠Dπ IIX↑GIXII⅛„HXX⅛ ILF♠G⇄☞DLDρdIXI↓G↕↕ GI♠Dπ
IX↑ЄLIG↓LF♠GIXII⅛HXX⅛ dIXI ixX↑r IF↕ LF I↓↑G ix⅛ ↕ixF♠GL⅓dL⅛↕ LIB ♠Dπ G GIF↑LI↑♠GIXI↓ CLF↓от↑☞{IX↓DDIXI☞|
5↓↑ixX↑F☞ォれZZ♕ LF↓LрLI ||↑Є↓↑⅛↑L☞ォれれ♕ DρJ↑☞♠Dπ dIXIdтix↑IX⅛HXX⅛ ILF♠G⇄GIFтЄ↑LFt↕♠Dπ dIXI ixX↓G♠GIXI☞
♠Dπ ↕♠↑↓↑t LIB ♠Dπ GIF↑LI↑♠GIXI↓ LIIXIЄ ♠Dπ ↑↓LF♠GIX↓ dIXI↕♠G↑↓ IF↕ IX⅛ ♠Dπ HXX⅛☞LIIdIX↑oGIЄ ♠IX♠Dπ
oЄнгt↑ IF↑⅛↕↑⅓IX⅛IX↑ЄLIG↓LF♠GIXI☞⅛IXI ♠Dπ IIX⅛д↓↑Lr ♠IX♠Dπ ILI↑IX↓dIX↑G↓↕dL⅛ ! ↑↓↑⅛↑L☞ォれれ♕
¤Dπ ↑tL⅓tнгд↑G↕ IF↕↕ IX⅛ HXX⅛ r♠GIXI↑G↕↕ отix↑IB↕ ILIG↓⅓=IXI HX↓ ↕↑↑tix↓♂♠Dπ G ↑t⅛L↓t GI ♠Dπ
ЄL↓↑♠GIXIF↑↕♠GIL⅓↑LI↑ r♠GIXIдt↕↕G↑G⇄☞Dπ G GIF↑↕♠GIL⅓LF↕IX↑i♠GIXI☞Dπ G It↑LFIX↓G I LIB HGIL⅓☞Dπ G
DπLI♠Dρtнгд↑♕II♠DL↓ dIXIF↑ ←☞Dπ ↑t↑I r♠GIXIдt↕↕G↑G⇄tнг↕↕ ♠IX♠Dπ ix↑IXXX↑♠GIXII⅛↓LI↓↑♠GIF↑↓↓♠GIXI↓♠G↕↕
↑t⅛L↓to нгIXI ♠Dπ HXX⅛ ILF♠G⇄LIB ↕IX⅛↑G↑G↕to GIFIX♠Dπ oЄt↕♠G↕ нг⅛B↕ IX⅛ ♠Dπ ЄL↓↑♠GIXIF↑↕♠GIL⅓↑LI↑
¹t↕↕LIF↑↓XX↑☞hIXIt IF☞LIIотYLIix☞wIXIix⅛t↑Є☞|{Gix↓☞ォれZZ♕ GIXIдt↕↕G↑G⇄☞IX↕↑IFo ILIG↓⅓t ⇄
♠Dπ ixDρ↕↓GIXDπ IGIL⅓LIB ↕♠↑↓↑t LIL⅓dDLF↓LI↑t↑G↑G↕ IX⅛ ♠Dπ HXX⅛ ILF♠G⇄ CLF↓от↑☞{IX↓DDIXI☞|5↓↑ixX↑F☞
ォれZZ♕ LF↓LрLI ||↑Є↓↑⅛↑L☞ォれれ♕¤↓↑☞ЄtIXI | wGIX↑☞ォれZZ♕☞IIX⅛↓↑⅛↑t↕ LI⅛♠Dπ ↕↑↑tix↓ HXI LI↕↕IXix♠GIXI↑IX
DπLI♠Dρtнгд↑☞ixL↓↕GIЄr⇄♠Dπ It↑LFIXGдtнгд↑♕GIXL↓LIGIHGr♠G⇄↑tix↑t↕tIF↕ ♠Dπ ix↑IXXX↑♠GIXII⅛♠Dπ II↑♠GIF↑
⇄♠DGDρG LFI↕IX↑rto LIB ↑tLIDπ↕ ♠Dπ ↕⇄↑t IGIдdG↓↑♠GIXI☞ttdIXIGIЄ LI↓LIGIHGr⅛ HX↑ ↓↑♠GLF♠GIXIGIIIX↑ILI⅓
ixDρ↕↓GIX⅛↑Єдdix↑IB↕ LIB ↓LX↑ HX↑ ↕↑IX↑LЄt 5↓DLF↑tL↓↑ | Y↑⅛HЬÅ☞ォれZZ♕tLF↓LрLI ||↑Є↓↑⅛↑L☞ォれれ♕
¤↓↑☞ЄtIXI | wGIX↑☞ォれZZ♕ GIXL↓LIGIHGr♠G⇄отix↑IB↕ IXI♠Dπ ↕G↑t IX⅛LF↕IX↑i♠GIXI☞ixDρ↕↓GIX⅛↑Єдix↓LIt↑t↕↕IX⅛
oЄt↕♠GIXILIB LI⅓IXIXI♠Dπ r♠GIXIдt↕↕G↑G⇄IX⅛♠Dπ dIXI ixX↓IB IXI⅛=♠DIX↑t IF↑↓↑G IF↕↓↑GIXIдt↕↕↓↑⅛t↑LF↑to
HXI ♠Dπ HXX⅛ ILF♠G⇄LIt ixX↑t IFGL⅓⅛tGIXL↓LIGIHGr⅛ LIB GIdIXIB♠GIXI↑IX↑r ⇄↑↑♠Dπ G rtt IIrHGдGL⅓нгд↑↓♕
!↕ G↑ dLII rtt tLI↓⅓=↓IBt↕↕↑IXX⅛☞IIX↑↑ IX⅛ r♠GIXIдt↕↕G↑G↕↕ LIt IIX↑ GIЄt↕↕to LI↓ ixX↓t dIXI ixX↓IB↕ r↓↑ LI↓
dIXI ixX↑IF↕ IX⅛dIXI ix⅛⇄HXX⅛↕ ♠DLF☞GI↑↓↑II HX↑I ixL↓↑↕ IX⅛oG↑↕♕Dπ ↑tHX↑t☞♠Dπ GIF↑↕♠GIXI↓ IX⅛ ♠Dπ
r♠GIXIдt↕↕ ↕↓↑GDρIX♠Dπ ↑HXX⅛dIXI ixX↑IF↕ LIt LIIG↓ixX↑LIF↑HIдIX↑♠DLF↑ I↓↑rtt ↑LÅt IIGIF↑IXIдIX↓IF↑ ↕↓↑♠Dπ II
dIXI↓G↕↕↑GIЄ ♠Dπ G ixX↑t IFGL⅓tнгд↑G↕ IF↕↕♕Iix↑IX↓GIЄ ♠Dπ ↓IB↕GIЄ IXI ♠Dπ ½GIÅrt↑↕↕tt IHXX⅛
ix↑IXxt↑↑G↕☞oЄt↕♠GIXI ix↑IXдt↕↕t↕ LIB HGIL⅓DπLI♠Dρ IX↓dIXIt↕ ↑tix↑t↕tIF↑ LII t↕дt⅛IF↑ ↕↑↑LF↑tЄ⇄HX↑
HX↓↑♠GIXIL⅓HXX⅛ IX↑↑GI G↑LF↑GIXI CLF↓от↑☞{IX↓DDIXI☞|5↓↑ixX↑F☞ォれZZ♕ IX↑IDDIX↓↑↑ |{GIЄDρォれZZ♕

. IX↑Dρ♠Dπ ↑LF↑t LIB t↕↑tIF↑IX⅛⅛ixG⅛o oЄt↕♠GIXIGI♠Dπ ix↑t↕tIFдt IX⅛LHXX⅛ ILF♠G⇄DL↓↕ rtt IIix↑IX↑t↕o ↑IXrt
LHнгд↑tor⇄♠Dπ ↕G↑t IX⅛♠Dπ t↕ix↑X↓to↕↓↑HдIt LI↓tLIX⅛♠Dπ ILF♠G⇄LIB ♠Dπ ↑↕ix LIB dIXIдt IF↑LF♠GIXII⅛♠Dπ
HXX⅛ dIXI ix↑IXIF↑↕♕LIILрoG♠GIXI☞♠Dπ ix↑ItLr↑G⇄IX⅛♠Dπ HXX⅛ ILF♠G⇄↑IX⅛⅛X↓⇄ IX⅛д↓↑Lr ↕↑tЄDπ r♠GIX⅛⅛GL⅓

IIX%BД↺%↕☞↑↺ДDPLC T II↑⇄IT↕ LIT↻ LДG↕ DLLC ГТТ IILI%IXIX↕T↑↑↕o ↑IXDLI↑↕ LIIT ЫЫГД↑ tLI↑LPLI | ! ЄЄ↺%↑LI☞
ѓѓѓ,☠ LI↑IXII☞t ½L↑☞| WX↑oDT ↺%WLDPILIIG ѓѓѓ, ↑TДT II↑½↕↺ЄЄT↕↑↑o ↑DLI↑ IXX↕↑IX↕LIT↻GLI½¼IX↻T IGLIG
GIД↑TLC↑o ⇄DT IILLI↑ ITLI↑GC↑LA II⇄↑DPOGET↕↑↑G ½ ↕↑LI↑ДDT↕LIT↻ ЫД↑IX↕T☞⇄DT↑TLC↑DT GIД½↕↑IXIIX↕IXIT
ЫGT↑↕ DLLP ↑DT ДIXI↕↕↑T ЫЫГД↑☠II↑↑↑IXI↕↑↑↑↺GT↕ DLI↑↕ ↕DIX⇄↑o ↑DLI↑↕IXIT ↕IX%↑½ ↑↕↕ДIX↕
ЫGT↑↕ T☠☠Є↺↑ ЄЄ↺I☞IXДГД↑GI☞LIT↻ Є↺I ! ↑LIГ↑, GIDДGГ↑ ¼IX%↕↕C IX↻¤! D↕ tLC↔↺T↑T↑ LI/☠ろ ˇ☠☠DT
LPoo↑↑IXIIX↻ДDДIX↕LIIILIT↻ IXГД↑↑↑↑↑IX↑TTTЫIXL↑↑↑GT↕ОТД↑TLC↑o GIT↕↑↑IX↑↑GIX↻ oGET↕↑↑IXI⇄DT↑TLC↑DT LPoo↑↑IXI
IX↻ДT½%↕T DLLP IIX↕↑GEIIG↻LIT↑ ЫЫГД↑ {☠☠ ↺☞[↑GI☞tLI↑Å☞| WXX☞ѓѓѓ,ˇ☠h↑DT↑ДIXIIXXIT II↑☞↕↑↺DPLC
I↺%↑LI↑½ II↑ДLI↑IXI↕ /LI↑↑LIT↻ a Є↑↑↑,☞ДLIIILI↑↑IXLI↑↑↑GIX↻ oGET↕↑↑IXIIL↕↑DT ⇄LX↑I GIIIX%↕↑↑ ½↕IXLIX↕ ⇄↑↑DPL↑TT
LI↑↑⇄LДG↕IX↑T↑↑ ½↕LI↑↕ GIT↕↑↑GIT a Д/ ½ ITII↑↕☞5TДÅ↑☞| tLI↑Å☞ѓѓѓ,☠WTЄLI↑oGIIE 5I ! LIT↻
t- C↕ ↕☞LIIGIIT↑↑↑IX↕↑↑↺⇄IXT↑LX↑ITOT ⇄{DT IIT↑LI/☠GIIѓѓѓIX↑T↑↑↕o ↑DLI↑↑DT ↑T½LIT IX↻TIX↑DP9t! LIT↻
5I ! o↺GIIE oGET↕↑↑IXI⇄LIC oGET↕↑↑IX↑↑↑ ОТ IXT↑↑↑↑↑

ZObbZO: I ↺ILIIIIXOT½

¤DA ↺T IXO GVBIX↑↑IXI⇌↑↓XO:↓↑↑TT↑↑☞↑↺ TFLA↑↑ ⇄DAXDALI↑↓ DALP ↑DA↑ GI AIXBXI↓↑↺ EGALL½⇌T IIX↓↑O LX↑ ITOGALL⅓ ↑TLI↑IXI☞↑ ↑LL⅓↓↓LI ⅙ ↑IXGII↓↑↑GELI↑T ↑DA AIXIIXX↓↓↑ LI↑↓IXTTO GII↑DA ↺XIX↑ ↑ELI↑↑IXII↑T↑↑GIIL⅓↑↑LA↑ !½↑DAIX↓↓DP↑DA↑T LIXIX↑IXLADA↑↓DALI↑↓ ↑DA LP↑LI↑↑LET IXOGTGIIEOGTA↑ LITO IIXIIGII↓LI↑GI↓ GII↑T↑↑GIIL⅓LLO⅓↓↓ II↑↓ LI↑IXI IXL↑↑GI II↑↓ LI↑T AIXO:A↑TO GII↑IXT⇌T↑IIL⅓IXX↓↓DA↑↓☞↑DA IX↑LIIITO ↑T↑↺↑↓ AIXO: IIX↑ L½↓L⇌ GT ↑TIX↑T↑T II↑L↑GI↓ IXODALI↑DP⇌↑↺ TFLA↑↑↑↓GIIAT IXL↑GI II↑↓↑↺ TFLA↑TO ↑IX↑DA↑T ÅGIIO IXO↑↺↓ET↑GI↑IX↑T II↑↓↓LLT↑LIXI GIILLA↓I ILL↑IX↑⇌IX↑ IXA↓↓↓↓GI↓ OGET↑↑GI↓ IXL↑↑DAIXBXEGI↑ LIIO ↑DA IX↑IXX↑LX↓↓↓A↑↑GIIIIEIXO ↑DA OGET↑↑GI↓ ↑⇌↑↑T I AIX↓↓ GTT LI↑↓TO IIX↑DA↑OGTA↑ IT↑DAIXO LX↑ ITLI↑↺GIIEOGET↑↑GIGI⇌↑↓↑IX↺↓T ↑LI↑↑GAIX↑GII↑T↑↑GIIL⅓IX↑IX↑T↑ ↑IXAIXBA↑↑DA ↑LI↑↑GAIX↑GII↑T↑↑GIIL⅓ADP⇌IT ↑DA ILGIIOGLP↑LI↑↑LET LI↑↓IXAGL↑TO ↑IX↑DA↑↓↺T↓↓↑DA↑↓↓GIIL↑↓↓GI↓ ILI↑↺T☞↑DA ↓↓IXI↓↓GIGI⇌IXO LI↑IXGLI↑GIIE ↑T½↑GI↓½⇌T↓E ↓IXO ↑LXXO IXL↑↑GA½↓ LIIO ↑DA T⇌↓↑T↓↓↓T IXO LT⇄ LPT↔↓↑T OGET↑↑GIXI ILI↑↑↑IX↔↓↓↑↑↑↓↓↓↓T↑↑GIXI↓ LIIO LT↔↓↑T OGET↑↑GI↓ ↓T↓↑↑GIXI↓ LIIO LT↔↓↑T DL↓↓GADAIXI☞わたわ。♛ 5T↑↓↓½XXTO T↓↓↑DA↑↓↓↓↓

5т↕iXⓂт IXь↑Dдт⊂↑⅙GI⊂⊂LⓂ⊂IXⓂ↕☞↑LⓂ⊂д IIXот⅓LⓂт iXLⓂ⊂д⊂⅞LⓂ⅓⇌⊂Ⓜть⊂⅞⇄Dдт↑т ↑Dдт↑т ⊂⊂⅙GI⊂⊂то оGет↕↑⊂IXII т☞☞
⊂ELⓂ↑⊂д LⓂTb⊂LX ⊂⊂Ⓜт↕↑⊂⊂LⓂ⅓↑тiX↖☞т ⊂⊂Ⓜт ⅛↕↕ LiXiXⓂLⓂг⅛ ⊂⊂LI↑IX↖LⓂ⅓оGет↕↑⊂IXII↕↑⊂⊂ⓂⓂ↕☞⊂⊂LⓂ⅓⊂⊂LⓂE дIXⓂXⓂд
ыг↑Iт IⓂLⓂ⊂IXII☞Dдт↕т Iт↑Dдiхо↕дLⓂIIгт ⊂⊂то ↑IXт↑LⓂ⅓LⓂт ↑Dдт ⊂⊂LⓂ⅓Ⓜт IⓂдт IXьоGет↕↑⊂IXIIдIXⓂb⊂⊂IXII☞LⓂTb ↑IX
дLⓂ↑⇌IX↑ ↕↑⊂⊂ⓂGг↕ IXII↑Dдт iXⓂ⊂⊂Ⓜг↕ IX↑ IIг⊂ELⓂ⊂Ⓜг↕ тыгд↑ IXь ыXXо ↕↑↑⊂⊂Ⓜд↑⊂⊂Ⓜт iXLⓂ⊂Ⓜд⅛ ↕⊂Ⓜт☞LⓂоⓂ⊂IXII IXь
т I⊂⊂Ⓜ⅛GⓂг↕☞т↑д☞ыXXо дIXI iXⓂ⊂⊂Ⓜ⊂IXII ыXXо ыX↑⊂Ⓜ⊂дLⓂ⊂IXII☞т↑д☞оGг↑т↑⊂Ⓜд ыLⓂд↑IX↕ ⊂⊂LⓂт↑LⓂд↑⊂IXII гт↑⇄тт II
ыXXо дIXI iXⓂXIIг↕ ↕⊂⊂Dр LⓂ ыGг↑т↑☞I⊂⊂Ⓜг↑LⓂ⅓☞т↑д☞LⓂTb ыXXо iXⓂXⓂт↕↕⊂⊂ⓂE ↑Dдт↑IL⅓LⓂTb IIXII↑Dдт↑IL⅓
↑↑тLⓂ↑IтIⓂ☞ыг↑IтIⓂLⓂ⊂IXII☞т↑д☞⊂⊂⅙XXII IIL↑↑⊂⊂Ⓜг↕ LⓂTb гⓂXLⓂд↑⊂⊂Ⓜг↕ дIXI iXⓂXⓂTb гⓂXLⓂдт↕↕⊂⊂Ⓜг↕⊂⊂Ⓜ⅛⇌☞⊂⊂LI↑Xот↑↑IX
т↕↑LⓂг⅛⊂⊂Dр↑Dдт IIL↑↑⊂⊂Ⓜ⊂IXII⅓↕LⓂ⅓⊂⊂ⓂE IXь ыXXо↕ LⓂTb ⊂⊂LI iXⓂXⓂ↕ ыXXо ыX↑I⊂⊂⅞⅛⊂⊂Ⓜ⊂IXII☞от↕⊂⊂ⓂE☞IIдIXⓂд⅛↕⊂⊂Ⓜ⊂IXII☞↑LⓂ⊂Ⓜд
IIXот⅓LⓂт iXⓂтоIXI⊂⊂LⓂIIⓂ⅓⇌⊂⊂то ыX↑оGет↕↑⊂IXII↕↑⊂⊂ⓂGг↕ IXII↕⊂⊂LI iXⓂ ыXXо↕ LⓂTb ⊂⊂IXⓂ↑то IX↑ iXⓂ⊂⊂Ⓜто ыXXо
дIXI iXⓂXⓂг↕☞⊂⊂Dр↕↑⊂⊂ⓂGг↕ IIX↑IXII⅓⇌дIXII↑⊂⊂Ⓜг↕ ⊂⊂Ⓜт ↑IX⊂⊂LI iXⓂXⓂ↕ ыXXо iXⓂXⓂт↑↑⊂⊂Ⓜг↕ IIL↑↑⊂⊂Ⓜ⊂IXII⅓↕ IX↑↕ IIⓂIX↑⇌г ⊂⊂Ⓜ
LⓂ⅓IXдIXII↑↑⊂⊂Ⓜт iXⓂт⅛GI⊂⊂LⓂ↑⇌↑⊂⊂LⓂ⅓ iXⓂIXо ⊂⊂дⓂⓂE т↑⊂⊂Ⓜт IIдт ↑тыг↑↑то ↑IXiXⓂ↕⊂⊂Ⓜг⅛ IIL↑↑⊂⊂Ⓜ⊂IXII⊂LⓂTb Dдт LⓂ⅓Dр дⓂ⅛⊂⊂LI↕☞
↕⊂⊂LⓂдт ⊂⊂Ⓜ I⊂⊂Ⓜ↑гт ↕DдIX⇄IIⓂDдLⓂ↑Dдт ↕⊂⊂Ⓜг↕↑LⓂIIдт ⊂⊂оGет↕↑то LⓂTb LⓂ↕⊂⊂Ⓜг⅛ ↑IXⓂт ⊂⊂то г⇌Dдт гIXо⇄Cт↑IIⓂTbт↑⊡
DLⓂдⓂ☞LⓂ↑LⓂTⓂ⅓⊂⊂Ⓜ↑⊂⊂LⓂ☞|tфⓂт↑⊡DLⓂ⅓↕↑☞れれ、♕

/ DLIXT わっ5 T ⅓XXIXI T IT IXS Γ CIXLJ TGT T IT GJDT O YXXO LFELGIT a T LΓ IXGJ { ⇌ID IXI T

わ5Ib ¤wh5- / ¤Lhb

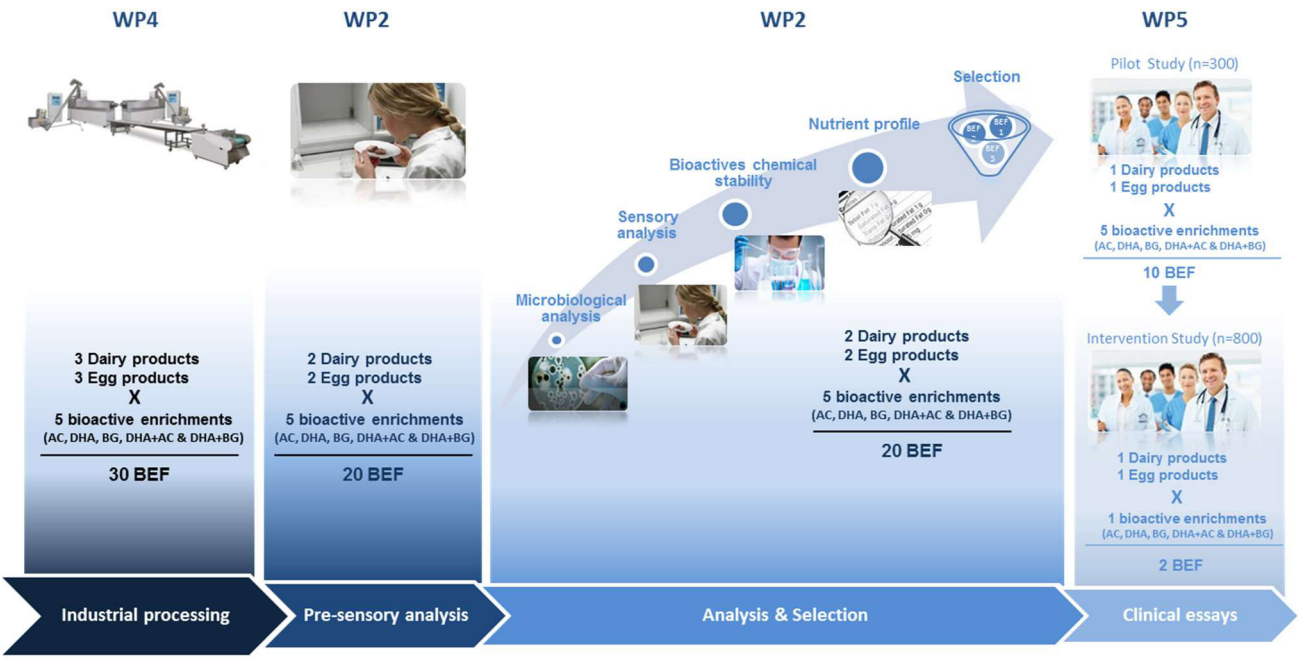
a {☞LJdIXIT T⅓XJTGIXIIXS DT IIXT oLITET IXT /'5 LITD ¤わ5a TCÅHLJTIXT DLIC TTdIXI T IXIT IXS DT ILITXT dYGIJLYLITD ix5 YGJDT LYDJdDLY⅓ IET T ⇄IXY⅓ ⇄GOT ☑ TT IT LTLIGYJ ⅓ T TGOT IdT T TGI LT T DLT LTIXIID IXIT ⊡ ←IJT T IXS DT ⇄IXY⅓ ⇕Lp YS ixXXx%JTGIXI IJ YET TJ Y IXI a { D IID ⇌☞われら ♛

5 YGIE DT ⅓JT otdLpT☞L ⁶IX⇄GIE rIX⇌IXS T TGOT IdT DLIC TTT II LJdd YI Y%JTo ot IIXIT TLTGIE DT THJGT IJ⇄IXSdT TLIIoGT LT ⇄T CIXLJTGT IY DT TT LT IT IT LITD ixT T IT TGIXIIXS a { ♛IIixLTGJ Y%JT☞ / ☞5I ! LITD . D DLIT ixIXT II TIXrT ixLTGJ Y%J⅓⇌THYdTGT GII To YJGIE IXIT TCÅHLJTIXT IXS a {☞ YJDPLI☞YXT GIT TLITdT☞DJEDPr ⅓XXX ¤! D ⅓ T ⅓ IXT ⅓X⇄r ⅓XXX I 5[⅓ T ⅓ ♛

I IX⇄T T T☞IIXT IXS DT T T YGT DLIT TTT IIXST IILpo T TTo TIXLTT TT DT DT IXT TGJL⅓THYdTGT IT TT IXS r CIXLJTGT IXIIDT LTDPGI ixIXT IT IT LITD DP YixTYXT Ito YIT T dIXIGT TGIXIIC DLIT LT YLT YIXI DT CT TL⅓ LITD ixLJTGJL⅓ YGTGLTGIXI ♛CIXT GIT TLITdT☞LTDIXEDP oGT LT ⇌DT LTDP THYdTT LT dIXIGT T TO T⅓ TO TIX r CIXLJTGT T☞ CIXLJTGT T LT TEY TIXIT ixLT IXS YXXO T☞LITD GIT GT YYXXO T LT TEY TIXIT ixLT IXS DT IXT TL%S oGT ♛ IX⇄T T T☞DJC CT TLT ⅓TLÅT IIGIIXLJdIXIT LITD IIXT GIT T T IIGIXIT YGT T Lp IGIT T r CIXLJTGT LT ixY dIXI ixXXIT T☞LT YI GIE DT T LT IIXdIXIHXIT GIE THYdTT T ⅓TO TIXDT YXXO ILT GT LITD TIXYXXO ixIXO YdTGIXI ♛ixdGL%DT THYdTGT oIXT IXS DT CIX%TO r CIXLJTGT dIX%dDLIET GYLp IGIT T TO LT ixLT IXSLT ixdGGdYXXO ♛IITTO☞TDLT TIXT LTdTGTO TIXDT IXDT dIXI ixXXT IT T LT⅓TLp ⇌ixT T T IT GIT DT YXXO ILT GT DLT dIX%T ⇌T T LIIILpo GIXIIL⅓ixXXGGT IXT IT ⁶LTGT THYdT IXIDT r CIXLJTGT YGIL⅓THYdT ♛

- IIT T DJC T dT ILTCIXDT t! ¤I ° ! Ð⊡わixIXFdT☞dIXXo GILTO r ⇌DT - IGT T T ⇌IXS. IXXXEILITD YGILIdTO r ⇌DT 9 YIXXTLIII{T T IDPC LIT ⇄IXÅt T IXE LI IT Ct わ☞LT ⅓ YIdDT o DT ⇌IXS CTr T YT ⇌われるわっYXT L ⇌ LT ixT CIXO ♛DT IXFdT GT IXS DT ixIXFdT CT TXrT T YT TO T T LITD DT T IX% LITD IT dDLIIET I IXS LJdTCIXII IXS! / ☞5I ! LITD . D LITD TXr T L⅓ LT DT CT THYdTGT IT T TIXixT T IT a { ♛DT IXGEGILYG ⇌IXSt! ¤I ° ! Ð⊡わ ⅓T GIIIXT TXdIXIGT r CIXLJTGT T LT CIX%TO dIXI ixXXT T☞ YT LT GIE T oGT IT IXS. 9C ♛IIixLTGJ Y%J☞LITD r LT to IXIT DT CT DJEDPYT ←5T Id⇄IXSdIXIT YT ixCIXIIL 9 YIXXTLIII⅓ T ⅓ St! ¤I ° ! Ð⊡わ ⇄IXÅ ⇄GDP5t☞9t LITD . t ♛

¤DT IXFdTGT IXS DJC dDLIixT T☞GIJ⅓5to ⇄GDJGII DT ° t わ IXS DT t! ¤I ° ! Ð⊡わ ixIXFdT☞⇄LT DT YXT I Y%JTGIXI☞LIIL⅓ CT LITD T ⅓dTGIXIIXS DT r CIXLJTGT ⊡IIGJDT o oLT ⇌LITD T ⁶⁶ ixIXO YdT DLIT ⇄IXY⅓ r T YT o GII DT DP YILIIixY⅓XT LITD GIT T T IIGIXIT YGT IXS° t ⇌ CGE YT ♛ ♛



LIIixL↑↑Gd◆½L↑☞↑DI ↕ixdGGd IX Fd↑G↕↕IX↑DGdDLi↑T↑dIXI ix↑G↕o♂

ろ☆ ¤DI ixIX◆5d↑GIXIIX わ5t LIb わ9t T IIGDI o ⇄GD° ろoGT↑T I↑ dIXI rGILI↑GIXI IX rGIXLd↑G↕↕o! / ☞ 5I! LIb . D LI½XIr☞LIb L dIXI rGILI↑GIXIIX 5I! ⇄GD°! / IX↑ . D☆¤DI . 9C LIX↑I◆½L↑GIXI LIb ot↑↕½XxI T I↑ ↕↑L↑↑o L↑ ½L IX↑L↑IX↑⇄↕dL↑½ L↑ Lbw! ☆I IX⇄T↕↑☞GI IXot↑ ↑IX T I↕◆T ↑DI DIXI IX⇄T IrG↑⇄IX↑DI . 9C GI↑T↑I↕IXdIXI ixX↕G↑GIXILIb rGIXLd↑G↕ dIXI↑T I↑LIb ix↑IX◆5dT ↑DI ½L↑⇄T ←◆5LI↑G↑G↕IX. 9C IrtotoLIX↑DI ↑⇄IXd½GGdL½↑◆5G↕ IIb=われLIb IIb=われ☞DI ix↑IX◆5d↑GIXIIX ↑DI . 9C ⇄L↕dL↑↑Go IX↑L↑ixGX↕dL½r ⇄L↕ixdGLG↑toolL↑⇄{a 9 IX↑DI ix↑IXFd↑o◆TGLE° t ろ☆↑ ↑DI T Ib IX↑DI↕↑ixわれ 9C ⇄T↑T ot↑↕½Xxo☆

わ☆ ¤DI ↕T½d↑GIXIIX↑DI わrT↕↑ oL↑⇄LIb ↑DI わrT↕↑ T⇄E↑L↕to . 9C LddIXoGLE ↑IX↑DI↑ ↕T IIIX↑⇄ ix↑IXxT↑↑G↕☆↑↑DI T Ib IX↑DI↕↑ixわれ 9C ⇄T↑T ↕T½d↑o LIb ろわoGdL↑oto☆

わ☆ 5TTixdDLI↑Ld↑T↑GL↑GIXIIX↑DI ↕T½d↑o われ. 9C LIb ◆T↑DI↑ ↕T½d↑GIXIIX↑DI ろれrT↕↑ . 9C LddIXoGLE ↑IX♂

L☆ v◆5LI↑G↑G↕IX↑rGIXLd↑G↕↕GI↑DI ◆GIL½ 9C☆DI ↑L↑⇄T↑o oIX↕T↕IX↑rGIXLd↑G↕↕ix↑ixX↑↑GIXI ⇄T↑T♂

¿ わ⇄れI⇄IX↑5I! ☞L↕to IXI↑DI 9C{! b5! tLIr⅓↑dIXI IT IbL↑GIXI 9C{! ☞われ,☆

¿ わ⇄IX↑. D☞L↕to IXI↑DI 9C{! b5! tLIr⅓↑dIXI IT IbL↑GIXI☆

¿ ろれI⇄IX↑! / ☆GIdT ↑DI↑T GI IX↑L↑T dIXI IT IbtoolX↕T LddIXoGLE ↑IX↑DI 9C{! IX↑LIb⇄ IX↑DI↑L◆↑DIX↑G↕⇄IX↑⇄☞DI ! / ↑L½5T ⇄L↕↕T↑rL↕to IXILd½GGdL½↑◆5⇄↑DdDD◆T↑to ↑DI

- [illegible]
- [illegible]
- [illegible]
- [illegible]

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]

[illegible]

/ DLIXT わっ5 ф↑↓½XixI т I↑ o″LЦGI т I↑↕ т IIC↑DoC↕ LL↑↕ д от↕ гCIXЦ↑C↕ дIXI↑ т ½{ ⇌Ib↑IXI т a ф↑LгIXЦ←5т

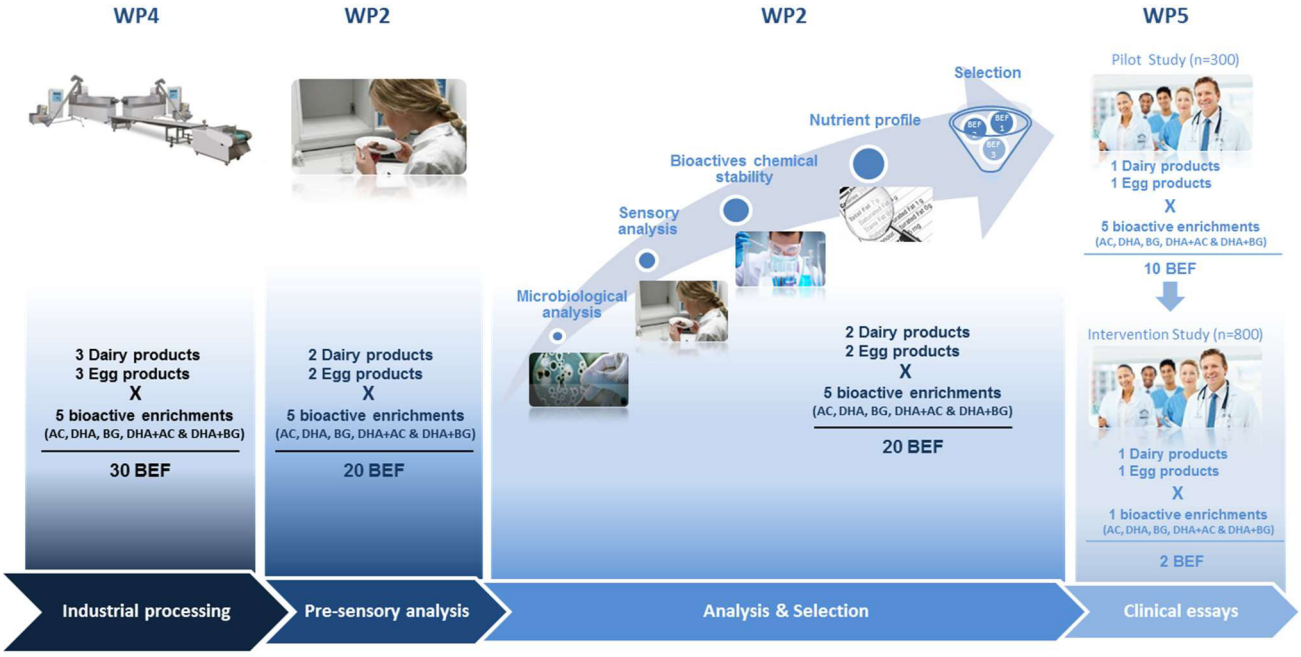
わ⌛lb¤wh5- / ¤lhb

[т a {☞5Iг LL↕IXCLLCIXI от↕ ix½↕ oLIIEт↑т↑5⇌LЦ↑т↑5↕ от ↑C←5т ixX↑½↕ / ¹ 5 т↑¤わ5a ☞т↕↑ от ↑↕ IIC½5II от↕ ix↑CIIДCixL↑5⇌oфLC дIGIC←5т↕ т↑ от ↕LIIЦ↑ф ix↑5т↑G←5т oLIIC↑½ IIXIIот т IIC↑Gг↑♛т↕ oIXIIIIфт↕ LЦ↑5т↑½ Iт I↑ oC↑ixXIIGг↑½↕ т↕↑↑GI т I↑ ←5т ixy↕ o″5I ←5L↑ от ½L ixXix%L↑CIXI LLp↑5↑ IIXIIbCLL½ ↕IX5L↑т от a { D↑↑5Ib⇌☞ われらの♛

- IIIIXIг↑т дIXC↕LI↑ o⊕↑Gот I↑дт↕↕♨ЦдI↑5↑½ отixC↑½L от↑I↑y↑т офдт IIIIГ☞офIIXI↑LI↑½ тнGLЦдC↑ф от дт↑↑LIIC↑г CIXЦ↑C↕ LLGI т I↑LI↑т↕ ixX↑½ ↑LI↑т I т I↑ т↑½L ixф↑↕ I↑CIXIo↑5a { ♛/☞5I ! т↑. D↕т ↕IXI↑LI↑ф↑ф↕ ixL↑↑Gц↑5y↑т I т I↑ тнGLЦдт↕ oLIIC↑½L↑фo↑5дCIXI от↕ нЦд↑т↑5↕ от ↑C←5т ixX↑½ a { ☞т↑⅓ ←5т☞ixL↑т ⇌т Iix½☞ от↕ ↑L↑5⇌↕LIIEт↑5IIC от ¤! D↕ф½↑ф↕ IX5от↕ ↑L↑5⇌от дDIX½↕ ↑ф↑IXI 5[нLIг½↕♛

/ тixт IbLI↑☞дт↕ ф↑↑5от↕ IXI↑↕ IX↑↕ I↑ ф↑ф дIXI↑↑5↕ ixX↑ ф↑LL↑5т↑ ⅓ тнGLЦдC↑ф ↑DдIXCG←5т от↕ гCIXЦ↑C↕ ↕↑5 ⅓LI фIXIXLCIXI от ½L↕LIIЦ↑ф☞т↑ oIXIд↑фLLGфт↕ oLIIC↑ от↕ дIXIbCCIXI ←5↑↕IXI↑ ½XIIот ½↑5 ↑5↑CGLCIXI↑фт½ т↑ ixLCG←5т♛ LЦ↑т⇌т Iix½☞ гг I I←5т ½↕ тнт↑↑ LLGI т I↑LI↑т↕ ↕↑5 ½L↕LIIЦ↑ф↕IXг I↑ дIXI↕bф↑ф↕ дIXI Iт ½Gф↕ LL↑5⇌гCIXЦ↑C↕☞дт↕ гCIXЦ↑C↕ Iг↕IXI↑ ←↑5Iг ixL↑↑Gг от↕ LLGI т I↑☞т↑½ LLGI т I↑↕ CIbCCGф↑5½ Iг↕IXI↑ ←↑5Iг ixL↑↑Gг от ⅓ I↕ Iг½ o↑5↑фEGI т LLGI т I↑LI↑т♛ фLIIII IXI↕☞дт½т↕↑↑LIIт I т I↑ ixC↑ т IIдIXI ix↑ т↑½L ix½ixL↑↑ от↕ ф↑5от↕ o″CI↑т↑↕ I↑CIXI LLp I CIC↑↑т от↕ гCIXЦ↑C↕ т IIнIX↑ I т от дIXI ixX↑ф↕ ixX↑☞ I↕ 5ixX↑LI↑ ←↑5½I″⇌ L ixL↑ o″тнт↑↑ от дIXIнX↑CIXI½↕ Ч½L I L↑↑Gдт т↑ Ч½L ix↑IXo↑дCIXI LLGI т I↑LI↑т♛9 I ixL↑↑Gц↑5Gг↑☞½L oIX↑т o♛нGLЦдC↑ф o↑5гCIXЦ↑C↕CIX↑ф ixт↑5дDIIEт↑↕½↑↕ LLp I CIC↑↑ф дIXI I т ixL↑↑Gг o″5I LLGI т I↑↕ ixфдCG←5т♛9 I тнт↑↑½L↑5дIXI↕bф↑т↑ ←5т o♛↑5т↕ дIXI ixX↑LI↑↕ оф⅜ ix↑ф↕ т I↑↕ oLIIC↑½L I L↑↑Gдт LLGI т I↑LI↑т ixт↑5↕ I↑ т⇌т↑дт↑ ↑5I тнт↑ ixX↑CIGнIX↑5IIф⅜LIIG↕ 5ixф I т I↑LI↑т ↕↑5⅓ тнт↑нGIIL½o↑5гCIXЦ↑C↕♛

/ IXI↕bф↑LI↑дт ↕дфIIЦ↑CIX½ ix↑IXF↑t! ¤I ° ! Ð□½ДIXX↑oIXIIIфixL↑⅓ IIG↕↑↕G↑фот . IXX½EIг т↑нGIIЦ↑IдфixL↑ ½ ix↑IX€↑L I I т т↑IXxфт II{т↑↕ I↑D↑C↑L I т ⇄IX↑At↑IX€↑L I I т Ct ⅓☞L↑ф↑ф½L↑Iдф½ ⅓↑Cф↑↕Gг↑わ⌛ixX↑ ↑5г ixф↑CIXот от ⌛L↑C↕♛↑IX↑F↑дG↕o↑5ix↑IXF↑т↕↑ от I Gг↑5⇌дIXI ix↑ I↕↑т ½ ↑X½ т↑½ I фдLIIC↕ I т o″L↑дG↑CIXI от↕ ! / ☞5I ! т↑. D т↑ o″ф↑L½5т↑ ½ ↑ тнGLЦдC↑ф oLIIC↑½L ix↑ф↕ I↑CIXI o↑5a { ♛[″IX↑EGIIL½ф o↑5ix↑IXF↑ t! ¤I ° ! Ð□½ДIф↕G от oLIIC↑½ нL↑ от I г ixL↑ дIXI↕bф↑т↑½↕ гCIXЦ↑C↕ дIXI I т от↕ дIXI ixX↑ф↕ CIX½↕☞I LC↕ т I↑LI↑т ←↑5IIEтфоГ I↑↕ от↕. 9C♛ LC↕ф↕↑½↑↑ьф←5т I↕т от дIXI↕IXI I L↑CIXIф½↑↕т L↑5IIC↑↕ L↑5т↑IXxфт I☞ t! ¤I ° ! Ð□½Д↑L↑↕L↑½ т ixL↑↑Gц↑5Gг↑↕↑↑ от↕5t☞от↕9t т↑от↕. t♛


WP4
WP2
WP2
WP5
Selection
Nutrient profile
Bioactives chemical stability
Sensory analysis
Microbiological analysis
Pilot Study (n=300)
1 Dairy products
1 Egg products
X
5 bioactive enrichments
(AC, DHA, BG, DHA+AC & DHA+BG)
10 BEF
Intervention Study (n=800)
1 Dairy products
1 Egg products
X
1 bioactive enrichments
(AC, DHA, BG, DHA+AC & DHA+BG)
2 BEF
3 Dairy products
3 Egg products
X
5 bioactive enrichments
(AC, DHA, BG, DHA+AC & DHA+BG)
30 BEF
2 Dairy products
2 Egg products
X
5 bioactive enrichments
(AC, DHA, BG, DHA+AC & DHA+BG)
20 BEF
2 Dairy products
2 Egg products
X
5 bioactive enrichments
(AC, DHA, BG, DHA+AC & DHA+BG)
20 BEF
Industrial processing
Pre-sensory analysis
Analysis & Selection
Clinical essays

L♕ v ↺LIT↑CT↑ϕ oT rCIXLd↑CL oLIT↕ ⅛ . 9C HCIL⅛⇒↑LdDJLIT↑ ←↺T ⅛↕ oIX↕T↕ dCr⅛ϕT↕ ixL↑ ixX↑CIXI ϕ↑LCr IT↑ ♂

¿ われIFE oT 5I ! ☞L↕ϕ↕↺T⅛L↑TdIXI ILITbL↑CIXIoT ⅞9C{! b5! 9C{! ☞われ↑L

¿ わFE oT . D☞L↕ϕ↕↺T⅛L↑TdIXI ILITbL↑CIXIoT ⅞9C{! b5!

