Analisi e Modificazioni di Sequenze di DNA o di RNA con la

TEORIA TRICROMATICA DELL'EQUILIBRIO DEI SISTEMI

Capitolo I ° (Parte Prima):

Analisi della Sequenza n°1/1 della Catena A dell'Insulina

Autore: *Nunzio Bonaventura*
Tecnico informatico: *Vincenzo Viggiano*

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BIBLIOGRAFIA RIGUARDANTE PSEUDOMONAS

BIBLIOGRAFIA RIGUARDANTE HELIGMOSOMOIDES POLYGYRUS

INTRODUZIONE

Lo scopo di questo lavoro è quello di presentare un'importante applicazione della **TEORIA TRICROMATICA DELL'EQUILIBRIO DEI SISTEMI** (**T.T.E.S.**) all'**analisi e alle modificazioni di sequenze di DNA o di RNA**.

Con il software della **T.T.E.S.** è possibile analizzare una sequenza di DNA (o di RNA) in *maniera innovativa*.

A partire dalla **sequenza originaria** di DNA o di RNA, il software della **T.T.E.S.** genera numerose e diverse **nuove sequenze** di DNA o di RNA **che rispettano fedelmente i diversi e numerosi "trend non manifesti" della sequenza originaria**.

Questo risultato è possibile per **due motivi**:

1) perché ogni specifica sequenza di DNA (o di RNA) può essere "trasformata" in numerose e diverse nuove sequenze, rispettando i diversi e numerosi "trend non manifesti" della specifica sequenza originaria (Fig. 1);

2) perché ogni specifico "trend non manifesto" della sequenza originaria può generare numerose e diverse nuove sequenze (Fig. 1).