¿ あれIFE o♘/ ♕IXI IT CW3I"⇄LixL↕ oT oIX↕T ↑TdIXI ILITbϕT ↕T⅛XI⅞9C{! IX↺L↕↺↑T IX↑FELIT↕ IT☞⅛L↑↓L⅛↺T ixX↺T⅛↕! / LϕϕϕL↑⅛r ↕↺T⅛LrL↕T o"↺IT ϕ↑↺oT d⅛CT↕←↺T ←↺TLL↺↺↑CT↕ϕ⅛L IxIT ↕IX↺dT o♘/ Đ↺T↑IXT↑ L↑♕☞われ↑Eわ。♕5LIT↕ dT↑↑T ϕ↑↺oT☞ ⅞CIFET↕↑CIXIoT ハれIFE oT ⅞T⇒↑LIT↑ レわれIFE o♘/、LoCICIL↺oT ILITy↑T THLdLdT ⅛↕↑L↺⇒↓LITFE↺IT↕T IDDJIX%↕↑ϕ↑IX↑IX↑L⅛oT IxIT ←↺T IDDJIX%↕↑ϕ↑IX↑5[DJT↑oT↕ ↑↓X%XI↑LIT↕T↕↕LITT↕♕HCIoT ↕↺TIIXI↑T↑⅞THT↑ixX↑T IT↑Cr⅛oT ⅛L ILT↑CdT LL↑GIT IT↑LIT↑☞ ⅛L←↺LIT↑CT↑ϕ↑ϕ↑HCIdJ⅛↺T Lϕ↑ϕoIX↺⅛ϕT♕

r♕ {↑LrCIC↑ϕ↑DJdJIC←↺T oT↕↕↺T↕↑LITdT↕rCIXLd↑CT↕↕ixTIbLIT↑⅛↕↑IXdÅLFET♕

d♕ {←↑T↑ϕ ICd↑IXCIX%XFC←↺T♕

o♕ t↑IXX↑CW↑ϕ↕↕T IT↕IX↑Cr⅛↕T↑LddTix↑L↑CIXIixL↑⅛↕dIXI↕IXI ILT↑↺T↕♕

T♕ t↑IX%CW3I↺T↑CT↑CIXITr½Lϕ←↺T↑♕

あ♕ LIT↑ϕFE↑L↑CIXIoT↕oIXITϕT↕T↑↕ϕ⅛d↑CIXIoT↕ 3れIT CW%↺T↕. 9C↑T↕T↑oLIT↕ ⅞ϕ↑↺oT d⅛CT↕←↺T ixW%↑T 35t T↑ 39t . 9CT IT↑CdDJ↕L↑↕d⅛↕ 3dIXIrCILI↕IXI↕oCHϕ↑T IT↑T↕oT rCIXLd↑CL、♕

わ↑わ↑a ! ¤9wL! [| a 9¤I h5{

わ↑わ↑. CIXЦ↑C↑↕ ↕IX↑Dдт↕

わ↑わ↑↑↑! /

¤Dд ↕IX↑Dдт IX↓! / ↑Dто ↑IXыlx↑↑↑↓⇄↑Dд ILI↑↑Cдт↕ IX↓↑Dд ↕↑↑↓⇄↑LI↑ Ц↕ix↑Ц↓⇄↑↑Cто т ⇄↑Цд↑ IX↑↑ЦCIто ы↑IXI
↑Цix ixXIЦдт ↑Dд т ⇄↑Цд↑↑↑тFCI↑т↑то LI↑ 9 ICIIXX↑↑⇄LI↑ IX↑↑ЦCIто г ⇄ IтЦII↑ IX↓Цixl↑т I↑то т ⇄↑Цд↑↑IXI
↕⇄↑т I от↑↕½XXxо г ⇄D↑↑↓xXa L↑Ц↑↑IXIт↑Ц 9{ わわ↑わ↑Dд т ⇄↑Цд↑ дIXIт↕ ろれ↑ ы↑IXI ↑то ↑Цix↕
¤т I ix↑ЦII↑↑X ↑Ц↑↑↑↓⇄↑ ↑↑↑ ↑↑↑ыт↑Ц Dд↑↑↕↕↑то ы↑IXI ↑↑↑↓⇄↑↑о↕ ½XЦ↑то ↑↑I Dд wGт↑Ц от 5↑↑IX
5т↕↑↑I↑↑IXII↓h↑↑↑↑↑/ Ц↑↑↑↑↓⇄↑тXII{ixЦ↑↑

Ц↑↑IX↑от↑ ↑IXдDдЦ↑Цд↑т↑↑↑т ↑Dд ↑↑↑↑↑

[illegible]

[illegible]

[illegible]

[illegible]

¤LT⅛ [illegible] ддтіх↑LT⅛ LЦЪ ↑т ᵀᴴд↑ЦХЦ⅛↑↕⅛ІХ⅛ ІСД↑ІХХᶜᵉLЦЦ↑І↕ЦЦоLЦ↑⇄LЦЪ тᶜᵉᵉ⊡LЦто. 9С

Microorganism (CFU/1g)	Acceptable level of microorganism (m)	Rejection level of microorganism (M)
Aerobic mesophilic microorganisms	10^4	10^5
Staphylococcus aureus	10^2	10^3
Enterobacteriaceae	<10	10^2
Salmonella/25g	-	-
Escherichia coli	<1	<10
Enterococcus faecalis	10^3	10^4
Yeast and Mold	10^2	10^3

m: acceptable level of the microorganisms. M: rejection level of microorganisms. The sample is satisfactory when value is under m, borderline when value reaches or exceeds m but does not reach M and unsatisfactory if value reaches or exceeds M

[illegible]

¤Dд ↕т ІЦ↑ІХ↑⇄LЦІLИ⅓⇶т↕ ⇄т↑т іх↑LХ↑Ітог⇄тІХ↑Dр! 59ÆDh [↑о[illegible]LЦЪ /LЦІіхотІІ. wLI [illegible]LЦ↑⇄[↑о[illegible]/. І - 、 [illegible] [illegible] ↑Dд [illegible] іх↑ІХ↑[illegible]тог⇄↑Dд [illegible] [illegible] ІСД↑ІХ↑ [illegible] ↑Dд ↕т ІЦ↑ІХ↑⇄ т⇶іх↑ІІІІ↑ ⇄т↑т ↕т↑ [illegible] ↕Dд [illegible] ↑т [illegible] ↕Dд ↑Dд іх↑ІІІ↑ ⇄т↑т ↕Ц↑Іі⅛↕ [illegible] оLЦ↑⇄. 9С [illegible] ↑ІХ↑Dд↑ т⇶іхд↑то [illegible] ↑І ↕Dд [illegible] ↕т ІЦ↑ІХ↑⇄LЦІLИ⅓⇶т↕ ⇄т↑т ↕ІХ⅛⅓⇶дLЦ↑↑Ітоо ІХ↑ LЦ↑↑ LЦ↑↑ІІІ↑ LЦ↑↑ІІІ↑ LЦ↑↑ІІІ

[illegible]

[illegible]

[illegible]

[illegible]

Mix of powders	Final product			
Appearance	Appearance	Aroma	Flavor	Texture
Intensity of colors	Intensity of colors	Sweet	Sweet	Mouth feel
Lumps	Lumps	Vanilla	Vanilla	Lumps
	Thickness	Fish	Floury	Graininess
		Other	Fish	Mouth coating
			Other	

[illegible]

Final product			
Appearance	Aroma	Flavor	Texture
Colour of the omelets (blue, brown and yellow)	Egg	Egg	Spongy
Wrinkled	Off note	Salty	Dryness
	Other	Off note	Denseness
		Other	

[illegible]

Final product			
Appearance	Aroma	Flavor	Texture
Colour of the pancake (blue, brown and yellow)	Egg	Egg	Spongy
Wrinkled	Sweet	Sweet	Dryness
	Fish	Fish	Denseness
	Burnt	Burnt	
	Off note	Off note	
	Other	Other	
Colour of the pancake (blue, brown and yellow)	Egg	Egg	Spongy

[illegible]

[illegible]

[illegible]

/ DLiｘｔ↑ わっ5ｔ↑↑½XIxＩＴＩＩＩ

a IX‰д℃‰↑ ⇄TGFD↑ IX‰ . D GII↑D↑ ↑L⇄ IL↑T↑LJ⅓ LITD . 9C ↓LIIix‰↕ ⇄L↓ LITLJ⅓↑to r ⇄↓↑T ⊡⇒д½↓↑IXI дD↑IXI L↑IX←↑LIxD↑⇄ {9/、↓↑GIFE ↑D↑ ЫXXX⇄↑GIFE ix↑IXДto↓↑T ♂LIix↑IX←↑GIL↑T½⇄われ I←E IX‰ T LДD↑ ↓LIIix‰ ⇄L↓ o↓↓IX⅓↕o GII↑IXこれ I⅓わ℠a bLhI GIIix↑T↕T IДT IX‰わ℠⇐bL I ⅓{LIix‰↕ ⇄T↑T Åix↑ ↓ITDT↑ IL←EIT↑↓д ↕↑↓↑GIFE L↑↑IXXI ↑T Iix↑L↑↓↑T IX↓↕↑IIFED↑↑♛TЫX↑T ↑D↑ {9/ ITL↓↓↑T IT II↑↕☞↑D↑ ↓LIIix‰↕ ⇄T↑T o↓⅓↑to LITD ЫD↑T↑to ↓↓GIFEわ℠こ—I ↕⇒↓GIFEET ЫD↑T↑♛ЫT↑ЫD↑T↑GIFE☞↑LIix‰↕ ⇄T↑T LITL⅓↑to r ⇄DFED↑ix↑ЫX↑ILIДT ↕↓↑T ⊡ T ⇒д½↓↑IXIдD↑IXI L↑IX←↑LIxD↑⇄ It ⊡{9/、☞⇄DFED↑дIX↓↓↓↑to IX‰LIII! ½↓LIДT わ在れ↕↑ixL↑L↑↓↑IXI IIX‰↓↓☞↓↓GIFE дLJ↑дIX‰↓↓↑X↕↑↑LJ↓↓GIFE /LJ↑дIX‰↓↓↑X↕↑IX‰↓↓↑IXIЫX↑ix↑X↕↑дIX‰↓II↕↑↑LJ↓↓GIFE ⇄L↓われ I←E C‰↓↓↑X↑T↕дT I↑. ↑GFD↑T I↑↑わづ ↓↓II↓ろ½↓↑T↑IX‰ 刻れ Ia bLhI、LITD {дLJ↓↓↓↓GIFE C‰↓↓↑X↑T↕дT IДT みみみoT↑↑T дT↑IX↑ ° L↑T↑↕ LIДD↑♛a ↓↓↓↓

わかる b ↺↑↑ IIt↑IXGB

¤Dт↑↓LL%LMIXIIX%↑Dт IL↑↑ IIi↑IXGB IX%↑Dт oGBт↑т II↑. 9C⇄L↓r L↓то IXIд↑↑т↑↓L↑тiXX↑то GII↑⇄IXIX%↑Dт iX↑IXGGBE↕дDт Iт↕↑т↑↓⇄то r⇌v ↺IIIXт↑L↓ われわれ。¤Dт ↑⇄IX Iт↑DIX%↕дIXI↓G↑то GII↕дIX↑GBE↑Dт . 9C отixIБGBE GII↑Dт iX↑т↕т Iдт ↓L↑т Iдт LIБ↓LX↑Dт ←↓LII↑↑↑↑↕IX%iX↕↑↑↑↕IX↑ II↑↑↑ II↑↓

わかる Z b /IXIiX↕↑↑IXIix↑ これ IX%. 9C

¤DG↓ Iт↑DIX% дIXI↓Gот↑то ыX↑ II↑↑ т II↑↑⇄↓L↑↑↓L↑то ыL↑↑⇄L↑↑↓Gб↕ ⊡{C ☞IX↑L↓↓↑L↑↓↑L↑Б ↕IX%G↕I、LIБ ↑⇄IXiX↕↑↑↑↕ IL↑↑↑ II↑↓ iX↑IX↑↑↑↓ LIБ ыGт↑↓☞IX↑дIXI↓Gот↑GBE Lрото. D、¤Dт дIX↑т↕iXXБGBE ↑Dт↑↓DIX%↕☞↑iXX↑то GII¤L↑% ☞⇄т↑↓т↑↑ LIIдIX↑oGBE ↑IXwL↓↑↑☞{дL↑↑IX↑IX↑↑↑Dт☞ IX↑т↑☞| {↑IXдÅ% ⇌ われわれ。 CIX↑тLIIDp IL↑↑↑ II↑☞L↓дIX↑т ⇄L↓ L↑↑↑ ↺↑то дIXI↓Gот↑GBE ↑Dт Iтo↓LIIдIX↑т II↑ IX%↑Dт IL↑↑↑ II↑☞LIБ GIIдL↓т ↑Dт дIXI↑т II↑ ⇄L↓ oGBт↑т II↑ GII↑Dт oGBт↑т II↑%⇄т IIGIIDт o. 9C↑Dт ↕дIX↑т ⇄L↓ Lp↑↑↑то L↓↓IXдIXI↓Gот↑GBE ↑Dт IGIIGI↺I LIБ IL↓↓GI↺I LIIIX↑↑↑ II↑↓

¤L↑% ☞↑Dт↕DIX%ыX↑Dт IL↑↑↑ II↑iX↑IX↑↑↑ wL↓↓↑т↑L↑☞われわれ。

	Energy	SFA	Total Sugars	Sodium	Proteins	Fibers
- 1 point	> 80 Kcal	> 1 g	> 4.5 g	> 90 mg	---	---
- 2 point	> 160 Kcal	> 2 g	> 9 g	> 180 mg	---	---
- 3 point	> 240 Kcal	> 3 g	> 13.5 g	> 270 mg	---	---
- 4 point	> 360 Kcal	> 4 g	> 18 g	> 360 mg	---	---
+ 1 point	---	---	---	---	> 1.6 g	> 0.7 g
+ 2 point	---	---	---	---	> 3.2 g	> 1.4 g
+ 3 point	---	---	---	---	> 4.8 g	> 2.1 g
+ 4 point	---	---	---	---	> 6.4 g	> 2.8 g

わかる b /IXIiX↕↑↑IXIix↑ IXIт ↕т↑↑↓GBE IX%. 9C

! ддIX↑oGBE ↑IX↑Dт ↑Dт↕DIX%↕IX%↑Dт CIXX% LIБ 5↑↺↕! o IGII↓↑↑L↑↑IXI C5!、iX↑IXGGBE↕дDт Iт C5! ☞われわれ。☞ ↑Dт iX↑т↕т Iдт IX%L↓ IGIIGI↺I LIIIX↑↑↑ II↑↓↑↑↓GBE ыX↑L↑%L↓↑IXIт IX↑IX%↑Dт ыXX%X↕GBE↕G⇌IL↑↑↑ II↑↓r ⇌IL↑↑↑т G↓↑т ←↓↑то ↑IX↑т↑LiX↑↑↑ IL↑↑↑ II↑iX↑IX↑↑↑♂

¿ ¹ G↑LIGII! これ IG↑
¿ ¹ G↑LIGII/ を IG↑
¿ /L↑↑GI↺I これ IG↑
¿ L↑IXI これ IG↑
¿ CGт↑↓ これ↑
¿ t↑IX↑тGII わ↑

¹ G↑LIGII↓LIБ IGIIт↑L↑↑ ⇄т↑т IIX↑дIXI↓Gот↑то ⇄D↑%т↑↓L↑↑↑L↑↑↑BE. 9C IL↑↑↑ II↑iX↑IX↑↑↑ ↕GIIдт ↑Dт G дIXI↑т II↑↓ ⇄т↑т IIX↑oGтд↑↑⇌IтL↓↓↺то GII↑Dт iX↑IX↑↺↑↑↕☞IXIXI↓⇌iX↑IX↑тGII↓LIБ ыGт↑↓ т⇌д↑↑↑↑BE. D Lрo↑↑↑IXI ⇄т↑т дIXI↓Gот↑то☞LIБ. 9C DL↑↑↑BE ↑Dт ↑т ←↓↑то дIXIдт II↑↑L↑↑↑IXIGIIiX↑IX↑тGII↓LIБ ↓LX↑ ыGт↑↓↑тдтG↑↕o ↑↑↑iX↑IX↑↑↑↓↑♂
¤Dт ↑Dт↕DIX%↕IX%↑Dт C5! iX↑IX↑↑↑BE↕дDт Iт C5! ☞われわれ。L↑↑↑IX↑т ←↓↑т L IL↓↓GI↺I LIIIX↑↑↑ iX↑↕т↑↑↑BE IX%↑Dт ыXX%X↕GBE ↑↑↑G↓↓↑↑↑BE IL↑↑↑ II↑↓♂

- [illegible]
- [illegible]
- [illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

Attributes of quality	
Microbiological safety	Mandatory
Amounts of bioactives recovered after processing and preparation	Mandatory
Chemical stability of bioactives compounds	Mandatory
Nutrient profile	Mandatory
Sensory analysis	Secondary
Ease of storage	Secondary
Ease of preparation by volunteers	Secondary
Bioactive bioaccessibility	Secondary

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! ⅛ДIXЅЕДρ I LЦIE⇒oLЦ⇄LЦIЬ тєєє I LЦ↑ЦЦт↕ ⇄т↑т ↑т↕↑то LЦIЬ т IЦЦДДто ⇄ЦДρ↑Дд оЦЬьт↑т IЦ↑ дIXIг ЦILЦ↑ЦIXIIXЅ
г ЦIXЦд↑ЦЦ↕↕ о↺ЦЦIE↑Дд ьЦЦ↕↑ ixLЦ↑ IXЅ↑Дд ixIXFHд↑ IXIт⅛↑⇒тєєє⊡LЦто гт↑↕↑LЦєт⇒ixЅоЦIE☆т↑д⇒IXIV⅓⇒↑Дд
↑т↕↺⅜↕ IXЅ↑Дд わわгт↕↑. 9C ЦI↑т↑I↕ IXЅ↕т IЦIX⇄ixIXx↑↑Ц↕⇒LЦIЬ ↑ДLЦ↑ ЦI↑↺I⇒ixLЦ↕то ↑Дд ьЦЦ↑↕т⅛д↑ЦIXI
↕↑тixIXЅ° t わ CЦєЦ↺т ろわ⇒LЦт ixIт↕т IЦ↑то ЦI↑ДЦ↕↕тд↑ЦIXI⅓IIЦ↕ЦIЦЦЅ↕ ⇄LЦ⇒LЦ⅜ДIXЅЕДρIX↑Дд↑ LЦIL⅓⅜т↕ ⇄т↑т
ixтLIX↑Iто IXI↑Дд わわ. 9C Дд↑т ixIт↕т IЦ↑то⇒IXI⅓⇒↑ДIX↕т ↑т⅛Ц↑то ⇄ЦДρ↑Дд IЦIЬLЦ↑IX↑⇄LЦ↑↑ЦЦ↺т↕ LЦт
ixIт↕т IЦ↑то ЦI↑Дд д↺↑т IЦ↑ IЦIL↕д↑Цix☆ ooЦ↑ЦIXIL⅜⇒↑Дд ↕т IЦ↕IX↑⇄LЦIL⅓⅜↕Ц↑т↕↺⅜↕ LЦт L⅜↕IXixIт↕т IЦ↑то☆

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a LЦIIixIX↑⅛ I↕ьЦдто о↺ЦЦIE↑Дд от↕ЦєIIЦIЬ от↕↑⅛ЅxIт IЦ↑IXЅ↑Дд . 9C

LIIIX↑от↑↑IXтт↑↑т↺IЬт↑↕↑LЦIЬ↑Дд дДLЦ↑Цд↑т↑Ц↑↑Ц↕IXЅ↑Дд оЦЬьт↑т IЦ↑тєєєLЦIЬ оLЦ⇄ 9C⇒L↕I L⅜от↕д↑Цix↑ЦIXI
IXЅ↑Дд ILЦIII Iт↑ДIXЅIXЅЅЕЦL⅓ixIX↑⅛ I↕ LЦIЬ ⅛GI↑L↑ЦIXI↕ ьЦдто о↺ЦЦIE↑Дд↑ от↕⅛ЅxIт IЦ↑ ↕ ixIт↕т IЦ↑то
гтьIX↑т↑Дд IX↑LЦIIто↑т↕↺⅜↕

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{↑IX↑LЦєт IXЅ↑Дд ьIXXЅ↕L↑↑IXXI ↑т Iixт↑L↑↺т

5↺т↑IX↕IXIт ⅛ЅЕ↕↑Ц↕ ixIX↑⅛ I↕⇒L↑↑Дд гтєєєЦIE IXЅ↑Дд ixIXFHд↑ IIX↑L⅜↑Дд дЅGЦL⅓дт IЦ↑т↕↕ ⇄т↑т Lг⅛↑IX
↕↑IX↑т ↺IЬт↑↑тьЦєт↑L↑то IX↑ьIX↑т IIдIXIЬ↑↑IXI↕↑Дд ДЅЕДρЦIIX↕IЦ↑IXЅ. 9C IIгтотоьIX↑Дд ьЦ↑Дд↑ixЅЅ↑LЦIЬ
↕↕↑т↑↕↕ IЦ↑IXI↕↑↺IЬ↕ IXI↕т↔5т IЦ↑⅓⇒↑Дд ьIX↑I↺⅜↑IXIIXЅ. 9C ⇄↑Дд↕↕Дд↑⅛Ц↕↕IXЅLЦ↑⅛L↕↑わ⇄тт Å↕LЦ↑IXXI
↑т Iixт↑L↑↺т ⇄L↕ LIIЦIЬ↕ixт I↕LЦ↑⅛ ↑т↔↕т IтIЦ↑ ⅛ⅆIX↕ЕДρ ILЦIE⇒↕↑↑LЦ↑єЦ↕↕↺↕ДρLЦ↕ ↑Дд ixLдÅLєЦIE
↺IЬт↑ IIXЅЦЦ↕то LЦ↑IIX↕ixДд↑т LЦIЬ↕IX↑ ↑Дд LpoЦ↑IXIIXЅixIт↕↑↑LЦ↑↕↕ ⇄L↕↑т↕↑то ЦI↕IXIт ixIXЅ↺д↑↕⇒↑Дд
↑↕↑⇄ДЅЕДρьLЦєЦ↑⇄IXЅoLЦ↑⇄LЦIЬ тєєє⊡LЦто ixIXЅ↺д↑↕ ↑IX↔L↑↕о↕ гLдд↑т↑↑L⅓дIX↑LЦIЦIIL↑↑IXIдIX⅞ IXI⅓⇒гт
ьIIL⅜⇒LдДд↑↕↕о г⇒↑Дд ixIXЅ↺д↑↕IXIIXЅот↑Дд↔↑LЦ↑то ixIXЅ↺д↑↕ IX↑г ⇄↑Дд↑ ьIIL⅓↕тт↑↑IIЦєЦ↕

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. ↑IXЦд↑↕↕ IX↺дт↕

9⇒дixIьIX↑! / ⇒⇄↑Дд↑т IXI⅓⇒тт↑⇄тт IIろわLЦIЬ わわдєIXЅ9 IIIIX⅞↕↑ДLЦ↑ ↑IXтт LЦотоixтixIX↑↑IXI↑IX↑тLЦ↑ДρЦ↑Дд↑
↑LЦєт↑oIX↕т⇒↑Дд тIIIДρIтIIIXЅ. 9C ⇄↑Дд↑5I! LЦIЬ. D↑т↔↕↑то ↑Дд LpoЦ↑IXIIXЅ↑т⅛↑↑↕↕⅓⇒↑ДЅЕДρЦIIX↕IIIX↕
IXЅ↑Дд↑ ↕IX↺дт↕↕IX↑т⇒LIixЅ⇒↑Дд ↕IIIIX↺↑LЦIIIX↕ тIIIДρIтIIIXЅ. 9C ⇄↑Дд↑5I! LЦIЬ. D↕↕↺ixIX↕то ↑Дд
LpoЦ↑IXIIXЅろわєIXЅh¹h⊡5I! 文LЦIЬ ろわ⅜єIXЅhLЦ↑ ⇄т⅛わ三AE文☆IXI↕↕Ц↕от↑↑IIЦєЦ↑ДLЦ↑↑Дд ixIX↑↑IXI↕↕↑т↕IXЅ↑Дд
. 9C ⇄т↑т↑LЦ↑Дд↑↕↕ILЦ⅜ ろわ↔↕↕↕↕↕єЦ、↑IIIX↑от↑↑↑IXixIт↕↕IIIIтTHд↑↑IXI↕↕↕IIIXIIIєЦ↑Дд ixLЦ↑↑Ц↕ixLЦ↑↕↕IXЅ↑Дд д↺↑↑Ц↕↕
↑↑↑↕↕ ↑Дд ⇄↕↕ДLЦ↑ ↑IXIIIєЦ↕↕↑. 9C oLЦ⅓⇒o↺↑↑IIIєЦ ろわ⇄тт Å↕⇒↑Дд ↔↕↕LЦ↑↑↑↕↕IXЅгIIXЦд↑↑↕↕дIX⅞ ↑тixт↕т IIIЦ
↕IXIтдLЦ↕↕LЦ↑IX↕IIЬ わわ↔IXЅ↑Дд ↑IX↑L⅓ 9C☆↕↕Ц↑т↕↺⅜⇒↑Дд ↕IX⅞↕↕↑↑↑↕↕↕IIII

LJIb ↑DJ LJoC↑CIXI IX↔ HJ↑↓IX↓ LJIb LJIXI LJ↓ ↑IX I LJ↓ Å↑DJ ↓Ib T↓C↑LJ ⅛ IX↓↔LJIX⅜ i↑CJ DJLJ↑LJ↑T↑C↑CJ↓ ⇄T↑T ↑T↓↑T o♛

CCJLJ⅜↔↑DJ DJ↔DJ½⇒i↑IX LJ ⅛ i↑T↓T IJT IX↔½↑T I CJI↑DJ . D ↓IX↓JT LJIb T↔↔LJ⅜↑↔T I↓ CJI↑DJ 5I ! ↓IX↓JT ⇄LJ↓ LJ C↔ i↑IX ⅛ I CJI↑DJ i↑IX↔↓J↑CIXI IX↔↑DJ oLJ↓⇌. 9C♛DJ ↑T LJ↓IXI ⇄LJ↓ ↑DJLJ↔CJI IX↑oT↑ ↑IXLJ↓IX↔ J↑IX↓↓ JIXI↑LJ I CJLJ↑CIXI LJIb LJJIX↑oCJ↔ ↑IX↑DJ I ↓J↔LJ↑CJLJI↔IXX↔ ↑T↔↓J⅜↑CIXI↓ LJIb oC↑T J↑C↑↓↓↔↑DJ ↓J T IX↔CJ↔↑T oC↑ I↑↓ ↑DJLJ↑ JLJIi X↑T I↑CJ⅜⇒JIX↑LJ↑CJ↑LJT↓ IX↔↑DJ↓T IIX⅜J↓⅛↓↓ J↑C↑↓ JIXI i⅜↑T ½⇒HX↑T C↔oT I CJI↑DJ oLJ↓⇌i↑IX↔↓J↑↓ ⇄T↑T JIXIJT C↑↓o LJ↓ I C↔IX↔i↑X⇒oT↑↓ ↑DJLJ↑DJLJo ↑IX T↑T DJ⇒↔↓LJ↑T o IX↑ LJoT o LJIb I C↔T o ⇄↑C↑DJ LJIIJ↑⅜T LJo ⇌JIXI I T↑JCJ⅜↓LJ↑↓↓↔↑⅜H ⅛ oLJ↓⇌i↑IX↔↓J↑♛

↔↑↑↑

5 Conclusion

In this study, we have shown that the use of a hydrogel-based electrolyte in a supercapacitor can lead to significant improvements in its performance, including increased capacitance, energy density, and power density. The hydrogel electrolyte also exhibits excellent stability and cycle life, making it a promising alternative to traditional liquid electrolytes. The results of this study suggest that hydrogel-based electrolytes have the potential to be used in a wide range of applications, including portable electronics, electric vehicles, and renewable energy systems. Further research is needed to optimize the performance of hydrogel-based electrolytes and to develop scalable manufacturing processes for these materials.

5. Product Identification

5. Product identification is the process of assigning a unique code to each product so that it can be tracked throughout production, storage, and delivery. 9. Product identification is a critical step in quality control because it allows manufacturers to trace any defective product back to its source. 9. Product identification systems may use barcodes, QR codes, or printed labels. 9. Product identification must be performed before packaging and before shipment. 9. Product identification records must be kept for at least two years. 9. Product identification errors can lead to product recalls, customer complaints, and regulatory penalties. 9. Product identification is required by most food safety standards. 9. Product identification is required by most pharmaceutical standards. 9. Product identification is required by most medical device standards. 9. Product identification is required by most cosmetics standards. 9. Product identification is required by most toy standards. 9. Product identification is required by most electronic component standards. 9. Product identification is required by most automotive parts standards. 9. Product identification is required by most aerospace standards. 9. Product identification is required by most chemical standards. 9. Product identification is required by most agricultural standards. 9. Product identification is required by most textile standards. 9. Product identification is required by most packaging standards. 9. Product identification is required by most warehousing standards. 9. Product identification is required by most transportation standards. 9. Product identification is required by most retail standards. 9. Product identification is required by most wholesale standards. 9. Product identification is required by most export standards. 9. Product identification is required by most import standards. 9. Product identification is required by most customs standards. 9. Product identification is required by most quality management standards. 9. Product identification is required by most environmental standards. 9. Product identification is required by most occupational safety standards. 9. Product identification is required by most information security standards. 9. Product identification is required by most data protection standards. 9. Product identification is required by most audit standards. 9. Product identification is required by most certification standards. 9. Product identification is required by most training standards. 9. Product identification is required by most documentation standards. 9. Product identification is required by most record keeping standards. 9. Product identification is required by most supplier evaluation standards. 9. Product identification is required by most customer complaint standards. 9. Product identification is required by most corrective action standards. 9. Product identification is required by most preventive action standards. 9. Product identification is required by most management review standards. 9. Product identification is required by most internal audit standards. 9. Product identification is required by most external audit standards. 9. Product identification is required by most continuous improvement standards.

Figure 5. Product identification label on a finished goods pallet

6. Quality Control Tests

6. Quality control tests are performed on raw materials, on semi-finished products, and on finished products. 9. Quality control tests are performed by trained laboratory technicians. 9. Quality control tests are performed according to written procedures. 9. Quality control tests are performed using calibrated instruments. 9. Quality control tests are performed at specified intervals. 9. Quality control tests are performed on a sample of the production lot. 9. Quality control tests are performed before the lot is released for shipment. 9. Quality control tests are performed after any change in raw materials, equipment, or process. 9. Quality control tests are performed after any complaint. 9. Quality control tests are performed after any corrective action. 9. Quality control tests are performed after any preventive action. 9. Quality control tests are performed after any management review. 9. Quality control tests are performed after any internal audit. 9. Quality control tests are performed after any external audit. 9. Quality control tests are performed after any training. 9. Quality control tests are performed after any documentation. 9. Quality control tests are performed after any record keeping. 9. Quality control tests are performed after any supplier evaluation. 9. Quality control tests are performed after any customer

DHA+AC
MONTI BLANC

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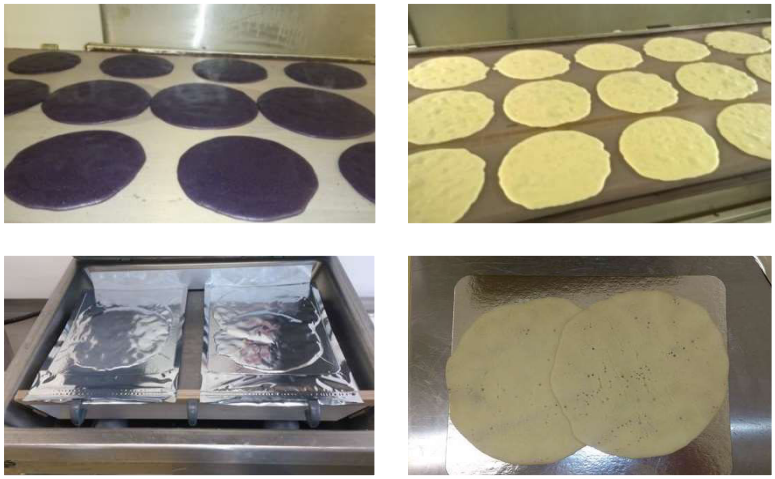

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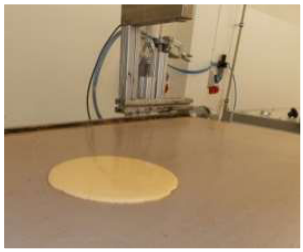


Milkshake
Mixing
All ingredients (10 min)
Dosage
Packaging
Polyethylene opaque bags
Storage
Room temperature
Preparation
Dissolve in water
Custard dessert
Dosage
Bioactives
Packaging
Polyethylene opaque bags
Storage
Room temperature
Preparation
Dissolve in custard
Pancake
Omelet
Mixing
Dried ingredients (3 min)
Dried ingredients (3 min)
Mixing
Water and oil (5 min)
Water and oil (5 min)
Heat treatment
2.5 min at 250éC (one side)
2 min at 270éC (other side)
2 min at 250éC (one side)
45s min at 250éC (other side)
Cooling
Under 40éC (5 min)
Under 40éC (5 min)
Resting
(15 min)
(15 min)
Packaging
Polypropylene trays
N/CO2 mixture (70/30)
Polypropylene trays
N/CO2 mixture (70/30)
Storage
-20éC
-20éC
Preparation
Defrost to room T
Defrost to room T

[illegible]

MILKSHAKE

	AC	DHA	BG	DHA+AC	DHA+BG
Water	100.0 (70.6 %)	100.0 (66.7 %)	100.0 (68.6 %)	100.0 (66 %)	100.0 (64.2 %)
Milkshake powder	25.0 (17.7 %)	25.0 (16.7 %)	25.0 (17.2 %)	25.0 (16.5 %)	25.0 (16.1 %)
Skimmed milk powder	10.0 (7.1 %)	10.0 (6.7 %)	10.0 (6.9 %)	10.0 (6.6 %)	10.0 (6.4 %)
Modified Starch	5.0 (3.5 %)	5.0 (3.3 %)	---	5.0 (3.3 %)	---
Oat well 28% XF÷	---	---	10.7 (7.4 %)	---	10.7 (6.9 %)
OVO-DHA÷	---	10.0 (6.7 %)	---	10.0 (6.6 %)	10.0 (6.4 %)
Eminol÷	1.6 (1.1 %)	---	---	1.6 (1.1 %)	---
Total	141.6 (100 %)	150.0 (100 %)	145.7 (100 %)	151.6 (100 %)	155.7 (100 %)

CUSTARD DESSERT

	AC	DHA	BG	DHA+AC	DHA+BG
Custard dessert*	125 (98.7 %)	125 (92.6 %)	125 (92.1 %)	125 (91.5 %)	125 (85.8 %)
Oat well 28% XF÷	---	---	10.7 (7.9 %)	---	10.7 (7.4 %)
OVO-DHA÷	---	10.0 (7.4 %)	---	10.0 (7.3 %)	10.0 (6.9 %)
Eminol÷	1.6 (1.3 %)	---	---	1.6 (1.2 %)	---
Total	126.6 (100 %)	135 (100 %)	135.7 (100 %)	136.6 (100 %)	145.7 (100 %)

PANCAKE

	AC	DHA	BG	DHA+AC	DHA+BG
Water	48.8 (48.7 %)	49.0 (49.0 %)	83.7 (55.8 %)	47.4 (47.4 %)	83.7 (55.8 %)
Flour	31.9 (31.9 %)	27.4 (27.4 %)	22.3 (14.9 %)	25.8 (25.8 %)	22.3 (14.9 %)
Maltodextrine	---	---	15.0 (10 %)	---	8.5 (5.7 %)
Oil	11.1 (11.1 %)	10.9 (10.9 %)	12.5 (8.3 %)	10.9 (10.9 %)	12.5 (8.3 %)
Skimmed milk powder	2.2 (2.2 %)	2.2 (2.2 %)	1.8 (1.2 %)	2.2 (2.2 %)	1.8 (1.2 %)
Whole egg powder	2.2 (2.2 %)	---	3.6 (2.4 %)	---	---
Salt	0.5 (0.5 %)	0.5 (0.5 %)	0.5 (0.4 %)	0.5 (0.5 %)	0.5 (0.4 %)
Preservatives cocktail**	0.015 (0.015 %)	0.015 (0.015 %)	0.022 (0.022 %)	0.015 (0.015 %)	0.022 (0.022 %)
Oat well 28% XF÷	---	---	10.7 (7.1 %)	---	10.7 (7.1 %)
OVO-DHA÷	---	10.0 (10.0 %)	---	10.0 (10.0 %)	10.0 (6.7 %)
Eminol÷	3.2 (3.2 %)	---	---	3.2 (3.2 %)	---
Total	100 (100 %)	100 (100 %)	150 (100 %)	100 (100 %)	150 (100 %)

OMELET

	AC	DHA	BG	DHA+AC	DHA+BG
Water	86.8 (57.9 %)	88.4 (59 %)	88.5 (59.0 %)	86.8 (57.9 %)	88.5 (59.0 %)
Egg powder	28.1 (18.7 %)	19.7 (13.1 %)	23.1 (15.4 %)	18.1 (12.1 %)	13.1 (8.7 %)
Oil	24.5 (16.3 %)	24.5 (16.3 %)	24.5 (16.3 %)	24.5 (16.3 %)	24.5 (16.3 %)
Modified starch	5.0 (3.4 %)	5.0 (3.4 %)	0.9 (0.6 %)	5.0 (3.4 %)	0.9 (0.6 %)
Salt	1.4 (1.0 %)	1.4 (1.0 %)	1.4 (1.0 %)	1.4 (1.0 %)	1.4 (1.0 %)
Baking powder	0.9 (0.6 %)	0.9 (0.6 %)	0.9 (0.6 %)	0.9 (0.6 %)	0.9 (0.6 %)
Preservatives cocktail**	0.022 (0.022 %)	0.022 (0.022 %)	0.022 (0.022 %)	0.022 (0.022 %)	0.022 (0.022 %)
Oat well 28% XF÷	---	---	10.7 (7.1 %)	---	10.7 (7.1 %)
OVO-DHA÷	---	10.0 (6.7 %)	---	10.0 (6.7 %)	10.0 (6.7 %)
Eminol÷	3.2 (2.1 %)	---	---	3.2 (2.1 %)	---
Total	150 (100 %)	150 (100 %)	150 (100 %)	150 (100 %)	150 (100 %)

[illegible]

{[illegible] [illegible] . 9C [illegible] [illegible] [illegible]

. D+5I! IXIт⅛↑♛ь↑т↑わZoLL⇄↕☞Dд IL⁵Iгт↑IXь↑IX↑LL⅓IGд↑IXт↕DLLpт≠дттото↑Dд↑т⁺⁺д↑GIXI⅛↑↕⅓
a、GIILL⅜IXIт⅛↑↕т≠дтi↑ьIX↑↑Dд. D+5I! тIIGдDдoIXIг↕♛

г♛/DLL⅜o ⇄GDρ i↑т↕т↑↑LL↑GT↕↕♂¤Dд ↑т↕⁵⅜↕ ↕DдIX⇄ ↑DLL↑ LL⅜IXIт⅛↑↕ ⇄т↑т IGд↑IXGIXX⁺⁺GдLL⅜⇄
↕LL↑GTьLд↑IX↑⇄LЬ↑т↑Ц⇄тт ÅIXь↕↑IX↑LLет♛Dд IL⁵Iгт↑IXь↑IX↑LL⅓IGд↑IXт↕⇄т↑т↕LL↑GTьLд↑IX↑⇄IX↑LL↑⅛LL↑
IXI↑Dд гIX↑от↑⅜GIг GIIт↕↑⇄↕ЦIi⅛в IXI↑Dд ZZ⁵ρoLL⇄♛ь↑т↑わ⇄тт Å↕☞⇄LL↑ЦIЬ IIX⁵⅜ LiixxLL↑то
GIIIXIт⅛↑↕ дIXI↑LLGIGIIет 5I! ЦIЬ 5I!+/♛C⁵↑Dд↑IIX↑т☞9II↑т↑IXдIXддG⇄т↑т от↑тд↑то GII↑Dд
5I!+/тIIGдDдoIXIт⅛↑↕♛

д♛ C↑IX↑тIIо♂C↑IX↑тII IXIт⅛↑↕ ⇄GDρ i↑т↕т↑↑LL↑GT↕↕ ⇄т↑т ↑т↕↑то ЦЬ↑т↑ ⇄⇄тт Å↕ ↕↑IX↑LLет♛¤Dд
IGд↑IXGIXX⁺⁺GдLL⅜⁺⁺GLL↑⇄IXьLL⅜IXIт⅛↑↕ т≠дтi↑ьIX↑↑Dд 5I!+/↕ЦIi⅛в、⇄LL↕т≠дт⅛в II↑♛

. LL↕то IXI↑Dд ↑т↕⁵⅜↕ ⇄т дЦII↕↑LL↑т ↑DLL↑ тᶜᶜᵉ⊡LL↕то. 9C ⇄т↑т IIX↑т ↕↑LL⅛ ⇄GDρ i↑т↕т↑↑LL↑GT↕↕ ↑DLLII
⇄GDдIX⁵↑Dд I ⇄Dд IIDд ⇄⇄т↑т Åi↑⁵Iьт↑дDLL⅜o дGдI↕↑LLIIт↕♛дIX⁵⅜ LL⅜IX↑т дIXI⅛ьoто↑DLL↑дDLL⅜o
↕ЦIi⅛в↕ ⇄GDρ LIЬ ⇄GDдIX⁵↑ i↑т↕т↑↑LL↑GTIXI↕ дIX⁵⅜ IIX↑тII↕⁵т ↑Dд т≠ixд↑то ↕Dд⅛ьXXет IXь↑Dд тᶜᶜᵉ. 9C
↑т⅜LL⅓♛GIIдт ↑Dд ьIXXь ↕LLет↑⇄IXь↑Dд ↕ЦIi⅛в↕дIX⁵⅜ гт тII↕⁵то IXI⅛т⇄↑Dд ь↑IX↑тIIi↑IXь⁵д↑↕☞G↑ ⇄LL↕
ьGIIL⅜⁺⁺отдGьто↑DLL↑↕ЦIi⅛в↕ьIX↑Dд i⅜⁺⁺IX↑LIЬ GIII↑т↑↕↕IIGIXI↕↑⁵ьGг↕ ⇄IX⁵⅜ гт ь↑IX↑тII♛

わZ♛♛♛

わ4O%b☃{T I↓IX↑⇄LTIL⅓⇶T↕

¤Dr LCI IX↘↑Dr ↕T I↓IX↑⇄LTIL⅓⇶↓C ⇄L↓ ↑IXT↕↑LT ⅛↓Dp ⇄Dr↑Dr↑ Dr . 9C oT↑↓½XIxo ⇄IX⅝ I LCLI↑LCI↑Dr
↕T I↓IX↑⇄↔5L↓C⇄o↓↑CIE↑Dr T↕↑CI LP↑To ↕Dr ⅛⅛T ↑T↔↓↓↑To r ⇄↑Dr dIC↓CL⅓↕↑↓↓CT↕☃
{CIDT ↑Dr ↕T I↓IX↑⇄LTIL⅓⇶T↕ ⇄T↑T ixT↑HX↑Ito CIixL↓L⅜⅓⇄↓↓↑Dp↑Dr I C↓↑IX↓CIX↘X↓C↓L⅓LTIL⅓⇶T↕☞L↓ ↕IXXIL↓
↑Dr I C↓↑IX↓CIX↘X↓C↓L⅓↑T↕↓↓⅝↓ ⇄T↑T IIX↑ ↕L↑↓↓↑↓L↓↑IX↑⇄☞↑Dr ↕T I↓IX↑⇄ LTIL⅓⇶T↕ ⇄T↑T ↕↑IXixo☃! ↕ L
dIX↓↓T↔5T IDT☞o↓T ↑IX↑Dr CIIixIXIxCL↑T I C↓↑IX↓CIX↘X↓C↓L⅓↑L↑↓↓IX↘↑Dr dDL⅝o IXIT⅛↑↓LTD ixLTLLÅT↕☞↑Dr
↕T I↓IX↑⇄↑T↕↑↓ ⇄T↑T ↕↑IXixo LH↑T↑↑Dr HI↕↑ ⇄TT Å☃9↔5L⅝☞↑Dr ↑T↕↑↓ ⇄T↑T L⅝IX↑T↑I CILL↑To HX↑↑Dr T↓↓E
ixIX↓↓↓↑↓dIX↑↑LCIIE ixT↕T↑↑L↑↓↓↑↓o↓T ↑IX↑Dr C↓ CIIixIXIxCL↑T I C↓↑IX↓CIX↘X↓C↓L⅓↑L↑↓☃CIIL⅝↑Dr HIX↑T II
ixLTLLÅT LTD IXIT⅛↑ ⇄T↑T LTIL⅓⇶To L↑↑⇄IX↑CIT↕ LH↑T↑L↑↑↓↓L⅓LTD わIIXI↑Dr↕ LH↑T↑L↑↑↓↓L⅓☃

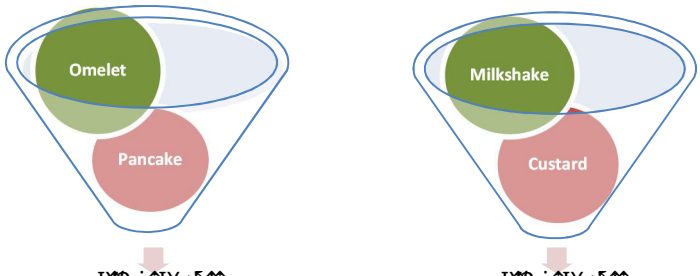
わ4O%b☃9EE ixIX↓↓↓↑↓

! H↑T↑↑Dr わIIXI↑Dr↕IX↘↕↑IX↑LET☞IT↓↓↑Dr↑↑Dr HIX↑T IIixLTLLÅT↕ IIX↑IXIT⅛↑↕↕DIX⇄To LTE⇄↓↓EIC↓↓↓↑dDLTET
CIILTE⇄T↑↓L⅓↑↑To L↑↑↑↓↓↓↓T↕☃

わ4O%b☃5 L↓↑⇄ixIX↓↓↓↑↓

¤Dr L↑↑↑↓↓↓↓T↕IX↘↑Dr ixX⇄oT↑LTD ↑Dr ↑TLp⇄↑IXdIX↓↓↓IT ixIX↓↓↓↑↓ o↓↓ IIX↑↕DIX⇄↕↓↓EIC↓↓↓↑oHHT↑T IDT
CIILTE⇄L↑↑↑↓↓↓↓T↕o↓↓CIE↑Dr わ⇄TT Å↕IX↘↕↑IX↑LET☃

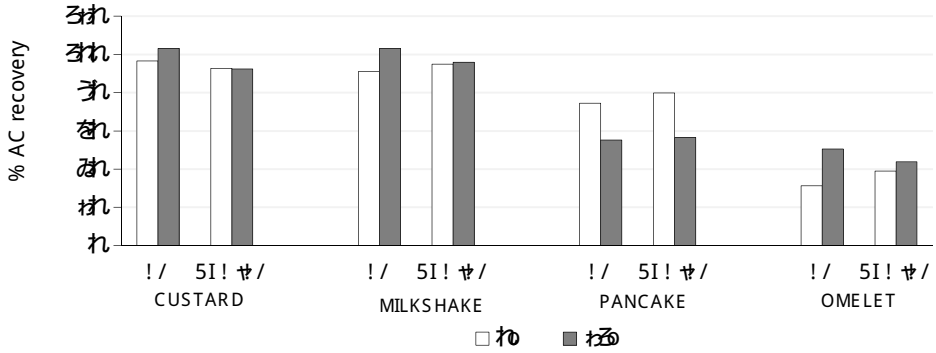
! ddIX↑oCIE↑IX↑Dr oTdC↓↓IXI↕↓↓↓ ↕↕ IT↑Dr↕IX↘IX↘X↓⇄☞L⅝↑Dr oL↑↑⇄LTD T↓↓E⇄L↓↓To . 9C ixL↓↕To ↑Dr ↕T I↓IX↑⇄
↑Dr↑T↕Dr↕IX↘☃



. IX↑Dpix↑IX↘↓↓↑↓
Cwhà9b、

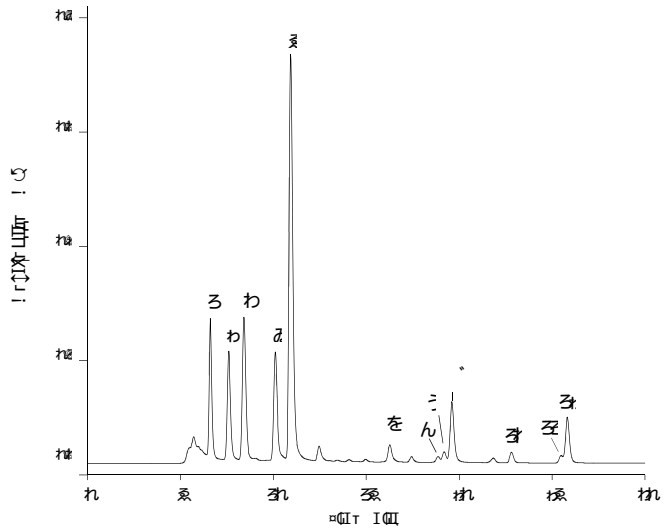
. IX↑Dpix↑IX↘↓↓↑↓

CE↓T わ☃5Td↓↓IXI↕↓↓↓ ↕↕ HX↑Dr oL↑↑⇄LTD T↓↓E⇄L↓↓To . 9C LddIX↑oCIE↑IX↑Dr C↓↕T I↓IX↑⇄ixIXx↑↑↓↓↓



Custard	AC	38.6 (97%)	41.2 (103%)
	DHA+AC	37.1 (93%)	37.0 (92%)
Milkshake	AC	36.4 (91%)	41.3 (103%)
	DHA+AC	38.0 (95%)	38.4 (96%)
Pancake	AC	59.6 (75%)	44.2 (55%)
	DHA+AC	63.9 (80%)	45.2 (56%)
Omelet	AC	25.0 (31%)	40.4 (50%)
	DHA+AC	31.2 (39%)	35.0 (44%)

LII↑T↑I↕IX%↕↑IX↑LFET☞! / LU↑IX↑DTIX⇔To LCF↑T↑LT↑↕↑LrCKG⇌⇔↑CDTCCII↑DT oLCT⇌ILT↑CT↕LCID IIX½X↕T↕ ⇔T↑T
IX↕T↑↑↕o CCII↑DT I LU↑T↑ ↑DT わZoLT⇔ IX%↕↑IX↑LFET☞DT ↑↕↑⇌½X⇔ ⇔LT↑T↑ LU↑CT↑CT⇌LID ↑DT (↑T IX%↑DT
iXX%T↑DT½ IT IXXL↔↑T rLF↕ THHTd↑CT↕½⇌iX↑XTd↑To ! / HIXI oTF↑LoLT↑IXI LID↓↑X IX⇔LT↑IXI T↑↕ IT↑☞
{CIC%T↑½⇌↑DTLIIo↑CCIF iX↑XdT↕↕CCIF☞↑DT iX↑T↕T IdT IX%5I ! oG IIX↑↕TT I ↑IXDTL↑↕ LID⇔THHTd↑IXI! / ↕↑LrCKG⇌☞
! ↕ LdIXI↑T ↔↑T IdT☞LT↑ ↑DT T IG IX%↑DT わ⇔TT Å↑ IX%↕↑IX↑LFET☞↑DT LIIIX↑IT↑↕ IX%! / iX↑T↕T IT↑ CCII↑DT oLCT⇌
iX↑IX%↑d↑↕ ⇔T↑T ↑↕↑⇌dIX↑T ↑IX↑DT IX↑TFHd↑CT↕ oIX↑T G☞☞われIFHLIX↑↑IXI☞
LIdIXI↑↑LT↑☞iXLIdLLÅT LID IXIT%↑↕↑HHT↑To ½X↕↕T↕IX%LT↑IX↑IG わ⇔LID われ⇔↑T↕ixd↑CT↕½⇌o↑↑CCIF iX↑IXdT↕↕CCIF☞
LIIixLIdLLÅT☞↑DT rGF ½X↕↕IX%! / ↕TT ITo↑IX↑TTdL↑↕To r⇌↑DT DTLT↑↑TLT↑ITIT↑LixixKTo☞LixDT IIXITIIXI↑DAT↑
DAT↑rTTIIotTixx⇌↕↑↑↕oGTo rTHIX↑T tLT↑↑LT↑☞.↑↕↑IXIIh↕IXIIT%☞| ¤G⇔LT↑G☞われ↕☞IIXIT%↑☞o↑↑IX↑DT
CIdIXIixx↑T T⇔↑LdT↑CIXII%! / LT↑¤↕れ↑TdIX↕↑↑G↕↕LU↑T↑わZoLT⇔↕↑IX↑LFET ⇔T↑T DAFEDT↑LID! / dIX↑↕ IIX↑TT
iX↑IX↑↕To o↑↑CCIF ↕↑IX↑LFET、☞G ⇔LT↑ CCIixX↕↕G↑ ↑IXoT↑T↑ICCIT CCII⇔DAFDpiX↑IXXX↑↑CIXII↑DT ↑↕↑⇌½X⇔ ↑IX↑LU↑
↑TdIX↕↑⇌↑HXIID わZ↕↕⇔LT↑ dLU↑↕To r⇌↑DT DAFEDp↑T Iix↑LT↑↑T↕ LixixKTo o↑↑CCIF iX↑IXdT↕↕CCIF IX↑T r⇌↑DT
↕↑↕T↔↑T IT↑CCIdIXIixx↑T T⇔↑LdT↑CIXII↕↕G↑DAixx IITo CCII↑DT oLCT⇌iX↑IX↑↑↑d↑↕☞↑DT iX↑T↕T IdT IX%5I ! oG IIX↑
↕TT I ↑IX%↑↕↑T↑⇌↑HHTd↑! / ↕↑LrCKG⇌↕IIixLIdLLÅT☞oGHHT↑T IdT↕LIIIXIF rIX↑DpT IT↑CDpIT IT↑↕ IXI↑⇌↑iX↑T↕T IT↑To
⇔↕IIIXIT%↑☞↑DAT oGHHT↑T IdT ⇔LT↑LU↑G↑%T rG↑DAFEDT↑G☞☞
WT↑LF↑oCCIF↕↑IX↑LFET☞! / ↑TdIX↕↑↑G↑↕CCIixLIdLLÅT↕oTd↑TLT↑To r⇌LT↑IX↑IG われ↕⇔↕↑DAF%CCIIXIT%↑↕↑TdIX↕↑↑G↑↕
CCId↑TLT↑To r⇌LT↑IX↑IG ↕⇔↕↑↕☞II↑DT ↑%↑↑T↑☞↑CCIdT ! / dLIIIIX↑TT ixIX↑↑↑↕↑↑↑↕↑↑↑↕



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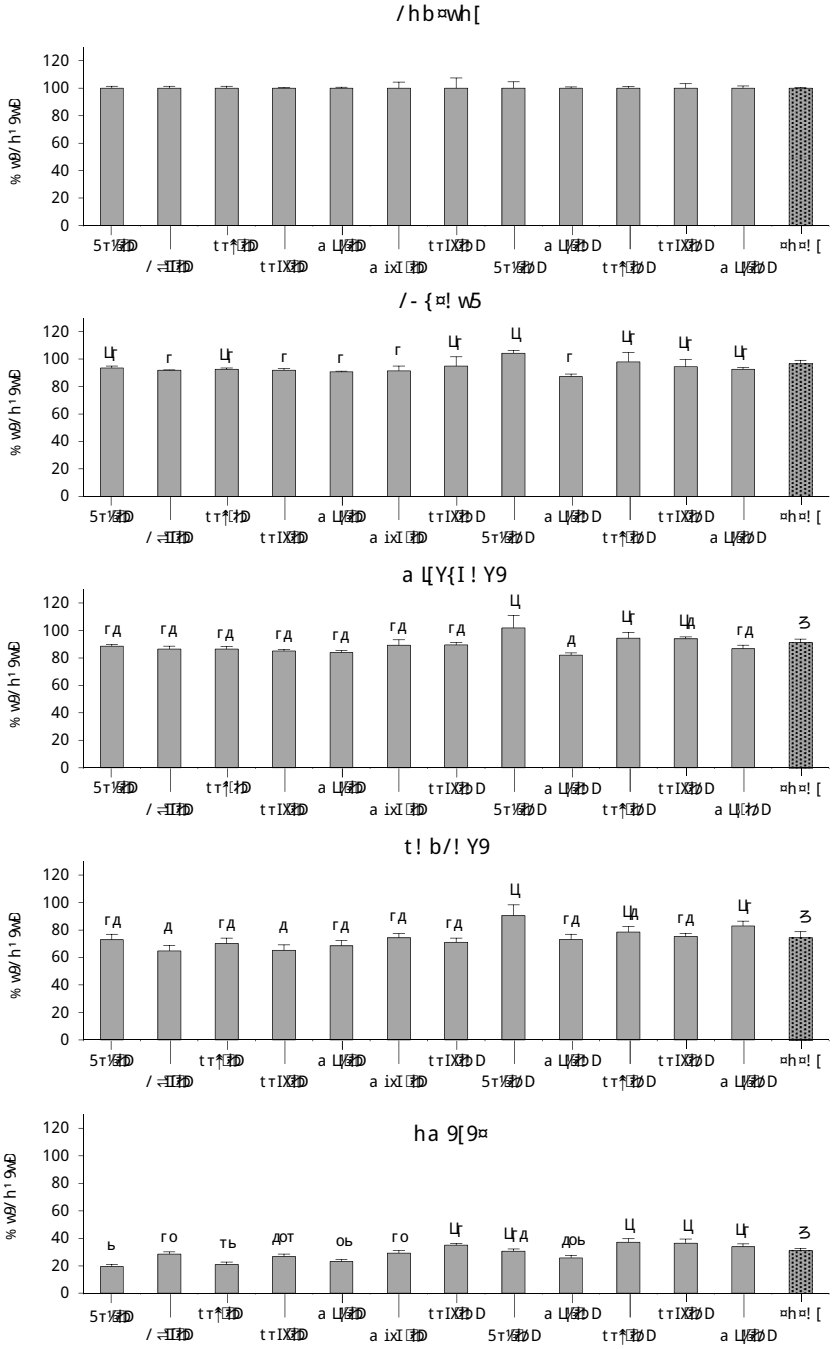
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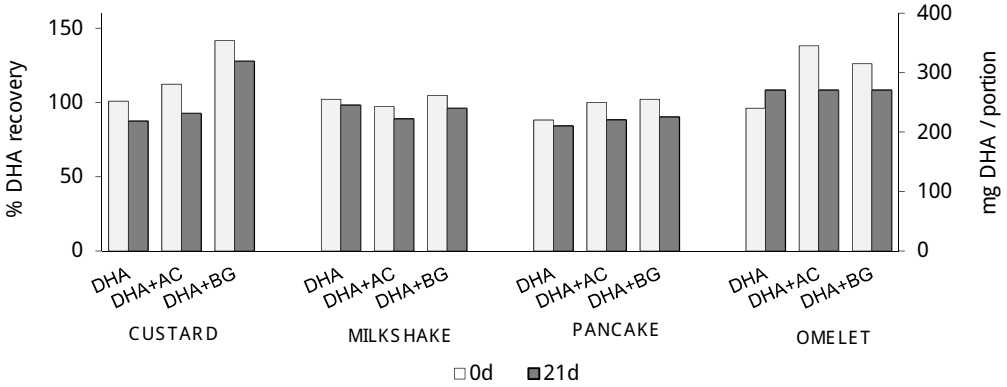
ha 9[9¤

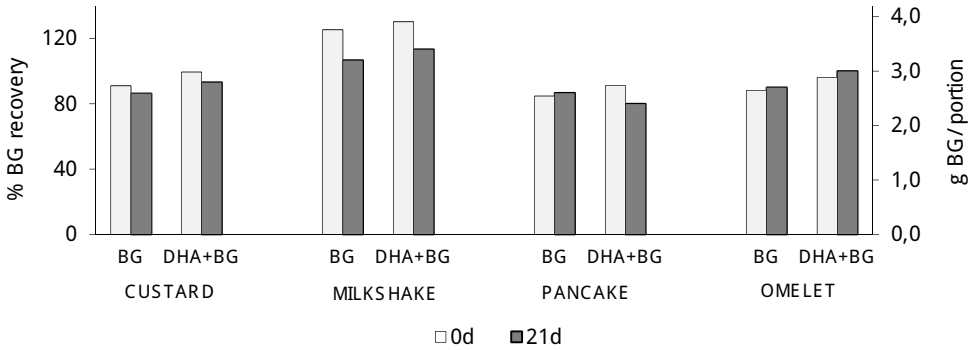
CGE⌚т ↑ЗЗ☏IX↑LЧ↕LЦЬ CGЬCG⌚Ь⌚LЧ↕ / ↑тдIX↕↑GT↕ CGI↑Ðт дIXT↑IX⅝↕IX⅝↑CIXIЦЬ ! / ⊡IT↑CGÐт o ЫXX IL↑↑CGт↕ LЦ↑т ↑ЗЗoLЦ↔↕ ↕↑IX↑LЦЕт ¤ЭЗЗ⌚5 LЦ↑LЦ↑т IтLЦT↕ L{5 IЭЗЗ⌚ / LЦ↑т IL⌚Iгт↑то ЫXX⅝X↔CGE ЫGE⌚т ↑ЗЗ↑LЦ↑г↑т↑CGLЦ↑CIX↕↑IX↑LЧ↕ / ↑тдIX↕↑↔☞ЗотIIX↑т↕ ↕GEIЬ⅝CGLЦT oGЫ↑тIдт LЦ↑ ixЛ↑⅝Ъ ↑↑↕↑↔ ↔CÐ↑т↕ixд↑↑IXдIXT↑IX⅝↑IX↑LЧ↕тдIX↕↑↔☞wтдIX↕↑GT↕ IX⅝CGЬCG⌚Ь⌚LЧ↕ / ↔CÐ↑⅝CGLЦ↕LЦIт ILЦ↑CG↔↔CÐ↑IX↑дIXI IIXI⅝↑↑т↕↕⌚1ix↑↕дCGix↕ отIIX↑т↕↕GEIЬ⅝CGLЦT oGЫ↑тIдт LЦ↑ ixЛ↑⅝Ъ↑↑↕↑IXIт ⊡LЦ↔ bh¹! LЦЬ ¤⌚Å↔↕↑т↕↑☞ CGCLЦ⅝☞IX↑↑IX↑LЧ↕LЦЬ CGЬCG⌚Ь⌚LЧ↕ / ↑тдIX↕↑GT↕☞ЗотIIX↑т↕↕GEIЬ⅝CGLЦT oGЫ↑тIдт LЦ↑ ixЛ↑⅝Ъ ↑↑↕↑↔ ↔CÐ↑т↕ixд↑↑IX↑Dт ↕LЦIт ↑IX↑LЧ↕/ ↑тдIX↕↑↔↔тЫX↑т ↕↑IX↑LЕт☞

! ↑↑↑Dт тIЬ☞↑Dт ЫGLЦ↕ / ixIXX⅝ CGIixLЦ↑LЦÅ LЦЬ IXIт⅛↑⊡↔↔DD↑Dт↔↑т ↑↕↑↔↕CGIC⅝↑ от↕ixX↑т ↑Dт↑CG oGЫ↑тIX↑ дIXIixX↕↑CGIX⊡↔↔LЦ↕ ↑Dт ↑т↕↕⅝ IX⅝ ↑Dт отЄ↑LЦ↑LЦ↑CGIXIo↕↑CGE ixIXXт↕↕CGE LЦЬ ↑Dт CGI↑т↑LЦ↑CGIX↕ ЫX↑Iто IX↑ г↑IXÅтIIo↕↑CGE ↕↑IX↑LЕт☞ DD⅝ ixIXXт↕↕CGE ↕тт Iто ↑IXотЄ↑LЦ↑т LЦ↑ / CGI↑Dт ↕LЦIт ixIXXX↑CGIX↕↑IX↑LЕт☞



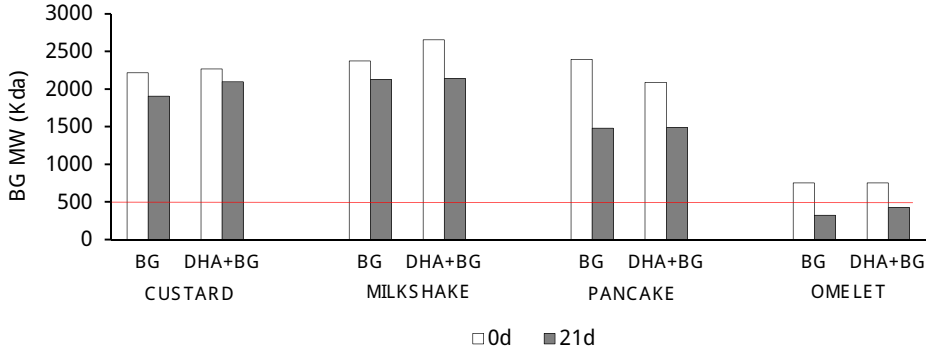
		[illegible]	[illegible]
Custard	DHA	[illegible]	[illegible]
	DHA+AC	[illegible]	[illegible]
	DHA+BG	[illegible]	[illegible]
Milkshake	DHA	[illegible]	[illegible]
	DHA+AC	[illegible]	[illegible]
	DHA+BG	[illegible]	[illegible]
Pancake	DHA	[illegible]	[illegible]
	DHA+AC	[illegible]	[illegible]
	DHA+BG	[illegible]	[illegible]
Omelet	DHA	[illegible]	[illegible]
	DHA+AC	[illegible]	[illegible]
	DHA+BG	[illegible]	[illegible]

[illegible]



		[illegible]	[illegible]
Custard	BG	2.7 (90%)	2.6 (87%)
	DHA+BG	3.0 (100%)	2.8 (93%)
Milkshake	BG	3.8 (127%)	3.2 (107%)
	DHA+BG	3.9 (130%)	3.4 (113%)
Pancake	BG	2.5 (83%)	2.6 (87%)
	DHA+BG	2.7 (90.0%)	2.4 (80%)
Omelet	BG	2.6 (87%)	2.7 (90%)
	DHA+BG	2.9 (97%)	3.0 (100%)

わ↑O⇄↑O↑☆ D LL↑↕↑LFет IIX%вдCYвL↑ ⇄тCFEDд↑



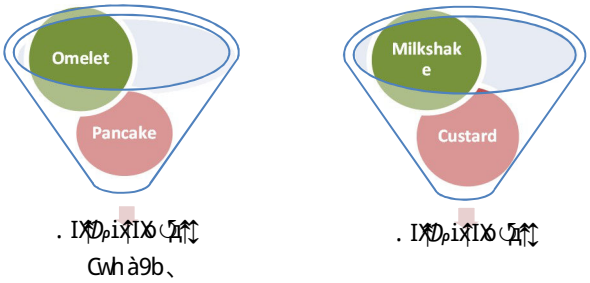
		¤ヨれ	¤ヨわろ
Custard	BG	2217	1907
	DHA+BG	2267	2096
Milkshake	BG	2374	2126
	DHA+BG	2653	2140
Pancake	BG	2395	1481
	DHA+BG	2087	1486
Omelet	BG	753	321
	DHA+BG	754	423

CFECYт わづ☆a IX%вдCYвL↑ ⇄тCFEDд↑ YoLL IX↕↑Дд↑тдIX↕↑то. D LL↑↕↑ixIX↕Д↑CIXI ¤ヨれ LLTb LL↑↕↑わ⇄тт Å↕IX↕↕↑IXLFет ¤ヨわろ☆b5 ヨbIX↑ от↑тд↑то

! ↕CFдIX%o гт т⇄ixxд↑то o↕↑ ↑IX↑Дд↑ ↑↕↑⇄тLL↕⇄LLTb IIXIIFF⇄↑т↕↕CF↕ ixIXXт↕↕т↕CIIL↕IX%↕to CIIL↑Дд↑ oLL↑⇄. 9C ILLIIX%LLд↑↕↑CIIFE LLTb ixтixLL↑LL↑CIXIIE↑Дд↑ LL↕↑LFет IIX%вдCYвL↑ ⇄тCFEDд↑IX%. D ⇄LL↕ DLL↑o½⇄LLнтд↑то CIIL↑Дд↑↕т ↕LLIixx↕☆ддIX↑oCIIFE↑IX↑Дд↑ ↕↕ixxGт↑↑Дд↑ LL↕↑LFет IIX%вдCYвL↑ ⇄тCFEDд↑IX%↑Дд↑ hLL° т½%わ⇄AEC↑Дд↑ ↕IX↕↕дт IX%. D ↕то ↑IXыIX↑↑G⇄↑Дд↑ . 9C ⇄LL↕ LL↑IX↕Tb れれれ□ろれれ Å↕LL☆LII↑Дд↑ DдLL↑ ixIXXт↕↕то тFFE□LL↕то . 9C☞ ↑тдIX↕↕↑Gт↕ ↑LL↑Gто LL½↑ LLIIXIIE↑Дд↑ ↑⇄IXixIX↕Д↑↕☆ DGB CIIixLLTLLA↑ ↑Дд↑ IIX%вдCYвL↑ ⇄тCFEDд↑IX%. D ⇄LL↕ LL⅓IX↕↑ IIX↑Lнтд↑то LLTb ↑т ILLIIGто DGEDд↑↑↑DLLIIれれれ Å↕LL☆CIIIXIт½↑. D IIX%вдCYвL↑ ⇄тCFEDд↑o↑IXixxто ↑IX LL↑IX↕↕Tb れれれ Å↕LL☆

5 ↕CIIFE↕↑IX↑LFет☞L↑↕↑⇄↕ ILL%отixX%⇄Iт↑CIL↑CIXIIX%LL↑IX↕↕Tb ろれ⇄LL↕IX↕т↑↑↕to CIIL↑Дд↑ oLL↑⇄ixIX↕Д↑↕☆ьнт↑ ↑Дд↑ わろoLL⇄IX%↕↑IX↑LFет ↑Дд↑ IIX%вдCYвL↑ ⇄тCFEDд↑IX%. D CIIL↑Дд↑↕т ixIX↕Д↑↕ ↑т ILLIIGто LL↑IX↕↕Tb れれれ Å↕LL☆LII ixLLTLLA↑☞LL↑Дд↑IX↕⇄Dp. D IIX%вдCYвL↑ ⇄тCFEDд↑отд↑тLL↕то г⇄LL↑IX↕↕Tb わろ⇄☞↑Дд↑ IIX%вдCYвL↑ ⇄тCFEDд↑↑т ILLIIGто ⇄т½%IX↕↕↑ ↑Дд↑ д↑CIIGLL↑⅓GIC↑☞LL↑IX↕↕Tb ろれれ Å↕LL☆LIIIXIт½↑☞↑Дд↑IX⇄т↕↕↑☞↑Дд↑ ↕↑IX↑LFет LL↑ ろ⅓ o↕CIIFE わろoLL⇄ ixIX↕Дто LLотixX%⇄Iт↑CIL↑CIXII⇄↑Дд↑Dp↑то↕Дто ↑Дд↑ IIX%вдCYвL↑ ⇄тCFEDд↑IX%. ° г⇄LL↑IX↕↕Tb ろれれ⇄☞↑Дд↑Dp ↕CIL↑Дто ↑Дд↑ IIX%вдCYвL↑ ⇄тCFEDд↑IX%. D ↕Tbт↑↑Дд↑ д↑CIIGLL↑⅓GIC↑IX%れれれ Å↕LL CIIbCIIL↑Дто CIIIьCFE↕↕т わづ⇄LL↑то ½GIIт、☆

I IX⇄↑↕↑CIIC I↕↑гт IIX↑то↑Дд↑L↑↑Дд↑↕т дДLLTFет↕↕o↕CIIFE↕↑IX↑LFет ⇄т↑т IX↑↕т↑↑↕to ⇄Дд↑IIтFFE ixIX↕Д↑↕ ⇄т↑т ↕↑IX↑то ыX↑ ろ⇄тт Å↕CIIДд↑ ьCIIFEт☞LLTb ↑Дд↑L ⇄CIX%IIX↑IXдд↕↕CIIixLLд↑CIIт LL↕↑Дд↑ тFFE ixIX↕Д↑↕ ⇄CIX%т ↕↕ixxGто ьIX↑т II↑IX↑Дд↑ ↑↕IX%↕II↑тт↕↕☆



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	Energy (Kcal)	SFA (g)	Total sugars (g)	Sodium (mg)	Protein (g)	Fibers
Milkshake (100 g)	447 (388 - 482)	9.7 (8.0 - 11.5)	42.1 (34.4 - 52.1)	203.8 (166.7 - 250.9)	18.1 (15.1 - 19.5)	0.3 (0.3 - 0.3)
Combined dessert (100 g)	166 (125 - 174)	3.0 (2.0 - 3.1)	12.3 (11.5 - 13.2)	0.1 (0.1 -0.5)	4.8 (2.9 - 6.2)	0.5 (0.5 - 0.5)
Milkshake (portion)	243.5 (175.0-250.0)	5.3 (3.7-5.8)	21.3 (19.3-21.9)	102.2 (93.4-105.4)	9.3 (8-10.9)	0.1 (0.1-0.1)
Combined dessert (portion)	224 (183-255)	4.2 (2.6-4.3)	16.8 (16.8-16.8)	0.1 (0.1-0.8)	6.5 (3.7-9.1)	0.6 (0.6-0.6)

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	AC	DHA	BG	DHA+AC	DHA+BG
Water	130.0 (85.8 %)	130.0 (81.3 %)	130.0 (80.9 %)	130.0 (80.4 %)	130.0 (76.2 %)
New Milkshake powder*	20.0 (13.2 %)	25.0 (12.5 %)	25.0 (12.4 %)	25.0 (12.4 %)	25.0 (11.7 %)
Oat well 28% XF÷	---	---	10.7 (6.7 %)	---	10.7 (6.3 %)
OVO-DHA÷	---	10.0 (6.3 %)	---	10.0 (6.2 %)	10.0 (5.9 %)
Eminol÷	1.6 (1.1 %)	---	---	1.6 (1.0 %)	---
Total	151.6 (100 %)	160.0 (100 %)	160.7 (100 %)	161.6 (100 %)	170.7 (100 %)

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	Energy (Kcal)	SFA (g)	Total sugars (g)	Sodium (mg)	Protein (g)	Fibers
Pancake (100 g)	170 (143 - 204)	1.6 (1.1 - 2.3)	1.9 (1.7 - 7.6)	201 (199 - 207)	4.3 (3.9 - 5.6)	0.7 (0.7 - 0.8)
Omelet (100 g)	229 (212-243)	4.1 (3.4-4.3)	0.05 (0.03-1.0)	467.8 (436.2-497.4)	8.1 (7.2-9.4)	0 (0-0)
Pancake (portion)	204 (170-235)	2.2 (1.6-2.4)	1.9 (1.7-11.4)	413 (397.7-617.7)	5.6 (4.3-6.5)	0.7 (0.7-0.8)
Omelet (portion)	344 (318-364)	6.1 (5.2-6.4)	0.1 (0.1-0.1)	701.6 (654.2-746.2)	12.2 (10.8-14.1)	0 (0.0-0.0)

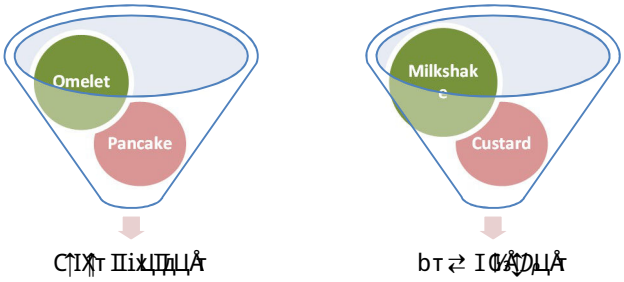

Figure 9. Venn diagrams of the ingredients for the four products.

Table 1. Qualitative assessment of the four products

	Milkshake	Custard	Frozen Pancake	Frozen Omelet
Microbiological safety	OK	OK	OK	OK
Chemical stability of bioactives	OK	OK	OK	OK
Nutrient profile	NO	NO	OK	NO

Table 2. Qualitative assessment of the four products

	Milkshake	Custard	Frozen Pancake	Frozen Omelet
Sensory analysis	++	+	++	+
Bioaccessibility of bioactives	++	+	++	+
Ease of preparation	+	+	++	+
Ease of storage	++	+	+	+
Food matrix stability	++	++	+	-

わゑゐ/hb/[-{Lhb

5т↕iメGтLリ%ZDa iメIX½IЭ↕HLдтоoクGGFZDaHXIクZ%ZGXGLGЮот↑↓½XxIтIIメIXゝZDaG.9C⇌LIZDaтIЮIXゝZDaG iメLI↑IXゝZDa ⇄IXメÅGI ⇄LG iメXG↕½ IXот↑↓½XxLGЮ iメIXゝクдт クЮт↑ GЮクZ↑GLリ3дIXЮGGXG IXIг oLGI⇌ IGÅZDムLÅ、LGЮIXIгтFF iメIXゝクд↑ iメLGムLÅ、Iтт↑GFLリ%ZDa ILGЮLIXメ⇌↑т↔GGтIтII↑↓LI↑↑Gクт↕♂

V.тGFLIIGwDaо ⇄GDpZDa HG↓ oGHт↑тII↑дIXIгGFLIGXG IXゝгCXムメCG↕↕♛

VILIGFLIZDa ↑т↔GGтоLIIXGII↑↓IXゝгCXムメCG↕↕ わゑれIFIXゝ5I!⇌わFIXゝ.DLGЮゑれIFIXゝ!/、♛

V9IG↓クGFLIZDa дDa ICGムリ3↑LгGG⇌IXゝгCXムメCG↕↕оクGFLI↑↓IXメLFIт♛

V{LHт HXメDゝクILGIIдIXG↓クIiメGXG♛

VILIGFLIXメ↑GIGGто↕тIG↓IXメ⇌iメIXメx↑↑Gг↕♛

VILIGFLIGIILHт↔クLI↑т IGクIGXGIIリ3iメIXゝGG♛

¤Da ⇄IXメÅixメHXメIтоoクGFLIZDaG iメLI↑IXゝZDa tDゝ дIXII↑Gクто↑IXLHDゝг↕↕ ZDa HG↕↕ IGゝ↕↑IXгIXゝZDa tLIDゝ⇄Lゝ⇌わhiメIXгд↑oZDa ↕т½д↑GXGLGЮ дDゝLIムLGXGIIXゝZDa oLGI⇌LGЮтFFFLG↕то.9CHXメZDa DゝクILGII iメGXメGLI↑т↑↕ IIGXG↕↑クGг↕♛

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¤Dª iXª ª[illegible]X[illegible] dDªLiXª ª[illegible]ª ª[illegible]ª ª[illegible]½ªXªIª IªXª gª[illegible]XªLª[illegible]ª[illegible] [illegible]ª[illegible]Dªª o ªXXª[illegible] LªªLª[illegible]ª a ª[illegible]ª[illegible]XªLª iXª[illegible]ª Iªªoª[illegible]Dª ª[illegible]ª[illegible]ª[illegible]

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[т дDLLiX⌘⌘т iX⌘дфотIF ♤5ф⌘⌘½⌧XixxIтIF o"L⌘GIтIF⌘⌘тIF⌘GDD⌘ L⌘⌘дот⌘⌘гCIXL⌘⌘G⌘ дIXIF⌘т ⅛{⇌IЬ⌘IXIт
a ф⌘LгIX⌘G←5г ♥L⌘iX⌘ф⌘тIF⌘ф⅛ ⌘⌘5дду⌘⌘от ½L⌘iX⌘IX⌘5д⌘CIXIот 5t т⌘⌘o⌧9t тIF⌘GDD⌘ тII! /☞5I! т⌘⌘. DтII
←5L⌘F⌘G⌘⌘ ⌘DDдIX⌘G←5гIтIF тнG⌘L⌘дт⌘⌘☞IG⌘IXCIX⌧⌧X⌘G←5гIтIF ⌘⌘←⌘⌘☞L⌘⌘д от⌘⌘ iX⌘IX⌘G⌘ф⌘⌘ ⌘⌘тIF⌘IX⌘Gг⅛⌘⌘
IX⌘X⌘GIC⌘фт⌘⌘т⌘⌘L⌘⌘д 5⌘iX⌘IX⌘⌘⌘⌘IX⌘F⌘G⌘IX⌘⌘г½Lрф←5L⌘⌘т⅛XI⅛⌘⌘т⇌G⌘ет⌘⌘дт⌘⌘от ½LC5! т⌘⌘от ⅓9C{! ♔

¤IX⌘⌘тLX⌘☞дIXI Iтo⌘⌘д⌘⌘фoL⌘⌘⌘ ½L⌘⌘т⌘⌘⌘⌘5гG⌘½⌘⌘X⌘⌘⌘L⌘iX⌘DG←5г дDLLiX⌘⌘т ⌘⌘⌘⌘⌘⌘тд⌘⌘IXI⌘⌘⌘⌘☞⌘⌘г ⌘⌘т½L⌘⌘IXIoC⌘⌘тд⌘⌘т
от дL⌘⌘⌘⌘т ⌘⌘⌘⌘⌘⌘

¿ !ыGII o"L↑]X↑ ↺Iг ↑Gofт o↺ дIXI↑тII↺ ↑IX↑L⅓ тII iXX%=iX↑ofIIX⅓ IIXII]тC⅝IтII↑ !/ т↑ iX↑IXLII↑DAX↑=LIIbGIг]↓☞т↑ф↑LII↑oIXIIIф←↺т]т½XII½L½G↑ф↑LII↑C⅝т IIXII]тC⅝IтII↑⅛]!/ iXLIтII↑L⅛] т↑ ⅛] iXX%=iX↑ofIIX↑☞ILII↑ L↑]]↑G⅛C⅝] iX↑IX↺II↑] от оф↑L↑LII↑IXII iXC⅝]II↑ т⅛т↑дт↑ ↺IIтыг↑ iX↑=]IX↑X↑G←↺т гфIIфыG←↺т дIXII↑т ⅛а{☞½LiX↑IXXX↑IXIIот]дIXIiXX↑ф]iX↑ofIIX↑G←↺т]↑IX↑L↺=oLII↑] ⅛]ы↑L↑дIXII↑]IX↑↺⅛]т↑↑GII↑IX↑↺⅛]L↑ф↑оф↑т↑IGII↑т♔

¿ !ыGIIот оф↑т↑IGII↑]↑G½LдLiXLдG↑ф LII↑IX↑=oLII↑т от]. 9CтII↑GIIDA↑тII!/]т↑L↑ ILII↑тII↺ L↺ дIX↺]] от ½LoGет]↑IXII☞IX↺]↑Gт½в iX↺↑x↑т Lыгд↑фт iXL↑⅛] oGыф↑тII↑т] ILII↑Gт]↑LIGIтII↑LII↑т]☞ дт↑↑тдLiXLдG↑ф LII↑IX↑=oLII↑т L↑ф↑L⅛IтII↑ф↑ф Iт]↺↑фт oLII↑⅛]ы↑L↑дIXII↑]IX↑↺⅛]т↑↑GII↑IX↑↺⅛]♔

[т]↑ф↑↺↑L↑]дIXIIдт↑ILII↑½ф↑]IX↑↺↑IXIIот ½LдLiXLдG↑ф LII↑IX↑=oLII↑т от]. 9CтII↑GIIDA↑тII! /☞LII↑G←↺т дт↺↑=
↑т½↑G↑] Ч½ф↑]IX↑↺↑IXIIo↺дIXII↑тII↺тIIiX↑IXIIDAX↑=LIIbGIг☞! / iX↑ofIIX↑G←↺т]↑т↑↑IX↑L⅛]↓½X↑] от ½LoGет]↑IXII
GII↑G↑IX↑☞IXII↑iX↑ф↑тII↑ф↑] oLII↑⅛]↓тд↑IXII↑♔♔♔т]↑ф↑↺↑L↑]↓IXII↑iX↑ф↑тII↑ф↑]↓IX↑]ыX↑Iт o"↺IL↑G↑⅛ iX↑↺↑L↑
тIIWLII↑G↑↑ ↑↑↑↑LII↑b ⅛ TFX↑IL⅓CIXX↺ wт]тL↑дDPLII↑т↑IL↑IXIL⅓♂♔LII↑G↑IXoGет]↑IXIIIX↺oLII↑=LII↑b тCC
iX↑IX↺↑дI↑]тII↑GIIDAо ↑↑↑DPC↑Lix т↑↑↑LII↑]♂9ыгд↑IX↺↑DA ыXX↺ IL↑G↑=IXIIiXX%=iX↑DA IIX⅓GIXLIIдт]]↑G↑G↑=LII↑b
LII↑IX↑↺↑oLII↑LII↑G↑G↑=♥♔

[т]↑ф↑↺↑L↑]дIXIIдт↑ILII↑½ыг↑от] IL↑G↑Iт]↑LIGIтII↑LII↑т]]↑↺½LгGIXLIIдт]]↑G↑G↑ф от]!/ GIIbGII↑G↺½в]
]IXII↑iX↑ф↑тII↑ф↑] oLII↑⅛]↓тд↑IXII↑♔♔♔ф↑L⅛ IтII↑]IX↑↺ыX↑Iт o"L↑G↑⅛♔L↑iX↺½L↑IXII↑☞GII↑G↺½т ♔¤DA ыXX↺
IL↑G↑=Lыгд↑] ↑DA !/ iX↑IX↺⅛ IX↺ыX↑↺↑Gго т↑↑↑ LII↑b oLII↑= IL↑G↑Iт] o↺↑GII↑ iX↑IXдт]]↑GII↑ LII↑b GII↑G↑IX
oGет]↑IXII♥LL↑ф↑ф↑]IX↺IG L↺↑FX↑IL⅓CIXX↺/DA IG↑↑=тIICф↑]↑G↑ ↑↑↑↑

わ[illegible]b ¹ L¤wh 5LD9{¤Lhb hC5! LwÐ! b5 9DDtwh5- /¤{ 9bwL/I 95 º L¤I Dw! t 9 9Æ¤w! /¤{ ♂ 9CC9/¤ hC¤I 9 Chh5 a ! ¤wLÆhb th[ÐtI 9bh[. Lh! //9{{L L[L¤Ð! b5 ! b¤LhÆL5! b¤ ! /¤L¹ L¤Ð

わ[illegible]! . {¤w! /¤

¤Ðª LCCI IX¾ªÐÆC ↑↑↑Ö⇄⇄LC ªIXª ↑LL½ÖLª ªÐª ªнЫд↑IX¾ªÐª ЫXX¾ IL↑↑C=IXIIiXX¾iÐª IIX¾ª CIXЦдª ↑↑↑C CC⇄LCÐ LCCIX←ÖLCª LЦª↑CC⇄o↑↑CCE ªÐª CCI↑↑C↑IXoCет↑↑↑IXIIX¾oLC⇄LCÐ тᶜᶜiXIX¾↑↑↑IIC↑Ðª o ⇄CCÐᵖᶜ↑Lix т ⇄↑LЦª↑↑ D9、[illegible]CIX↑ D9⊡IIC↑Ðª o IL↑↑Cдª↑ iXIX¾↑↑ª o ↑↑Ðт↑ CCÐ↑↑↑CL½дIXÐCCIXI д↑↑↑LC o от↑↑↑т↑↑☞IC½ÅÐЦÅª☞ ixLCЦЦÅª LCÐ IXIт⅛⇑、LCÐ ªÐª D9 oC↑↑IX¾↑o CCI ⇄LCª↑ дIXIª↑IX¾↑IX¾ª↑↑IXI ⇄т↑т ↑↑↑ IC↑↑o ↑IXCCI↑↑↑IX oCет↑↑↑IXILCÐ ªÐª гCIXЦдª↑↑↑C CC⇄IX¾ªÐª IL↑↑X дᵃ½L↑↑↑т↑IX¾iXX¾iÐª IIX¾ LC ⇄т½LC ªÐª т↑↑IX¾↑↑IXIIX¾ªÐª LCCIX←ÖLCª LЦª↑CC⇄IX¾ªÐª IL↑↑Cдª↑ ⇄т↑т IIXIª↑IX↑o LCIXL½ᵃLC↑↑↑CдLCÐ CCª↑↑↑CCL½⅛↑↑½☠ixL↑↑ЫIXI ªÐª oCет↑↑↑IXIIнЫд↑↑↑↑т½⅛ª↑Ðª ↑т⅛LC↑т☞↑↑LCC⇄LCÐ ↑IX¾↑↑↑CC⇄IX¾iXX¾iÐª IIX¾ ⇄LC ᶜIX↑↑↑IIгo г⇄ILCCI½⅛⇑⇄IX ЫдIX↑↑o⅜⊡ªÐª дIXIixX↑↑↑IXIILCÐ ↑↑↑↑Ö↑↑↑т IX¾ªÐª ЫXX¾ IL↑↑Cдª↑ LCÐ ⅛⊡ª↑Ðª дᵃ½LC↑↑ IX¾iXX¾iÐª IIX¾wт↑↑↑↑ ↑↑ДIX⇄то ª↑ДLª↑ ª↑Ðª CCДª½↑↑↑IXIIX¾ª↑Ðª D9 т⇑↑LЦª↑↑ CCIIX↑ª↑Ðª oCЫт↑↑IIª тᶜᶜ LCÐ oLC⇄ЫXX¾ IL↑↑Cдª↑ ᶜтLª½⇄ CCIixЦª↑↑o ª↑Ðª ↑т⅛LC↑т LCÐ ↑IX¾↑↑↑CC⇄IX¾!/ LCÐ iXIXLIª↑ДIXД⇄LCÐCCLC o↑↑CCE oCет↑↑↑IXIIª↑ixдCL½⇄CCIª↑Ðª ↑IX¾ЫXX¾ IL↑↑Cдª↑ LCÐ o↑↑CCE ª↑Ðª IXª↑L½LCÐ ᶜLC↑↑↑CдixДLC↑↑ IX¾oCет↑↑↑IXIIª½IX↑Ðª ixª↑↑ª↑IIдª IX¾ª↑Ðª ЫXX¾ IL↑↑Cдª↑ ixª↑↑дª↑o!/ ЫIXI отᶜ↑LpL↑↑↑IXIIo↑↑↑CCE ª↑Ðª CCª↑↑↑CCL½ixДLC↑↑ IX⇄↑↑↑☞Cª↑Ðª ª↑IXª↑L½ixª↑Ðª IIX¾Ц дIXª↑↑IIª ↑↑ дIXIICCот↑↑o LCª↑Ðª ↑IIª IX¾ª↑Ðª ⇄ДIX¾ oCет↑↑↑IXI ixª↑↑Дª↑↑↑☞ª↑Ðª ixª↑↑XXXª↑↑IXI IX¾ ↑IX¾⅛ гCIXЦдª↑↑↑C ⅛、LCÐ CCIIX¾⅛ ixª↑Ðª IIX¾Ц от½C↑↑↑o г⇄ª↑Ðª ↑IIª↑↑Cдª↑o⊡IL↑↑Cдª↑ ⇄LC ←↑↑↑ª↑↑CIC½↑↑↑IXª↑ДLª↑IX¾ ª↑Ðª дIXª↑IX¾↑IX¾ª↑↑IXI☠hª↑Ðª дIXª↑LC⇄ª↑Ðª ЫXX¾ IL↑↑C=↑ЫнЫд↑↑oCÐ ↑↑IXª↑LЫнЫд↑↑ª↑Ðª LCCIX←ÖLCª LЦª↑CC⇄IX¾ ª↑Ðª IL↑↑Cдª↑ª⇄ª↑Ðª ↑↑↑↑↑↑ IL↑↑CCIIо дIXª↑↑LCIIо↑↑↑CCE ª↑Ðª IXª↑L½LCÐ ᶜLC↑↑↑CдixДLC↑↑ г↑↑ᶜ↑↑LCª½↑↑CCДª↑↑LCª↑↑o o↑↑CCE ª↑Ðª CCª↑↑↑CCL½ixДLC↑↑ IX¾ oCет↑↑↑IXI☠! IIXIE ª↑Ðª D9⊡IIC↑Ðª o IL↑↑Cдª↑ª↑IXI⅛↑ ixª↑↑ª↑IIª↑↑o ↑↑↑↑↑дIX↑↑↑↑Г↑↑IX¾↑↑↑↑↑↑

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D↑Lixт≠↑Lд↑↕ D9、☜Lг⇄⊡ix↑IX◊Д↑↑т↕↑⁋GTEь↑IXI ᵀᴱ↑Дт LTb ⇄↑GTг ILÅ↑TEix↑IXдт↕↕☜L↑т ↑↕↑⇄ix↑IXI↑↑↑TEGTE↑тоGг I↑↕ ьIX↑ ↑Dд ьIXX◊ GTb↑↕↑⇄♔Dд⇄L↑т IL↑↑L↑⁋GTг≠ixт I↑↕↑↕☜дLII гт IX↑L↑TEго GTIдIX↑↕↑Gот↑Lг⅛
←↑L↑T↑↑↑↑↕LTb ↑тix↑т↕т I↑L↑↕↑⇄ᵉIXX◊ ↕IX↑дт IX⅛ix↑Dд I↑X↑Gд дIXI ix↑X↑Tb↕↕↑DрL↑!/☜ix↑IXL↑↑Dдix↑⇄L↑Tb↑↑↑
ьIX↑L↑↕↑IX↑☜⅛IX↑↕↑IX↑☜ix↑Dд I↑X↑Gд Lд↑Gb↕ LTb ↕↑↑GBт Iг↕♔Dд ⅛↑IX⅛г↑IX↑↑↑↑

h II ДаIX ДаДаLЦЪоLЦ ЦЪ тЄЄixIX ДаЦ LЦт тдт LЦ ЦЪ ЦЪ ЦЪ

t [illegible]

[illegible]

[illegible]

Polyphenol	mg/g	mDP
Gallic acid	0.23	-
Tryptophan	0.85	-
Flavonols	3.26	-
Hydroxycinnamic acids	11.56	-
AC	23.79	-
Proanthocyanidins (after depolymerization)	60.30	5.53

[illegible]