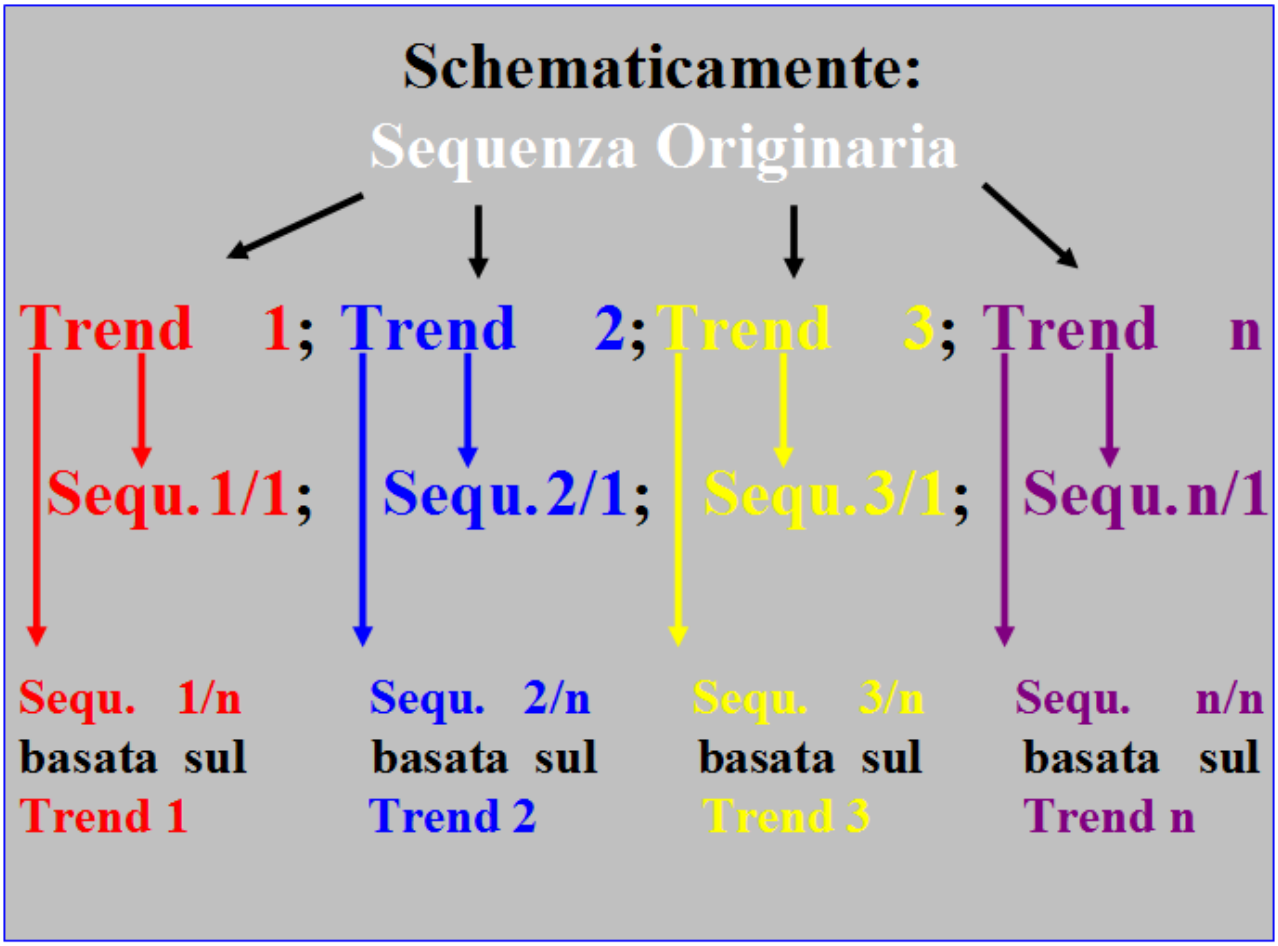

Fig. 1

Queste **nuove sequenze** di DNA (o di RNA) sono costituite da basi quasi totalmente differenti.

L'**ipotesi** che s'intende avvalorare, in questo e negli altri capitoli che seguiranno, è quella che **le nuove sequenze** (generate rispettando fedelmente ognuno dei possibili specifici "trend non manifesti"della sequenza originaria) **abbiano forti relazioni con le caratteristiche della sequenza originaria**.

Queste *nuove sequenze di DNA* (o di RNA) possono, *parzialmente* o *totalmente*, essere utilizzate per scopi di **ricerca scientifica**, **industriale**, **alimentare**, **ecc**.

Nel Capitolo I° di questo lavoro, *che costituisce solo il primo di molti altri capitoli che seguiranno*, delle numerose e diverse **nuove sequenze generate**, si è deciso di analizzarne solo una tra le possibili: la **Sequenza n°1/1**.

I risultati della ricerca **BLAST** (*Basic Local Alignment Search Tool* (1)) sulla **Sequenza n°1/1** hanno evidenziato allineamenti significativi con il DNA (o RNA) di diversi *organismi*.

La **ricerca bibliografica** ha confermato l'esistenza d'**importanti relazioni** tra le caratteristiche di due *organismi* "esempio" (*Pseudomonas* e *Heligmosomoides polygyrus*) identificati con la ricerca Blast eseguita sulla **Sequenza n°1/1** e alcune caratteristiche funzionali dell'**Insulina**.

In conclusione, l'analisi (attraverso la **T.T.E.S.**) della *sequenza originaria* basata su uno dei suoi "trend non manifesti" (*il **Trend n°1***), la creazione di una *nuova sequenza* di DNA (la **Sequenza n°1/1**) dal ***Trend n°1*** della *sequenza originaria* e la *congruenza* con i dati ottenuti dall'*approfondimento bibliografico* aprono prospettive totalmente inesplorate riguardo all'ambito della ricerca genetica e delle sue innumerevoli applicazioni.

(1) Altschul S. F., Madden T. L., Schaffer A. A., Zhang J., Zhang Z., Miller W. and D. J. Lipman. Gapped BLAST and PSI-BLAST: a new generation of protein database search programs. Nucleic Acids Res., 1997, 25 (17) :3389-3402. PMID: 9254694. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC146917/

CAPITOLO I °
(Parte Prima)

1.1 LA TEORIA TRICROMATICA DELL'EQUILIBRIO DEI SISTEMI (T.T.E.S.)

La **T.T.E.S.** è una teoria dei sistemi con la quale è possibile osservare, analizzare, controllare e modificare lo stato di qualsiasi sistema (http://www.ttesystems.eu/).