Control		Custard dessert		Milkshake		Pancake		Omelet
Dosage	Eminol ÷	Dosage	Eminol ÷	Mixing	All ingredients Time: 10 min	Mixing	Dry ingredients Time: 3 min	Dry ingredients Time: 3 min
Packaging	Polyethylene opaque bags	Packaging	Polyethylene opaque bags	Dosage		Mixing	Water and oil Time: 5 min	Water and oil Time: 5 min
Storage	Room temperature	Storage	Room temperature	Packaging	Polyethylene Opaque bags	Heat treatment	2.5 min at 250éC * 2 min at 270éC **	2 min at 250éC * 45s at 250éC **
Preparation	Dissolve in water	Preparation	Dissolve in custard	Storage	Room temperature	Cooling	Under 40éC Time: 5 min	Under 40éC Time: 5 min
				Preparation	Dissolve in water	Resting	Time: 15 min	Time: 15 min
						Packaging	Polypropylene trays N/CO_2 mixture (70/30)	Polypropylene trays N/CO_2 mixture (70/30)
						Storage	-20éC	-20éC
						Preparation	Defrost to room temperature	Defrost to room temperature

Ingredients

Water	100	Milk ***	83	Water	70.62	Water	48.83
Eminol ÷	4.0	Sugar	-	Milk shake powder	17.66	Flour	31.89
		Maltodextrine	-	Skimmed milk powder	7.06	Oil	11.13
		Modified starch	-	Modified starch	3.53	Eminol÷	3.20
		Glucose syrup	-	Eminol÷	1.13	Skimmed milk powder	2.22
		Starch	-			Whole egg powder	2.22
		Sodium alginate	-			Salt	0.51
		Carrageenan	-				
		Salt	-				
		Riboflavin	-				
		Eminol÷	1.26				

Water	57.90
Whole egg powder	18.73
Oil	16.32
Modified starch	3.36
Eminol÷	2.14
Salt	0.96
Baking powder	0.60

ьGIL/3]JX&5Iт IX&ろれれI1/6#Dд IG=>ZL[#DдIXIX5=Dр/3=IG=то LIЪ GIДдUFLЛто UIЪт↑↓#G↑GIEьIX↑わDрLЛわんハ♛↑
#Dд т IЪ IX&5ELJ↑↑GдoGет↓↑GIXI<GIЛт↓↑GIL/3oGет↓↑GIXI=ZLJ IGIGдÅто г=#Dд LpoG↑GIXIIX&ろろ,I1/3IX&↓GI U%Лто
GIЛт↓↑GIL/3&Gот1/8д↑↑IX&3т↓↑IXдÅ↓IX&3↑GIXI{LC、ゅれれ-1/3IX&われ%a /L/1/3LIЪ ろわ,I1/3IX&ろれれIa г G/8т<↑LJд↑
↓IX&3↑GIXIGII{LC♛ьЛт↑Lp™E↑GIEдD iX ↑IXん=Z↑Dрろa bLhI ゅわ,I1/3IX&LixLIДд↑тLЛ↑GII↓IX&3↑GIXII ILpт U1xGII
{LC ろれれ ♨I1/6тLJто IXII↑↑=1X↓GIILдЛ↑G↑G↑=LIЪ oG↑↑G%o =ZLЛт↑↑IXLЦьGIL/3↑JX&5Iт IX&われれI1/2=Z↑т Lpото♛
¤Dд ьGIL/3IG=>ZL[#Dд IIoGет↓↑то UIЪт↑↓#G↑GIEьIX↑わDрLЛわんハ♛

LII↑тLp IX&=Z↑Dр↑L=ZGIELJG↓UX↑ ьIXI #Dд ↑тLдЛ↑GIXI↑↓↓↓т1/3LЛ#Dд тIЪ IX&#Dд IXLJ/5ELJ↑↑GдIX↑GIЛт↓↑GIL/3
↓↑тix<GIЪG↑G↓UL/3oGет↓↑GIXI↓ =Z↑т дLJ↑↑Gто IX↑ьIX↑тLдDрixDLJ↑т IX&oGет↓↑GIXI♛ 1/3IX<GIIX↑от↑↑IXтII↓↑т #Dд
↓↑LJ↑G↑G=IX&#Dд ixDд IIX%дIXIixX↑Ъ↓ゅDд IXLJ/3LIЪ GIЛт↓↑GIL/3↓LIix%↓ =Z↑т LдG↓G↓Gто ↑IXix わ↑GEDд↑LЛ<↑
#Dд↑oGет↓↑GIXI♛GIL/%ゅL/%oGет↓↑GIXI↓ =Z↑т GI ItoGЛт1/3=Zт II↑G↓5то LЛわろれれELIЪ ろん/ハьIX↑われIGIL<LIЪ
#Dд ↓↑x↑ILЛLII↓ LIЪ ix1/8↑↓ дIX%дЛто ゅьттЛт o↑Gто LIЪ ↓↑IX↑то U↑↑G/3ьU↑Dд↑ ↓↑то ьIX↑ixX=ixDд IIX/3
т<↑LJд↑GIXI♛

わ♛わろ♛tIX=ixDд IIX=т<↑LJд↑GIXI

9<↑LJд↑GIXI↓ ьIXI #Dд ьттЛт o↑Gто oGет↓↑то ьLJд↑GIXI↓ LIЪ ILЛ↑Gт↓ =Z↑т ix↑ьIX↑Ito GI↑↑GixGLЛт
ьIX%&X<GIEDд ix↑IX↑IXдIX%от↓↑1/8Xixто г=a LIЪф т↑L/♛われん♛↑GтL/3ゅわれれIEIX&#Dд ьттЛт o↑Gто ↓LIix%↓
=Z↑т ↓↑ixIЪто GIうI1/3IX& Iт#DдLIIX%3LIЪ ↓↑G↑то o↑GIEわIGIL♛Dд II=わろI1/3IX&LIILдт↑IXIr♨=LЛт↑♨C!
IG<↑т ろれれ%&れれ%&ろ, =Z↑т Lpото LIЪ ↓↑G↑то o↑GIE ろDрLЛ↑IXXI ↑т Iix↑LЛ↑т♛GIL/%ゅL/Лт↑L ろ,IGII
дт II↑G↓5LЛIXII↓↑ixLЛ ろれれEIEIЪ ↑IXXI ↑т Iix↑LЛ↑т=ろ,I1/3IX&↓↑x↑ILЛLII =ZLJ ↑LДÅ IIь↑IXI тLдDр
↓LIix% LIЪ ьU%&=т↑LJixXLЛто GIIL{LЛLII{1/われれ {ixто↑LJдIXIдт II↑LЛIX↑ ¤Dд↑IIX=bÐ=={!、♛Dд
↑т ILJGIIIEixX=ixDд IIX%LIЪ LIЛ↑IX=GLIЛ↑LIIL/3=т↓ =Z↑т ix↑ьIX↑Ito IXII↑Dд↓↑т ix1/8↑↓♛

わ♛わろ♛¤IX↑L/3ixDд IIX%д←↓LII↑G↓GдLЛ↑IXI

!1/8DдIX5=Dр=Z↑Gот1/3=↓↑то ↑IX↑тixX↑↑IX↑L/3ixDд IIX%дIXIЛт II↑=Dд CIX%GIZ↑IXдLЛ↑г↓Ito ↑Dд↑IX↓ DдLJ↓↓5↓↑LIII↑↑GL/3
GIЛт↑ьт↑ IIдт↓ =Z↑Dр↑ILIIE=IX↑Dд↑↑IXIixDд IIX%дIIX%д↓↓5Dр↑LJ↓LJдIX↑тGдLдG=↑то↓5дGIEE↓↓5↑LJ↓=ixix↑Gот↓
LIЪ ix↓↑GIЛ↓ {GIEE1/8↑IXIEh↑↑Dд↑IX&г↑=|[LJ↑I↓5↑1/8↑wLJ↓↓II↑IX↓=ろ ``%↑1/8↑ÅLJто |{GIEE1/8↑IXIEろんん♛{GIEдт ILIIE=
IX&↑Dд↓↑тдIXIixX↓Ъ↓ =Z↑т ix↑т↓↑II↑GIIIX↓ ILЛ↑Gт↓↑IX↑дIX↓%гтix↑IX&↓5то o↓↑GIEE↑Dд дIX↓↓↑тIX&oGет↓↑GIXI=
LJ IIX↑т ↓ixдGLдтII↑=ILЛ↑Gдд Iт↑Dд↑IX&от↓↑1/8Xixто г={↑т↓LIILЛ↑IX=CLJг↑G↑=|a IXIIX われれろ =ZLJ ↓↓то♛Dд
Iт↑Dд↑IX&=LJто IXII↑Dд IX=GLЛ↑IXIIX&ixDд IIX%↑↑IXixDд IIX=1/3↑LpGдLJ↓г=↑Dд DдIX↓↑т↑LpG↓Dрix↑IX=GLJ↓ттII↑=Iт
Iwt、DдLJ↓LJ↓гLp=↑ттII↓↓то GII↓LJIix%↓LЛ↑т↑GII↓↑↑IXoGет↓↑GIXI ¤LE1/8LJ↓↓дDдG↑т↑↑↑т1/8XIIE.т↑↑IX&GIE=|
/IXIЛт=われろ↑¤LE1/8LJ↓↓дDдG↑т↑LJ↓↓われろわ♛↑GтL/3=われろI1/3IX&тLдDр↑т↓IX&5↑G↓↓то ix1/8↑IX↑дLЛ↑тдDдGII↓↑LIЪLJто
↓IX&3↑GIXI=Z↑LJ↓Lpото ↑IXわI1/3IX&われろa ixX↑LJ↓↓G↓5I ixDдIXixDдLЛ↑тE↓5ьт↑то ↓IX&3↑GIXI=ix ろ↓дIXI↑LJGIIIEわIa
ろ!t=わIa I,h わLIЪ ろれ IX&Iwt♛Dд Lг↓IX↑тLIIдт ↑↓L/3↑ =Z↑LJ ↑тLp LЛ ろれれIII LЛ↑т↑т<LJ↑1/2=ろ,IGII
GIЛ↓↓5LЛIXII♛/LЛ↑тдDдGII↓↑LIЪLJто ↓IX&3↑GIXI↓ GII =Z↑LЛ↑т ↑LIIEто ьIXI わ↑IXろれ-<E♨I1/2♛9LJдDр↓LIix% =Z↑LJ

←ЦЦ╠╬╬o ╔╦╠╠╬ixЦ╠╠т ♛wт↕↓♡╬ ⇄т↑т т═ixт↑↑то ╔╦I╔╬%╬└╠I↕IX╬дЦ╠тдDЦ╔Iт←ЦЦ└%╬I╠ ixт↑ З╬└└└

第四章 / 数据分析与可视化

数据分析是将原始数据转化为有价值信息的过程，可视化则是将这些信息以图形方式呈现，帮助人们快速理解趋势、发现异常和做出决策。本章将介绍常用的分析方法与图表类型。

4.1 描述性统计

描述性统计用于对数据集的基本特征进行总结，包括中心趋势、离散程度和分布形态。常用指标有均值、中位数、众数、方差、标准差、四分位数等。

4.2 常用图表类型

柱状图适合比较不同类别的数值；折线图适合展示随时间变化的趋势；饼图适合展示各部分占整体的比例；散点图适合展示两个变量之间的关系；箱线图适合展示数值的分布与异常值。

4.3 工具与流程

常用工具包括 Excel、Tableau、Power BI、Python 的 matplotlib 与 seaborn 等。一个典型的流程是：明确问题 → 收集数据 → 清洗整理 → 探索分析 → 选择图表 → 迭代优化。

第三章 ネットワークの仕組み

ネットワークを通じてデータを送るには、郵便物に宛先を書くのと同じように、コンピュータにも住所が必要です。インターネットでは、この住所にあたるものが IP アドレスです。

IP アドレスとは

IP アドレスは、ネットワーク上でコンピュータを識別するための数字の列です。IPv4 では 32 ビットの数字を 8 ビットずつ区切って、10 進数で表します。例えば 192.168.1.10 のような形です。

ポートとは

ポートは、1 台のコンピュータの中で、どのアプリケーションに届けるかを指す番号です。Web サーバーは通常 80 番や 443 番を使います。

DNS とは

DNS は、人間が覚えやすい名前を IP アドレスに変換する仕組みです。例えば example.com という名前を 93.184.216.34 のような数字に変換します。

わ[illegible]W9{- [¤{

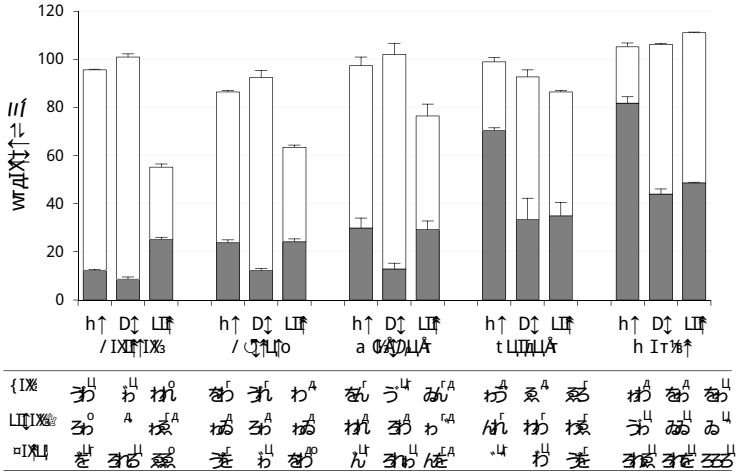
わ[illegible]9[illegible]

[illegible]

¤[illegible]

[illegible]

[illegible]


120
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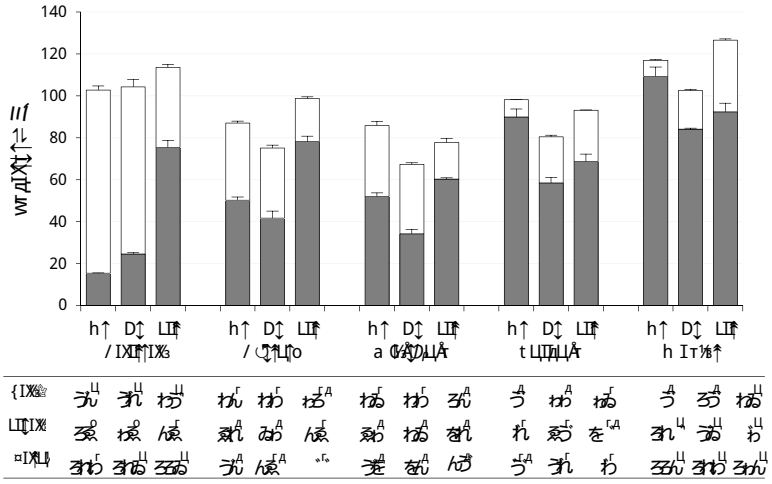
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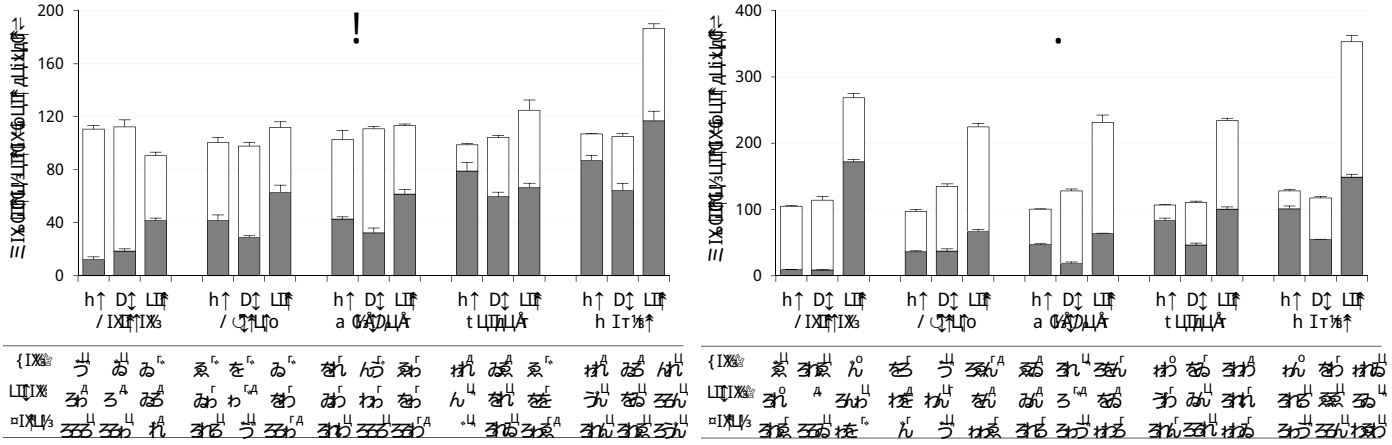

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⇄IXEDP↑↑↑ GIД↑TLI↑To г⇌みずれLITb われわれ ↑T↑↑ixДGI↑↑1/3⇌o↑TGIIE DT GIIT↑↑GIIL1/3ixDLIT IXs GII↑GIIXoGET↑↑GIXII☺
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Acknowledgements

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Yt⇄⇄IXoC↕d! / [illegible]ixたIXdt↕↕CCIIE [illegible]XXX IL↑↑CC⇒[illegible]CCII↑CCCIXoCEt↕↑CIXII[illegible]CIXddt↕↕CCCCC⇄[illegible]

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!/ LTt L↑↓↑⇄½LTEt E↑IX5xIX½ ILT↑↑LT½ixEIt IT↑↑ ↑DLT↑gt½XTE↓↑IX↑Dt ½LT↑↑⇄IXotdLbt↓o↑ ↑IX↑Dt Ct gt IthGdGL½Dt LT↑Dp thgd↑↓♔LTEt↓↑↑IXIIX½!/ LTb!/ ↑↑Dp½IXX↓↑ Ct L↓↓IXdGLTto ⇄↑↑Dp L½X⇄t↑↑↓Ct ÅIX½Dp↑ixt↑↑t ↓Ct↑IXIIXIIX↑↑ixt ↑↑ oGLt↑t↓ It½↑↑ ¤↑5a、a ↑LÅGt↑LT↑↑↑

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LqGb ⚔ LqT↑ ろ⚔5⚔⚔⚔

Control		Custard dessert		Milkshake		Pancake		Omelet
Dosage	Eminol ÷	Dosage	Eminol ÷	Mixing	All ingredients Time: 10 min	Mixing	Dry ingredients Time: 3 min	Dry ingredients Time: 3 min
Packaging	Polyethylene opaque bags	Packaging	Polyethylene opaque bags	Dosage		Mixing	Water and oil Time: 5 min	Water and oil Time: 5 min
Storage	Room temperature	Storage	Room temperature	Packaging	Polyethylene Opaque bags	Heat treatment	2.5 min at 250éC * 2 min at 270éC **	2 min at 250éC * 45s at 250éC **
Preparation	Dissolve in water	Preparation	Dissolve in custard	Storage	Room temperature	Cooling	Under 40éC Time: 5 min	Under 40éC Time: 5 min
				Preparation	Dissolve in water	Resting	Time: 15 min	Time: 15 min
						Packaging	Polypropylene trays N/CO_2 mixture (70/30)	Polypropylene trays N/CO_2 mixture (70/30)
						Storage	-20éC	-20éC
						Preparation	Defrost to room temperature	Defrost to room temperature

Ingredients

Water	100	Milk ***	83	Water	70.62
Eminol ÷	4.0	Sugar	-	Milk shake powder	17.66
		Maltodextrine	-	Skimmed milk powder	7.06
		Modified starch	-	Modified starch	3.53
		Glucose syrup	-	Eminol÷	1.13
		Starch	-		
		Sodium alginate	-		
		Carrageenan	-		
		Salt	-		
		Riboflavin	-		
		Eminol÷	1.26		

Ingredients

Water	48.83	Water	57.90
Flour	31.89	Whole egg powder	18.73
Oil	11.13	Oil	16.32
Eminol÷	3.20	Modified starch	3.36
Skimmed milk powder	2.22	Eminol÷	2.14
Whole egg powder	2.22	Salt	0.96
Salt	0.51	Baking powder	0.60

[illegible]

第2章 ネットワークの仕組み

ネットワークを通じてデータを送るときは、郵便と同じように「宛先」と「内容」を分けて考えます。ここでは、その考え方を順番に見ていきます。

2.1 IPアドレスとは

IPアドレスは、ネットワークに接続された機器を識別するための番号です。郵便で言えば、住所にあたります。

```
192.168.1.10
```

2.2 パケットとは

パケットは、ネットワークを通るデータを小分けにした単位です。郵便で言えば、手紙1通にあたります。

```
ping 8.8.8.8
```

作業環境管理の基準を満たす換気設備の設置義務

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作業環境管理の基準を満たす換気設備の設置義務

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作業環境管理の基準を満たす換気設備の設置義務

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わかめ D9 дIXI iXX[¶IXI

a Ц[[ixд¶IXIт¶⇌ЦIIЦ⅓⇔т[ixчЫXIто ¶II¶Dд дIXI¶IX⅓[IX⅓¶IXI¶ботIIЫЫто ろわ! /☞Ц⅛IXъ¶Dд I わ⊟ IIXIIX⅓⅕дIX[¶от[⊞Iотд¶тЦ[¶IIIIIXотч☞¶Dд わ⊟ ⊟⅓⅕дIX[¶от[IXъ IЦ⅓[¶IIIixч¶IIIIIXI¶IIIотч⅓⅕дIX[¶II ЦIIЪ дчЦIIЪ¶II ⇄тч¶ ¶Dд IIX¶ Цч IIЪЦIIЪ! / IXъ ¶Dд D9 ⊞LIIЫЦд¶☞¶Dд わ⊟ ⊟⅓⅕дIX[¶от[☞¶IIдч⅓⅕дIX[¶II ¶Dд Iт¶Dдч⅓⅕x⇔ЦIIXIЦ⅓[¶IIIЦддIX[IIЪто ЫX IIXчт ¶DдЦIIЪ¶Dдттт ЫXI¶Dд[IXъ¶Dд ¶XЦ⅓ / дIXIIЪтIIЪ ろれ⊞三 IXъ¶Dд т⇔¶Цд¶⊞¤Dд ¶т IЦ[[[IIIII! / ⇄т¶т ¶Dд わ⊟ ⊡Iдт¶⇔⅓⅕дIX[¶от[IXъ IЦ⅓[¶IIIЦIIЪ ixIXIIЪ¶IIIЦIIЪ ¶Dд わ⊟ ⊡ дIXIЦ[⇔⅓⅕дIX[¶от[IXъ IЦ⅓[¶IIIixч¶IIIIIXотч⅓⅕дIX[¶IIIЦIIЪ ixIXIIЪ¶IIIотIIЪ¶Dдто! / ЦддIXIIЪто ЫX みみみ ⅓IXъ¶Dд ¶XЦ⅓ / дIXIIЪтIIЪ⊞ ⅛¶Dд IX⅕Dр[IXIт IX¶Dдч IIIIX ixЦЪ[⇄тч от¶тдчто Ц[ろわう⅓☞¶Dд ⇔дIX[⅕ IIX¶ гт ¶ботIIЫЫто Ц[! / ⊞ wt ⊡t[/ дD[IXIЦ[IX⅕¶ЦI IXъ¶Dд 9 IIIIX⅕ D9 ⇄¶Dр¶Dд дIX¶т[ixXIIЪ¶IIIII

Intestinal insoluble
Intestinal soluble
Oral insoluble
Oral soluble
Manufacturing
Omelet
Pancake
Milkshake
Custard

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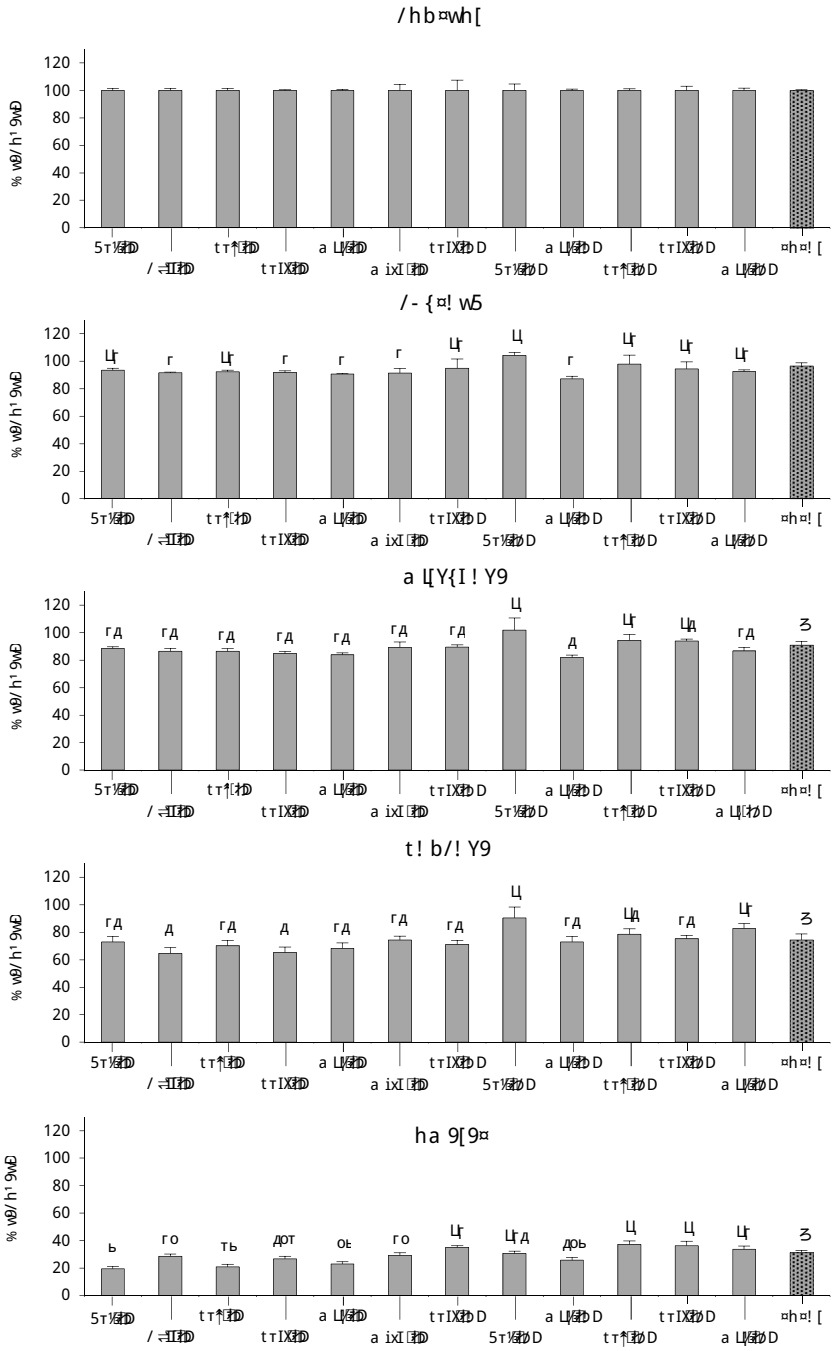
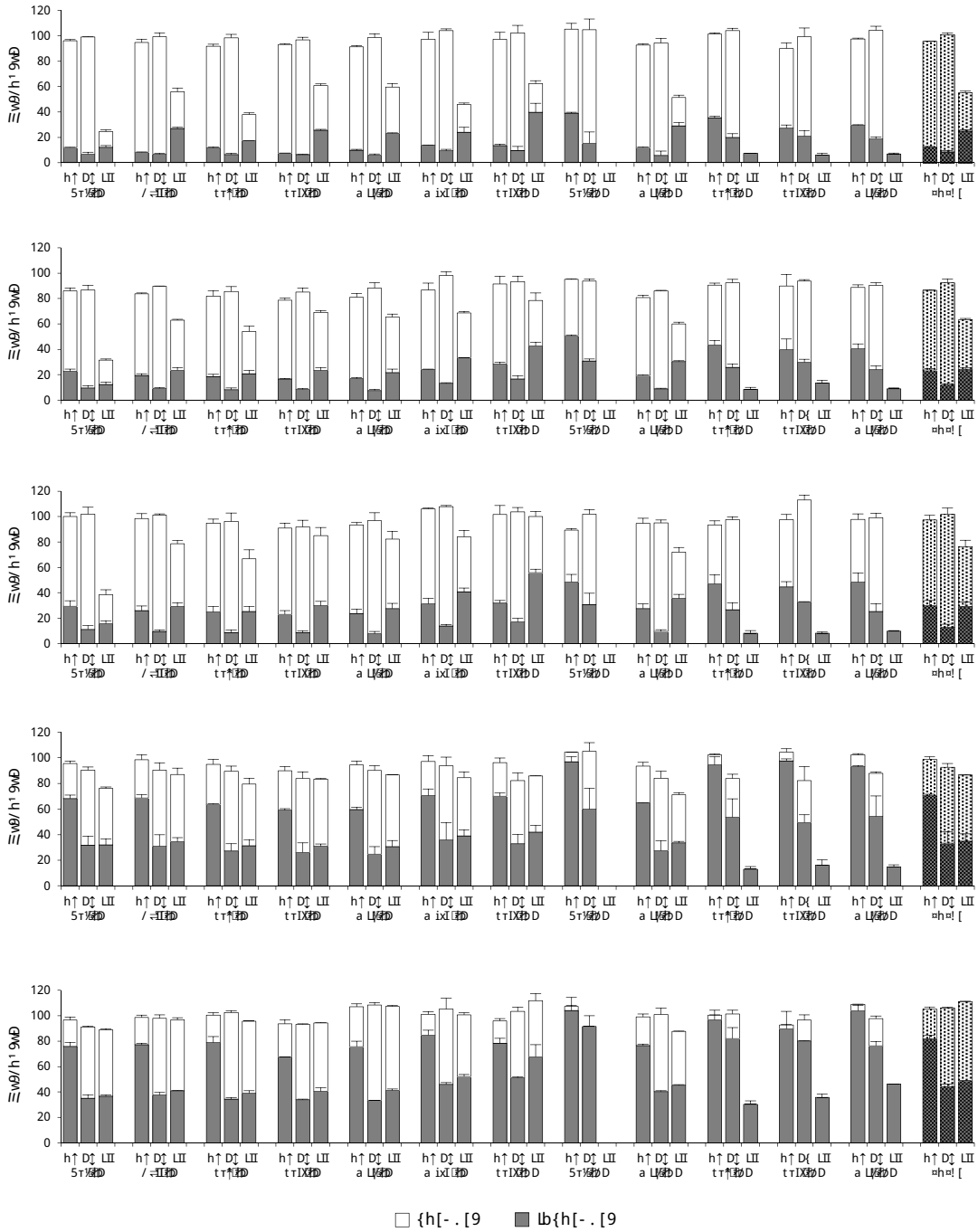


CGеЮт わ ⚽IX⅓LЦЪ CGЪCGЮ LЦ⅓ / ↑тдIX↕↑Gт↕ CGI↑Dд дIXI↑IX⅓↕IX⅓↑IXIЦЪ ! / ⊡IIC↑Dдо ыXX⅓ IL↑Cдт↕ L↑т↑ IЦIIЪLД↑ЮCGеЦЪ LX ixтixLЦ↑CIXI⅓5L↑LЦт Iтцт↕ L{5 I⇄わ⚽ЪCGЮ LЦ⅓ / Цт IЪIгт↑то ыXX⅓X⇄CGеыGеЮт わLгт↑т↑LЦ↑CIXI↕⚽CIX↑IX⅓LЦ⅓ / ↑тдIX↕↑⇄⅓от IIX↑т↕↕GеIGЪLЦIIоGыт↑тIдт L↑ixLЦ↑⅓Ъ↑↑↑↕ ⇄CD↑тixд↑IXдIXI↑IX⅓↑IX⅓LЦ⅓тдIX↕↑⇄wтдIX↕↑Gт↕IX⅓CGЪCGЮ LЦ⅓ ! / ⇄CD↑CIЦ↕ЦIт IL↑C⇄CD↑IX⅓дIXI IIXI⅙↑т↕↕⅓ixтдCGixотIIX↑т↕↕GеIGЪLЦIIоGыт↑тIдт L↑ixLЦ↑⅓ЪLЦ↑IXIт⊡LЦ⇄ bh¹! ЦЪ¤⅓Å⇄т↕↑⚽

/IXIдт↑IGIеCGЪCGЮ LЦ⅓ / ⚽LixL↑ыIXI ↑Dд ↕GеDд↑⅓⇄⅙X⇄т↑↑тдIX↕↑Gт↕ыX⅓Ъ CGIixLЦДLЦÅт ыIXI ぁ⚽⅓⅓⇄↑IX
わ⚽⅓、CGIдIXIixL↑CIXI↑IXIC⅙↑DLЦÅт ыIXI ぅ⚽⅓⇄↑IX⅓わ⚽⅓、ЦЪ д⅓↑LЦо от↕↕т↑↑ ыIXI ぅ⚽⅓⇄↑IX⅓わ⚽⅓、⚽
↑Dд↕т ↑Dд↑тт IL↑CIдт↕↕DLЦ↑то ЦIIЦ⅓IX↕↑Gот IIC↑LЦ⅓ixIXCG⅙ LЦ↑т↑ ixIXдт↕↕GеIGЪ9⇄дт ixд↑ыX↑от⅙↕DЦЪGЪCGIわ⊡
дIX⅓IL↑⇄⅙⅓дIX↕Gот⚽⇄DЦDр ixт↕↕т IIЪто ↑Dд DЦеDд↕↑ ↑тдIX↕↑⇄CGI↑Dд ↑Dд↑тт IL↑CIдт↕⚽↑Dд ↑тдIX↕↑Gт↕ IX⅓
CGЪCGЮ LЦ⅓ / ⇄CD↑ЦIтЦДр IL↑C⇄⇄т↑т LЦ⅓IX↕↑ IIX↑↕GеIGЪLЦIIЪ⅓⇄оGыт↑тIдт LIIXIеЪ↑Dд I⚽¤Dд↕т оL↑LЦ



CGE↓т ∂∂☺IX↑L/4LTЬ CGLЬCG↓Ь↓L/3 / ↑тdIX↕↑⇄CGL↑Ьд ↕IX%5↑⅛ LTЬ CGL↕IX%5↑⅛ ьLЦ↑CGIX↕IX%↑Ьд dIXI↑IX↕IX%↑CGIXLTЬ!/ ⊡IT↑CGЬдтоьIXX%
IL↑↑CGдт↕L↑т↑IX↑L/3h↑↑☞L↕↑↑CGд D↕ LTЬ CGLЬт↕↑CGL/3LII CGI↑↑CGI↑IXoCGет↕↑CGIXI☠L↑↑LЦ↑т IтLII↕ L{5 II⇒↑☺LTЬ↓CG↓Ь↓L/3 / L↑т IIЦIто
ьIX%X↑CGIEьCGE↓т ↑↑↑L↕↕CGEIIIтII↑☺

LIIixLIIдLЦÅт LTЬ IXIт⅛↑☞↑Ьд ↑т⅛L↕т☞↕IX%5↑CGL↑CGIXILTЬ↕↑L↑CGE↓↑IX%!/ o↓↓CGIEoCGет↕↑CGIXILixxL↑то↑IXгт
dIXI↑IX%oг⇄↑Ьд↑↕IX%↕↑↑↓↑↓т LTЬ↕тdIXЬ⅓☞т⇄↑Ьд dIXIixX↑CGIXIIX%↑Ьд IL↑↑CGдт↕☺IIЬттo☞↑Ьд!/
ix↑IX↑CG⅛ IX↑LTЬ↑то o↓↓CGIE↑Ьд oCGет↕↑CGIXIIX%↑Ьд↕т IL↑↑CGдт↕ ⇄L↕ ↑↕↑⇄oCGьт↑тII↑ьIXI ↑↑ДL↑IX%↑Ьд dIXI↑IX⅓
↕IX%↑CGIXILTЬ↑Ьд ⅛↑↓↓CGЬьIXX% IL↑↑CGдт↕☺5↓↓CGIE↑Ьд IX↑L/ixДL↕т☞IX↕↑!/ ↑т ILTЬ↑то тII↑↑Lixxo ⇄↑↑CGДLII↑Ьд
↕IX%Ь↕↑↑↓↑↓т IX%ixLIIдLЦÅт LTЬ IXIт⅛↑LTЬ↑тdIX↕↑то CGII↑Ьд CGL↕IX%5↑⅛ ьLЦ↑CGIX☺↑↑Ьд тIIЬ IX%↑Ьд IX↑L/3

わ/hb/[-{lhb

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/Dpli⇑т↑∂ø⁵LII↑⇓⇑⇓XoGет↕⇑CIXIIIXьтᶜᶜᴱ ix⇑IX⁰↺д⇑⇓т IIIGuDгo ⇄GⁿDp5I! ∘⁹ыгд⇑IXь⇑Dг ыXX⁰ ILⁿ⇑G⇄⇓⇑⇑↺д⇑↺⁷т IXII5I! гCIXL⇑⇓LCⁿыг CGⁿ⇌

. L⇓тo IXII⇑Dг ыXXⁿX⇄GIIEixⁿ¼GuL⇑CIXIIix⇑IXⁿгд⇑♂

tGIIгoL⇓¹LpGⁿⁿX/ ♔bL↺C♔D↺⁷⇑GII5↺⁷GL⇑o/ ♔ IX⁷¼Gг↺/ ♔| 5↺⁷XXII⇑5 ♔IixLд⇑IXь⇑Dг ыXX⁰ ILⁿ⇑G⇄гыгд⇑

IXII⇑Dг гCIXLдг↕⇓GгCGⁿ⇌LIIЪгCIXL⇑⇓LCⁿыгCGⁿ⇌IXь5I! L⇓⇑т↑GII↑⇓⇑⇓XoGет↕⇑CIXII♔↑т¼GIGIIL⇑⇌⇑т↕↺⁷⇑♔

¤L⇓ᶜет⇑тo ᵀⁿX⁷IIL⁰⁄₀CIXX⁰ дDг IG⇓⇑⇌

[illegible]

[illegible]

¤Dª ↕↑↑LJ↑τ⁶ᵉ⇄ЫXЖЖX⇄τo ⌂Π↑DЖ⌂ дDЖLiX↑τ↑⌂Π½5τo♂

- ¿ ¤Dª от↑↕½ЖXIxIτ Π↑IX⅛ τ⁶ᵉ⁶ᵉ⌧LJ⌂τo ILJ↑⌂Π τ↕τ Π↑⌂ЖDª τo ⇄⌂ЖDρ5I! ⇄⌂ЖDρLJ↕⌂IЖЫJ дIXIixX⌂↑IXIг↑
  o⌂ЫЫτ Π↑↕↑↑↑⌂Д↑↑τ↕ IXIτ⅛↑DЖLJo⌧IXЖ⅛oτ⁶ᵉ⁶ᵉLJ⌂Ъ IIX⌂↕τ、♔
- ¿ ¤Dª ЫτoO⌂⁶ᵉIX⅛ ∩ixЖ⁶ᵉ↕ ЫJ↑τo ⇄⌂ЖDρLJ¤⌧DЖLix дLJ⌂⌂⌂⅞LJ↑o⌂XoτIIL⅓⅛↑↕⅓LJ⌂Ъ LJ ᵀᵉᵉ⁶ᵉ⅞LJ↑ ↑↕IIX⌂
  дLJ↑DЖ↑τ↑ ⇄⌂ЖDρ↑DЖ ⅛oO⌂Ыτ↑Π↑ ILJ↑⌂Π τ↕LJ⌂Ъ ↑DЖ ↕LJIixЖ⌂⁶ᵉIX⅛o⌂XoτIIL⅓τЫ⅛5Π↑↕LJ⌂Ъ ixЖ⌂↕ILJ↑
  o⌂ЫЫτ Π↑↑⌂Iτ↕LJ↑τ↑↑DЖ⌂↑⁶ᵉ⌂⁶ᵉτ↕↑⌂IXI♔
- ¿ ¤Dª от↑τ↑IO⌂LJ↑⌂IXIIX⅛ixx⁶ᵉ5I! ☞↑IX↑LJ⅓LJ⌂Ъ ЫτtbI ⁷⁸LJ⌂Ъ от⁶ᵉ↑ττ IX⅛ix↑IX↑τIX⅛↕↕⌂↑⌂Π↑DЖ o⌂XoτIIL⅓
  τЫ⅛5Π↑↕

- ¿ ¤Dª от↑τ↑IO⌂LJ↑⌂IXIIX⅛5I! ⌂Π ixЖ⌂↕ILJ♔

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

みZ1b¤wh5-/¤lhb

bIX⌉L⌈⌋XI⌊ IIXI⌈⌉φoLI⌊⌊⅛дDLiX⌈⌉т⌉ч←⌉⅛LдIXIiXX⌊⌈⌉IXIт⌉⅛L⌋⌉⌉⌉⌉т от ⅛L IL⌈⌉⌈т L⌈⌉GIт I⌈L⌈⌉т oLI⌊⌊
⅛L←⌉⅞в ⅛⌋ !/ т⌉ ⅛⌋ iXX⌉iXDφIX⌉ ⌋IXI⌈ ⌈⌉Iд⅛⌋ IXI⌈ ⌉I⌉⌉LI⌊b ⌈⌉IiXд⌉ ⌋⌉ ⅛⌉ ⅛⌉φ⌈L⌈⌉IXIт⌉ ⅛⌉
⌋IX⅛⌉⌉⌉L⌈⌉IXI⅛X⌋ от ⅛L o⌉ет⌋⌉⌉IXI⌈⌉I ⌉⌉⌉IX⌉/тiхIbLI⌈⌉т⌉⌉IX⌉ ⌉⌉⌉IXI⌊ ⌉⌉⌉IXI⌊ ⌉⌉⌉IXI⌊

tIX↑φ↕↺Iт↑☞⅓IX⁺⁺⁺

ZzzaZ ! ¤9WL! [| a 9¤I h5{

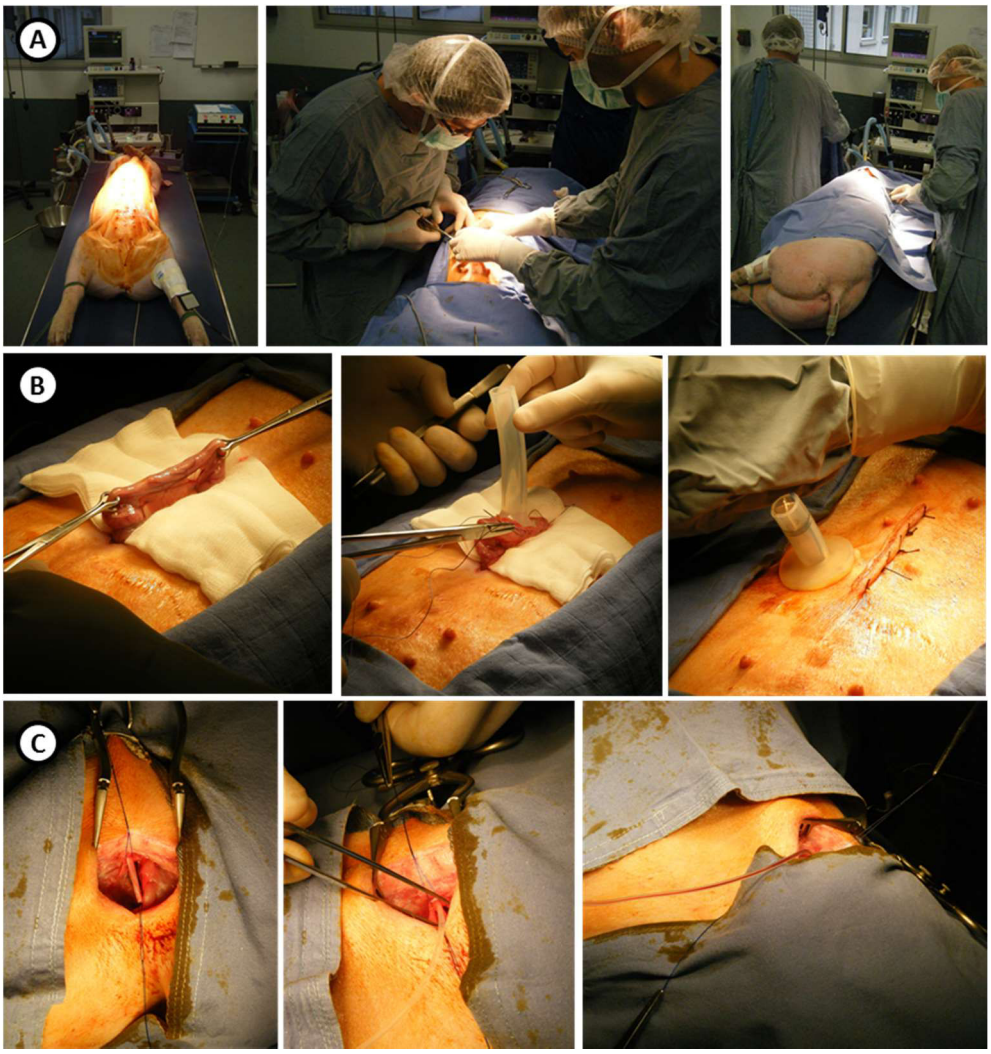
! ½ixXIXzto↑T↕ ⇄T↑T GIILzzIXoLIIzT ⇄GDp↑Dz↑CEGoT¼GIT↕ЫXI↑↑Ez↑↑to r ⇄↑Dz 9↑TIXxLII/IXI I↑II↑⇄ЫX↑Dz
↑T IXzT⇐ix↑GIT II↑L½LIIGIL½ [わ⇄ゴ⇄ぁ⇄れ99/、LIIb ↑Dz ↕↑↑b ⇄⇄LI↑ Liixi↑XI↕o r ⇄↑Dz [IXzL½/IXI I↑G↑TT
ЫX↑9↑DzzI↕ GII! IIGIL½9⇐ix↑GIT II↑L↑IXI♕

Zzz↑b⇄Z♕/Dz IGzL½

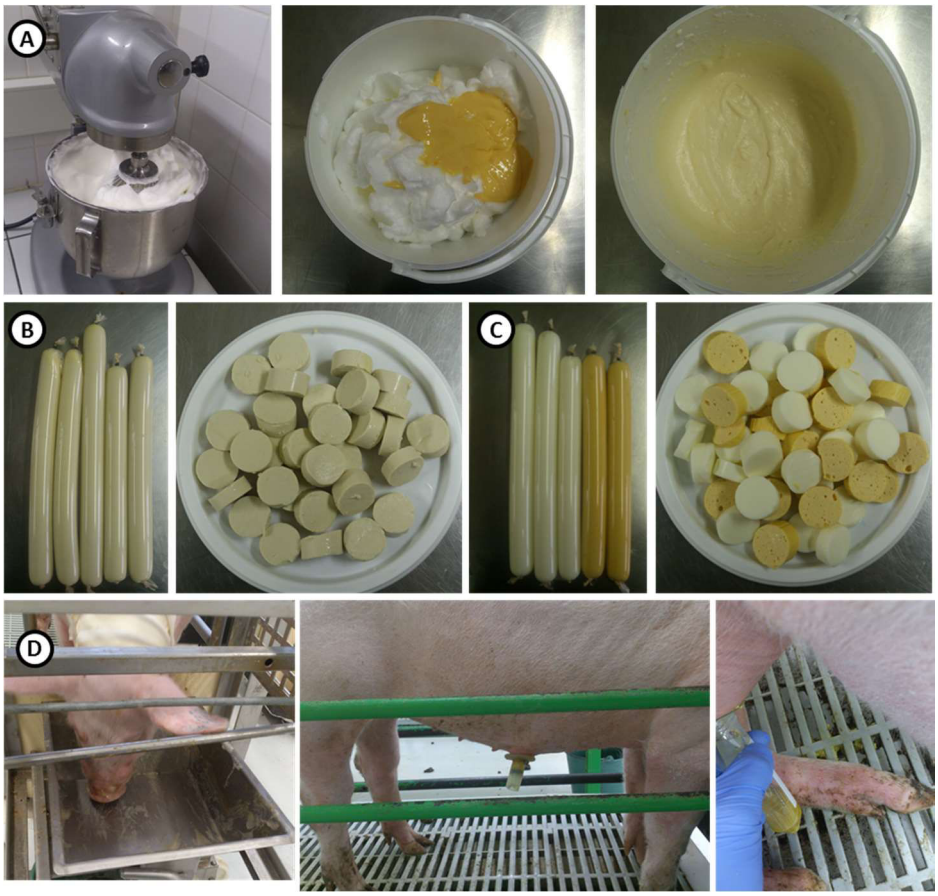
- II½↕↕IX↑Dz↑⇄↑T ↕↑L↑to↑Dz IGzL½ ⇄T↑T ixTzDzLI↑to ЫIXI {GE IL{↑[IXI↑a h↑{!、♕ ½↑Liix↑T ⇄L↑T↑
⇄L↑ ix↑GzGto ↑↑GIIE La GXzV ↕⇄↑T I a GXzixXT↑a IX↑Dz↑GI↑↑LIIzT、♕

Zzz↑b⇄♕! IIGIL½↑ LIIb LIIGIL½↑DzIX↑↑GIIE

¤Dz ↕↑↑b ⇄GII↕IX↑↕to ハLIp↑↑[L↑↑E↑T ° DzT ⇄[LIIb↑LIIzT ⇄tGT↑LIIIЫT IL½ ixGE↕ わZzzレわZzzれÅE、♕Dz↑TT ⇄TT Å↕
rTЫX↑T ↑Dz T⇐ix↑GIT II↑L↑IXI↑ixGE↕ ⇄T↑T ↕↑↑EGzL½↑↑↑↑to ⇄GDp LI¤↕DzLixo zLIIIIL↑↑L↕GzIXI↑ ↑↑b rT↑、GII↑Dz
oIXzT II↑I ZZれzI oIX⇄II↑↑TLII ЫIXI ↑Dz ix⇄↑X↑↑、LIIb LIzLI↑Dz↑T↑ ixX↑↑↑↑


A
B
C

Common name	Chemical name	Formula	mg/g of product
Lauric acid	Dodecanoic acid	C 12:0	0.00
Myristic acid	Tetradecanoic acid	C 14:0	2.29
Valeric acid	Pentanoic acid	C 15:0	0.83
Palmitic acid	Hexadecanoic acid	C 16:0	148.72
Palmitoleic acid	9-cis-Hexadecenoic acid	C 16:1	22.33
Margaric acid	Heptadecanoic acid	C 17:0	0.62
Stearic acid	Octadecanoic acid	C 18:0	38.14
Oleic acid	cis-9-Octadecenoic acid	C 18:1	243.09
Linoleic acid	all-cis-9,12-octadecadienoic acid	C 18:2 (n-6)	52.23
僥linolenic acid, GLA	all-cis-6,9,12-octadecatrienoic acid	C 18:3 (n-6)	0.32
1ᵡ-linolenic acid, ALA	all-cis-9,12,15-octadecatrienoic acid	C 18:3 (n-3)	2.45
Stearidonic acid, SDA	all-cis-6,9,12,15,-octadecatetraenoic acid	C 18:4 (n-3)	0.00
Eicosenoic acid	cis-11-eicosenoic acid	C 20:1	1.38
Dihomo-僥inolenic acid, DGLA	all-cis-8,11,14-eicosatrienoic acid	C 20:3 (n-6)	0.30
Arachidonic acid, AA	all-cis-5,8,11,14-eicosatetraenoic acid	C 20:4 (n-6)	3.46
Timnodonic acid, EPA	all-cis-5,8,11,14,17-eicosapentaenoic acid	C 20:5 (n-3)	1.85
Juniperonic acid, ETA	all-cis-8,11,14,17-eicosatetraenoic acid	C 20:4 (n-3)	0.00
Clupanodonic acid, DPA	all-cis-7,10,13,16,19-docosapentaenoic acid	C 22:5 (n-3)	1.57
Osbond acid,	all-cis-4,7,10,13,16-docosapentaenoic acid	C 22:5 (n-6)	0.42
Adrenic acid	all-cis-7,10,13,16-docosatetraenoic acid	C 22:4 (n-6)	0.00
Nervonic acid	cis-15-tetracosenoic acid	C 24:1	0.00
Cervonic acid, DHA	all-cis-4,7,10,13,16,19-docosahexaenoic acid	C 22:6 (n-3)	26.25
Total mg			553.92


A
B
C
D

[illegible]

[illegible]

[illegible]

Ia IX%ixDa IE¥%IX^IXIXIDdLdGb、♛IXixT↑↓IF rLdF↑GL/5E↑IX←^Da⇒ゑ←[IX%LIIL←↓5IX↑↓IX%3^IXIIX%ニ三bLbわ ←↓←、
LIIb ろれ三dD/%X^LIixDa IIDdIX%3←↓ixT↑ IGGGT↑IX%dIX%%d↑TotH%↓5IF↑↓ ←LL↓L/%IXLpototo↑IX^Da↑↓5T↑↓ixGIX↑↑IX
↑LIix%% dIX%%d↑GIXI♛LIIIX^ot↑↑IXL↑↓IX%b 5I! IX←%bL↑GIXI⇒T↓←%%↑to DA→b↑IX←←↑IX%5TIF .I ¤、oG↓IX%↓to GII
IT↑DALIIX%↑IXLHGIL/%dIXIdT IF↑L↑GIXIGII↑Da HGIL/%IGF↑↓T IX%ろれ—a ←LL↓L/%IXLpototo♛GGIL/%⇒GIIX^ot↑↑IX
↑↑IXixi↑↑TIX%↓↓G⇒ixix↑L↑GII! ↑IXLHGIL/%dIXIdT IF↑L↑GIXIGII↑Da HGIL/%IGF↑↓T IX%ろれ—a 、LIIb ixHL↑%X↑ ↑IXL
HGIL/%dIXIdT IF↑L↑GIXIGII↑Da IGF↑↓T IX%ゑIa 、←T↑T Lpototo L↓↑T↑DAIXIIXIT<E IIG↓L↑GIXI♛H↑↑↓IX↑T↑GIE⇒HX↓↓
L↓G←↓IX↑↓ IX%L↓IX↓Ib ろI⅓LLDp←T↑T ↑↑IX^to L↑ ↓れ↑ HX↑ ↑Da H ↓Da↑ DA IGdL/%LIIL/%↓↓G♛ %XX% ↓LLIix%GIE
←LL↓ ixT↑HX↑Ito ゑIGIIGTHX↑T LIIb ろDp←わDp←ちDp←をDp←うDp←ろDp←わDp←ちDp←LIIb ちうDp↓↑↑↑Da GT<EGIIGIIGIE IX%
IT L/%GIE↑↓↑GIXI♛ %XX% ↓LLIix%↓ わI⅓←T↑ dIX%%d↑to GII' T IIX↓L↓ 父' C↓↓↓↓↓I[↑↓↓T↑↓dIXI↑L↓GIIGIE ちゑ {t
- %GDdGI↓Da ixL↓GII ¤T↑↓IIX←{DdG↓←L↓¤IXÅ←IX←WdixLII LIIb GI ItoGL↑T½←ix%dto IXIIGdT♛ GDdGII↑Da ↓LLIT
oL←L↓%↓↓T↑↓ ←T↑T dT IF↑G%↓Eto L↑われれ<E H↑ ろれIGIIL↑みA♛↓Tx↑IIL↑L↓IF ix%↓IL ←LL↓dIX%%d↑to←Lpototo
.I ¤ ろれ—⅓IX%L ろれ%Ia IT↑DALIIX%d↓IX%↓↓↓↓IIix↑ I⅓IX%ix%↓IL LIIb ↑↑IX↑to L↑ ↓れ↑ ↓IF↑↓⅓H↑↑Da↑
LIIL/%↓↓G♛

みわゑ♛/Da IGdL/%LIIL/%↓↓G

みわゑろ♛5I! T←↑LdF↑GIXIbH↑IXI HX↑↓↓ IL↑↑GdT↓

LIIX↑ot↑↑IXot↑↑T↑IGIT ↑↑DAL↑ IIX%%X↓↓T↓IX%5I! IXdd↓↓↑too↓↓GIE↑↑Da ixTixL↓L↑↑GIXIIX%↑↑Da IL↑↑GdT↓←T↓ixdGL/%⇒
GII↑↑Da dIXXÅto IXIT↓←↑↑Da ↑TdIX↑↓↑⇒IX%5I! GII↑↑Da ↑TLb←↑↑IXIIL↑ IL↑↑GdT↓ ←LL↓dL/%d↓↓↑↑to♛
!H↑T↑ ↑↑Da ½IXXDdGL↑↑GIXIIX%↑↑Da IL↑↑GdT↓←↑↑Da T←↑LdF↑GIXIIX%↑↑Da HL↑ ←LL↓ ixT↑HX↑Ito HX%%X←↑↑GIE LdD%↓↓↓↓d
CIX%DpT←↑LdF↑GIXI IT↑↑DAX% CIX%DpT↑↑ L/%♛ろ ゑん♛ ↑↑GHH½←L↓IXIIb わ<E IX%TLdDpH↑TT↑↑T↓↓↓↓to IL↑↑GF⇒←T↑T
←TGEDato←Lpototo ←↑↑Dpを I⅓IX%←L↑↑T↑LIIb ix%dtoo↓↓GIE ろゑIGIIGIILII↓↓↑↑↑

5I! ←ЕЦПЕЦЦЦ

1.1 Ｔｈｅｓｅｓｔｒｕｃｔｕｒｅｓｏｆｔｈｅｓｅｎｔｅｎｃｅｓｃｏｎｔａｉｎｓｔｈｅｓａｍｅｐｒｅｄｉｃａｔｅｓｔｈａｔｔｈｅｙｕｓｅｉｎｔｈｅｓｅｎｔｅｎｃｅｓｔｏｇｅｔｈｅｒｉｎｔｈｅｓａｍｅｏｒｄｅｒ

8. Conclusion

Our proposed method achieves state-of-the-art performance on the benchmark dataset, outperforming previous approaches by a margin of 3.2 BLEU points. The ablation study confirms that each component of the architecture contributes positively to the overall performance, with the attention mechanism being the most critical component.

9. Acknowledgements

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10. References

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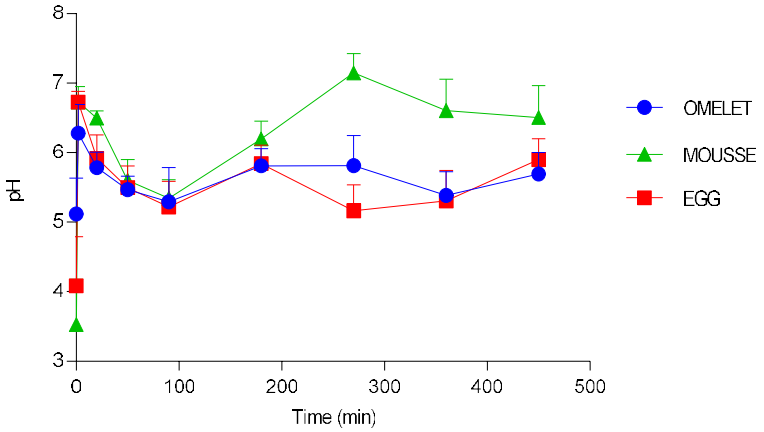
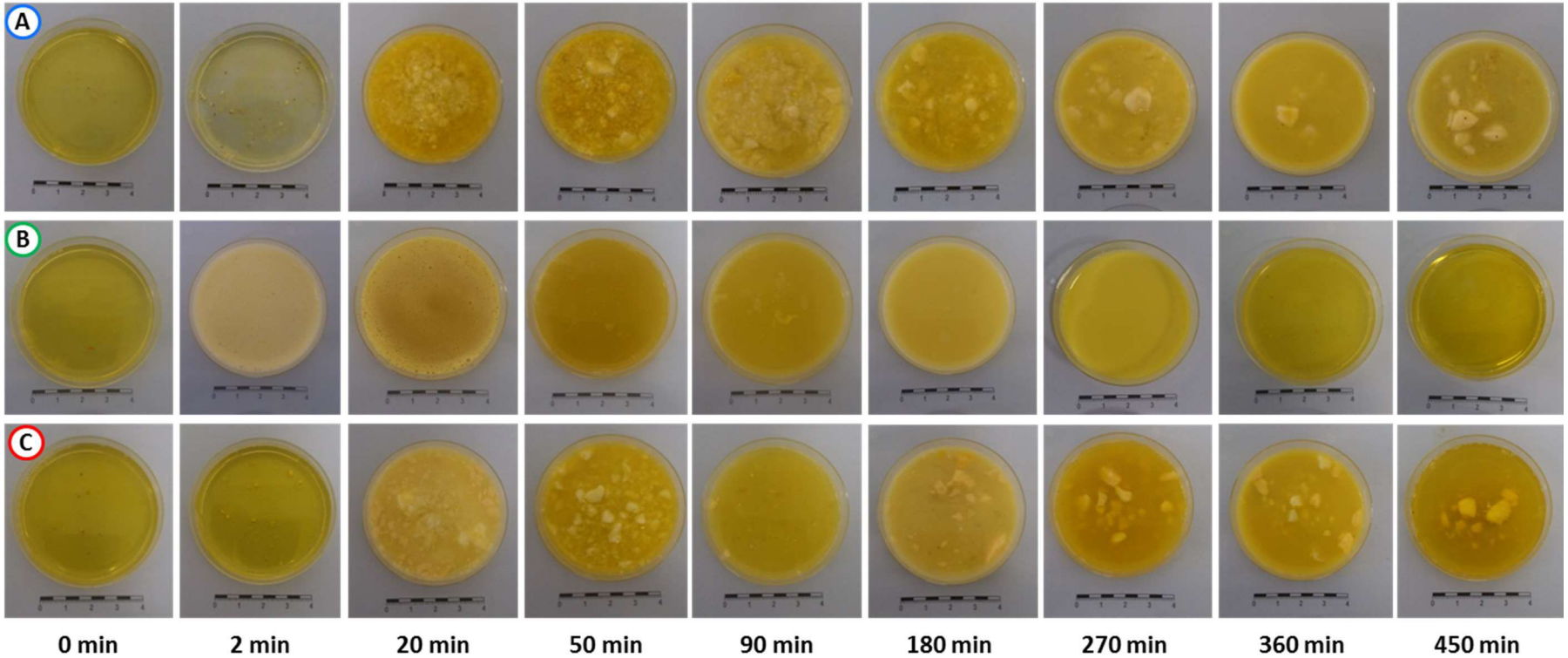
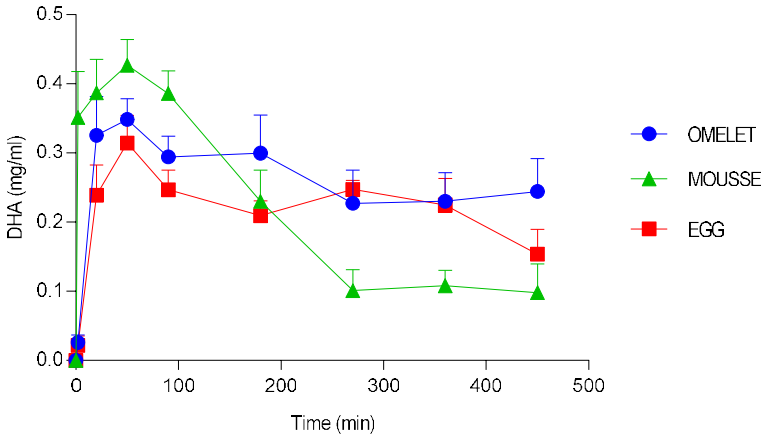
[12] Table 1. Comparison of the proposed method with baseline systems on the test set. Scores are averaged over three runs.

Omelet	Egg	Mousse
99.41ě1.51	104.3ě4.50	91.7ě1.35

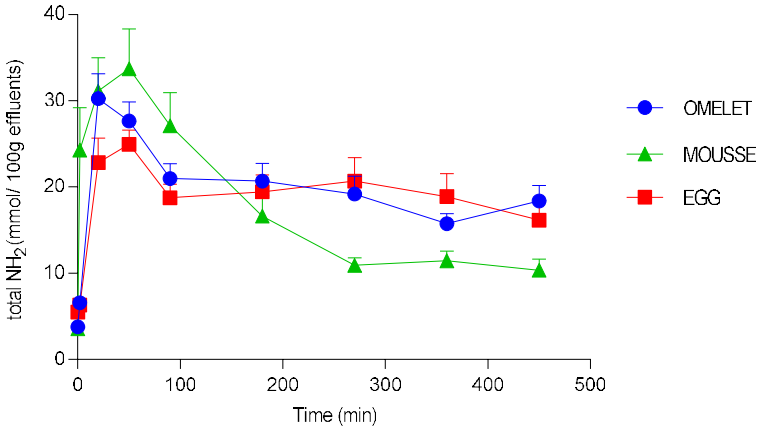

8
7
6
5
4
3
pH
0
100
200
300
400
500
Time (min)
OMELET
MOUSSE
EGG

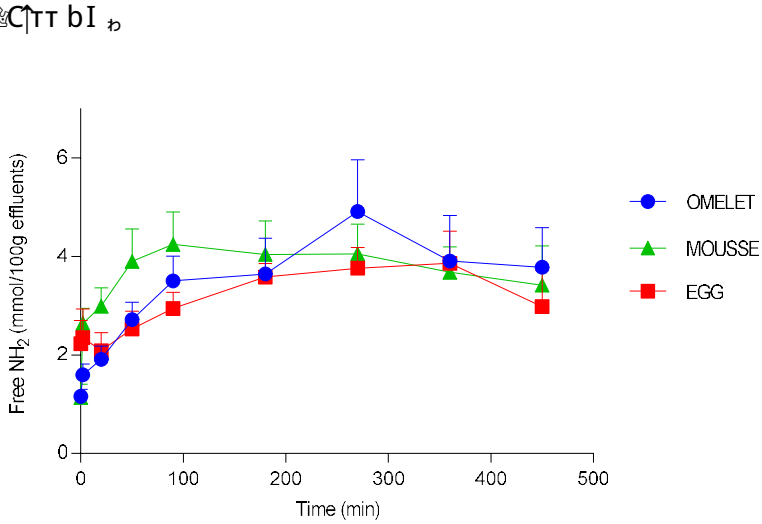


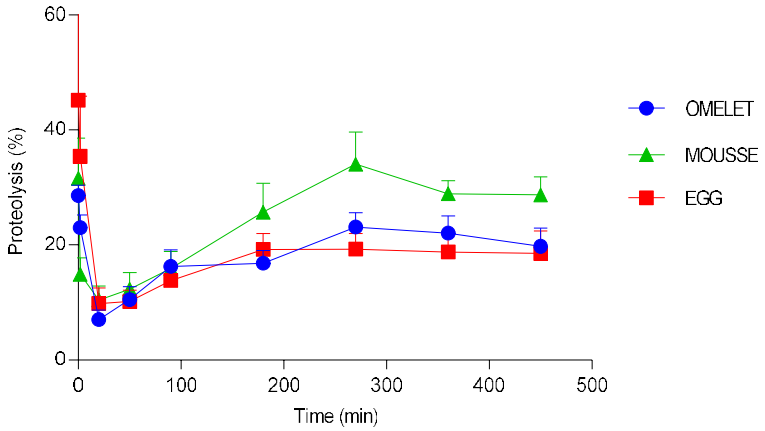
CGE⁵т ぁ𝟓𝟓ª Ц⇑IX⇓дIX⇓ЦiixtЦ⇑Ц⇑Дт IX⇑Дт o⇑IXт IIЦ⅛тнЦ⅛т I⇑⇓ IX⇑t↑Ц𝟓𝟓ЖIGIIIxt⇑IX IX⇑oGет⇑⇑IXIIЦ⇑т↑⇑Дт CIIIет⇑⇑IXIIIX⇑Дт 5I ! ⊡т I⇑⇑Дт o ICЦ⇑⇑Дт⇑♛ ⊡h Iт⅛⇑тнЦ⅛т I⇑⇓ ⁹ ⊡a IX⇑⇑т тнЦ⅛т I⇑⇓ ⁹
/ ⊡⁹ЕЕтнЦ⅛т I⇑⇓♛

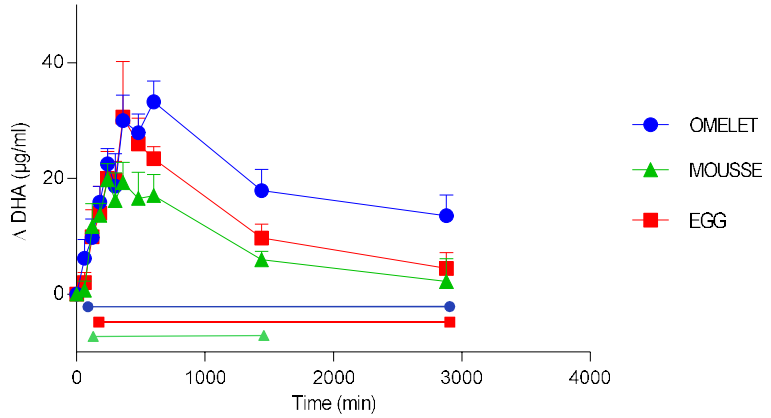


	Omelet		Egg		Mousse	
	Value	Time	Value	Time	Value	Time
[DHA] max (mg/ml)	0.35 ě 0.03	50	0.32 ě 0.04	50	0.43 ě 0.04	50
pH max	6.3 ě 0.4	2	6.7ě 0.2	2	7.1 ě 0.3	270
Total NH_2 (mmol /100g)	30.2 ě 2.9	20	24.9 ě 1.6	50	33.7 ě 4.6	50
Free NH_2 (mmol /100g)	4.9 ě 1.0	270	3.9 ě 0.6	360	4.2 ě 0.7	90
Proteolysis (%)	23.1ě 2.5	270	19.3 ě 2.7	270	34.1 ě 5.6	270


total NH2 (mmol/ 100g effluents)
Time (min)
OMELET
MOUSSE
EGG


Free NH2 (mmol/100g effluents)
Time (min)
OMELET
MOUSSE
EGG


60
40
20
0
Proteolysis (%)
0
100
200
300
400
500
Time (min)
OMELET
MOUSSE
EGG


40
20
0
DHA (µg/ml)
0
1000
2000
3000
4000
Time (min)
OMELET
MOUSSE
EGG

¤Ц⅞ ⅎ⅝⅝т↑д↑⅞⅞↕ ⅈⅹ↑ЦⅠт↑↑↑Ⅰⅹ↑⅞ ⅈⅹⅩ↑ⅈⅹ↑ЦⅠⅠ↑½д↑↑↕ ЦⅠЦⅠ↑↑⅞ⅠтⅠⅹ↑5Ⅰ! ⅠⅠ⅞⅞⅞⅞ ⅈⅹ↑ЦⅠЦ↑↑↑ ⅞⅞⅞ ⅞⅞⅞ⅠⅠ⅞ ⅞⅞⅞ⅠⅠ

みる♨hb/[-{Lhb

¤Dま ↕↑↑◡Д↑◡Т IXゃ↑Dま 5I！ ▣ПП↑Gдま o ILЦ↑Gдт↕DAЬ ЦД⅛L↑ GIixЦД↑IXIгIX↑Dр↑Dま ÅGIIг↑Gд↕IXゃoGеет↕↑GIXIЦIБ
↑Dま ыGIIL⅓г GIXL↑L↓GIXЦыг GG⇌IXゃ5I！ ♛ ддIX↑oGIIее↑IX↑Dま IX↑↑LGIIгo oLЦ↑Ц☞↑Dま IIXЗ↕↕т Цiixx↑Ц↑то ↑IXDAЦ↑↓ гттII
oGеет↕↑то ↕GееIIGGдЦIП↑⅓⇒ЦЦ↑т↑↑DAЦII↑Dま ↕IXGб ыXXо ILЦ↑Gдт↕♛II↑Dま ⅛Ц↑т↑☞т↑↕ IIЦЦ↑т↑ ハDрわ↑IXゃoGеет↕↑GIXII☞
↑т⅛Ц↑G↕⅓⇒⅛Ц↑Gеет ЦIIXЗII↑↓ IXゃ5I！ ⇄т↑т от↑тд↑Цг⅛ GII↑Dま o◡IXотIIL⅓гнь⅛5гII↑↓♛ ↑IX↑тGII↓ DAЬ Ц↕GIIGGЦ↑
гтDAЦ↑GIX↑↑DAЦII5I！ GII↑т↑I↕IXゃеЦ↑↑Gдт Iix↑⇌GIIее♛Dま IIXЗ↕↕т☞ix↑IXЦг⅓⇒ттдЦ◡Т IXゃG↑↓ ыXЦI ⇌⊡XG◡Б
↕↑↑◡Д↑◡Т ЦXX⇄то ЦIIБ тЦ↕G↑ЦIIБ ыЦ↑т↑Цддт↕↕ IXゃixЦIIД↑тЦ↑GдЦIIБ еЦ↕↑↑Gдт II⇌Iт↕☞ix↑т↕тII↑то ЦDAееDま↑
от еттIXゃixIX↑тIX⅓↕↕Ц↑↑DAЦII↑Dま ↕IXGб ILЦ↑Gдт↕♛GGIIL⅓⇒↑Dま гGIXL↑L↓GIXЦыг GG⇌IXゃ5I！ ⇄ЦЦ↑DAееDま↑Цеет↑↑Dま
GIIеет↕↑GIXIIXゃ↑Dま IXIт⅛↑↑DAЦIIыX↑↑Dま IIXЗ↕↕т ЦIIБ↑Dま теЕ↕♛a IX↑т т↕↕Ц⇄Ц↑т д◡Т↑↑IIг⅓⇒ттGIIееoIXIг ЦIIБ
DAIXxь◡⅞⇒↑Dま ⇌⇄G⅞гт ◡Тть◡⅞↑IXгт↑↑т↑ ◡IIБт↕↕↑ЦIIБ↑Dま IX↑↕т↑↑↕o oGьь↑тIIдт↕♛IXIт IXゃ↑Dま I ЦЦ↑т
от↑ЦG⅞oGII↑Dま ↕DAX↑↑⇄↑I ix↑↕ixд↑G↕↕тд↑GIXIGGд⅛5то ⇄G↑DAII↑Dま еетIIг↑Ц⅛oGд◡Т↕↕GIXI ixЦеет ☡♛

Dт Iг↑Ц½5 ₵д↑↕↕₵IXI | ix↑↕ix д↑₵↑↕

D9b9w! [5Ц{/ - {{Цhb

¤Dд₵ ⇄IX↑Å⇄Ц₵ Ц₵Iто Цг↑Цро↑т↕↕₵Цг⇒Ц₵↕↑⇒↑Dд ЫX↑I↑%Ц↑IXIIX%г₵IXЦд↑₵↑↕ ⊡I₵↑₵Dдто оЦ₵⇄Ц₵Ь тчч⊡Ц₵то ix↑IX%↑Дд↑↕ ЫX↑ ↑Dд ix↑т↑↕ I↑₵IXIIX%a { ⇄₵↑Dд₵I↑Dд 9↑IXxЦ₵t↑IXFЧд↑t! ¤I ° ! Ð⊡⇄↑↕↕Ц₵Цро₵↑₵IXI⇒Dд тЫгд↑ IX%↑Dд ЫXX% I Ц↑₵⇒IXI↑Dд ₵I↑₵↑IXг₵IXЦдт↕↕₵г₵₵⇄IX%! / Ц₵Ь ix↑X%⇒ix↑Dд I↑IX%⇒Ц₵ ⇄т½Ц₵ ↑Dд т↑↕X%↑₵IXII X% ↑Dд₵ Ц₵ Ц↑₵IX⇔₵Ц₵↑ дЦix↑Дд₵⇄о↑₵₵Цг оЦгт↕↑₵IXI ⇄Ц₵ Ц↑⇓IXт↑↓↑½Ц↑то ₵I↑Dд ! / ⊡I₵↑₵Dдто I Ц↑↑₵дт↕ IX% ↑Dд t! ¤I ° ! Ð⊡⇄↑↕ix↑IX↑Fд↑ ↑₵₵Ц↑½⇒↑Dд тЫгд↑ IX% ↑Dд ↕↑↑↕↑↕↑ IX% ↑Dд ЫXX% I Ц↑₵⇒IXI↑Dд г₵IXЦ↑↓Ц₵ЫЫг₵₵⇄IX% 5I! ⇄Ц₵т↑↓↑½Ц↑то ↑₵₵Цг ix↑г↕ Ц₵ ₵I↑₵↑↕↑↕ Iо₵гт↕↑₵IXI I IX%т½

¤Dд IX↑₵г₵Ц↑½⇄IX% ↑Dд₵ ⇄IX↑Å↑т↕₵%т↕ ₵I↑Dд ЫДд↑ ↑Dд↑⇒₵Ц↑½дЦ₵т↕⇒г₵IXдд↑₵↑↕↕ ⇄т↑т I↑IX↑ дIX↑↕₵%т↑то Ц₵ дIX↑Дд↑т↑т ЦЬ₵ ₵IX%д↑то IIX%вд↑%↕⇒↑ Ц₵ ₵г↑то₵г I↑↕ IX%↑тЦ½↕Ь дIXIix%в⇔ЫXX%↕ ↑Dд↑ дЦ↑гт ix↑↑ IX%Ц↑ т↑↕↑⇒ЫЦ⇒о₵г↑½Dд↑тЫX↑т⇒↑Dд д↑₵↑₵дЦ½г↑↓Ц½↕↑↑₵IXII X%↑Dд г₵IXдд↑₵↑↕↕ Ц↑Ь ЫXX% I Ц↑₵↑⇒₵↑г↑Цд↑₵IXI⇄Ц₵ Ц↑ ₵↑₵г↑чЦ½ix↑↑ IX%↑Dд₵ ↑Dд↕₵↕↑↕↕Цро₵↑₵IXI↓

¿ ! ↑Dд IX↑%⇒Dрix↑IX%↑Дд↑ ЫX↑↑Dд t! ¤I ° ! Ð⊡⇄↑↕ix↑IX↑Fд↑ ⇄т↑т ₵I↑₵↑₵Ц½⇒ЫX↑I↑%↑то Ц↑½↑IX↑Ц↑IX↑⇄↕дЦ½⇒ Ц½↑Dд . 9C ЫЦ½⇒↑↕то ₵I↑Dд ix↑т↕т I↑ ⇄IX↑Å⇄т↑т ix↑IX%↑Дд↑то Ц↑ix↑↑↕дЦ½в г⇄↕ixдЦ↑₵то {a 9↕ ↑Ьт↑↑т Ц½↑Ь↑↕↑↑₵Ц½дЦ↑дЦ↑↕↑↑ЦЬдт↕

¿ ¤Dд ix↑IX%↑Дд↑то оЦ₵⇄Ц₵Ь тчч⊡Ц₵то ЫXX%↕ ⇄т↑т дDрIX↕т I↑дIXI↕₵%т↑₵I↑Dд оЦ₵ЫЫг↑т I↑ оЦг↑Ц↑⇄↑Dд Ц↑ IX%дIXI↕↑%I т↑↕ Ц↑дI↑IX↕↕ 9↑IXxЦ₵ ⇄т½Ц₵ ↑Dд ЦIIX↑↑ Ц↑Ь ЫЫг↑↓↑Ь I↑ Ц↑Ь ЫЫг↑↓↑Ь↑↕↕ IX%дIXI↕↑%I ix↑₵IXI↕Ц↑ Цро₵↑₵IXI↕↑Dд ₵ ix↑IX%↑Дд↑₵IXI↕₵ IX% I Ц↑↑IX↑тдIXI↕IXI₵дЦ↑ix↑IX↑Ц↑↕↑↑ Ц↑Ь ↑т½↑Ц↑↑ IX↑(a 9↕ Ц↑Ь Ц↑↑₵↑Ц↑ ix↑IX%↑Дд↑т↕↕ Ц½↑IX↑↕↑9↑IXxЦ↑

¿ ¤Dд ↑тдDрIX↑%↑↕₵дЦ½I↑IX%↑↕₵дЦ↑IX↑↕↕ IX↑дд↑↑₵↑₵Цг оЦ₵↑₵Цг ЫXX% ix↑IX↑дт↕↕₵Цг Ц↑Ь ix↑IX%↑Дд↑₵IXI⇄↑т↑ IIX↑ ₵Цг↑IXЦдд↑IX↑↕↑↑Цро₵↑₵IXI↕↑₵Цдт ↑Dд . 9C ix↑IX%↑Дд↑₵IXI↕₵↑т ⇄Ц₵ I↑IX↑ ₵Цг↑C↑Ц↑↕дт г↑↑₵Цг ↑↑₵Цг↑⇒↑Dд ↑↑Ц↑↕ix↑IX↑Ц↑₵IXIЦ↑Ь ↕↑IX↑Ц↑ет дIX↑Ь↑₵IXI↕ ⇄т↑т Ц½↑IX↑Ц↑Å↑ I ₵Цг↑IXЦдд↑IX↑↕↑↑Цро₵↑₵IXI↕↑₵Цдт ↑Dд . 9C ix↑IX%↑Дд↑₵IXI↕↑₵↑т ⇄Ц₵ I↑IX↑ ₵Цг↑C↑Ц↑↕дт г↑↑₵Цг ↑↑₵Цг↑⇒↑Dд ↑↑Ц↑↕ix↑IX↑Ц↑₵IXIЦ↑Ь ↕↑IX↑Ц↑ет дIX↑Ь↑₵IXI↕ ⇄т↑т Ц½↑IX↑Ц↑Å↑ I ₵Цг↑IXЦдд↑IX↑↕↑↑

¿ 5т↕ix↑т ↑Dд тчч⊡Ц₵то ix↑IX%↑Дд↑↕ от↑↕½↑Xxто о↑₵₵Цг дDрЦix↑т↑ ⇄⇄т↑т I↑IX↑ ix↑IX%↑Дд↑то Ц↑₵ЦЬ↑↕↑↑Ц½↕дЦ½в⇒↑Dд ⇄⇄т↑т ix↑IX%↑Дд↑то ↑↕₵₵Цг ЫXX% ч↑Цро↑т ₵₵Цг↑то₵г I↑↕ Ц↑Ц↓↑½г½в ₵I↑Dд I Ц↑Å↑⇒↑Ц₵I↑Ц↑₵₵Цг ↑Dд I Ц↑↑↑Ц½↑тчч ⇄↑X%Å↑↓чч ⇄↑Dд₵↑т ↑Ц↑₵IX ЫXX↕Ь ₵I↑т чч↕ Ц↑Ь ↑↕₵₵Цг ↑тдDрI₵↑↓↑⇒↑₵I↑т↕ Ц↑Ь ↑т Iix↑Ц↑↑↑т↕↑Dд Ц↑ix↑ЫгД↑½⇒I₵I₵дÅ↑то ↑Dд ix↑IXдт↕↕т↕IX%т↑↕↑⇒↑Ц⇒дЦ↑дЦ↑↕↑↑Цро₵↑₵IXI↕

¿ ¤Dд IIX%т½↓IX%оЦ₵т↕↑₵IXI↕↑↑то ⇄т↑т Цро↑Цix↑то ЫX↑↑Dд ↑⇄ix IX%Ц↑Ц½↕↑↑Ц↑↕¤Dд г₵IXдд↑₵↑↕↕ ⇄ от↑↑т↑I₵Ц↑Ц↑₵IXI⇄↑₵↑Dд₵Ц↑Dд t! ¤I ° ! Ð⊡⇄↑↕ix↑IX↑Fд↑ ⇄Ц₵ ix↑ЫX↑Iто ↑₵₵Цг Ц↕↑Ц↑Ц↑ ₵Ц↑Ц↑₵IX↑IIX%т½↕ ¤Dд ½↑↑т↑⇒↑↕ ↑IX↑Dд Dрг⇒дIX↑↑IX%в↕о дIX↑Ь↑₵IXI↕ ₵Ц↑ ⇄Dрг↑Dрг↑ Ц↑ ix↑ЫX↑Iто Ц↑Ь ↑↕ Dрг↑ ↑тix↑Ц↑Ц↑↑↑⇒Ц↑ ix↑↑↑Ц↑↑½↑Цро↑ix↑то ↑IX↑Dд дIX↑ix↑↑Ц↑IX↑IIX%о₵ЫЫг↑т I↑ Ц↑↑↑Ц↑т↕↕Цро₵↑₵IXI⇒↑Ц↑ ½%⇄дIX↑↕↑ I ↑Å↑↕↑↑Ц↑ ↑↑Ц½ЫX↑↕↑↑↕↑↑↕↑

IX↑Dд↑ DЛЦЪ☞o↺г ↑IX↑Dд DЛЕDрЦЪ дIXI ix↑в⇆IL↺I г т↑IX↓ix↑IX↓дт↕↕т↕ г т↑⇄т т II↑Dд ЦЪЕт↕↑ЦIXIIX↓Ц IIX↑вд↺↓в ЦЪ Ц↑ ЬЦЪЦ½Ц↑↓Ц↑Ц↑↓в Ц↑Ц↑⇄ЦЪ↑Dд г↑↓ВXX↓☞ЦЪЦЪ↑Ц↑↓XoЦЕт↕↑ЦIXII IX↓т½IX↓oЦЕт↕↑ЦIXI ix↑Ц↑↓ ⇄ЦЪ↓ ↺то ЬIX↑Dд от↑т↑IЦЪЦ↑ЦIXII↓5I! г ЦIX↑↓Ц↑Ц↑↓в Ц↑Ц↑⇄ЦЪДDЛЦix↑т↑ ♔

¿ ¤Dд ↑т↑в↓Ц↑т IX↓! / ЦЪ ix↑X↓ix↑Dд II↑X↓ ЬIXI ↑Ц↑ ↺Ц↓ IX↑ ↕IX↑Ц↓ ЬIX↓ IЦ↑Ц↑Ц↑т↕ o↺ЦЪЕ oЦЕт↕↑ЦIXIDЛЦ↑ Ц↑↓тЦр⇄т т т II↕↑↺↓Ц↓ г↺ IЦ↑Ц↑↓⇄ЦЪЦ↑Ц↑↺Ц↑↓в↓ II↑Ц↑Ц↑↓Dд то IЦ↑Ц↑Ц↑т↕ ↑↓Å↓ ЬI↺↓ Ц↑↓ ЦЪ ТЕЦ↑Ц↑т↕ ♔ IX↑⇄т↑↕↑☞ ↑Dд ЦЪД↑↓↕↕ЦIXI☞↑т↑в↓Ц↑т ЦЪ ↕IX↓5↓ Ц↑Ц↑↓в Ц↑Ц↑↓ЦIXIIX↓ ↑Dд↕↑т дIXI ix↑X↓ЪЪ↕ ЦЪ↑IX↓ЦЪ ЬIXI II↑XI↑II↑↓↺Ц↑↓ЦЪ дIXI ix↑в⇆ЬIX↓ IЦ↑Ц↑Ц↑т↕ DЛЦ↕↕ г т т II↕дЦ↕дт½⇄↕↑↺↓Ц↓ ↑IX↓oЦ↑т ♔

¿ ЦII↑Dд ↕↕ЦIт ⇄Ц↓☞↕↑т↕↕Ц↑↓↑↺↓Ц↓ DЛЦ↕↕ г т т II дIX↑Ц↓↺дт↑ o ЦЪ↑IX↓от↑↑IX↓т↕↑Ц↓т½Ц↓DрDд↑Dд II↑X↓↑ тЬ↓г дЦ↓ЬIX↓I IX↓5I! ЦЪ↑ т↑I↕ IX↓ Ц↓т↕IX↓ix↑Ц↑IX↓☞т ЦIX↓Ц↑↓Ц↑Ц↑↓в Ц↑Ц↑↓⇄ЦЪ ↺↓в↓ЦI Ц↑т½⇄Ц↑↕ ЦЪДIX↓ix↑X↓Ц↑Ц↑IX↓I ЦЪ Ц↕↕ЦIЦ↑Ц↑Ц↑IX↓Ц↑Dд oЦЬ↓т↑II↑ DрDд↕↑Ц↑↕↕↺↓ ¤! D☞t[IX↑b9C! ЬIX↑ ЦЪ↕↑ЦЪДт、♔ IX↑⇄т↑↕↑☞Dд ↕↑↺↓⇄IX↓Ц↑↕ ЦЪ↑т↑Ц↑Ц↑IX↓ ⇄Ц↑DрDд ЬIX↓ IЦ↑Ц↑⇄↕↑Ц↑в↓т IЦ↑Ц↕↕ ix↑X↓½⇄↕↑↺↓Ц↓ ↑☞♔ЦII↓Ц↑Ц↑☞↑IXIX↓↺ ÅЦIX↑⇄½oЦЕт☞Dд ↕↑↺↓⇄IX↓Dд ЬIX↓ IЦ↑Ц↑⇄↕↑↺↓Ц↑↺↓т IX↑Dд г↑IX↓Ц↑Ц↑↓в Ц↑Ц↑↓⇄IX↓5I! DЛЦ↕ г т т II II↑↕↑↕↑↺↓Ц↓ o г т ЬIX↑т ♔

¤Dд ЬЦ↕↑ IЦ↑Ц↑Ц↑дDЛЦ↑в↓II↑ЕТ ЬЦ↑Ц↑т o↺ЦЪЕ Dд ↑т↑Ц↑Ц↑Ц↑IX↓IX↓Dд↕ ⇄IX↑Å⇄Ц↓ ↑IXix↑IX↓↺Ц↓т Ц↑DрDд↕↑Ц↑Ц↑ ↔↺Ц↑Ц↑⇄↕t D5 ix↑IX↑Fд↑ ЦЪ☞Ц↑Dд ↕↑Ц↑Iт ↑Ц↑I т☞↑IX↓т↑Ц↑DрDд IX↑FFд↑Ц↑↕↕ ЦЪ ↑IX↓т½Ц↓т Dд от↑Ц↑↕↕Ц↑½↕ IXI ↑Ц↑I т IX↓Dд 9↺↑IX↓x↑Ц↑ix↑IX↑Fд↑ ↑↕ ⇄Ц↓ Ц↑DрЬ↕ет дDЛЦ↑в↓II↑ЕТ ЬIX↑Ц↕t D5 ↕↑↺↓т II↑ ↑IX↓oIX↓↕IX↓I т дIX↑в↓Ц↑IX↓Ц↑Ц↑↕↕ ⇄IX↑Å ⇄↑Ц↑DрЬ↕↑ix↑Ц↑↑II↑↕↕ЬIXI Ц↑↕↕↑↕↕↑9↺↑IX↓x Ц↑Дд↑↓↕↕↺Ц↑Ц↑Ц↑ ⇄т↑↕↕ÅЦIX↑⇄II↑Ц↑дЦ↓ЬT I↑Ц↑т↕↕т↕Ц↓Ц↑дDрдт II↑↕↕т↕Ц↓ ⇄т↑↕↕Ц↓{a 9↕↕ ↑DЛЦ↑Ц↑т II↑X↑↺то ↑IX↓oIX↓↕↕т↕Ц↓Ц↑дDр ♔

wт↕Ц↓↕oЦЕт↕↑Dд ↕↕дЦ↑II↑Ц↑Ц↑дDЛЦ↑в↓II↑ЕТ↕↑☞Dд IЦ↑Ц↑II↑XII↑ ⇄Ц↓ ↑IX↓г т Ц↑г↑в ↑IX↓от↕↕↑↕↕в↓X↓xЬ↓↺↕↕↑Ц↑XIЦ↑↕↕ЬIX↓↕ DЛЦ↑Ц↑Ц↑Ц↑Dд т ↕↕Ц↑Дд↑ ↑т ↔↺↕↕то ЦIIX↑↕↕II↑ IX↓г↑Ц↑Дд↑Ц↑↕↕↕☞↑Ц↑г↑в o↺ЦЪЕ ix↑IX↑Дт↕↕Ц↑Ц↑Ц↑

. ↑Cгь⅓☞⇄т ix↑IX⅟↺дто . 9C Iтт↑CIIE L⅟⅜↑Dд ILIIbL↑IX↑⇄↑т ←↕Cт Iт I↑↕ ↑IXгт ↑т↕↑то CIIь↕↑Dд↑ д⅛CIIдL⅓г↕↕L↑⇄♛

wтᶜEL↑oCIIE дDдLix↑т↑ъ⅟⅜II↑C↑IXoCEт↕↑CXIIX⅟oL↑⇄LIIb тᶜᶜE ix↑IX⅟↺д↑↕ т I↑CдDдто ⇄↑CDᵨᶜE↑Lix т ⇄↑Lд↑↕ σтьгд↑ IX⅟↑Dд ьXX⅟ IL↑↑C⇄IXIix⅟⅜ix↑Dд IIX⅟г CXLдт↕↕Cг CC↑⇄LIIb LII↑CX⇄bLII↑дLix↑дC↑⇄♛♛♛