La **T.T.E.S.** è stata applicata, per la prima volta, all'analisi del Sistema Nervoso Vegetativo attraverso l'ausilio del biofeedback periferico

(Il Biofeedback Periferico e la Teoria Tricromatica dell'Equilibrio del Sistema Nervoso Vegetativo; Il Futuro del Biofeedback Periferico: La Teoria Tricromatica dell'Equilibrio del Sistema Nervoso Vegetativo;
L'iperventilazione: un modello privilegiato per la valutazione quantitativa e qualitativa dell'attivazione psicofisiologica con la Teoria Tricromatica dell'Equilibrio del Sistema Nervoso Vegetativo;).

Della **T.T.E.S.** sono previste molte altre applicazioni (http://www.ttesystems.eu/applicazioni.php) e alcune di esse sono in corso di sperimentazione e futura pubblicazione.

Per calcolare e per rappresentare visivamente tutte le variazioni di un sistema, la **T.T.E.S.** si è servita del modello di colore RGB.

Il modello RGB è un metodo per definire i colori basato su *TRE Colori Primari* (Rosso, Verde e Blu).

Il **CUBO** è il solido usato per rappresentare visivamente tutte le possibili variazioni dello stato di un sistema (Fig. 2).

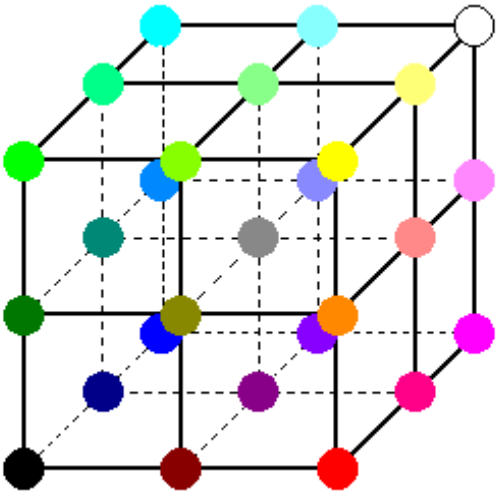

Fig. 2

Per descrivere sinteticamente tutti i possibili stati funzionali di un sistema sono stati utilizzati **8 CODICI PRINCIPALI** (Fig.3) dei **64 CODICI TOTALI**.

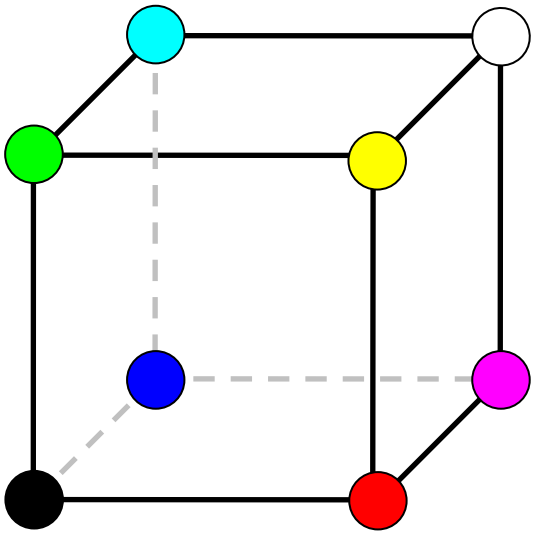

Fig. 3 *

Nei paragrafi successivi è presentato un esempio di elaborazione di una sequenza di DNA con la **T.T.E.S.**.

* Tratto e modificato da: https://commons.wikimedia.org/wiki/File:Avl3119color4a.jpg

1.2 ESEMPIO DI ELABORAZIONE DI UNA SEQUENZA DI DNA CON LA T.T.E.S.

L'**acquisizione della sequenza di DNA (o di RNA)** da analizzare o da modificare rappresenta la *prima fase* del processo di analisi con la **T.T.E.S.**.

L'acquisizione della sequenza può essere effettuata direttamente dal sito del **NCBI** (*National Center for Biotechnology Information* (2)) o da qualsiasi altra fonte.

Supponiamo di aver deciso di analizzare la seguente **sequenza di 63 basi**:

ggcatcgtggagcagtgctgcaccagcatctgttccctctaccagctggagaactactgcaac

Le **63** *basi, tutte codificanti* (CDS<1..63), dell'intera sequenza corrispondono alla ben nota **Catena A dell'Insulina**.

L'**insulina** è formata da *due catene* polipeptidiche unite da *due ponti disolfuro*:

la **catena A** di **21** aminoacidi (GIVEQCCTSICSLYQLENYCN)
e
la **catena B** di **30** aminoacidi (FVNQHLCGSHLVEALYLVCGERGFFYTKPT).