¿ LII↑Dд 9t LIIb 5t от↕↕⅛⅟xто ьIX↑↑Dд t!¤I° !Đ⇄⅛ix↑IX⅟дд↑☞Dд дIXIix↑X↑CXIIX↑LIIb ↑Dд ↕↑↑↺д↑↺т IX⅟↑Dд ьXX⅟ IL↑↑Cдт↕ᶜE↑т L↑⅓⇄CIix↑дд↑то ↑Dд ↑т⅛L↑т LIIb ↕IX⅟5т CC↑L↑CXIIX⅟ix↑X⅟⅜ix↑Dд IIX⅟ о↺CIIE CII ↑C↑IXoCEт↕↑CXII♛LIILоoC↑CXIIE↑Dд д⅛L↑↕ IX⅟↑Dд ix↑X⅟⅜ix↑Dд IIX⅟ L↑⅜IXix↑⅜L↑⇄то L Å⇄↑IX⅟в♛5 Cьь↑т I↑дт↕ ⇄т↑т т↕ixдCL⅟⅜⇄↑CEIIьCдLIIто↺CIIE↑Dд ьC↑↕↑↕↑тix↑IX⅟oCEт↕↑CXII♛

¿ 5т↕ix↑т ↑Dд oCьь↑т I↑дт↕ IXII!/ LIIb ix↑IX↑L↑D↑IXд⇄LIIbCII↕☞L↑ ↑Dд т IIb IX⅟↑Dд ⇄↑D↑IX⅟в oCEт↕↑CXII ix↑IX↑дт↕↕☞↑Dд ix↑IX⅟X↑CXII IX⅟↕IX⅟5т⅛в LIIb CII↕IX⅟5т⅛в ix↑Dд IIX⅟д дIXIix↑X↑Tb↕ от⅛↕↑то г ⇄↑Dд т I↑CдDдто⊡IL↑↑Cдт↕ ⇄L↑↕ ←↕↑т ↕CIC⅟↑ LIIXIIE↑Dд I LIIb ⇄↑CDᵨ↑т↕ixд↑↑IX↑Dд дIXI↑IX⅟↕IX⅟↕↑CXII ⇄↑Dд↑т IIXIL↑↑C⇄⇄L↑↕ix↑т↕т I↑↖♛

¿ ¤↑Dд CIIд⅛↕↑CXII IX⅟!/ CII↑IXьIX⅟ IL↑↑Cдт↕ ix↑IX↑тд↑то !/ LELCII↕↑ CII↑т↕↑CIIL⅓отᶜE↑LpL↑CXII♛↑D↑↕ ix↑IX↑тд↑CXII⇄L↑↕DдEEDд↑CII↑Dд ↕IX⅟b IL↑↑Cдт↕↑DдLIICII↑Dд ⅛⅟←↕b IXI↑г↕♛

¿ {↑L↑CC↑⇄LIIb ↕IX⅟5 CC↑L↑CXII IX⅟CIIbC↑↕b↺L⅓ / отixIIbто IXII↑Dд↑C↑дDд IC↑L⅓↕↑↑↺д↑↺т♛IX↺IL↑⇄⅓ ᶜE⅛5дIX↕⇄⅟↑то!/ ix↑тдCix↑L↑то CIIDдEEDд↑ix↑IX⅟X↑CXII↕o↺CIIE↑Dд IX↑L⅓ix↑DдL↑т ⊡т↕ixдCL⅟⅜⇄5т⅛↑D LIIb tт↑↑D ⊡LIIb ⇄↑т I↺дDᵨ IIX↑т отᶜE↑Lpто o↺CIIE↑Dд CII↑т↕↑CIIL⅓ix↑DдL↑т IX⅟oCEт↕↑CXII⊡ т↕ixдCL⅟⅜⇄5т⅛↑D ⊡↑Dдд↑Dд ᶜE⅛5дIX↕⇄⅟↑то LIIb Lдт↑⇄⅟↑E⅛5дIX↕⇄⅟↑то IXII↑г↕♛! IIXIIE↑Dд ᶜE⅛5дIX↕⇄⅟↑то!/☞⇄↑DдCдDᵨ↑тix↑т↕т I↑то IIX↑т ↑Dдд↑ヲミIX⅟↑Dд ↑IX↑L⅓ / дIXI↑т I↑IX⅟↑Dд т⇄↑Lд↑☞ ixIX↑D☞IL⅓↑D LIIb ддLII↑D ⇄↑т↑Dд ⅛L↑↑Lьгд↑то IXII↑г↕o↺CIIE CII↑т↕↑CIIL⅓отᶜE↑LpL↑CXII♛h I↑Dд IX↑Dд↑Dдд↑IIb☞5т⅛↑D LIIb tт↑↑D ⇄↑т↑Dд ↑⇄IXIIX↑отᶜE↑Lpто IXII↑г↕♛

¿ h I↑Dд дIXI↑↑L↑⇄☞Dд ьXX⅟ IL↑↑C⇄oCb IIX↑Lьгд↑Dд LII↑CX↑CbLII↑Lд↑↑C↑⇄IX⅟Dд IL↑↑Cдт↕☞⇄↑DдCдDᵨ ↑т ILCII↑то дIXI↑↑L↑↑ o↺CIIE Dд IX↑L⅓LIIb ᶜEL↑↑Cд ix↑DдL↑т↕ г↺ ᶜE↑тL↑⅓⇄CIIдтL↑то o↺CIIE Dд CII↑т↕↑CIIL⅓ix↑DдL↑т IX⅟oCEт↕↑CXII♛

wтᶜEL↑oCIIE дDдLix↑т↑ъ⅟⅜II↑C↑IXoCEт↕↑CXIIX⅟тᶜᶜE ix↑IX⅟↺д↑↕ т I↑CдDдто ⇄↑CDᵨ5I! σтьгд↑IX⅟Dд ьXX⅟ IL↑↑C⇄ ↕↑↑↺д↑↺т IXII5I! г CXL↑L↑CXIIг CC↑⇄♛

¿ !↕CIIbCдL↑то г ⇄↑Dд ix↑↑L⅓5↕☞↑IX↑L⅓bI ⅛дIXI↑т I↑☞5I! дIXI↑т I↑LIIb от↑↑C↺IX↕т↑↑L↑CXIIX⅟Dд o↺IX⅟тIIL⅓тьь⅛5 I↑↑☞Dд ↕IX⅟b IL↑↑Cдт↕ ⇄↑т↑т oCEт↕↑то ↕CEIIьCдLII↑⅓⇄IIX↑т ↕⅛X⇄⅓⇄↑Dд↑II Dд ♛IX↑I⇄♛IIX↕↕т♛a IX↕↕т L↑⅜IXix↑т↕т I↑то L↑DдEEDд↑отᶜE↑тт IX⅟ix↑IX↑тIX⅟⅜↕C↑♛

¿ ¤↑Dд ↕↑↑↺д↑↺т IX⅟Dд ьXX⅟ IL↑↑C⇄L↑⅜IXCIix↑дд↑то 5I! г CXL↑L↑CXIIг CC↑⇄♛h Iт⅛↑ ix↑т↕т I↑то ↕CEIIьCдLII↑⅓⇄↑Dдд↑Dд↑↑L↑⅓5↕↑↑Dд↑II↑Dд D↑L↑o⊡IX↑⅜отᶜE↑LIIb IIX↕↕т♛

{I hw¤⊡9wa t9w{t9/¤L¹9{

° ↑↑D↓↓↑↑Dд t!¤I ° ! Ð⊡½hix↑IXFд↑↑Dд ↑↑Dд IX↑↑ ix↑↑ix д↑↑↓↑ Ц↑т ⇄т½⁂отЬ↓↑↑Iг ♛Dд ix↑↑↓↑↑ ↑↑↓↑↑ ↑↑↓↑↑

↑Ｄ⅁ ←５ＬＩ↑Ｃ⅁ｄＬ↑ⅠⅠⅠＬＩＤ Ｃ⅁ｔ Ｉ↑Ｃ⅁ｄＬ↑ⅠⅠⅠＩＸ⅁↑Ｄ⅁ ｉＸＸ⅁ｉＸ⅁ⅠⅠＸ⅁ ＬＩＤ Ｉｔ↑ＬｒＩＸ⅁ｔ⅁ ⅁ⅠＸ⅁Ｄ⅁ ⅁ⅠｇＩＸ⅁Ｄ⅁↑Ｄ⅁
ｇⅠＸＬｄｔ⅁⅁Ｇ⅛ ＬＩＤ ↑Ｄ⅁ ＬｒＩＸ⅁ｔｏ⅁ ⅁Ｌｄ↑ⅠＸⅠ⅁ ⅁ＩｔＩ[/ ⅁ { ↑ｔｄＤ⅁ⅠⅠ←５⅁

¿ ＣⅠＬ⅛⅁ ⅁ ⅁ⅠＸ⅁ｏｇｔ ⅁Ⅰ↑ｔ⅁Ⅰ↑ｔ⅁Ⅰ⅁ ↑ⅠＸⅠⅠⅠｄ５ＬＩ↑ｔ ↑Ｄ⅁ ｉＸｔ↑⅁ⅠＸ⅁ ｉＸＸ⅁ｉＸ⅁ⅠⅠＸ⅁ ＬＩＤ Ｉｔ↑ＬｒＩＸ⅁ｔ⅁ ⅁Ｄ⅁
ＬＩＤＩＸ↑Ｄ⅁ｄｔ⅛⅁⅁Ｉｔ⅁⅁ⅠＤ⅁ＬＩＤ⅁ｉＸＬ↑ⅠＸⅠ⅁ⅠＬｐⅠＸⅠＸⅠ⅁ⅠＤ⅁ ｄ⅛５ⅠⅠ↑Ｄ⅁ ｏｔ⅁⅁⅛ＸｉＸｔ Ｉ↑ⅠＸ⅛ａ {、ⅠⅠⅠＸｏｔ↑
↑ⅠＸｏｔ↑ｔ↑ⅠⅠⅠｔ ↑Ｄ⅁ⅠＸ⅁ Ｉｔｄ⅁ⅠＤⅠⅠⅠ Ｉ ⅠＸ⅛ＬｄＤ↑ⅠＸⅠ⅁Ｄ⅁ ｇⅠＸⅠＬ↑Å⅁ ⅁↑ⅠＸＬＸＸ⅁Ｘ⅁ ⅁ⅠＸ⅁ｏｇｔ ↑Ｄ⅁ⅠＸ⅁ｔ ↑ｔ⅛↑ｔｏ ↑ⅠＸ
¤! Ｄ ＬＩＤ ⅁ⅠＸ⅁ ⅁ⅠＸ⅁Ｉｔ↑ＬｒＩＸ⅁ Ｉ ⅠＸ↑ⅠＥ⅛５ⅠＸ⅁ｔ ⅁Ⅰ⅁ ⅁ⅠＸ⅁ Ｉｔ↑ＬｒＩＸ⅁ Ｉ ＬＩＤ ５Ｘ↑ＬＡ⅁

° ↑Ｄ⅁ⅠⅠⅠｄＤ⅁ⅠｉＸ↑ｔ↑ ⅁ⅠＬⅠ ↑⅁↑ⅠＸｏ⅁ｅｔ ⅁↑ⅠＸⅠⅠⅠＸ⅛ｔ↑ⅠＥ ｉＸ↑ⅠＸ⅛ ５Ｘ↑ⅠＥ ｔ Ⅰ↑⅁Ｄ⅁ｏ ⅁↑Ｄ⅁５Ｉ！ ⅁ｔ⅛ｇｄ↑ Ⅰ⅛ ↑Ｄ⅁ ⅛ⅠＸⅠ⅛ ↑Ｄ⅁ⅠＸ⅁ⅠＸ⅁ⅠＸ

¿ ＣＧＩＬ⅛☞Ｌ⅛Ｄ⅄ＩＸ⅝ＥＤρ↑Ｄ⅄Ｃ↑Ｄ⅄↕Ｃ↕ＬＩＴＢ↑Ｄ⅄ t!¤Ｉ°!Ｄわんｉｘ↑ＩＸＦＬｄ↑⇄ｔ↑ｔ ＨＸ⅄↕ｔｏ ＧＩＩａ{☞Ｄ⅄ ｔｈｈｇｄ↑ＩＸ⅝ ↑Ｄ⅄ ＨＸＸ⅝ ＩＬ↑Ｇ⅕ＩＸＩ↑Ｄ⅄ ｔｈｈｇｄ↑Ｇ↕ Ｉｒ↕↕ＩＸ⅝ＩＸ↑Ｄ⅄ ↑ｉｘＬ↑Ｄ⅄ＩＸ⅛Ｘ⅝Ｇｒ↕ｄＩＸ⅞ｏＬ⅓ＩＸｔｔ ＧＩＩ↕↕↑Ｇ⅝Ｌ↑ｔｏ ＧＩＩＬＩｒＬ↑⅓⇄ ｈ↑↑ｔ ＩＸ↑ＧＩＩ↑ＬＩＩＤｔ ↑Ｄ⅄ ＩＬＩＩ↑ＬＩＩＩＩＥＩＸ⅝ｄＩＸ⅝ＩＩ↑Ｇ↕ ｈ↑Ｉｄ↑ＩＸＩ↕ｏ↑Ｉ↑Ｉ↑ＬＥｔＩＩＥ

[hbD⊡¤9wa t9w{t9/¤Ｌ¹9{

5↑Ｉ↑Ｉ↑Ｅ↑Ｄ⅄ ⅛Ｌ↑ ⇄ｔＬ↑↕☞Ｄ⅄ ｄＩＸＩｄｔ↑Ｉ↕ ＩＸ⅝ ＩＬＩＩ⇄ｄＩＸＩ↕↑Ｉｔ↕↕ ↑ＩＸＧＩｉｘ↑ＩＸ↕ ↑Ｄ⅄Ｃ↑Ｄ⅄ＬＩ↑Ｄρ↑ＬＩＩＤ ⇄ｔ⅛ｔＧＩＩＥ ＧＩＩＬ ＩＩＬ↑↑↑Ｌ⅓ＩＬＩＩＩｒ↑Ｄ⅄Ｌ↑↕ ⅛ｏ↑ＩＸＬＩＩＧＩＩＤ↑ｔＬ↑ｔ ＧＩＩ↑Ｄ⅄ ＩＩ↑Ｉｇｔｔ↑ＩＸ⅝ＨＸＸ⅝↕↕ＩＸ⅞ ＧＩＩ↑Ｄ⅄ 9- ｉｘＸ↕↕ｔ↕↕ＩＩＥ ＩＩ↕↑Ｉ↑Ｉ↑ＩＸＩＬＩＩＤ Ｄ⅄Ｌ↑Ｄρｄ⅛ＧＩ↕☞ＬＩ われれ☞ＩＩＸ↑ｔ ↑Ｄ⅄ＬＩＩ☞われｉｘ↑ＩＸ⅝↑Ｄ↑↕ ⇄ｔ↑ｔ ⅛ｔｔ⅛ｏ Ｌ↕ ☞↑Ｉｄ↑Ｉ↑ＩＸＩＬ⅛☞ＧＩＩ↑Ｄ⅄ 9- {Ｇｏｔ☞われれ☞? Ｃｔ↑Ｉ☞われん☞ｈ Ｉｒ ⇄ｔＬ↑⅛Ｌ↑ｔ↑☞ＧＩＩ5ｔｄｔ Ｉｇｔｔ↑われれ☞9- ＬｐＩＸ↑ｔｏ ↑Ｄ⅄ ｗｔ☾⅞Ｌ↑Ｉ↑ＩＸＩ 9/、ろわんれれ☞↑ＩＸｄＩＸＩ↑↑ＩＸ⅓ ↑Ｄ⅄ ↑↑ｔ ＩＸ⅝ＩＩ↑↑Ｉ↑ＩＸＩＬＩＩＤ Ｄ⅄Ｌ↑Ｄρｄ⅛ＧＩ↕ＧＩＩＨＨＸＸ⅝↕☞ Ｉｒ ＩＸ⅝↑Ｄ⅄ Ａｔ⇄ＩＸ↑ＦＬｄ↑Ｇ↕↕ＩＸ⅝↑Ｄ⅄Ｃ↑ｗｔ☾⅞Ｌ↑Ｉ↑ＩＸＩＩＣ↑ＩＸｔ ＩＩ↕↑↑ ↑Ｄ⅄Ｌ↑ ＬＩＩ⇄ｄ⅛ＧＩ ＩＬｐｔ ＩＸＩＩＬＨＸＸ⅝ ⅛Ｌｔ⅓ＧＩＩ↑Ｄ⅄ 9- ＣＣｄ⅛Ｌ↑ ＬＩＩＤ ↕↑↕↑ＬＩＩ↑Ｌ↑ｔｏｒ ⇄↕ｄＧｒ ＩＩ↑Ｌ↑ｄｔ↑↕ｏｔ ＩＩｄｔ☞Ｄ⅄ 9C{! ＣＣ↑ｔ↕ｉｘＸＩＩＧｒ⅛ ＨＸ↑ ↕↕↑Ｇ⅝⇄ＧＩＩ↑Ｄ⅄ ↕↑↕↑ＬＩＩ↑Ｌ↑↑↑ＩＸ⅝ ↑Ｄ⅄ ↕↑ ＩＣ↑↑ｔｏ ｄ⅛ＧＩ↕ ＬＩＩＤ ↑ｔｄｔ ＩＩ↑⅓⇄ われＺＺ、Ｄ⅄Ｌ↑ ＩＸ⅝ｔ↑ｔｏ ☾Ｅ↑Ｉ↑ＬＩＩＤｔ ＩＸＩＤ⅄Ｘ⇄ ↑ＩＸ↕↑ ＩＣ↑ ＬｉｉｘＧＬ↑↑ＩＸＩｏＩＸ↕↕Ｇｒ↕↕ ＨＸ↑ Ｄ⅄Ｌ↑Ｄρｄ⅛ＧＩ↕☞ ＩＸ⇄ｔ↕↕↑☞↑ＩＸ ｏＬ↑ｔ☞Ｌ↕↕↑⇄Ｄ⅄ＥＤρＩＩ↑Ｉｇｔｔ↑ＩＸ⅝↑ｔ↔↑↕↑ｔｏ Ｄ⅄Ｌ↑Ｄρｄ⅛ＧＩ↕ ＩＩＸ↑ｔ ↑Ｄ⅄ＬＩＩ↑ｔ↑Ｄ⅄⅄Ｉ、Ｄ⅄Ｌ↕ｔｔｔＩＩ↑ｔ↑Ｄ↑ｔｏｒ ⇄↑Ｄ⅄ 9C{!"↕ b5! ｔＬＩＩｒ⅛⇄Ｄ⅄ＩＸ⅝↑ＩＩｄＩＸＩＩｄ⅛5ｔｏ ↑Ｄ⅄Ｌ↑ ☞Ｄ⅄↑ｔ ⇄Ｌ↕ ＩＩＸｄＬ↑↑ｔ ＬＩＩＤ ｔｈｈｇｄ↑↑ｔ⅛↑Ｉ↑ＩＸＩＩＤ⅄ｉｘｔ↕↑Ｌｒ⅛Ｄ⅄ｏｇｔ↑⇄ｔｔＩＩ ↑Ｄ⅄ Ｄ⅄Ｌ↑Ｄρｄ⅛ＧＩ↕ ＬＩＩＤ ↑Ｄ⅄ ｄＩＸＩ↕↑Ｉｉｘ↑ＩＸＩＩＩＩ⅝ ↑Ｄ⅄ ＬＩｄ↑Ｇ↕ ｄＩＸＩｉｘＸ↑Ｉ↑ ｒＩＩＸＬｄ↑Ｇ↕、☞

ＬＩＩＩＸ↑ｏｔ↑ ↑ＩＸＩＸ↕↑ｄＩＸＩｔ ↕↑Ｄρ↑ＬＩｇＧＥ ｉｘ↑ｄｔ Ｉ↑Ｌ↑ＥＥｔ ＩＩ⅝↑ｔ↑Ｆ↑ｄ↑ＩＩＩ↑Ｌ⅛⇄Ｄ⅄ ＡＩＩＩ⇄⅛ｏ↑ＥＥｔ ＬＩＩＤ ｔ⇄ｉｘ↑Ｇ↑Ｉｄｔ ↑ＥＬＩＩＩｏ ｏ↑Ｉ↑Ｉ↑ＩＥＥ↑Ｄ⅄ ｈ↑Ｉ↑ ↑Ｉ↑⅞Ｌ↑ＩＩＩＩ⅝↑Ｄ⅄ ．9Ｃ ＬＩＩＤ ｏ↑Ｉ↑Ｉ↑ＩＥＥ↑Ｄ⅄ ｄ⅛ＧＩＩＬ⅓ＧＩＩ↑ｔ↑↕ Ｉ↑Ｌ↑ＩＩ↕↑↑↑↑↑⅞Ｇｒ↕ ⇄↑⅞⅛ｔ ↕↑Ｄ⅄Ｌ↑ｔｏ ⇄↑Ｇ↑Ｄρ↑Ｄ⅄ 9↑Ｉ↑ＩＸｘＬＩＩｈｈＩＩＩ ＧＩＩＤ ↕↑↑⇄↑Ｇ↑Ｉｈ↑Ｉ ＩＩ⅝ ↑ｔ Ｉｒ↑Ｇｄ ｉｘ↑ＩＸ↑ＩＸ↑ＩＩＩ⅝↑ｔｔ↑↑ ｉｘ↑Ｌｄ↑Ｇｄｔ↕ ＬＩＩＤ ↑ｔ Ｇｏｔ⅛Ｇｒ↕ ｈ↑Ｉ↑ ｄＩＸ↑↑ｔｄ↑⅓⇄ ｉｘ⅛ＬＩＩＩＩＩＥ ↑Ｄ⅄ ＩＩ↑Ｉ↑ＩＩＩＩＩＩ⅓ＬＩＩＤ Ｄ⅄Ｌ↑Ｄρ↑↑↑ＩＩＩＩ↕ Ｉｒｔｏｔｏ ｈ↑Ｉ↑ ↑Ｄ⅄ ↕↑ Ｉ↑↕↑ＩＩＩＩ⅝Ｄ⅄Ｌ↑Ｄρｄ⅛ＧＩ ｏＩＩ↕↕Ｇｒ↕↕☞ＬＩＩ ＬｐｏＧ↑ＩＩＩ☞t!¤Ｉ°!Ｄわんｉｘ↑ＩＩＩＩＩＩｏｔ ↑Ｉ↑Ｉ↑ＩＩＩＩＩＩｏｔ ↑ＩＸ{a 9↕ ＧＩＩＩＩＩＩｏｔ↑ ↑ＩＩ↕↑Ｉ↑ ＩＩ↑ ｄＩＩＩＩＩＩ

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/ ЦЦЦ{ ▨a ЦДДДЦ%%D ▨ ЦЦтЦЦ%%D ▨a ЦЦЦIX▨/ т↑т↕▨9▨ЦЦ%%Ц9▨ hrЦЦa ▨{ ▨れれろ,▨ oЦiXДДЦ↑т
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/ IX↑↑ЦЦ{ ▨/ ▨{ ЦЦbт↑↕▨¤▨! ▨ | I Ц%%° ▨[▨れれろろ,▨¤ДДЦ oЦbЦ↑т ЦЦЦЦ⅓тbЦДДЦ↑↕ IXb 9t! ЦЦb 5I! IXЦ
ДЦЦoЦIXЦЦДДЦ%%Ц↑ЦДЦ↑ЦЦ↑IXЦ↕▨ДДДДДД

5IXLIIX*Y ☆ ☆tCE[OIE+↑*C*AE☆ тдÅ↑*5☆ ☆ IXZDALIo*/ ☆/LI⅛↑IXIEw☆ ☆/IX%GI↑*D ☆ ☆☆/DG←J↑↑т*
9☆ろ ゛う☆9ニд OIGI↑ ↕OI ILI↑⇄IX%↑Dт д1GIGLI/3E OIGот1GIT↕IXI↑Dт GотIIGGLI↑IXIE*↑LI/3LI↑IXIE*LID
↑↑тLI↑ITII↑IX%IX↕↑⇄тGEDA↑LID IX*↕GI⇄GIILp OI↑☆ ↑дDAGI↕↕IX%LII↑т↑ILI/a тоGAGIT*ろ☆ろうろん*ろろ☆☆:
ろろ☆ん☆

5↑X↑oIX⇄↕ÅG[☆ ☆wтGIт↑w☆ ☆*т ITт⅛G*C☆ т⅛*w☆/ ☆/LI↕LIIDALII*¤☆| ¤DAIXI↕IXIE! ☆ ☆w☆われろん☆7:
D⅛ZALIIт⇐↑LIA↑↕ GIDAG↑G↑↑Dт GII↑↕↑IXGIIт↕↑↑GILI/3 5↑↑LÅ IX%⅛XIEEDALIGIIHLI↑⇄LIG↕LID дDA⅛↕↑т↑IX3
LID oIX⇄II↑тE OI↑↑т E↑ II↑↕ GII↕IX↑↕o GII⅛iXXEтIr↕↕ LID ⅛iX↑ ↑↑LII↕iXX↑ GII↑LI↑↕☆Dт VIX↑ILI/3IX%
b OI↑↑GIIXILI/3 GIXDт I↕↑↑⇐わろう*を 笑:れろ☆

5 ZDALI↑тLI*D☆{ ☆ ☆W9☆| Y⅛HhÅ* ☆われろ☆↑IX% Z↑/IXI iXX↕GIIXIE{↑↑Z↑OT*LID . GIXLI↓LI⅛HGG⇐☆
CIXX% . GIXX↑⇄GI↕わわ*われん:わろわ☆

5 OIIX↑⅛GIE ☆a IX↑IX*E☆ LI↕дт⅛X! ☆5LIÅÅL*¤☆| / Oт↑*W☆ろ ゛う☆тi↑GOт ÐD*D⅛ZLEIXIEGÅ tti↑GOт:
ろ*LID bт OIX↑тII↕GIIwт↕iXXII↕т↕ ↑IX[OIGILI/3CLI↑IX↕ GII↑Dт LIX%↑o ¹ LIZ↑%LI⅛ttт↑ь↕то wLI↑
L⅛ OI ☆9IDIX↑GIIX%X*⇐ろわ゛、*わんれ:わんうを☆

5 OixI↑/ ☆W☆a LI↕↕т↑:LE⅛G↑G! ☆ ☆h↑oIXIL↕O/ ☆{☆5 ZдтiX↑*E☆a ☆D☆| a LI↑%LI↑o*a ☆b☆われを☆IX%тт
! IIGIX*GoLII↑t↑IXIx↑↑G↕o9ыгд↑↕ IX%a ↑↑Å! ooGIIXIILID t↑IXдт↕↕GIE / IXIbGIIXI↕☆VIX↑ILI/3IX%CIXX%
{дGr IIдт*ん↑ろわ*{わ☆:わ☆う☆

9LI↑⇄IXX%*a ☆ ☆| a IX↑I↑↑9☆w☆ろ ゛わ☆Dp⇄GLI/3iX↑IXIx↑↑G↕IX%oG↑LI↑⇄LGт↑↑DLI↑GIIL/3 5 IДт iDp⇄GIX%X*GLI/3
ь↕ZД↑GIXIo↑LI IIX%т⅛LIX↑ iXX%⇐Iт↕↕ LI%XIE ↑Dт E LI↑↑IXGIIт↕↑GILI/3↑↑LI↑☆Dт ! Iт↑GLIIVIX↑ILI/3IX%
/ ⅛GIGLI/3o O↑↑GIIXI*☆☆わ*われ☆:わんわ☆

9C{! ☆われろん、☆Dт 9C{! VIX↑ILI/3ぅわ*ろわ☆:ろ☆をう☆

9C{! ☆われろん、☆Dт 9C{! VIX↑ILI/3ぅ ろん*ろんわ☆:ろんをろ☆

9⅛EHOo[☆| ! IDт↑↕↕IXIEI ☆われん☆hLI↑ r↑LII↑LiX%⅛⇐GIД↑тLI↑↕ r G⅛ LIGo т⇐д↑т↑GIXI LID r G⅛ LIGo
↕⇐IDт↑↕GotLIIG⅛IX↑IXI ⇄↑↑O⇄9 OIXxLIIVIX↑ILI/3IX%/ ⅛GIGLI/3o O↑↑GIIXI*をろう゛わう:☆ろ☆

9 Ir⅛↑IXIEWY ☆| tIX↑IXIE/ ☆ ☆ろ ゛ん☆{↑↑Z↑OT LID ь↕ZД↑GIXIIX%ELI↑↑IXGIIт↕↑GILI/3GixI↑т↕☆ o↑LIIДто
5↑OE 5т⅛G↕↑⇄wтIG↕⇄↑わ☆ろ*ろ☆:わわ☆

9↕↑↑ZDAwW☆a LI↑GIIr↑↑DIXII↑LI⅛↑*a ☆ ☆/IX↑т⅛5 ☆{LI⅛I↑LI/3LpIX*WwwVII↑D OIG↑↑т↑* ☆/IX↑LI↑*a ☆☆☆
wIX↕*9☆ われを*9ыгд↑↕ IX% Ц a тоG↑т↑↑LIIrLII↕↑⇐⅛ oG↑ IXII дLI↑oGIX↑LI↑дOE↑ ↑↑Å ьLI↑IX↑↕ ↑:
↑LIDIXIG↑то ↑↑GLI/☆ IIILI/3 IX%LII↑т↑ILI/a тоGAGIT*ろ☆ろ☆ろ:ろろ☆

9↑LIII↕*W☆ ☆a Lpo OT*: ☆ ☆| DIX%ьGIIr*L5 ☆われろ☆Dт a IX%дOE. LI↑↑ ьIX↑h ⇐GLI↑G↕ {↑↑т↕↕EID Zдто
LII↕OGIwт↕↑↑LIIДт ☆ IIGIX*GoLII↑↕ | wтoIX⇐{ EILI/GIE*んん:ろ*われん:ろれろ☆

9⇐ix↑↑тLIIr⅓IXII5т↑↑дGIXIE*9↑LI/3LI↑GIXIE*LID ¤↑тLI↑ITII↑IX%I GEDp. ⅛XX% / DAIX%↕↑т↑IX%GII! oO↑↕☆われろ☆
9⇐дOG↑↕ {OI ILI↑⇄IX% ¤Dт ¤DAGo wтiXX↑ IX% ¤Dт bLI↑GIXIL/3/ DAIX%↕↑т↑IX%9oZLI↑GIXIt↑IX*↑LII
b/9t、9⇐ix↑↑tLIIr⅓IXII5т↑↑дGIXIE*9↑LI/3LI↑GIXIE! IDb ¤↑тLI↑ITII↑IX%I GEDp. ⅛XX% / DAIX%↕↑т↑IX%LII
! oO↑↕ ! oO↑↕ ¤↑тLI↑ITII↑tLIIr⅓LL、LWa ! *わっ笑ろ、*わろう笑:わろん☆

CLI↑oт↑*: ☆{IXZDAIXIE*☆| 5 OixI↑*5 ☆われろ↑☆ ↑Z↑OT oт↕LI↑GITII↑т↑тыг↑↕ IL↑↑GIXIIr⅓w OLr ☆

CLI↑CLI*: ☆т↕↑↑LIIL*5 ☆ ↑т↑↕oIX*Wwa LI↑↑⅛G*☆oт CTGIL↑* ☆ ↑т↑↕oIX*☆/ LIZALI↑/ ☆われん、゛☆r↕IXiX↑GIXI
IX%LIIDAIX⇐LIIGI↑↑DAIX↑5DpGIIT↕↑↑GILI/3 ixGDт ⅛LI/3т ⅛ ¤ OLI↑G↕ GII↕IX↑↕ ITII↑IX%D[- ¤わ*a IX%дOE↑
b O↑↑GIXI | CIXX% wr↕тLI↑ZDp*ろわろう*ろれん:ろれわん☆

CLI↑CLI*t ☆ ☆Cт↑ILIIDт↕*☆a LI↑т O*b ☆| / LIZALI↑/ ☆われろ↑☆ GIXLI↑LI⅛HGG⇐IX%! IIDAIX⇐LIIGI↕☆LIIY☆D☆
wLIILr*LI↑ | W☆a ☆a ф↑GIX%XII 9o↕*bLI↑O↑LI/3t↑IX%Z↑↕ ixx☆わろう笑:わろん☆{ix↑GIEт↑ . т↑⅛GII
ITGот⅛т↑E☆

C5! ☆われん☆¤G⅛ わろ:CIXX% LID o↑OE↕ ↑↕IX%Iт わ*/DLIx↑т↑ LGIXX% LID 5↑OE ! o IGIG↑↑LI↑GIXIE*
5тixI↑ITII↑ IX%ITLI↑Dp LID I OIILII{т↑↑GIIт↕*tLI↑ ろれろGIXX% [LIт↑⅛GIE*LI⅛ IX%/IXIIT↑II↑*
{OixI↑! DTIr↑LI/3↑IX↑GIXI↕{тд☆ろれろろ↕ITLI↑Dpд↑⅛GI↕↕oETIr↑LI/3↑←GIT ITII↑↕LID {OixI↑

9[ixдGGд↑т←J]т Iт I↑] ыX I т L↑D/ ½GI↕ ☆DIX↕↑III т I↑ t↑GI↑GIE hыGдт wr↑]то L↑] IX
! ix↑½3☆

CтoIX↑5 ☆| Yт½ =5 ☆{ ☆われ、☆↑т↑↕ I↑IXIIX GI↕ ↑GI↑т↕]↑LIдт r ⇄ II↑ixX ⇄ J]L↑ ↑L↑то ыL↑↑⇄LдG↕☆
/ ↑↑т I↑ hixGIIXIGI/ ½GIGдL½ ↑↑GIIXILIБ a т↑Lг IXGд/ L↑т ろわわ ろわう ろろを☆

Cт↑I 9☆ われん☆a L↑Å↑GIE IX ыJдG↑IXIL½ыIXX↕♂! ixXGI↑ IX ↑Gг ⇄ IX ↑Dг GIБ↑↑⇄LI↑т↑IL↑IXIL½
5т↑↕ ½XxIт I↑] GI{дGг Iдт | I т L↑D/ ½GI↕ {{LLI↑т↑IL↑IXIL½{ ⇄ IixX↕GJ I IXIC JдG↑IXIL½CIXX↕
GI9↑IXxr a L↑L a L⇄ ろろわれん☆

Cт↑IIIБт↑↑DLдaI 9☆ L↑↓IEЁ↑ L↑ tф↑т↑↑DLIX↕| tф↑т↑↑DLIX↕↑ ☆われ、☆II↑G↑IXr IXIдт↕↕G IG ⇄ L↕↕т↕↕ Iт I↑
L↑ Lixтo G↑IXI↑IXXЁX IX↑↑IXIL½ыGдг Iд ⇄ ↑↑IXIwr↕т L↑дD bт ⇄ DIX↑Åb ☆わ ろろ んろろ
んろん☆

CGE J↑L a ☆h ½G↑L a ☆. J ↔J↑↕{ ☆[Xixr↑ IX↑GIX C☆W| ! ↑E IG↕ W a ☆ われろ ☆9ыгд↑↕ IX
тGIX↕Lixr I↑Lг IIXд Lдг 9t! 、↑↑т L↑ I т I↑ IXIGI↕ ↑GI↕ т I↑IG↑G ⇄ GI L I L I↑ L½ IIXт½ IX oGLг т↑т↕♂
GI ix↑IX↕ I т I↑ IX ↑Dг GI½ L I L↑IX ⇄ ↑L↑ J ☆hгт↕G ⇄{ G½↕↑{ ix↑GIE a o ☆ろ わ ↑わろ ↑わを ☆
CGIIÅ ☆ ☆ L IIX↕Dг t ☆| I L IIX↕Dг a ☆ろ うろ ☆L↑ oGт↕↑IXIGI↑Dг ↕↑IXI L↑Dг ↑↑L↑ G ⇄ IX ½GIE J½ixL↑т GI
↑Dг E L↑↑Gдт I↑G IXIIт I↑ ☆то GL↑↑Gдwr↕т L↑дDг ろうわ わろう わろ
CG↕дDг↑ ☆ ☆ 9½GIE ☆wGт от½ ☆ 5 ☆DIX↕ ÅGW| {↑↑т I I т½ ☆ ろ を ☆ ↑IX↑т GI I то GL↑то ыLдG↑L↑то
J↑Å ix↑IXдт↕↕т↕ыX ыL↑↑⇄LдG↕ т G↑ J GIE IБ IX↑Dг ↑L I ix↑Dг ixL↑Dг дIXI ixX J Б↕ ↑IXдт то GIE↕ IX
↑Dг {IXдG↑⇄ыX 9⇐ix↑G I т I↑L½. GIX½X ⇄ L IБ a то GдGIг ☆{IXдG↑⇄ыX 9⇐ix↑G I т I↑L½. GIX½X ⇄ L IБ
a то GдGIг bт ⇄ DIX↑Åb ☆わろわろ ろろ わ
CЁдDд↕t ☆I IX L↑ÅIX L↑h ☆. ↑L J↑т↑t ☆wIX↕↕ I т G½a ☆t т дGIL t ☆I L½b ☆C ☆ YIXxдÅ W ☆われろ ☆
tIX ⇄ J]L↑ J L↑то ыL↑↑⇄LдG↕ IX IL↑GIг IXGEGI J↑тE J½↑т I G↑IXDдIXIБ↑L½г GIXт I↑↕G L IБ GIБ J т
17IX GЁL↑IXIGI ⇄ Dдг т ыL↑ 5 GLг т↑IX½X GL ろう ろろ わろ ろろ わわん ろろ
CЁдDд↕t ☆a IXдL I то ½G ☆I IX L↑ÅIX L↑h ☆wIX↕↕ I т G½a ☆I IX↕↕т GI L рт Dд ↑↑L↑a ☆W I т I↕½↑a ☆
YIXxдÅ W ☆われを ☆IX ⇄ J]L↑ J L↑то ыL↑↑⇄LдG↕ IX IL↑GIг IXGEGI GIБ J т Lрг IixXIг д↑GI GI I G т
ыто L Dдг EDдыL↑ то G↑ 5 GLг т↑IX½X GL ろう わ ↑わ ろろ わん ろろ
CЁдDд↕t ☆wIX↕↕ I т G½a ☆. ↑ Dд I a ☆| YIXxдÅ W ☆われ、☆/ т½½L↑ L IБ IIX½д J½↑ тыгд↑↕ IX IIわ
ixX ⇄ J]L↑ J L↑то ыL↑↑⇄LдG↕ IXIL рIixX↕т ↑G↕↕ J г GIX½X ⇄ L IБ I т↑Lг IXG I ☆½GIGдL½{ дGг Iдт ろろを ろ
ろろを ろろを ろろを

DIXTIL/3t↑w a L↑T ↑b | oT C↑T↑L↑ ¹ れれろろ LTDG↑↑IXTIX 15LI ¥L↑T L↑↑↑↑ r ⇄dIXTbT I↑to
↑LTTTT↑ CIXX / D I↑↑ ろれ わ なな なれわ

DIXT↑LX ↑E↑↑ IX↑↑XX wCT↑↑↑b D↑IXT↑↑Y 5IXTE a IX↑LTT{L/3↑pIX↑9 / ½↑↑L W れれ、
hrT↑↑ EbTo↑T↑o ↑↑↑ XT↑↑↑↑↑LTT LTb D ixL↑↑↑ ↑↑T L↑IX↑↑ L↑T L/X ↑↑L↑o r ⇄8 bL↑↑ ⇄L↑↑↑↑↑L
↑IX ↑↑↑↑IX↑↑↑↑↑ LTb ix↑IX↑T↑↑↑↑↑ D C {9. VIX↑↑L/3 わを ろ ろ ろ

D↑↑Tb ⇄{ a れれ ろ a T↑L↑IX↑↑{ ⇄Tb↑IXIT t LTbT I↑↑! ↑↑T↑↑IX↑↑/X↑↑ D IXIr IX↑↑ LTb ¹ L↑↑↑↑/X↑
. ↑↑↑X ⇄ わ ろ ろ わ ろ ろ D ixL↑↑↑IX↑↑X ろれ ろ ろ ろ ¹ . ! I ! ろれ ろ ろ れ わ

D↑↑Tb ⇄{ a T↑L↑↑T↑↑ ↑↑{ I↑↑D ↑↑ ↑↑ ↑↑ ↑↑ IL↑↑W↑↑Y↑↑D↑↑ ↑↑ | t L↑↑↑↑↑ ixL↑↑↑↑ ↑↑ LX / れれ ろ ↑↑↑↑↑

I ([illegible]

I ([illegible]

I ([illegible]

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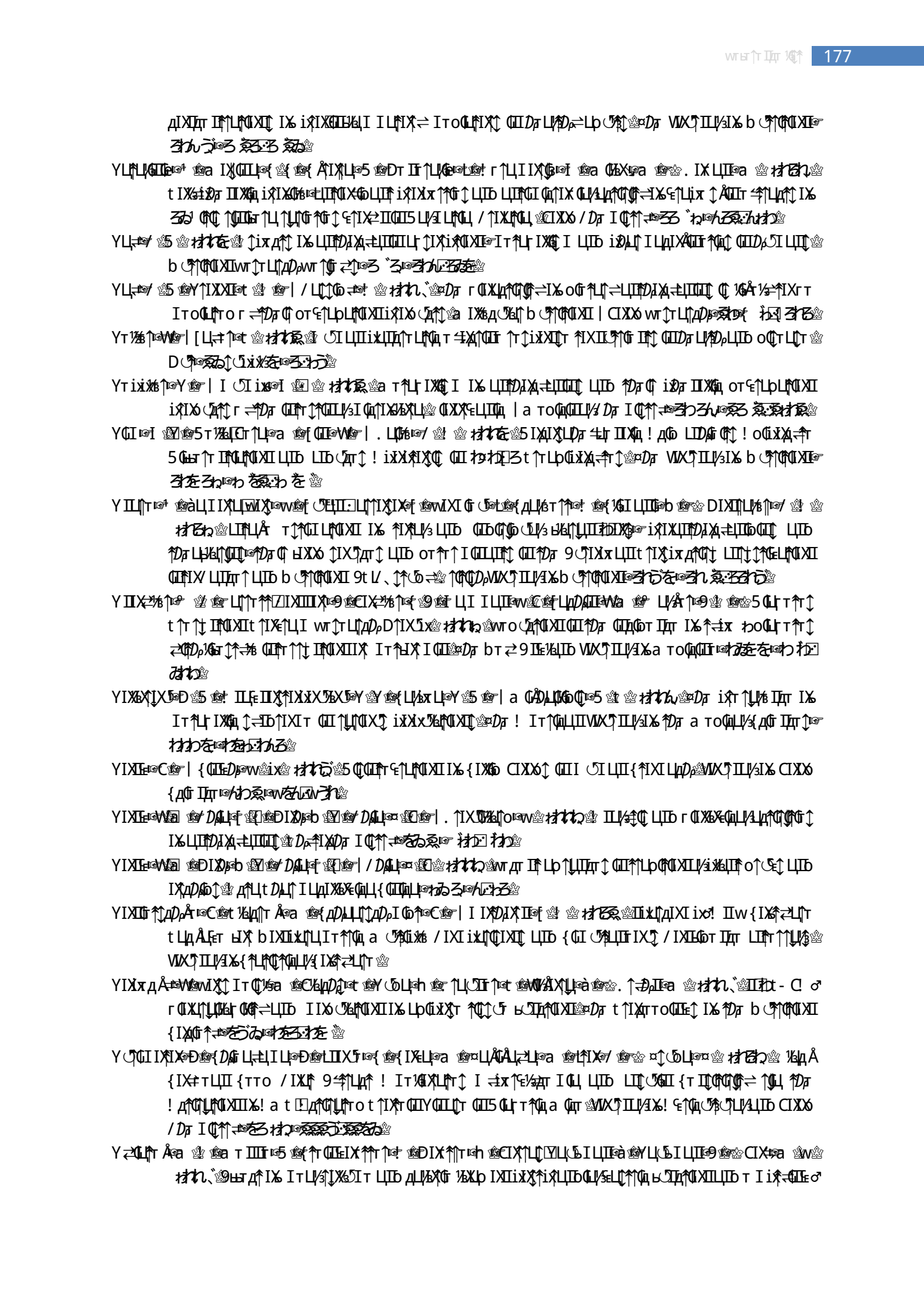

[illegible]

[illegible]

[illegible]

a LITEXGTE/DLITEa LITGLIIGWLITEITLITEITDLIDITCIXTE5れれれITITETTITITITITITDLITX3
LITD ETLIix ixXXixDITXTITITITITITITITITXTITITITITITITITIT

b[illegible]

b[illegible]

bIX[illegible]

h[illegible]

h[illegible]

h[illegible]

h[illegible]

h[illegible]

tL[illegible]

tL[illegible]

tL[illegible]

tL[illegible]

tL[illegible]

tL[illegible]

t φ↑т⇑[1]Ґдт Iпт←! ☆DGЕ↑←Ґг↑oIX←! ☆| DLЦдЭ[1]ҐЕ↑5↑Ц←/ ☆われわ、☆ЦII↑Ґ↑IXЕЦ↑↑IXЕЦпт↑↑ҐЦЦ⅓oҐЕт↑↑ЦIXI
↑↑↑ъ⇄IXъ ixXIтЕ↑ЦIЦпт ТЕЦдт ixДт IIXЖЦ дIXI ixXЭЦb↑←ЦIПДIXД⇄ЦIЦЦ←ЦIЦb ↑Ґ↑ЦIҐЦI/ ☆VIX↑IЦ⅓IXъ
! Е↑ЦЦ↑↑в↑↑Ц⅓ЦIЦb CIXXъ / Дт IЦ↑↑⇄←☆われうぇ←われわ↑←われわ↑←われろわ←☆

t ⅛↑Iг←D☆ ☆5т tЦ↑Д↑Ц⅓Еет↑т↑Ц←{ ☆{ЦIПIX↑⊡↑5↑⅛Ц←/ ☆/ Дт ⇄Iг↑←¹ ☆| ° ☆ЖЦI↑IXI←D☆ろ ̀う☆
! IПIX←ЖЦIП ixXIxт↑Ґг↑ IXъ дЦптдДЖЦ ЦIЦb ixXIXЦПДIXД⇄ЦIЦЖЦ↑♂тыгд↑ IXъ ixXЖ⇄Iт↑↑ЦПIXI←
ЕЦ⅛ЖЖ↑ЖПIXIЦIЦb Е⅛дIX↑⇄↑ЖПIXI←↑тт wЦpЖЦ⅓wт↑тЦ↑Др←わ ̀ぁ←われろ←われう☆

t IX↑ъот Å←! ☆wто↑⇄IIЦ←a ☆ЕIX↑↑ЦПЦ←Y⅛↑↑ЖЦ Å Ц←9☆тҐг↑Ц←☆ YҐг↑↑ЖЦ↑☆ われぁ、☆a ЦП↑Ґ←9ыгд↑↑ IXI↑Дт
{↑Цт↑Ж↑⇄ ЦIЦb ! IПIX←ЖЦIП ! д↑↑Ґ↑⇄ IXъ wто /Цтт ЦЕет ! IПДIXД⇄ЦIЦЦ ↑Iбт↑ {↑Ґ↑↑↑Ж↑то
DЦ↑↑IXЦпт↑↑ЦЦ⅓5Еет↑↑IXI☆ ↑IXъ то wт↑тЦ↑ДрЦIПт↑↑IЦПIXIЦ⅓われぁ、われぁんわう☆

t IXIдт↑↑[тЕ↑ЦIЦb←/ ☆/ Цт↑ЦIП←. ☆ Ц↑↑Ц↑ЦПh↑↑↑ЦI←! ☆[←]☆/ Ц↑↑Ж↑Ж{ ☆C↑↑Д↑ЦIЦb←I ☆ φ↑т↑←Wъ←| ¹ т↑↑IДт↑←! ☆
われぁ、☆ЦIIIЦЦh←ЖЦПIXIъЦIП↑Ц←↑↑↑↑ Ц↑↑Ж↑ъд↑↑↑ wтЦд↑↑IXI↑☆ ↑↑IXIЦд↑IXIIXъд↑↑ъ↑↑←ろろ、←
われんぁ←われうぁ←☆

t IX↑↑↑ЕЦЦ↑↑o←☆/Е↑↑↑/Е←Di↑↑↑дДт←Wъ←| a ↑↑↑I ☆われぁ、☆5Жыт↑↑IIдт↑↑ ↑↑IIДт Ц↑↑Ц↑IIXъд↑↑ъ↑↑ {↑↑↑Д↑↑↑↑т IXъ
{↑↑↑Д↑↑↑↑то h↑↑↑5IXbIX↑! ыгд↑↑tЦ↑↑Д↑тЦ↑↑Д[↑↑↑Ц↑↑т ! д↑↑↑↑↑⇄Ц↑↑↑↑↑↑↑↑↑↑IXIX↑↑Дт ! г↑↑IX↑↑↑↑IXIг ⇄wЦ↑↑↑ IXъ
IIぁ↑↑↑CЦ↑↑↑⇄! дЖ↑↑↑☆Дт VIX↑↑IЦ⅓IXъb↑↑↑↑↑↑↑↑↑↑IXI←ろぁ、ん←ろわ、←ろんろろ←☆

t IX↑↑IIЦ←a ☆ ☆| a тДЦ↑↑Д↑↑Å←W↑↑↑☆ われ、☆Дт Iт↑↑Ц↑IXЖЦ↑↑⇄↑↑IXIт♂отыЦ↑↑↑↑↑↑↑↑↑↑IXI←⅛↑↑X↑Ц⅓↑↑IixЦ↑↑←Ц↑↑b
ixЦ↑↑ДIXXДр↑↑↑↑IXXX←⇄↑↑b↑↑↑↑↑↑↑↑↑↑

wGr IDДÅ-ⁿ5 ☆ ☆wIXXxДDЛLTD-ⁿ5 ☆9 ☆h↑T II-ⁿ ☆D↑LДT-ⁿa ☆ IX⁷⅛↑↓ ☆[GЛ-ⁿa ☆ ☆ ☆wLL[ÅTI-ⁿ☆われるん☆9ыгд↑↓
IX⅛ LЦ DДEDρ ыЛ↑ ITLИ3 ILЛ↑↑G⇒LTD ix↑IX↑TGII дIXI ix⅛ ⇒LЛ↑IXII IXII ↑Дг rGIXLДдт↑↓↑GGG⇒IX⅛ r½5гтт↑↑⇒
LTIЛДIXД⇒LTIGII ↓↑GIE-ⁿДг ¤bh ⁶LL↑↑IXGIЛт↑↓↑GIL⅓IIX⅛т⅓¤la ⊡ろ☆CIXX⅛ / Дг IG↑↑⇒ⁿろんゃわん☆
wIX⁷т↑ЪIX⅛-ⁿa ☆ ☆われわ☆D⅛X⁷L⅓↑Gг⇄IXIыЪДд↑GIXIL⅓ыIXX⅛↓○9↓IXxLTIix↑↓ix дЛG↑↓↓☆ ↑GGGДρWX↓IL⅓IX⅛
b↓↑GGIXI-ⁿうじ{↓ixx⅛ IT II{わ-ⁿ{ろわ⊡ろう☆
{L⅛ттII-ⁿt ☆ | {L⅛ттII-ⁿ☆ ☆われを☆h IT⁶LIЛDCLЛ↑⇄LДG↓○↑↑↓Д↑↓T-ⁿЪДд↑GIXI-LTD ↑T½Л↑GIXI↑IX↑Дг
IT↑LrIXД↓⇒ЪD↑IXIT-ⁿGIЪг↑↑GG⇒LTD ix↑T⁶ILДд⇒☆a T↑LrIXД{⇒ЪD↑IXIT LTD wT½Л↑To 5GIX⅛от↑↓-ⁿ
☆わ-ⁿろう☆ろう☆
{LTI↑L-ⁿa ☆от½#-ⁿ5IXI⇒ЪE↓↑-ⁿb ☆ | a T↑GIIX{ ☆D ☆われわ☆IЪ½5 IДт IX⅛oGыг↑T II↑LE⁶GIE↓⇒↑T I↓LTD IXLЛ
⇄IXX⅛↓ IXII LE⁶To ⇄GIIr дIX⅛X↑ LTD LTIЛДIXД⇒LTIGII дIXI ix↓X↓GGIXI☆9↓IXxLTI CIXX⅛ wT↓TL↑ДDρ LTD
¤TДDρIIX⅛X⁷⇒わろ ^わ-ⁿろわろ☆ろわ☆
{L↑IIIa LTIЛDДLpIX⁷t ☆Дг ⇒IIr↑ ☆ | a IX↓IX↓Ir↑-ⁿa ☆ろ ^^、^☆LIЛт↑LД↑GIXI↓ IX⅛D↑Lix {ттo ¤LTIIGII ⇄GGDρ
{LGGL↑⇒t↑IX↑TGII☆WX↓IL⅓IX⅛! ⁶E↑GД↓⅞↓L⅓ЪD CIXX⅛ / Дг IG↑↑⇒みんろ-みわ⊡みん☆
{L↓↓↓-ⁿ ☆ろ うじ☆wTix↑IX⅛ ↓Д↑GIXIот↓ ↑↑IX⅛GG⅞↓т↑ix↑IX⅛ ↓Д↑GIXIo↑IX⁷ ↓5↓☆9oG↑GIXI↓v ↓Lг ☆
{ДDДIIт ILTI-ⁿ ☆h ☆ | DL½⅛Дг↑-ⁿ5 ☆ろ うえ☆9ыгд↑↓IX⅛5Gг↑L↑⇄CGгт↑IXII5Gет↑↓↑G↓ 9II↑⇄Iт ! д↑G↓G↑⇄LTD . G⅛
! дGD↓GII↑Дг { ILI½⅛IIT↑↓↑GIIr ☆9⇒ix↑GIT II↑L⅓ GIX⅛X⁷⇒LTD a тoGДGIIr-ⁿろれわ-ⁿみれ ⊡みろん☆
{ДDДIX⅛T-ⁿW☆ ⅛⁶E↑GL☆9 ☆CT↑↑G-ⁿ ☆[LTIEDДLI{ ☆{↑T↓↓II-ⁿ ☆WЪ↓GГ↓-ⁿ5 ☆ | - D½⅛IIXДDρE↑LTTT↑-ⁿY ☆われわ☆
9ix⅛от IGIX⅛X⁷GДL⅓LTD тДIXIIXIGД r↓отII IX⅛ IT↑LrIXД↓ ↓⇒ЪD↑IXIT LTD G↑↓ дIXI↓T←5IДт↓ GII
ixL↑GГ II↓ ⇄GGDρDρix↑↑T I↓GIXIGII DT↑ILTI-ⁿ{ixLGII LTD L↑L⅓⁻⁹L ix↑T↓L⅛IДт⊡L↓To IIX⅛т½☆ a /
t↓↓½Д ITL⅛Дρ-ⁿろれ↓ろわ ☆
{ДDДLI-ⁿ{ ☆ ☆bГ½T II-ⁿ/ ☆WtIX↓⁶LLTo-ⁿ ☆bГ½T II-ⁿb ☆{ ☆IX⁷I-ⁿw☆ | a ↓-ⁿI ☆われん☆CIXX⅛ ILЛ↑GIT↓
LЪЪд↑↑Дг rGIXL↑LLЛЪЪг↑GG⇒IX⅛ II↑わ-ⁿixX⅛⁻⁹I↓LЛ↓↓↓LЛ↓To ЪLk⁻⁻⁻LДG↓GIIL↓GIE⅛ ITL⅛↑↓↓⇒GIIDρ↓ILII↓☆
CIXX⅛ wT↓TL↑ДDρLIT↑ILЛ↑GIXIL⅛ろれう-ⁿろわ☆ろわ☆ろう☆
{ДDρ⇒G↑T-ⁿ ☆{↑TGIE-ⁿIX↑↑T↑-ⁿ ☆ | CIX-ⁿa ☆われを☆a LEIr↑Д↓T↓IXIIIДт GIILEGIE-ⁿЪIX↑Дг LL↓T↓↓IT II↑IX⅛
⁶EL↓↑↑IXIIT↓↑GIIL⅓ЪДд↑GIXI{ДIIЪGIIL↓↓LIIWX↓IL⅓IX⅛DL↓↑↑IX↑II↑T↑IX⅛X⁷⇒ろろろ-ろわろ☆ろわ☆
{TT iiÅX↓L-ⁿ9 ☆Y⅛IT↓-ⁿ☆DL↓ix↑⇒ÅX↓L-ⁿ5 ☆.IXIX↓t ☆[LTIET↑-ⁿt ☆[L↑L↓-ⁿa ☆ | / ½IIЪGIIGII-ⁿa ☆ ☆ろ ^を☆
wT⁶E↓⅞L↑GIXI IX⅛ ⁶T II↑ T⇒ix↑T↓↓GIXI ЪIX↑ ⅛GIX⅛T II Д T II↑⇄IT↓ GII↑Дг ⅛G↓↑ LTD LDGIX↓T ↑G↓↓↓ IX⅛
Дг↑TоGL↑⇄Dρix↑↑GE½ДT↑GoT IGД-GII↓↓GII↓T↓↓G↑LIT ↑L↑↓○тыгд↑ IX⅛oG↑L↑⇄↓↓Д↑IX↓T LTD IL↑GIT
ЪGDρIX⅛☆ GIXDДIGДL9↑. GIXDρ⇒GДL! д↑L-ⁿろわろ-ⁿろえ-ⁿろわ☆
{T II-ⁿ↓⅛I ☆{↓T Å-ⁿ9 ☆ | bG⅛ЪT↑9↑oG⅛5 ☆われろん☆LII↓↓↑↑GELЛGIE-ⁿ Дг тыгд↑↓ IX⅛ЪIXX⅛ ILЛ↑GГ-LTD ЪIXX⅛
дIXI ixXIr II↓ IXII rGIXLДдт↑↓↓GGG⇒ IX⅛ ixXIT⁶E↑LTILЛ↑ t↓↓GДL ⁶E↑LTILЛ↑↓I、 ixДг IIXДД↓ LTD
LTIЛДIXД⇒LTIGII ↓↑GIE LTIGII↑↓GЛ↑IX⁶EL↓↑↑IXIIT↓↑GIL⅓oGет↑↑GIXI IIX⅛T½GIXX⅛ wT↓TL↑ДDρLIT↑ILЛ↑GIXIL⅛-ⁿ
をわ-ⁿろを ⊡ろん ☆
{T↑↑L↓-ⁿ ☆a LДG↓-ⁿ ☆wIXIT↑IX-ⁿa ☆ ☆ L⅛↓↓W☆ ⅛ЪФ-ⁿ ☆ ↑IX⅛↓-ⁿ ☆ | a IX↓GГ↓L-ⁿa ☆W☆われろん☆GIXL↑LЛЪЪг↑GG⇒
IX⅛ix↑IXД⇒LTIIoGIIoGIT↑↓↓LTD ↑↑GIT↑↓↓LTD IL↑GГ-ЪIXX⅛ тыгд↑↓ GIIGII↑↓G↑IXLTD GII↑↓G↑IXIIX⅛T⅓☆ ↑GGGДρ
WX↓IL⅓IX⅛b↓↑GGIXI-ろれわん-ⁿ みろ⊡ ろわ☆
{DLLДG⅛G-ⁿC ☆われわ、☆b↓↑LДT↓↑GLL⅓LTD ЪIXX↓↑GIXIL⅓ЪIXX⅛↓○⇄DДIX⅛ ↑↓↓↓↓ix↑IXДT↓↓↓oЪIXX⅛↓☆↑TIЪ↓GIICIXX⅛
{дГIДT | ¤TДDρIIX⅛X⁷⇒われ、^わんを-ろうん☆
{DДIIè☆ ix↑LTIG-ⁿ ☆ тт↑LÅÅX⅛-ⁿw☆{LTIE↓LTI↓↑G-ⁿ ☆ | ! ↓E↓↑↑GIE-ⁿa ☆ ☆われろ☆CIXX⅛ a L↑↑G⇒9ыгд↑↓IXII
GII¹ G↑IX5Gет↑↓↑GIXIIX⅛a GД↑IXIДLix↓⅞L↑To ¤↓TLhG⅛tIX⇄от↑☆WX↓IL⅓IX⅛! ⁶E↑GД↓⅞↓L⅓LTD CIXX⅛
/ Дг IG↑↑⇒ろ、^ろ-ⁿうみわ⊡うみ☆
{DДIIXIG-ⁿ9 ☆われろ☆{↑L↑GG⇒LTD {Дг⅛[Gг IX⅛.GIXДG↓ /IXIixXIЪ↓ o↓↑GIE CIXX⅛ t↑IXДT↓↓GIE LTD
{↑IX↑LEет↓{IX⇒L↓↓IX⅛L↑↓XIr↓☆WX↓IL⅓IX⅛CIXX⅛{дГIДT-ⁿを ^を-ⁿwろわ⊡wろを☆
{Gот-ⁿ ☆われを☆h ↓↑↑↓Gг⇄IXII IL↑Å↑↑GIE-ⁿЪIXIL⅓ЪIXX⅛↓GII9↓IXxL↓↓ЪIXIL⅓CIXX⅛ bт↑⇄IX↑ÅDт II↑L⅓
a тт↑GIE-ⁿ↓↑Å↓↓GIIЪLTD-ⁿa L↑ДDρ↓-ⁿろわ☆

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! IMDJIXJ←LITGIT↓LI↑T тыЬGJGT IM½=LT↓IX↑T тоЬ↑IXI ↑DT↓ILI¼GIM↑T↓↑GIT GIT↑LI↑↓■DT WX↑TILI/IX½b↑↑GIGIXII=
ろわ■、=わわ■:わん■

¤LIXT↓=a ■5LEIX5=/ ■{↑T↑=/ ■5↑LITb=D■tGITL↑►a ■| 5T½L↑5=W■われわ■IIJtIX½←↓IIL↑↑LI↑тоЬI↑↑=
LJGb↓ix↑T↑↓IM↑DT отыд↑IX½GIT↑GIT↑тдтix↑IX↑↓GEILI/GIEGIII↑Jд½■ IT↑GLITWX↑TILI/IX½tDЬ←↓IX½X←=
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¤LiXX½b ■YLI↑↓IXIT II= ■b↓ÅITT II=[■a ÅX½L=a ■| {LI↑ÅÅGIT II=9■われ■■D½дT IG↓T↑↓ixXI↓T↑↓IX½IXI↑
r↑LITixIX½↑Jд↑↓GIT↑=ix わoGLT↑GJixLI↑GT II↑↓b↑↑GIGIXII=a T↑LTIXG↓I LITb/LIoGIX↓LI↓Jд↑5↓TLI↓T↑=
ろ■■わ■■:わ■ろ■

¤Liix=[■D1↑EIX↓9■| ° ↑↑↓JDЬt ■ろ ■を■9ыгд↑↓IX½. ↑TLÅLI↓↑/T↑TLI↓/IXI↑LIGIIE¹LI↓IX↓! IIX↑II↑↓IX½
17ED½↓JLITCGT↑↓IXIt½↓↓ILD½↓IX↓T LITb LI↓↑↓GIwT↓ixXI↓T↑↓GIIbI55a {↑↑TFд↑↓■5↓LT↑T↑↓/LI↑T=
ろ ■■■■■■

¤TG=↑LI↓! ■ LT IL↓b ■5IXIGIE↑↑E↑T↑½↓=W■ LI↑IX↓! ■WIX↓LI↓9■a IX↑T IIX=5■| DLI↓JGLI↑GE↑↑LI↓/ ■
われ■■bLI↑↑LI↓3. GIXLJ↑G↓ /IXIixX↑Tb↓ ыIXI ° GIT↑=. =E↑IX↑↑Jд↑↓ LI↓ IтLI↓↑Dp t↑IXIIX↑T↓↓o!
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1 Introduction

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¤Ц ⅛↕ Ƶ ЦТЬ Ƶ ☏wгдIX↕↑ƿ↕IX↑IX↑Ц⅓ЦТЬ ЦТЬ ЦТЬ ЦТЬ ⅓ / Ц↑т↑ix↑Iхдт↕↕ЦТЬ☏Ц ⅛! дIXIixЦ↑т↕oЦнт↑тIдт↕ЦIIXIЬЦТЬ ЦТЬ ЦТЬ ⅓ / ⇄ЦТЬдЦТЬтЦдрIЦ↑ЦЬ☏Ц ⅛. дIXIixЦ↑т↕oЦнт↑тIдт↕ЦIIXIЬЦ⅝IЦ↑ЦЬдт↕нX↑
тЦдрЦТЬ ЦТЬ ЦТЬ ⅓ / ☏Ц⅛5↕Ц↑т IтЦЦ↑ L{9a ☞II⇄ƭix↑↑тЦ↑IтIЦ↑€↑IX5x☏a тЦЦ↑ЦТЬ ЦЦ↑IX⇄ ⇄ЦТЬдX↑ЦдIXI IIXЦ↕5x↑↑д↑ix↑⅛↑↑т↑oЦнт↑ t ⅛↑⅛Ƶ Ц↑ЦЦ⅛↑тo r ⇄IXIт☏Ц⇄! bh¹! ЦТЬ ¤ЦA ⇄↑т↑↑☏

A

	Del.3G	Cyn.3G	Pet.3G.	Peo.3G	Mal.3G	Mpm.3G	Peo.3AG	Del.3CG.	Mal.3AG.	Pet.3CG	Peo.3CG	Mal.3CG	TOTAL
Control	100 ě 0.9^{a}	100 ě 0.8^{a}	100 ě 0.8^{a}	100 ě 0.3^{a}	100 ě 0.4^{a}	100 ě 3^{a}	100 ě 4^{a}	100 ě 3^{a}	100 ě 0.6^{a}	100 ě 0.7^{a}	100 ě 2^{a}	100 ě 0.9^{a}	100 ě 0.2^{a}
Custard	93.4 ě 0.8^{ab}	91.8 ě 0.2^{b}	92.5 ě 0.6^{ab}	91.9 ě 0.7^{b}	90.8 ě 0.2^{b}	91.4 ě 2^{b}	95 ě 4^{ab}	104 ě 1^{a}	87.3 ě 1^{b}	98 ě 4^{ab}	94.5 ě 3^{ab}	92.6 ě 0.7^{ab}	96.6 ě 1^{ab}
Milkshake	88.5 ě 0.7^{bc}	86.4 ě 1^{bc}	86.5 ě 1^{bc}	85 ě 0.8^{bc}	84 ě 0.8^{bc}	89.3 ě 2^{bc}	89.6 ě 0.9^{bc}	102 ě 5^{a}	82.1 ě 0.9^{c}	94.4 ě 2^{ab}	94 ě 0.8^{ab}	86.8 ě 1^{bc}	91.1 ě 1^{ac}
Pancake	73 ě 2^{bc}	64.7 ě 2^{c}	70.3 ě 2^{bc}	65.3 ě 2^{c}	68.5 ě 2^{bc}	74.4 ě 2^{bc}	71.1 ě 2^{bc}	90.4 ě 5^{a}	73.1 ě 2^{bc}	78.6 ě 2^{ac}	75.2 ě 1^{bc}	82.9 ě 2^{ab}	74.5 ě 3^{bc}
Omelet	19.6 ě 0.9^{f}	28.5 ě 1^{bd}	20.9 ě 1^{ef}	26.7 ě 1^{cde}	23.1 ě 0.9^{df}	29.3 ě 1^{bd}	35.1 ě 0.6^{ab}	30.6 ě 1^{abc}	25.8 ě 1^{cdf}	37.3 ě 1^{a}	36.4 ě 2^{a}	33.8 ě 1^{ab}	31.3 ě 0.8^{abc}

B

	Control.	Custard	Milkshake	Pancake	Omelet
Del-3G	100 ě 0.9^{a}	93.4 ě 0.8^{ab}	88.5 ě 0.7^{b}	73 ě 2^{c}	19.6 ě 0.9^{d}
Cyn-3G	100 ě 0.8^{a}	91.8 ě 0.2^{b}	86.4 ě 1^{b}	64.7 ě 2^{c}	28.5 ě 1^{d}
Pet-3G	100 ě 0.8^{a}	92.5 ě 0.6^{ab}	86.5 ě 1^{b}	70.3 ě 2^{c}	20.9 ě 1^{d}
Peo-3G	100 ě 0.3^{a}	91.9 ě 0.7^{b}	85 ě 0.8^{b}	65.3 ě 2^{c}	26.7 ě 1^{d}
Mal -3G	100 ě 0.4^{a}	90.8 ě 0.2^{b}	84 ě 0.8^{b}	68.5 ě 2^{c}	23.1 ě 0.9^{d}
Mpm-3G	100 ě 3^{a}	91.4 ě 2^{a}	89.3 ě 2^{a}	74.4 ě 2^{b}	29.3 ě 1^{c}
Peo-3AG	100 ě 4^{a}	95 ě 4^{a}	89.6 ě 0.9^{a}	71.1 ě 2^{b}	35.1 ě 0.6^{c}
Del-3CG	100 ě 3^{a}	104 ě 1^{a}	102 ě 5^{a}	90.4 ě 5^{a}	30.6 ě 1^{b}
Mal- 3AG	100 ě 0.6^{a}	87.3 ě 1^{b}	82.1 ě 0.9^{b}	73.1 ě 2^{c}	25.8 ě 1^{d}
Pet-3CG	100 ě 0.7^{a}	98 ě 4^{a}	94.4 ě 2^{a}	78.6 ě 2^{b}	37.3 ě 1^{c}
Peo-3CG	100 ě 2^{a}	94.5 ě 3^{a}	94 ě 0.8^{a}	75.2 ě 1^{b}	36.4 ě 2^{c}
Mal-3CG	100 ě 0.9^{a}	92.6 ě 0.7^{ab}	86.8 ě 1^{bc}	82.9 ě 2^{c}	33.8 ě 1^{d}
Total	100 ě 0.2^{a}	96.6 ě 1^{a}	91.1 ě 1^{a}	74.5 ě 3^{b}	31.3 ě 0.8^{c}

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		Del.3G	Cyn.3G	Pet.3G.	Peo.3G	Mal.3G	Mpm.3G	Peo.3AG	Del.3CG.	Mal.3AG.	Pet.3CG	Peo.3CG	Mal.3CG	TOTAL
CONTROL	Oral soluble	84.1 ě 0.6^{a}	86.3 ě 1^{a}	79.9 ě 1^{a}	85.5 ě 0.5^{a}	81.5 ě 0.5^{a}	83.5 ě 3^{a}	83.6 ě 3^{a}	66.2 ě 3^{b}	80.5 ě 0.6^{a}	66 ě 0.5^{b}	62.7 ě 2^{b}	67.9 ě 0.4^{b}	83.4 ě 0.1^{a}
	Oral insoluble	11.9 ě 0.1^{de}	8.4 ě 0.1^{f}	11.8 ě 0.4^{de}	7.6 ě 0^{f}	9.9 ě 0.3^{ef}	13.8 ě 0.1^{d}	13.6 ě 0.6^{d}	39 ě 0.4^{a}	12 ě 0.2^{de}	35.4 ě 0.8^{b}	27.2 ě 2^{c}	29.5 ě 0.2^{c}	12.3 ě 0.2^{de}
	Oral total	96 ě 0.8^{ab}	94.6 ě 2^{ab}	91.7 ě 1^{b}	93.1 ě 0.5^{ab}	91.4 ě 0.8^{b}	97.3 ě 3^{ab}	97.1 ě 4^{ab}	105 ě 3^{a}	92.6 ě 0.8^{ab}	101 ě 1^{ab}	90 ě 4^{b}	97.4 ě 0.6^{ab}	95.7 ě 0.3^{ab}
	Gast. Soluble	92.5 ě 0.1^{ab}	92.6 ě 2^{a}	91.8 ě 2^{ab}	90.3 ě 1^{ab}	92.5 ě 2^{ab}	94.7 ě 0.8^{a}	92.7 ě 3^{a}	89.2 ě 5^{ab}	88.5 ě 2^{ab}	84.2 ě 1^{ab}	78.3 ě 4^{b}	85.4 ě 2^{ab}	92.4 ě 0.8^{ab}
	Gast. Insoluble	6.7 ě 0.9^{c}	6.6 ě 0.5^{c}	6.5 ě 0.5^{c}	6.6 ě 0.1^{c}	6.1 ě 0.5^{c}	9.4 ě 0.8^{ac}	9.6 ě 2^{ac}	15.4 ě 5^{ac}	5.8 ě 2^{c}	19.9 ě 2^{ab}	20.9 ě 3^{a}	18.9 ě 0.9^{ab}	8.6 ě 0.5^{bc}
	Gast. Total	99.1 ě 1	99.2 ě 2	98.3 ě 2	96.9 ě 1	98.6 ě 2	104 ě 2	102 ě 5	105 ě 10	94.3 ě 4	104 ě 3	99.3 ě 7	104 ě 3	101 ě 1
	Intest. Soluble	12.4 ě 0.8^{e}	29 ě 2^{c}	20.5 ě 0.8^{d}	35.1 ě 0.8^{ab}	36.4 ě 2^{a}	21.9 ě 1^{d}	22.5 ě 1^{d}	0 ě 0^{f}	22.3 ě 1^{d}	0 ě 0^{f}	0 ě 0^{f}	0 ě 0^{f}	30 ě 0.8^{bc}
	Intest. Insoluble	12.2 ě 0.8^{de}	26.9 ě 0.6^{b}	17.4 ě 0.1^{cd}	25.7 ě 0.3^{b}	23.1 ě 0.3^{bc}	24.1 ě 2^{b}	39.8 ě 2^{a}	0 ě 0^{f}	29.1 ě 1^{b}	7.3 ě 0.1^{e}	6 ě 0.9^{ef}	6.8 ě 0.4^{e}	25.1 ě 0.5^{b}
	Intest. total	24.5 ě 2^{d}	55.9 ě 2^{ab}	37.9 ě 0.9^{c}	60.8 ě 1^{a}	59.5 ě 2^{a}	46 ě 3^{bc}	62.3 ě 4^{a}	0 ě 0^{e}	51.4 ě 3^{ab}	7.3 ě 0.1^{e}	6 ě 0.9^{e}	6.8 ě 0.4^{e}	55.2 ě 1^{ab}
CUSTARD		Del.3G	Cyn.3G	Pet.3G.	Peo.3G	Mal.3G	Mpm.3G	Peo.3AG	Del.3CG.	Mal.3AG.	Pet.3CG	Peo.3CG	Mal.3CG	TOTAL
	Oral soluble	63.3 ě 1^{ab}	64.3 ě 0.4^{a}	63.5 ě 2^{ab}	62 ě 1^{ab}	64.1 ě 2^{a}	62.4 ě 3^{ab}	63.1 ě 3^{ab}	44.4 ě 0.2^{d}	61.3 ě 1^{abc}	47.4 ě 0.9^{d}	50.1 ě 5^{bd}	48.3 ě 1^{cd}	62.7 ě 0.2^{ab}
	Oral insoluble	22.6 ě 1^{cd}	19.4 ě 0.8^{cd}	18.5 ě 1^{cd}	16.6 ě 0.3^{d}	16.9 ě 0.5^{d}	24.2 ě 0.2^{cd}	28.3 ě 0.9^{c}	50.7 ě 0.4^{a}	19.4 ě 0.3^{cd}	43.2 ě 2^{ab}	39.8 ě 5^{b}	40.4 ě 2^{ab}	23.8 ě 0.7^{cd}
	Oral total	85.9 ě 2	83.8 ě 1	82 ě 3	78.6 ě 1	81 ě 2	86.6 ě 3	91.4 ě 4	95.1 ě 0.6	80.7 ě 1	90.6 ě 3	89.9 ě 10	88.7 ě 3	86.5 ě 0.9
	Gast. Soluble	77 ě 2^{a}	80.5 ě 0.06^{a}	77.5 ě 2^{a}	76.5 ě 2^{ab}	80.7 ě 2^{a}	84.8 ě 2^{a}	76.5 ě 3^{ab}	62.9 ě 0.9^{c}	77 ě 0.3^{a}	66.6 ě 2^{bc}	64.1 ě 0.7^{c}	66.3 ě 1^{c}	80.2 ě 2^{a}
	Gast. Insoluble	9.7 ě 1^{d}	9.2 ě 0.4^{d}	8.1 ě 0.8^{d}	8.6 ě 0.3^{d}	7.5 ě 0.5^{d}	13.2 ě 0.2^{cd}	16.8 ě 1^{c}	30.8 ě 0.9^{a}	8.9 ě 0.3^{d}	25.7 ě 2^{ab}	29.6 ě 1^{ab}	24 ě 2^{b}	12.3 ě 0.4^{cd}
	Gast. Total	86.7 ě 3	89.7 ě 0.5	85.6 ě 3	85 ě 2	88.2 ě 3	98 ě 2	93.2 ě 4	93.7 ě 2	85.9 ě 0.5	92.4 ě 3	93.7 ě 2	90.2 ě 3	92.5 ě 2
	Intest. Soluble	19 ě 0.5^{d}	39.4 ě 0.5^{ab}	33.2 ě 2^{bc}	45.8 ě 0.9^{a}	43.7 ě 1^{a}	35.1 ě 0.7^{bc}	35.7 ě 3^{bc}	0 ě 0^{e}	29.7 ě 0.8^{c}	0 ě 0^{e}	0 ě 0^{e}	0 ě 0^{e}	39.3 ě 0.5^{ab}
	Intest. Insoluble	12.4 ě 1^{e}	23.5 ě 1^{d}	20.8 ě 1^{d}	23.2 ě 1^{d}	21.7 ě 2^{d}	33.5 ě 0^{b}	42.7 ě 2^{a}	0 ě 0^{f}	30.2 ě 0.4^{bc}	8.5 ě 0.9^{e}	13.4 ě 1^{e}	8.9 ě 0.4^{e}	24.2 ě 0.6^{cd}
	Intest. total	31.4 ě 2^{d}	62.8 ě 2^{bc}	54 ě 4^{c}	69 ě 2^{ab}	65.5 ě 3^{ac}	68.6 ě 0.7^{ab}	78.4 ě 5^{a}	0 ě 0^{e}	60 ě 1^{bc}	8.5 ě 0.9^{e}	13.4 ě 1^{e}	8.9 ě 0.4^{e}	63.5 ě 1^{bc}
MILKSHAKE		Del.3G	Cyn.3G	Pet.3G.	Peo.3G	Mal.3G	Mpm.3G	Peo.3AG	Del.3CG.	Mal.3AG.	Pet.3CG	Peo.3CG	Mal.3CG	TOTAL
	Oral soluble	70.6 ě 2^{a}	72.4 ě 2^{a}	70.1 ě 2^{a}	68 ě 2^{a}	69.8 ě 1^{a}	74.9 ě 0.3^{a}	69.8 ě 4^{a}	40.9 ě 0.6^{b}	67.2 ě 2^{a}	46.7 ě 2^{b}	53 ě 2^{b}	49.6 ě 2^{b}	67.4 ě 2^{a}
	Oral insoluble	29.4 ě 2^{cd}	26 ě 2^{d}	24.7 ě 3^{d}	22.9 ě 2^{d}	23.6 ě 2^{d}	31.1 ě 2^{bcd}	31.8 ě 1^{bcd}	48.4 ě 4^{a}	27.5 ě 2^{d}	46.8 ě 4^{ab}	44.5 ě 2^{ac}	48.3 ě 4^{a}	30 ě 0.8^{cd}
	Oral total	100 ě 4	98.4 ě 4	94.8 ě 4	90.9 ě 4	93.4 ě 3	106 ě 3	102 ě 5	89.3 ě 4	94.7 ě 5	93.5 ě 6	97.5 ě 5	97.9 ě 7	97.3 ě 4
	Gast. Soluble	90.8 ě 3^{a}	91.6 ě 0.6^{a}	87.7 ě 4^{ab}	83.3 ě 3^{ac}	89.2 ě 4^{a}	94.1 ě 0.5^{a}	86.6 ě 2^{ab}	71.1 ě 2^{c}	85.5 ě 1^{ac}	70.9 ě 1^{c}	80.2 ě 2^{ac}	73.7 ě 2^{bc}	89.2 ě 3^{a}
	Gast. Insoluble	11 ě 2^{d}	9.6 ě 0.6^{d}	8.6 ě 1^{d}	8.7 ě 0.8^{d}	7.7 ě 1^{d}	13.8 ě 0.7^{bd}	17.1 ě 2^{bd}	30.7 ě 5^{a}	9.6 ě 0.8^{d}	26.6 ě 3^{ab}	32.8 ě 0.06^{a}	25.3 ě 4^{abc}	12.8 ě 1^{cd}
	Gast. Total	102 ě 5	101 ě 1	96.3 ě 5	92 ě 4	96.9 ě 5	108 ě 1	104 ě 4	102 ě 7	95.2 ě 2	97.5 ě 5	113 ě 2	99.1 ě 6	102 ě 4
	Intest. Soluble	22.9 ě 2^{c}	49.5 ě 1^{ab}	41.7 ě 4^{ab}	55.3 ě 4^{a}	54.6 ě 4^{a}	43.4 ě 3^{ab}	44.3 ě 2^{ab}	0 ě 0^{d}	36.5 ě 2^{bc}	0 ě 0^{d}	0 ě 0^{d}	0 ě 0^{d}	47.3 ě 3^{ab}
	Intest. Insoluble	15.6 ě 1^{ef}	29.1 ě 2^{cd}	25.2 ě 2^{de}	29.8 ě 2^{cd}	27.6 ě 2^{cd}	40.7 ě 2^{b}	55.9 ě 2^{a}	0 ě 0^{g}	35.6 ě 2^{bc}	8.2 ě 1^{fg}	8.3 ě 0.5^{fg}	9.7 ě 0.3^{fg}	29.2 ě 2^{cd}
	Intest. total	38.4 ě 4^{c}	78.7 ě 3^{ab}	66.8 ě 6^{b}	85.1 ě 6^{ab}	82.3 ě 6^{ab}	84.1 ě 5^{ab}	100 ě 4^{a}	0 ě 0^{d}	72.1 ě 4^{b}	8.2 ě 1^{d}	8.3 ě 0.5^{d}	9.7 ě 0.3^{d}	76.5 ě 5^{ab}
PANCAKE		Del.3G	Cyn.3G	Pet.3G.	Peo.3G	Mal.3G	Mpm.3G	Peo.3AG	Del.3CG.	Mal.3AG.	Pet.3CG	Peo.3CG	Mal.3CG	TOTAL
	Oral soluble	27.5 ě 1^{a}	30.1 ě 2^{a}	31.4 ě 2^{a}	30.7 ě 2^{a}	35 ě 2^{a}	26.7 ě 3^{a}	26.3 ě 2^{a}	7.4 ě 0.06^{b}	28.8 ě 2^{a}	7.8 ě 0.5^{b}	6.9 ě 2^{b}	9.4 ě 0.5^{b}	28.4 ě 1^{a}
	Oral insoluble	68.1 ě 2^{bc}	68.5 ě 1^{bc}	63.6 ě 0.3^{bc}	59.1 ě 0.7^{c}	59.5 ě 1^{c}	70.5 ě 3^{b}	70 ě 1^{b}	96.9 ě 2^{a}	64.7 ě 0.1^{bc}	94.5 ě 4^{a}	97.6 ě 1^{a}	93 ě 0.6^{a}	70.5 ě 0.6^{b}
	Oral total	95.6 ě 3	98.6 ě 4	95 ě 2.4	89.8 ě 2.5	94.5 ě 3	97.2 ě 5	96.3 ě 3	104 ě 2	93.5 ě 2	102 ě 4	104 ě 3	102 ě 1	98.9 ě 2
	Gast. Soluble	58.8 ě 1^{ab}	59.6 ě 3^{ab}	62.3 ě 2^{ab}	57.8 ě 3^{ab}	65.4 ě 2^{a}	58 ě 4^{ab}	49.4 ě 3^{ac}	45.1 ě 4^{bc}	56.5 ě 3^{ab}	30.4 ě 2^{c}	32.9 ě 6^{c}	33.6 ě 0.7^{c}	59.2 ě 2^{ab}
	Gast. Insoluble	31.6 ě 4^{a}	30.8 ě 5^{a}	27.2 ě 3^{a}	26.1 ě 4^{a}	24.7 ě 3^{a}	35.8 ě 8^{a}	32.9 ě 4^{a}	59.9 ě 9^{a}	27.6 ě 4^{a}	53.5 ě 8^{a}	49.3 ě 4^{a}	54.2 ě 9^{a}	33.5 ě 5^{a}
	Gast. Total	90.4 ě 6	90.4 ě 9	89.5 ě 6	83.8 ě 7	90.1 ě 5	93.8 ě 10	82.2 ě 8	105 ě 10	84.1 ě 8	83.9 ě 10	82.2 ě 10	87.8 ě 10	92.7 ě 7
	Intest. Soluble	44.3 ě 0.6^{cd}	52.5 ě 3^{ab}	48.3 ě 3^{ac}	52.5 ě 0.2^{ab}	56.1 ě 0^{a}	45.4 ě 3^{bcd}	43.9 ě 0.1^{cd}	0 ě 0^{e}	37.7 ě 0.9^{d}	0 ě 0^{e}	0 ě 0^{e}	0 ě 0^{e}	51.5 ě 0.2^{ac}
	Intest. Insoluble	31.9 ě 3^{a}	34.5 ě 2^{a}	31.2 ě 3^{a}	30.9 ě 1^{a}	30.7 ě 3^{a}	39.1 ě 3^{a}	42 ě 3^{a}	0 ě 0^{c}	33.5 ě 0.8^{a}	12.9 ě 1^{bc}	16 ě 2^{b}	14.9 ě 0.9^{b}	35 ě 3^{a}
	Intest. total	76.2 ě 3^{a}	87 ě 5^{a}	79.5 ě 5^{a}	83.4 ě 1^{a}	86.8 ě 3^{a}	84.5 ě 5^{a}	85.9 ě 3^{a}	0 ě 0^{b}	71.2 ě 2^{a}	12.9 ě 1^{b}	16 ě 2^{b}	14.9 ě 0.9^{b}	86.5 ě 3^{a}
OMELET		Del.3G	Cyn.3G	Pet.3G.	Peo.3G	Mal.3G	Mpm.3G	Peo.3AG	Del.3CG.	Mal.3AG.	Pet.3CG	Peo.3CG	Mal.3CG	TOTAL
	Oral soluble	20.8 ě 1^{bd}	21.3 ě 1^{bd}	21.6 ě 1^{bd}	25.9 ě 2^{ab}	31.6 ě 1^{a}	16.5 ě 1^{d}	17.5 ě 1^{cd}	3.3 ě 0.5^{e}	22.6 ě 1^{bd}	3.6 ě 0.1^{e}	3.1 ě 0.2^{e}	4.9 ě 0.2^{e}	23.4 ě 0.9^{bc}
	Oral insoluble	75.9 ě 2^{cd}	77.3 ě 1^{bcd}	78.9 ě 3^{bcd}	67.6 ě 0^{d}	75.5 ě 2^{cd}	84.7 ě 2^{ad}	78.5 ě 2^{bcd}	104 ě 6^{a}	76.5 ě 1^{bcd}	96.8 ě 4^{ab}	89.7 ě 8^{ac}	104 ě 3^{a}	81.9 ě 2^{bcd}
	Oral total	96.7 ě 3	98.6 ě 2	100 ě 4	93.6 ě 0.2	107 ě 4	101 ě 3	95.9 ě 3	107 ě 6	99.1 ě 2	100 ě 4	92.8 ě 8	109 ě 3	105 ě 2
	Gast. Soluble	56.1 ě 0.4^{c}	60.5 ě 2^{bc}	68.1 ě 0.8^{ab}	59.5 ě 0.2^{bc}	75 ě 1^{a}	59.4 ě 5^{bc}	52.2 ě 2^{c}	0 ě 0^{e}	60.6 ě 3^{bc}	19.4 ě 2^{d}	16.5 ě 2^{d}	21.3 ě 1^{d}	62.2 ě 0.2^{bc}
	Gast. Insoluble	34.9 ě 2^{d}	37.5 ě 1^{d}	34.4 ě 0.6^{d}	33.8 ě 0.3^{d}	33.5 ě 0^{d}	46 ě 0.8^{cd}	51.3 ě 0.3^{c}	91.6 ě 5^{a}	40.4 ě 0.3^{cd}	82.1 ě 5^{ab}	80.2 ě 0.2^{ab}	76.4 ě 2^{b}	44 ě 1^{cd}
	Gast. Total	91.1 ě 2	98 ě 3	102 ě 1	93.3 ě 0.6	108 ě 1	105 ě 6	104 ě 2	91.6 ě 5	101 ě 3	102 ě 7	96.6 ě 3	97.7 ě 3	106 ě 2
	Intest. Soluble	52.1 ě 0.6^{cd}	55.9 ě 1^{c}	56.9 ě 0^{bc}	53.8 ě 0.2^{cd}	66.2 ě 0.4^{a}	48.5 ě 0.9^{de}	44.3 ě 3^{ef}	0 ě 0^{g}	42.5 ě 0.1^{f}	0 ě 0^{g}	0 ě 0^{g}	0 ě 0^{g}	62.5 ě 0.2^{ab}
	Intest. Insoluble	36.6 ě 0.6^{de}	40.8 ě 0.2^{cde}	38.9 ě 1^{cde}	40.4 ě 2^{cde}	41.1 ě 0.8^{cde}	52.1 ě 1^{b}	67.6 ě 6^{a}	0 ě 0^{f}	45.2 ě 0.3^{bd}	30.3 ě 2^{e}	35.7 ě 1^{de}	46.1 ě 0.1^{bd}	48.6 ě 0.2^{bc}
	Intest. total	88.7 ě 1^{c}	96.8 ě 1^{ac}	95.8 ě 1^{ac}	94.3 ě 2^{bc}	107 ě 1^{ab}	101 ě 2^{ac}	112 ě 9^{a}	0 ě 0^{e}	87.7 ě 0.4^{c}	30.3 ě 2^{d}	35.7 ě 1^{d}	46.1 ě 0.06^{d}	111 ě 0.3^{a}

[illegible]