L'**insulina** è un *ormone* anabolico di natura *proteica* secreto dalle *cellule beta* delle *isole di Langerhans* del pancreas.

Tra le sue attività principali, l'*insulina* usa il *glucosio* per produrre *energia*, riduce la *glicemia*, blocca la *glicogenolisi*, favorisce la *gligogenosintesi* e stimola la *proliferazione cellulare.*

La **sequenza di 63 basi** di DNA della **Catena A dell'Insulina** è stata oggetto di ricerca ***BLAST***.

(2) National Center for Biotechnology Information (**NCBI**)[Internet]. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information; [1988]. Available from: https://www.ncbi.nlm.nih.gov/

Parametri della ricerca BLAST:

Programme	*Blastn*
Word size	*11*
Expect value	*10*
Hitlist size	*100*
Match/Mismatch scores	*2,-3*
Gapcosts	*5,2*
Low Complexity Filter	*Yes*
Filter string	*L;m;*
Genetic Code	*1*

Risultati della ricerca BLAST:

Query = ggcatcgtggagcagtgctgcaccagcatctgttccctctaccagctggagaactactgcaac

Length = 63

Sequences producing significant alignments:	**Score (Bits)**	**E Value**
XM_021081278.1 PREDICTED: Sus scrofa insulin (INS), transcrip... https://www.ncbi.nlm.nih.gov/nuccore/1191854326/	114	1e-22
NM_001109772.1 Sus scrofa insulin (INS), mRNA https://www.ncbi.nlm.nih.gov/nuccore/172073147/	114	1e-22
AY242112.1 Sus scrofa EWB tyrosine hydroxylase (TH) gene, exo... https://www.ncbi.nlm.nih.gov/nuccore/33242556/	114	1e-22
AY242111.1 Sus scrofa H205 tyrosine hydroxylase (TH) gene, ex... https://www.ncbi.nlm.nih.gov/nuccore/33242553/	114	1e-22
AY242110.1 Sus scrofa H254 tyrosine hydroxylase (TH) gene, ex... https://www.ncbi.nlm.nih.gov/nuccore/33242550/	114	1e-22
AY242108.1 Sus scrofa LRJ tyrosine hydroxylase (TH) gene, exo... https://www.ncbi.nlm.nih.gov/nuccore/33242543/	114	1e-22
AY242107.1 Sus scrofa LW1224 tyrosine hydroxylase (TH) gene, ... https://www.ncbi.nlm.nih.gov/nuccore/33242539/	114	1e-22
AY242106.1 Sus scrofa LW1461 tyrosine hydroxylase (TH) gene, ... https://www.ncbi.nlm.nih.gov/nuccore/33242535/	114	1e-22
AY242105.1 Sus scrofa LW197 tyrosine hydroxylase (TH) gene, e... https://www.ncbi.nlm.nih.gov/nuccore/33242531/	114	1e-22
AY242104.1 Sus scrofa LW209 tyrosine hydroxylase (TH) gene, e... https://www.ncbi.nlm.nih.gov/nuccore/33242527/	114	1e-22
AY242103.1 Sus scrofa LW3 tyrosine hydroxylase (TH) gene, exo... https://www.ncbi.nlm.nih.gov/nuccore/33242523/	114	1e-22