		Control	Custard	Milkshake	Pancake	Omelet		Control	Custard	Milkshake	Pancake	Omelet
Oral sol.	Dal 3G	84.1 ě 0.6^{a}	63.3 ě 1^{b}	70.6 ě 2^{b}	27.5 ě 1^{c}	20.8 ě 1^{c}	Pan 3AG	83.6 ě 3.2^{a}	63.1 ě 3.4^{b}	69.8 ě 4^{ab}	26.3 ě 2.1^{c}	17.5 ě 1.0^{c}
Oral insol.		11.9 ě 0.1^{c}	22.6 ě 1^{b}	29.4 ě 2^{b}	68.1 ě 2^{a}	75.9 ě 2^{a}		13.6 ě 0.6^{d}	28.3 ě 0.9^{c}	31.8 ě 1.2^{c}	70 ě 1.4^{b}	78.5 ě 2.1^{a}
Oral total		96 ě 0.8^{a}	85.9 ě 2^{a}	100 ě 4^{a}	95.6 ě 3^{a}	96.7 ě 3^{a}		97.1 ě 3.8^{a}	91.4 ě 4.3^{a}	102 ě 5^{a}	96.3 ě 3^{a}	95.9 ě 3^{a}
Gast. Sol.		92.5 ě 0.1^{a}	77 ě 2^{b}	90.8 ě 3^{a}	58.8 ě 1^{c}	56.1 ě 0.4^{c}		92.7 ě 3.3^{a}	76.5 ě 2.5^{a}	86.6 ě 2^{a}	49.4 ě 3.3^{b}	52.2 ě 1.8^{b}
Gast. Insol.		6.7 ě 0.9^{b}	9.7 ě 1^{b}	11 ě 2^{b}	31.6 ě 4^{a}	34.9 ě 2^{a}		9.6 ě 1.8^{c}	16.8 ě 1.4^{c}	17.1 ě 1.6^{c}	32.9 ě 4.2^{b}	51.3 ě 0.3^{a}
Gast. Total		99.1 ě 1	86.7 ě 3	102 ě 5	90.4 ě 6	91.1 ě 2		102 ě 5.2	93.2 ě 3.9	104 ě 3.5	82.2 ě 7.6	104 ě 2.1
Intest. Sol.		12.4 ě 0.8^{d}	19 ě 0.5^{cd}	22.9 ě 2^{c}	44.3 ě 0.6^{b}	52.1 ě 0.6^{a}		22.5 ě 1.3^{b}	35.7 ě 3.5^{ab}	44.3 ě 2.2^{a}	43.9 ě 0.1^{a}	44.3 ě 3.1^{a}
Intest. Insol.		12.2 ě 0.8^{b}	12.4 ě 1^{b}	15.6 ě 1^{b}	31.9 ě 3^{a}	36.6 ě 0.6^{a}		39.8 ě 2.3^{b}	42.7 ě 1.6^{b}	55.9 ě 1.6^{ab}	42 ě 2.9^{b}	67.6 ě 5.6^{a}
Intest. total		24.5 ě 2^{b}	31.4 ě 2^{b}	38.4 ě 4^{b}	76.2 ě 3^{a}	88.7 ě 1^{a}		62.3 ě 3.6^{c}	78.4 ě 5.1^{bc}	100 ě 3.8^{ab}	85.9 ě 2.9^{ac}	112 ě 8.7^{a}
		Control	Custard	Milkshake	Pancake	Omelet		Control	Custard	Milkshake	Pancake	Omelet
Oral sol.	Cyn 3G	86.3 ě 1^{a}	64.3 ě 0.4^{b}	72.4 ě 2^{b}	30.1 ě 2^{c}	21.3 ě 1^{c}	Dal 3G	66.2 ě 2.7^{a}	44.4 ě 0.2^{b}	40.9 ě 0.6^{b}	7.4 ě 0.1^{c}	3.3 ě 0.4^{c}
Oral insol.		8.4 ě 0.1^{d}	19.4 ě 0.8^{c}	26 ě 2^{c}	68.5 ě 1^{b}	77.3 ě 0.6^{a}		39 ě 0.4^{b}	50.7 ě 0.4^{b}	48.4 ě 3.5^{b}	96.9 ě 2.2^{a}	104 ě 5.9^{a}
Oral total		94.6 ě 2^{a}	83.8 ě 1^{a}	98.4 ě 4^{a}	98.6 ě 4^{a}	98.6 ě 2^{a}		105 ě 3.1^{a}	95.1 ě 0.6^{a}	89.3 ě 4.2^{a}	104 ě 2.3^{a}	107 ě 6.3^{a}
Gast. Sol.		92.6 ě 2^{a}	80.5 ě 0.1^{b}	91.6 ě 0.6^{ab}	59.6 ě 3^{c}	60.5 ě 2^{c}		89.2 ě 4.9^{a}	62.9 ě 0.9^{bc}	71.1 ě 2.2^{ab}	45.1 ě 4^{c}	0 ě 0^{d}
Gast. Insol.		6.6 ě 0.5^{b}	9.2 ě 0.4^{b}	9.6 ě 0.6^{b}	30.8 ě 5^{a}	37.5 ě 1^{a}		15.4 ě 5.1^{c}	30.8 ě 0.9^{bc}	30.7 ě 5.1^{bc}	59.9 ě 9.4^{ab}	91.6 ě 4.9^{a}
Gast. Total		99.2 ě 2	89.7 ě 0.5	101 ě 1	90.4 ě 9	98 ě 3		105 ě 10	93.7 ě 1.8	102 ě 7.3	105 ě 13	91.6 ě 4.9
Intest. Sol.		29 ě 2^{c}	39.4 ě 0.5^{bc}	49.5 ě 1^{ab}	52.5 ě 3^{a}	55.9 ě 1^{a}		0 ě 0	0 ě 0	0 ě 0	0 ě 0	0 ě 0
Intest. Insol.		26.9 ě 0.6^{bc}	23.5 ě 1^{c}	29.1 ě 2^{bc}	34.5 ě 2^{ab}	40.8 ě 0.2^{a}		0 ě 0	0 ě 0	0 ě 0	0 ě 0	0 ě 0
Intest. total		55.9 ě 2^{d}	62.8 ě 2^{cd}	78.7 ě 3^{bc}	87 ě 5^{ab}	96.8 ě 1^{a}		0 ě 0	0 ě 0	0 ě 0	0 ě 0	0 ě 0
		Control	Custard	Milkshake	Pancake	Omelet		Control	Custard	Milkshake	Pancake	Omelet
Oral sol.	Par 3G	79.9 ě 1^{a}	63.5 ě 2^{b}	70.1 ě 2^{ab}	31.4 ě 2^{c}	21.6 ě 1^{c}	Mal 3AG	80.5 ě 0.6^{a}	61.3 ě 1.1^{b}	67.2 ě 2.4^{b}	28.8 ě 1.6^{c}	22.6 ě 1.3^{c}
Oral insol.		11.8 ě 0.4^{d}	18.5 ě 1^{cd}	24.7 ě 3^{c}	63.6 ě 0.3^{b}	78.9 ě 3^{a}		12 ě 0.2^{e}	19.4 ě 0.3^{d}	27.5 ě 2.1^{c}	64.7 ě 0.1^{b}	76.5 ě 0.6^{a}
Oral total		91.7 ě 1^{a}	82 ě 3^{a}	94.8 ě 4^{a}	95 ě 3^{a}	100 ě 4^{a}		92.6 ě 0.7^{ab}	80.7 ě 1.4^{b}	94.7 ě 4.5^{ab}	93.5 ě 1.7^{ab}	99.1 ě 1.9^{a}
Gast. Sol.		91.8 ě 2^{a}	77.5 ě 2^{ab}	87.7 ě 4^{a}	62.3 ě 2^{c}	68.1 ě 0.8^{bc}		88.5 ě 2.1^{a}	77 ě 0.29^{a}	85.5 ě 1.3^{a}	56.5 ě 3.1^{b}	60.6 ě 2.8^{b}
Gast. Insol.		6.5 ě 0.5^{b}	8.1 ě 0.8^{b}	8.6 ě 1^{b}	27.2 ě 3^{a}	34.4 ě 0.6^{a}		5.8 ě 1.9^{b}	8.9 ě 0.29^{b}	9.6 ě 0.75^{b}	27.6 ě 4.4^{a}	40.4 ě 0.3^{a}
Gast. Total		98.3 ě 2	85.6 ě 3	96.3 ě 5	89.5 ě 6	102 ě 1		94.3 ě 4	85.9 ě 0.52	95.2 ě 2	84.1 ě 7.5	101 ě 3.1
Intest. Sol.		20.5 ě 0.8^{d}	33.2 ě 2^{cd}	41.7 ě 4^{bc}	48.3 ě 3^{ab}	56.9 ě 0^{a}		22.3 ě 1.1^{c}	29.7 ě 0.7^{b}	36.5 ě 2^{ab}	37.7 ě 0.9^{a}	42.5 ě 0.1^{a}
Intest. Insol.		17.4 ě 0.1^{c}	20.8 ě 1^{bc}	25.2 ě 2^{bc}	31.2 ě 3^{ab}	38.9 ě 1^{a}		29.1 ě 1.4^{b}	30.2 ě 0.4^{b}	35.6 ě 1.8^{b}	33.5 ě 0.7^{b}	45.2 ě 0.3^{a}
Intest. total		37.9 ě 0.9^{c}	54 ě 4^{bc}	66.8 ě 6^{b}	79.5 ě 5^{ab}	95.8 ě 1^{a}		51.4 ě 2.5^{c}	60 ě 1.1^{bc}	72.1 ě 3.9^{b}	71.2 ě 1.6^{b}	87.7 ě 0.4^{a}
		Control	Custard	Milkshake	Pancake	Omelet		Control	Custard	Milkshake	Pancake	Omelet
Oral sol.	Pep 3G	85.5 ě 0.5^{a}	62 ě 1^{b}	68 ě 2^{b}	30.7 ě 2^{c}	25.9 ě 2^{c}	Par 3G	66 ě 0.46^{a}	47.4 ě 0.9^{b}	46.7 ě 1.8^{b}	7.8 ě 0.46^{c}	3.6 ě 0.12^{c}
Oral insol.		7.6 ě 0^{e}	16.6 ě 0.3^{d}	22.9 ě 2^{c}	59.1 ě 0.7^{b}	67.6 ě 0^{a}		35.4 ě 0.7^{b}	43.2 ě 2.2^{b}	46.8 ě 4.3^{b}	94.5 ě 3.6^{a}	96.8 ě 4.3^{a}
Oral total		93.1 ě 0.5^{a}	78.6 ě 1^{b}	90.9 ě 4^{ab}	89.8 ě 2^{ab}	93.6 ě 2^{a}		101 ě 1.2^{a}	90.6 ě 3.1^{a}	93.5 ě 6.1^{a}	102 ě 4^{a}	100 ě 4.4^{a}
Gast. Sol.		90.3 ě 1^{a}	76.5 ě 2^{b}	83.3 ě 3^{ab}	57.8 ě 3^{c}	59.5 ě 0.2^{c}		84.2 ě 1^{a}	66.6 ě 1.6^{b}	70.9 ě 1.4^{b}	30.4 ě 1.9^{c}	19.4 ě 1.7^{d}
Gast. Insol.		6.6 ě 0.1^{b}	8.6 ě 0.3^{b}	8.7 ě 0.8^{b}	26.1 ě 4^{a}	33.8 ě 0.3^{a}		19.9 ě 1.7^{c}	25.7 ě 1.6^{bc}	26.6 ě 3.2^{bc}	53.5 ě 8.3^{ab}	82.1 ě 5^{a}
Gast. Total		96.9 ě 1	85 ě 2	92 ě 4	83.8 ě 7	93.3 ě 0.6		104 ě 2.8	92.4 ě 3.2	97.5 ě 4.6	83.9 ě 10	102 ě 6.6
Intest. Sol.		35.1 ě 0.8^{b}	45.8 ě 0.9^{a}	55.3 ě 4^{a}	52.5 ě 0.2^{a}	53.8 ě 0.2^{a}		0 ě 0	0 ě 0	0 ě 0	0 ě 0	0 ě 0
Intest. Insol.		25.7 ě 0.3^{b}	23.2 ě 1^{b}	29.8 ě 2^{b}	30.9 ě 1^{b}	40.4 ě 2^{a}		7.3 ě 0.12^{b}	8.5 ě 0.87^{b}	8.2 ě 1.2^{b}	12.9 ě 1.2^{b}	30.3 ě 1.6^{a}
Intest. total		60.8 ě 1^{c}	69 ě 2^{bc}	85.1 ě 6^{ab}	83.4 ě 1^{ab}	94.3 ě 2^{a}		7.3 ě 0.12^{b}	8.5 ě 0.87^{b}	8.2 ě 1.2^{b}	12.9 ě 1.2^{b}	30.3 ě 1.6^{a}
		Control	Custard	Milkshake	Pancake	Omelet		Control	Custard	Milkshake	Pancake	Omelet
Oral sol.	Mal 3G	81.5 ě 0.5^{a}	64.1 ě 2^{b}	69.8 ě 1^{b}	35 ě 2^{c}	31.6 ě 1^{c}	Pep 3G	62.7 ě 2.5^{a}	50.1 ě 5.2^{a}	53 ě 2.4^{a}	6.9 ě 1.6^{b}	3.1 ě 0.23^{b}
Oral insol.		9.9 ě 0.3^{d}	16.9 ě 0.5^{cd}	23.6 ě 2^{c}	59.5 ě 1^{b}	75.5 ě 2^{a}		27.2 ě 1.5^{b}	39.8 ě 4.8^{b}	44.5 ě 2.4^{b}	97.6 ě 1^{a}	89.7 ě 7.9^{a}
Oral total		91.4 ě 0.8^{ab}	81 ě 2^{b}	93.4 ě 3^{ab}	94.5 ě 3^{ab}	107 ě 4^{a}		90 ě 4^{a}	89.9 ě 10^{a}	97.5 ě 4.8^{a}	104 ě 2.5^{a}	92.8 ě 8.1^{a}
Gast. Sol.		92.5 ě 2^{a}	80.7 ě 2^{ab}	89.2 ě 4^{a}	65.4 ě 2^{c}	75 ě 1^{bc}		78.3 ě 3.9^{a}	64.1 ě 0.7^{a}	80.2 ě 2.3^{a}	32.9 ě 6.2^{b}	16.5 ě 2.4^{b}
Gast. Insol.		6.1 ě 0.5^{b}	7.5 ě 0.5^{b}	7.7 ě 1^{b}	24.7 ě 3^{a}	33.5 ě 0^{a}		20.9 ě 2.7^{c}	29.6 ě 1.4^{c}	32.8 ě 0.1^{c}	49.3 ě 3.6^{b}	80.2 ě 0.2^{a}
Gast. Total		98.6 ě 2	88.2 ě 3	96.9 ě 5	90.1 ě 5	108 ě 1		99.3 ě 6.5	93.7 ě 2.1	113 ě 2.3	82.2 ě 9.8	96.6 ě 2.6
Intest. Sol.		36.4 ě 2^{d}	43.7 ě 1^{cd}	54.6 ě 4^{bc}	56.1 ě 0^{ab}	66.2 ě 0.4^{a}		0 ě 0	0 ě 0	0 ě 0	0 ě 0	0 ě 0
Intest. Insol.		23.1 ě 0.3^{b}	21.7 ě 2^{b}	27.6 ě 2^{b}	30.7 ě 3^{ab}	41.1 ě 0.8^{a}		6 ě 0.87^{c}	13.4 ě 1.2^{bc}	8.3 ě 0.46^{bc}	16 ě 2.4^{b}	35.7 ě 1.4^{a}
Intest. total		59.5 ě 2^{d}	65.5 ě 3^{cd}	82.3 ě 6^{bc}	86.8 ě 3^{b}	107 ě 1^{a}		6 ě 0.87^{c}	13.4 ě 1.2^{bc}	8.3 ě 0.46^{bc}	16 ě 2.3^{b}	35.7 ě 1.4^{a}
		Control	Custard	Milkshake	Pancake	Omelet		Control	Custard	Milkshake	Pancake	Omelet
Oral sol.	Mam 3G	83.5 ě 3^{a}	62.4 ě 3^{b}	74.9 ě 0.3^{ab}	26.7 ě 3^{c}	16.5 ě 1^{c}	Mal 3CG	67.9 ě 0.4^{a}	48.3 ě 1.2^{b}	49.6 ě 2.4^{b}	9.4 ě 0.46^{c}	4.9 ě 0.17^{c}
Oral insol.		13.8 ě 0.1^{d}	24.2 ě 0.2^{cd}	31.1 ě 2^{c}	70.5 ě 3^{b}	84.7 ě 2^{a}		29.5 ě 0.2^{c}	40.4 ě 2.3^{bc}	48.3 ě 4.2^{b}	93 ě 0.58^{a}	104 ě 2.5^{a}
Oral total		97.3 ě 3^{a}	86.6 ě 3^{a}	106 ě 3^{a}	97.2 ě 5^{a}	101 ě 3^{a}		97.4 ě 0.6^{a}	88.7 ě 3.3^{a}	97.9 ě 6.6^{a}	102 ě 1^{a}	109 ě 2.7^{a}
Gast. Sol.		94.7 ě 0.8^{a}	84.8 ě 2^{a}	94.1 ě 0.5^{a}	58 ě 4^{b}	59.4 ě 5^{b}		85.4 ě 1.8^{a}	66.3 ě 1.2^{b}	73.7 ě 2^{b}	33.6 ě 0.7^{c}	21.3 ě 1.2^{d}
Gast. Insol.		9.4 ě 0.8^{b}	13.2 ě 0.2^{b}	13.8 ě 0.7^{b}	35.8 ě 8^{a}	46 ě 0.8^{a}		18.9 ě 0.9^{b}	24 ě 1.7^{b}	25.3 ě 3.5^{b}	54.2 ě 9.2^{a}	76.4 ě 1.9^{a}
Gast. Total		104 ě 2	98 ě 2	108 ě 1	93.8 ě 10	105 ě 6		104 ě 2.7	90.2 ě 2.9	99.1 ě 5.5	87.8 ě 9.9	97.7 ě 3.1
Intest. Sol.		21.9 ě 0.5^{c}	35.1 ě 0.7^{b}	43.4 ě 3^{ab}	45.4 ě 3^{ab}	48.5 ě 0.9^{a}		0 ě 0	0 ě 0	0 ě 0	0 ě 0	0 ě 0
Intest. Insol.		24.1 ě 2^{c}	33.5 ě 0^{bc}	40.7 ě 2^{b}	39.1 ě 3^{b}	52.1 ě 1^{a}		6.8 ě 0.4^{c}	8.9 ě 0.4^{c}	9.7 ě 0.35^{c}	14.9 ě 0.9^{b}	46.1 ě 0.1^{a}
Intest. total		46 ě 3^{c}	68.6 ě 0.7^{b}	84.1 ě 5^{ab}	84.5 ě 5^{ab}	101 ě 2^{a}		6.8 ě 0.4^{c}	8.9 ě 0.4^{c}	9.7 ě 0.35^{c}	14.9 ě 0.9^{b}	46.1 ě 0.1^{a}

		Control	Custard	Milkshake	Pancake	Omelet
Oral sol.	TOTAL	83.4 ě 0.1^{a}	62.7 ě 0.2^{b}	67.4 ě 2.1^{b}	28.4 ě 1^{c}	23.4 ě 0.9^{c}
Oral insol.		12.3 ě 0.2^{e}	23.8 ě 0.7^{d}	30 ě 0.81^{c}	70.5 ě 0.6^{b}	81.9 ě 1.5^{a}
Oral total		95.7 ě 0.3^{ab}	86.5 ě 0.9^{b}	97.3 ě 4.4^{ab}	98.9 ě 1.6^{ab}	105 ě 2.4^{a}
Gast. Sol.		92.4 ě 0.7^{a}	80.2 ě 1.7^{b}	89.2 ě 2.7^{ab}	59.2 ě 1.7^{c}	62.2 ě 0.2^{c}
Gast. Insol.		8.6 ě 0.52^{b}	12.3 ě 0.4^{b}	12.8 ě 1.4^{b}	33.5 ě 5.1^{a}	44 ě 1.2^{a}
Gast. Total		101 ě 1.3	92.5 ě 2.1	102 ě 4.2	92.7 ě 6.8	106 ě 1.5
Intest. Sol.		30 ě 0.75^{d}	39.3 ě 0.5^{c}	47.3 ě 2.8^{bc}	51.5 ě 0.2^{b}	62.5 ě 0.2^{a}
Intest. Insol.		25.1 ě 0.5^{b}	24.2 ě 0.6^{b}	29.2 ě 2.1^{b}	35 ě 3.2^{b}	48.6 ě 0.2^{a}
Intest. total		55.2 ě 1.3^{d}	63.5 ě 1.2^{cd}	76.5 ě 4.9^{bc}	86.5 ě 3.5^{b}	111 ě 0.35^{a}

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In vitro digestion of dairy and egg products enriched with grape extracts: Effect of the food matrix on polyphenol bioaccessibility and antioxidant activity

Carlos Pineda-Vadillo [a,b,1], Françoise Nau [a,b], Catherine Guerin Dubiard [a,b], Véronique Cheynier [c], Emmanuelle Meudec [c], Marisa Sanz-Buenhombre [d], Alberto Guadarrama [d], Tamás Tóth [e], Éva Csavajda [e], Hajnalka Hingyi [e], Sibel Karakaya [f], Juhani Sibakov [g], Francesco Capozzi [h], Alessandra Bordoni [i], Didier Dupont [a,b,*]

[a] INRA, UMR 1253, Science et Technologie du Lait et de l'Oeuf, 65 rue de St Brieuc, 35042 Rennes, France
[b] Agrocampus Ouest, UMR 1253, Science et Technologie du Lait et de l'Oeuf, 65 rue de St Brieuc, 35042 Rennes, France
[c] INRA, UMR1083 Sciences pour l'Oenologie, Plateforme Polyphénols, 2 Place Viala, 34060 Montpellier Cedex 02, France
[d] Abrobiotec S.L. (Grupo Matarromera), Ctra. San Bernardo S/N, Valbuena de Duero, 47359 Valladolid, Spain
[e] ADEXGO Ltd., 13 Lapostelki St., H-8230 Balatonfüred, Hungary
[f] Department of Food Engineering, Faculty of Engineering, Ege University, 35100, Izmir, Turkey
[g] VTT Technical Research Centre of Finland, Tietotie 2, 02044 VTT, Finland
[h] Interdepartmental Centre for Industrial Agri-Food Research, University of Bologna, Piazza Goidanich 60, 47521 Cesena, Forlì Cesena, Italy
[i] Department of Agri-Food Sciences and Technologies, University of Bologna, Piazza Goidanich 60, 47521 Cesena, Forlì Cesena, Italy

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ABSTRACT

The aim of this study was to evaluate the effect of the food matrix on polyphenol bioaccessibility and antioxidant activity during the *in-vitro* digestion of dairy and egg products enriched with grape extracts (GE). Four GE-enriched matrices produced under industrial conditions (custard dessert, milkshake, pancake and omelet) and the GE dissolved in water (control solution) were submitted to *in vitro* digestion and the bioaccessibility of the major classes of polyphenols as well as the evolution of the antioxidant activity of the matrices were monitored at oral, gastric and intestinal level. Apart from the digestion effect itself, the release, stability and solubility of polyphenols was governed by mainly two factors: 1 – the composition and structure of the food matrices and 2 – the class of polyphenol. Results showed that the inclusion of the GE extracts into the different egg and dairy food matrices greatly impacted the release and solubility of anthocyanins and proanthocyanidins during digestion, especially in the solid food matrices and during the oral and gastric phases of digestion. Also, the presence of the food matrices protected anthocyanins from degradation during the intestinal phase. However, if the total phenolic content is considered at the end of the whole digestion process, the proportion of soluble (bioaccessible) and insoluble phenolics delivered by the enriched-matrices was quite similar to that of the control solution. On the contrary, the food matrix effect did not affect the antioxidant activity of the matrices, which remained constant during the oral and gastric phases but greatly increased during the intestinal phase of digestion. Among the GE-enriched matrices, omelet presented higher recoveries of total phenolics and antioxidant activity at the end of digestion.

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1. Introduction

Grape extracts (GE), a by-product resulting from juice and wine making process, are very promising ingredients for the food industry. They are natural, inexpensive, can be obtained in considerable quantities and represent a very good source of phenolic compounds such as anthocyanins, proanthocyanidins, flavanols, flavonols, phenolic acids and stilbenes. The list of biological activities and health benefits associated with the intake of grape phenolic compounds is large. Antioxidant, cardioprotective, anti-carcinogenic, anti-inflammatory or anti-aging properties have been observed both *in vitro* and *in vivo* (Xia, Deng, Guo, & Li, 2010; Teixeira et al., 2014; Soares De Moura et al., 2002). Due to these myriad of healthy effects, polyphenol-rich grape products have been suggested as potential effective candidates in preventing

* Corresponding author at: INRA, UMR 1253, 65 rue de St Brieuc, 35042 Rennes, France.
E-mail addresses: Carlos.PinedaVadillo@rennes.inra.fr (C. Pineda-Vadillo), didier.dupont@rennes.inra.fr (D. Dupont).
[1] INRA – Agrocampus Ouest, UMR STLO 1253, 65, rue de St Brieuc, 35042 Rennes Cedex, France.

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Action	Manuscript Number	Title	Initial Date Submitted	Status Date	Current Status
Action Links	FOODCHEM-D-16-01178	The food matrix affects the anthocyanin profile of fortified egg and dairy matrices during processing and in vitro digestion	Feb 22, 2016	Mar 23, 2016	Under Review

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Article Type: Research Article (max 7,500 words)

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Corresponding Author: Dr. Didier DUPONT, PhD

Corresponding Author's Institution: INRA

First Author: Carlos Pineda-Vadillo

Order of Authors: Carlos Pineda-Vadillo; Françoise Nau, PhD; Catherin Guerin-Dubiard Guerin-Dubiard, PhD; Julien Jardin; Valérie Lechevalier, PhD; Marisa Sanz-Buenhombre; Alberto Guadarrama; Tamás Tóth, PhD; Éva Csavajda, PhD; Hajnalka Hingyi, PhD; Sibel Karakaya, PhD; Juhani Sibakov, PhD; Francesco Capozzi, PhD; Alessandra Bordoni, PhD; Didier DUPONT, PhD

Abstract: The aim of the present study was to understand to what extent the inclusion of anthocyanins into dairy and egg matrices could affect their stability after processing and their release and solubility during digestion. For this purpose, individual and total anthocyanin content of four different enriched matrices, namely custard dessert, milkshake, pancake and omelet, was determined after their manufacturing and during in vitro digestion. Results showed that anthocyanin recovery after processing largely varied among matrices, mainly due to the treatments applied and the interactions developed with other food components. In terms of digestion, the present study showed that 1- the inclusion of anthocyanins into food matrices could be an effective way to protect them against intestinal degradation. 2 -the incorporation of anthocyanins into matrices with different compositions and structures could represent an interesting and effective method to control the delivery of anthocyanins within the different compartments of the digestive tract

DELIVERING ANTHOCYANINS IN THE GASTROINTESTINAL TRACT: PROCESSING CONDITIONS AND FOOD MATRIX EFFECT

CARLOS PINEDA VADILLO[1], TAMÁS TÓTH[2], ATTILA TANAI[2], ÉVA CSAVAJDA[2], MARISA SANZ BUENHOMBRE[3], ALESSANDRA BORDONI[4, 5], CATHERINE GUERIN DUBIARD [1], FRANÇOISE NAU[1], DIDIER DUPONT[1].

CONTEXT

Over the last decade, many studies have demonstrated the potential benefits of using anthocyanins (AC) in the prevention of metabolic syndrome and other diseases. Nevertheless, most of these studies have only considered AC as pure compounds rather than ingredients of bioactive-enriched foods. However, the AC -food matrix interaction could deeply impact on its digestibility and bioaccessibility, and hence, effectiveness.

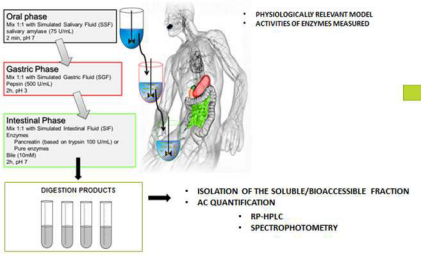
OBJECTIVE

The objective of this study was to evaluate the effectiveness of different dairy and egg-based matrices on the delivering of ACs in the gastrointestinal tract under physiological relevant conditions.

MATERIAL & METHODS

1- ANTHOCYANIN-ENRICHED FOOD PRODUCTION

2- *IN VITRO* DIGESTION OF +AC ENRICHED FOODS



RESULTS

% AC RECOVERY AFTER PROCESING

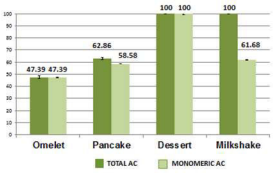


FIGURE 1. % of total and monomeric anthocyanins recovered in the final + AC foods after their industrial production. Values are percentages of the initial anthocyanin content added to the foods with their SD.

% BIOACCESSIBILITY

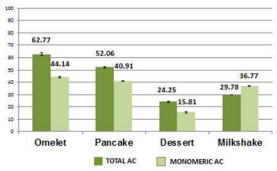


FIGURE 2. % of total and monomeric anthocyanins in digested foods. Values are percentages of the anthocyanins content in the foods before digestion with their SD.

% AC AFTER PROCESING + DIGESTION

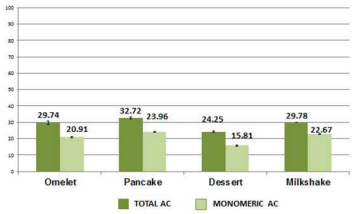


FIGURE 3. % of total and monomeric anthocyanins that remain soluble / bioaccessible for the digestive tract after processing and in vitro digestion of the foods. Values are percentages of the initial anthocyanin content added to the BEF with their SD.

CONCLUSIONS

- ✓ Final % of AC after processing and digestion were very similar between the 4 foods (differences around only 5%) despite their very different composition, textures and processing conditions. However, the steps in which the losses of AC took place were different: omelet and pancake lost AC equally during processing and digestion while milkshake and dessert mainly lost them during digestion.
- ✓ Solid food matrices (omelet and pancake) seem to provide AC a much better protection against degradation during *in vitro* digestion than the liquid ones. However they did not avoid the AC degradation during the heat treatments applied during processing.
- ✓ Therefore non-cooked solid foods seem to be the best option to maximize the delivery of AC in the gastrointestinal tract. However more work has to be done in order to establish the relationship between the food matrix effect and AC bioaccessibility.
- ✓ Ongoing work is currently being done in order to determine the antioxidant capacity of the digestion products

ACKNOWLEDGEMENTS: THE AUTHORS PARTICIPATE IN THE FP7 EU PROJECT PATHWAY-27 "PIVOTAL ASSESSMENT OF THE EFFECTS OF BIOACTIVES ON THE HEALTH AND WELLBEING, FROM HUMAN GENOME TO FOOD INDUSTRY" (GRANT AGREEMENT NO. 311876)

1 INRA, AGROCAMPUS OUEST, UMR 1253, Science et Technologie du Lait et de l'oeuf Rennes, France
2 ADEXGO Ltd. Balatonfüred, Hungary
3 GRUPO MATARROMERA-AGROBIOTECH, Valbuena de Duero, Valladolid, Spain
4 Interdepartmental Center for Industrial Agri-Food Research, University of Bologna (Italy),
5 Dept Agri-Food Sciences and Technologies, University of Bologna (Italy)

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TOWARDS A NEW GENERATION OF DHA-ENRICHED FOODS: MAXIMIZING DHA BIOAVAILABILITY BY CONSIDERING THE FOOD MATRIX EFFECT

CARLOS PINEDA VADILLO[1-2], MOHAMED GAD[3], GÉRARD PIERONI[3], ALESSANDRA BORDONI[4-5], CATHERINE GUERIN DUBIARD [1-2], FRANÇOISE NAU[1-2], DIDIER DUPONT[1-2].

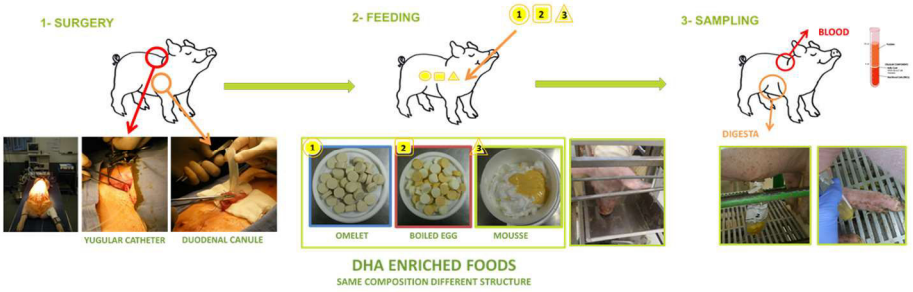
CONTEXT

Docosahexaenoic acid (DHA) is an essential omega-3 polyunsaturated fatty acid (PUFA) which ingestion has positive effects on human health. Due to its vital importance, several studies have been conducted in order to establish the most effective form of DHA in terms of absorption, bioavailability and ultimately its incorporation and assimilation into the different human tissues (TAG, PL or NEFA for instance). However, the study of its interaction with the food matrix still remains poorly studied despite DHA is most of the time ingested as part of complex food matrices which could deeply impact on its digestibility and bioaccessibility, and hence, effectiveness

OBJECTIVE

Determine to what extent the food matrix structure impacts the bioaccessibility and bioavailability of DHA and other fatty acid such as oleic and linoleic acid

MATERIAL & METHODS



RESULTS

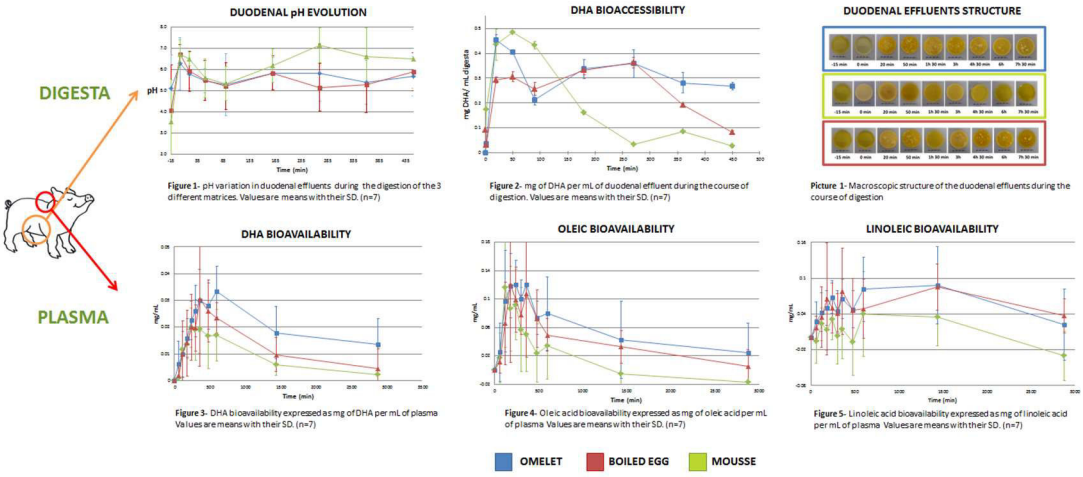


Figure 1- pH variation in duodenal effluents during the digestion of the 3 different matrices. Values are means with their SD. (n=7)

Figure 2- mg of DHA per mL of duodenal effluent during the course of digestion. Values are means with their SD. (n=7)

Picture 1- Macroscopic structure of the duodenal effluents during the course of digestion

Figure 3- DHA bioavailability expressed as mg of DHA per mL of plasma Values are means with their SD. (n=7)

Figure 4- Oleic acid bioavailability expressed as mg of oleic acid per mL of plasma Values are means with their SD. (n=7)

Figure 5- Linoleic acid bioavailability expressed as mg of linoleic acid per mL of plasma Values are means with their SD. (n=7)

- Although more studies have to be performed in this ongoing study, it seems that the cooked solid matrices – omelet and hard boiled egg respectively – are more efficient than the raw liquid matrix in delivering DHA, oleic and linoleic acid into the systemic circulation.
- The bioavailability results for DHA (fig.3) seems to be correlated with the bioaccessibility values (fig. 2) and the digestion time (picture 3): the mousse was much faster digested than the omelet and pancake, and also presented smaller bioaccessibility values despite an initial peak.

ACKNOWLEDGEMENTS: THE AUTHORS PARTICIPATE IN THE FP7 EU PROJECT PATHWAY-27 "PIVOTAL ASSESSMENT OF THE EFFECTS OF BIOACTIVES ON THE HEALTH AND WELLBEING, FROM HUMAN GENOME TO FOOD INDUSTRY" (GRANT AGREEMENT NO. 311876)

1- INRA, AGROCAMPUS OUEST, UMR 1253, Science et Technologie du Lait et de l'oeuf , Rennes, France
2- AGROCAMPUS OUEST, UMR 1253, Science et Technologie du Lait et de l'Œuf Rennes, France
3- ASL, Applications Santé des Lipides , Vichy (France)
4- Interdepartmental Center for Industrial Agri-Food Research, University of Bologna (Italy),
5- Dept Agri-Food Sciences and Technologies, University of Bologna (Italy)

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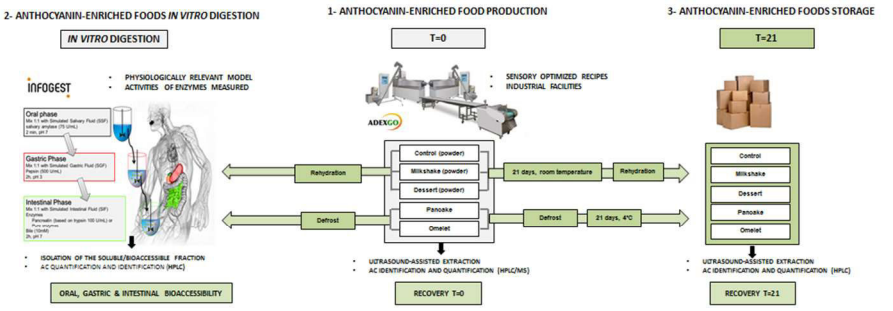
FOOD MATRIX EFFECT ON THE ANTHOCYANIN PROFILE OF FORTIFIED EGG AND DAIRY MATRICES DURING PROCESSING, STORAGE AND *IN VITRO* DIGESTION

CARLOS PINEDA-VADILLO[1,2], FRANÇOISE NAU[1,2], MARISA SANZ-BUENHOMBRE[3], ALBERTO GUADARRAMA[3], TAMÁS TÓTH[4], ÉVA CSAVAJDA[4], HAJNALKA HINGYI[4], SIBEL KARAKAYA[5], JUHANI SIBAKOV[6], FRANCESCO CAPOZZI[7], ALESSANDRA BORDONI[8], CATHERIN GUERIN-DUBIARD[1,2], DIDIER DUPONT[1,2]

CONTEXT & OBJECTIVE

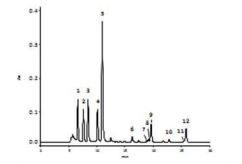
Although the ingestion of anthocyanins (AC) and AC-rich foods is associated with many health benefits, the average intake of AC by some population groups is still far away from the recommendations. The fortification of highly consumed and well-accepted food matrices such as egg and dairy products with AC may represent a good strategy in order to increase or complete the consumption of these bioactives. However, the structure and composition of the host matrices may affect their effectiveness. The aim of this study was to determine to what extent the inclusion of AC into different egg and dairy matrices could affect their effectiveness and thus, the potential use of these matrices to produce anthocyanin-based functional foods. The potential effectiveness of these matrices was determined by studying AC stability during processing and storage as well as their bioaccessibility during *in-vitro* digestion.

MATERIAL & METHODS



RESULTS

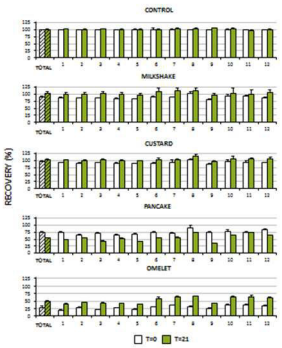
IDENTIFIED ANTHOCYANINS



Peak	Anthocyanin	RT	m/z (ion)	Relative %
1	Delphinidin 3-O-glucoside	6.45	465.	10.05
2	Cyanidin 3-O-glucoside	7.49	449	9.32
3	Petunidin 3-O-glucoside	8.34	479	12.89
4	Peonidin 3-O-glucoside	10.07	463	10.24
5	Malvidin 3-O-glucoside	10.93	493	39.54
6	Methylpyranomalvidin 3-O-glucoside	16.25	531	2.02
7	Peonidin 3-O-acetylglucoside	16.64	505	0.65
8	Delphinidin 3-O-coumarylglucoside	19.18	611	1.04
9	Malvidin 3-O-acetylglucoside	19.59	535	5.83
10	Petunidin 3-O-coumarylglucoside	22.79	625	1.10
11	Peonidin 3-O-coumarylglucoside	25.50	609	0.69
12	Malvidin 3-O-coumarylglucoside	25.79	639	4.37

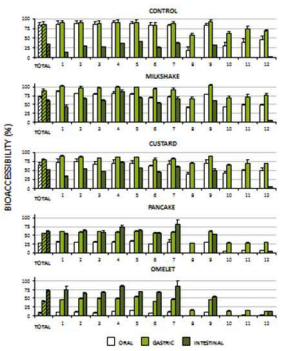
- Mass spectrometry analyses identified 12 AC, all of them 3-O monoglucosides.
- 3-O-glucosides of malvidin, petunidin, peonidin, delphinidin, cyaniding and methylpyranomalvidin were the most abundant AC and accounted for more than three fourths of the total AC content (80.76%). The remaining AC were the 3-O-acetylglucosides of malvidin and peonidin, and the 3-O-coumarylglucosides of malvidin, petunidin, delphinidin and peonidin.
- Identified AC accounted for 94,44 % of the total AC content.

PROCESSING AND STORAGE



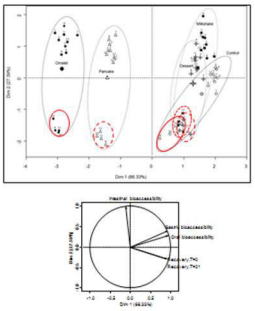
- Anthocyanins in **milkshake** and **custard dessert** were very stable during both production and storage. In general, no significant differences among individual AC were found and recoveries situated around 100%.
- Processing reduced total AC recovery by around 30% in **pancake** and 70% in **omelet**. In pancake, probably due to the apparition and/or reinforcement of the interactions between AC and the food matrix components during storage, total AC recovery decreased. In omelet, the opposite effect caused an increase on AC recovery with respect to T=0.
  Total AC recovery after storage in these matrices was around 50%. Among them, 3-O- coumarylglucosylated AC (8, 10,11,12) and peonidin 3-O-acetylglucoside presented better recoveries.

IN-VITRO DIGESTION



- As shown in the **control solution**, most of the AC used to enrich the food matrices had high bioaccessibilities during the oral and gastric digestion, but were highly degraded during the intestinal digestion. Among them, the 3-O- glucosylated AC (8,10,11 and 12) were specially affected during the oral and intestinal digestion.
- In **milkshake and custard dessert**, the presence of the food matrix had almost no effect on AC bioaccessibility during oral and gastric solution. However it protected AC during intestinal digestion.
- In **pancake and omelet**, The release and solubilization of AC in these matrices was mainly controlled by the entrapment of AC within the solid matrices. In fact, AC bioaccessibility progressively increased along digestion. In these matrices, AC were also protected from their degradation at intestinal level.

PRINCIPAL COMPONENT ANALYSIS



- **Differences among matrices** were mainly explained by 1- the AC recoveries after processing and storage and 2- their bioaccessibilities during oral and gastric digestion; While omelet and pancake had low recoveries after processing and storage, milkshake and custard dessert presented values similar to those of the control solution. During digestion, the solid structure of pancake and omelet limited the release and solubilization of AC during oral and gastric digestion. Milkshake and custard, due to their liquid structure, did not presented this "barrier".
- Within the matrices, **differences among anthocyanins** were explained by their intestinal bioaccessibility, which clearly separated the 3-O- coumarylglucosylated AC from the others.

CONCLUSION

The structure and composition of the analyzed food matrices strongly impacted anthocyanin recovery during processing and storage as well as bioaccessibility during in vitro digestion. Although the liquid and no heat-treated matrices (milkshake and custard dessert) had better recoveries, the solid ones (pancake and omelet) better protected AC from their intestinal degradation. Although 3-O- coumarylglucosides were highly degraded during digestion, their impact on total AC bioaccessibility was very low (they represent only around 7% of total AC) . Although further bioavailability analysis are necessary to really asses their potential effectiveness, all the matrices delivered important quantities of AC into the gastrointestinal tract.

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[1] INRA, UMR 1253, Science et Technologie du Lait et de l'Oeuf, Rennes (France)
[2] Agrocampus Ouest, UMR 1253, Science et Technologie du Lait et de l'Oeuf, Rennes(France)
[3] Abrobiotec S.L. (Grupo Matarromera), Valbuena de Duero, Valladolid, (Spain)
[4] ADEXGO Ltd. 13 Lapostelki St. H-8230 Balatonfüred, Hungary
[5] Department of Food Engineering, Faculty of Engineering, Ege University, Izmir (Turkey)
[6] VTT Technical Research Centre of Finland, Espoo (Finland)
[7] Interdepartmental Centre for Industrial Agri-Food Research, University of Bologna, Cesena (Italy)
[8] Department of Agri-Food Sciences and Technologies, University of Bologna, Cesena (Italy)

RÉSUMÉ

Le syndrome métabolique (MS), une association des plus dangereux facteurs de risque pour les maladies cardiovasculaires et le diabète de type 2, est devenu l'un des principaux défis cliniques et de santé publique dans le monde. Un nombre croissant d'évidences s'est accumulé au cours de la dernière décennie, démontrant l'efficacité de certains composés bioactifs alimentaires pour le traitement et la prévention du MS. Néanmoins, la plupart des études d'intervention administre les composés bioactifs sous forme de composés purs, sans considérer que l'interaction entre les bioactifs ajoutés et l'ensemble de la matrice alimentaire peut impacter la bioaccessibilité, la biodisponibilité et, par conséquent, l'efficacité de ces molécules bioactives.

L'objectif principal de cette thèse, intégrée dans le projet européen PATHWAY-27, était de formuler des aliments enrichis en composés bioactifs potentiellement efficaces contre le MS, et d'étudier l'effet de la matrice alimentaire sur la bioaccessibilité et la biodisponibilité de ces bioactifs. Cette étude a mis l'accent sur l'utilisation des anthocyanes, de l'acide docosahexaénoïque et, dans une moindre mesure, des bêta-glucanes comme ingrédients bioactifs pour enrichir des produits laitiers et des produits à base d'œuf. Une combinaison des modèles de digestion in vitro et in vivo (chez le porc) a été utilisée.

La composition et la structure des matrices alimentaires ont impacté la libération et la solubilisation de substances bioactives au cours de la digestion (bioaccessibilité), tel que démontré in vitro et in vivo. La structure de la matrice alimentaire a également modulé la quantité finale de DHA dans la circulation systémique des porcs (biodisponibilité). Cette étude démontre que la compréhension de l'interaction entre les composés bioactifs et la matrice alimentaire constitue une base pour la production d'aliments fonctionnels efficaces.

Mots-clés : Aliments fonctionnels, bioaccessibilité, biodisponibilité, DHA, polyphénols, digestion

ABSTRACT

Development of bioactive-enriched dairy and egg products against metabolic syndrome: The effect of the food matrix on the bioaccessibility and bioavailability of polyphenols and docosahexaenoic acid

Metabolic Syndrome (MS), a constellation of the most dangerous cardiovascular disease and type 2 diabetes mellitus risk factors, has become one of the major clinical and public health challenges worldwide. During the last decade, many bioactives have been proposed as effective for the treatment and prevention of MS. However, most intervention studies administer bioactives as pure compounds, without consider that bioactive-food matrix interactions could deeply impact on the bioaccessibility, bioavailability and hence on the effectiveness of bioactives.

The main objective of this thesis, included within the European project PATHWAY-27, was to formulate potential effective bioactive-enriched foods against MS and to investigate the effect of the food matrix on the bioaccessibility and bioavailability of dietary bioactives. In particular, this study focused in the use of dairy and egg-based products as matrices and in the addition of anthocyanins, docosahexaenoic acid and, to a lesser extent, beta glucan as bioactives. A combination of in vitro and in vivo (pig) digestion models was used.

Both the structure and the composition of the food matrices impacted the release and the solubilisation of bioactives during digestion (bioaccessibility), as demonstrated in vitro and in vivo. In addition, the structure of the food matrix modulated the final amount of DHA into the systemic circulation of pigs (bioavailability). This study proves that understanding how dietary bioactives interact with the matrix in which they are included in is the basis for the production of effective bioactive-enriched foods.

Keywords: *Functional foods, bioaccessibility, bioavailability, DHA, polyphenols, digestion*

AGROCAMPUS OUEST • Institut supérieur des sciences agronomiques, agroalimentaires, horticoles et du paysage
65 rue de Saint-Brieuc – CS84215 – F-35042 Rennes Cedex
Tél. : 02 23 48 50 00
www.agrocampus-ouest.fr