AY242102.1 Sus scrofa LW33361 tyrosine hydroxylase (TH) gene,.. 114 1e-22
https://www.ncbi.nlm.nih.gov/nuccore/33242519/
AY242101.1 Sus scrofa LW419 tyrosine hydroxylase (TH) gene, e... 114 1e-22
https://www.ncbi.nlm.nih.gov/nuccore/33242515/
AY242100.1 Sus scrofa LW463 tyrosine hydroxylase (TH) gene, e... 114 1e-22
https://www.ncbi.nlm.nih.gov/nuccore/33242511/
AY242099.1 Sus scrofa M220 tyrosine hydroxylase (TH) gene, ex... 114 1e-22
https://www.ncbi.nlm.nih.gov/nuccore/33242508/
AY242098.1 Sus scrofa P208 tyrosine hydroxylase (TH) gene, ex… 114 1e-22
https://www.ncbi.nlm.nih.gov/nuccore/33242504/
AY044828.1 Sus scrofa tyrosine hydroxylase gene, partial cds;... 114 1e-22
https://www.ncbi.nlm.nih.gov/nuccore/21956486/
AF064555.1 Sus scrofa preproinsulin mRNA, partial cds 114 1e-22
https://www.ncbi.nlm.nih.gov/nuccore/3885493/
XM_003909376.4 PREDICTED: Papio anubis insulin (INS), transcr... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/1220171442/
XM_009185350.3 PREDICTED: Papio anubis insulin (INS), transcr... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/1220171441/
XM_017948138.2 PREDICTED: Papio anubis insulin (INS), transcr... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/1220171440/
XM_020883287.1 PREDICTED: Odocoileus virginianus texanus insu... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/1187570232/
XM_020883286.1 PREDICTED: Odocoileus virginianus texanus insu... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/1187570230/
XM_015503336.1 PREDICTED: Marmota marmota marmota insulin (LO... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/984133697/
XM_015503335.1 PREDICTED: Marmota marmota marmota insulin (LO... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/984133695/
XM_015434180.1 PREDICTED: Macaca fascicularis insulin (INS), ... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/982292203/
XM_015113354.1 PREDICTED: Macaca mulatta insulin (INS), mRNA 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/966983385/
XM_011721319.1 PREDICTED: Macaca nemestrina insulin (INS), tr... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/795558861/
XM_011721318.1 PREDICTED: Macaca nemestrina insulin (INS), tr... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/795558858/
XM_011721317.1 PREDICTED: Macaca nemestrina insulin (INS), tr... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/795558851/
XM_011721316.1 PREDICTED: Macaca nemestrina insulin (INS), tr... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/795558842/
XM_012041172.1 PREDICTED: Cercocebus atys insulin (INS), tran... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/795499572/
XM_012041171.1 PREDICTED: Cercocebus atys insulin (INS), tran... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/795499567/
XM_012041169.1 PREDICTED: Cercocebus atys insulin (INS), tran... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/795499562/

XM_011930076.1 PREDICTED: Colobus angolensis palliatus insuli... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/795357485/
XM_011930075.1 PREDICTED: Colobus angolensis palliatus insuli... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/795357479/
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https://www.ncbi.nlm.nih.gov/nuccore/795357473/
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XM_011988227.1 PREDICTED: Mandrillus leucophaeus insulin (INS... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/795176052/
XM_011988226.1 PREDICTED: Mandrillus leucophaeus insulin (INS... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/795176047/
XM_011988225.1 PREDICTED: Mandrillus leucophaeus insulin (INS... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/795176041/
XM_008004634.1 PREDICTED: Chlorocebus sabaeus insulin (INS), ... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/635011293/
XM_008004561.1 PREDICTED: Chlorocebus sabaeus insulin (INS), ... 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/635011291/
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https://www.ncbi.nlm.nih.gov/nuccore/562822569/
XM_004278069.1 PREDICTED: Orcinus orca insulin (INS), mRNA 109 5e-21
https://www.ncbi.nlm.nih.gov/nuccore/466049859/
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https://www.ncbi.nlm.nih.gov/nuccore/532691821/
NM_001284919.1 Macaca fascicularis insulin (INS), mRNA 109 5e-21
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XM_022591057.1 PREDICTED: Delphinapterus leucas insulin (INS)... 105 6e-20
https://www.ncbi.nlm.nih.gov/nuccore/1246201225/
XM_022591055.1 PREDICTED: Delphinapterus leucas insulin (INS)... 105 6e-20
https://www.ncbi.nlm.nih.gov/nuccore/1246201223/
XM_022591054.1 PREDICTED: Delphinapterus leucas insulin (INS)... 105 6e-20
https://www.ncbi.nlm.nih.gov/nuccore/1246201221/
NM_001130093.2 Canis lupus familiaris insulin (INS), mRNA 105 6e-20
https://www.ncbi.nlm.nih.gov/nuccore/1212980167/
XM_021152514.1 PREDICTED: Mus caroli insulin-1 (LOC110286053)... 105 6e-20
https://www.ncbi.nlm.nih.gov/nuccore/1195703068/
XM_017887811.1 PREDICTED: Rhinopithecus bieti insulin (INS), ... 105 6e-20
https://www.ncbi.nlm.nih.gov/nuccore/1059087102/
XM_017887804.1 PREDICTED: Rhinopithecus bieti insulin (INS), ... 105 6e-20
https://www.ncbi.nlm.nih.gov/nuccore/1059087100/
XM_017887801.1 PREDICTED: Rhinopithecus bieti insulin (INS), ... 105 6e-20
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XM_017887795.1 PREDICTED: Rhinopithecus bieti insulin (INS), ... 105 6e-20
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XM_017669266.1 PREDICTED: Manis javanica insulin (INS), mRNA	105	6e-20
https://www.ncbi.nlm.nih.gov/nuccore/1048405902/		
XM_004759671.2 PREDICTED: Mustela putorius furo insulin (INS)...	105	6e-20
https://www.ncbi.nlm.nih.gov/nuccore/859820716/		
XM_013060037.1 PREDICTED: Mustela putorius furo insulin (INS)...	105	6e-20
https://www.ncbi.nlm.nih.gov/nuccore/859820712/		
XM_010382053.1 PREDICTED: Rhinopithecus roxellana insulin (IN...	105	6e-20
https://www.ncbi.nlm.nih.gov/nuccore/724917366/		
XM_007171156.1 PREDICTED: Balaenoptera acutorostrata scammoni...	105	6e-20
https://www.ncbi.nlm.nih.gov/nuccore/594635595/		
AC188659.9 Canis familiaris chromosome 18, clone XX-484I11, c...	105	6e-20
https://www.ncbi.nlm.nih.gov/nuccore/126032460/		
AC187029.8 Canis familiaris chromosome 18, clone XX-127C6, co...	105	6e-20
https://www.ncbi.nlm.nih.gov/nuccore/148245384/		
DQ250565.1 Mus caroli preproinsulin 1 (Ins1) gene, complete cds	105	6e-20
https://www.ncbi.nlm.nih.gov/nuccore/82749721/		
X61092.1 C.aethiops gene for preproinsulin	105	6e-20
https://www.ncbi.nlm.nih.gov/nuccore/X61092.1		
V00179.1 Dog gene encoding insulin	105	6e-20
https://www.ncbi.nlm.nih.gov/nuccore/V00179.1		
XM_014795833.1 PREDICTED: Ceratotherium simum simum insulin (...	104	2e-19
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XM_022507720.1 PREDICTED: Enhydra lutris kenyoni insulin (LOC...	100	3e-18
https://www.ncbi.nlm.nih.gov/nuccore/XM_022507720.1		
XM_021685179.1 PREDICTED: Neomonachus schauinslandi insulin (...	100	3e-18
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XM_004050427.2 PREDICTED: Gorilla gorilla gorilla insulin (IN...	100	3e-18
https://www.ncbi.nlm.nih.gov/nuccore/XM_004050427.2		
XM_004050428.2 PREDICTED: Gorilla gorilla gorilla insulin (IN...	100	3e-18
https://www.ncbi.nlm.nih.gov/nuccore/XM_004050428.2		
AH011815.2 Gorilla gorilla tyrosine hydroxylase (TH) gene, pa...	100	3e-18
https://www.ncbi.nlm.nih.gov/nuccore/AH011815.2		
XM_016149762.1 PREDICTED: Rousettus aegyptiacus insulin (INS)...	100	3e-18
https://www.ncbi.nlm.nih.gov/nuccore/XM_016149762.1		
XM_016149753.1 PREDICTED: Rousettus aegyptiacus insulin (INS)...	100	3e-18
https://www.ncbi.nlm.nih.gov/nuccore/XM_016149753.1		
KU548279.1 Uncultured bacterium clone PI_15F_Contig_5 genomic...	100	3e-18
https://www.ncbi.nlm.nih.gov/nuccore/KU548279.1		

KU548266.1 Uncultured bacterium clone CZ_15F_Contig_7 genomic... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/KU548266.1
KU548224.1 Uncultured bacterium clone CH_15F_Contig_16 genomi... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/KU548224.1
KU548210.1 Uncultured bacterium clone AZ_15F_Contig_2 genomic... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/KU548210.1
NM_008386.4 Mus musculus insulin I (Ins1), mRNA 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/NM_008386.4
XM_012743999.1 PREDICTED: Microcebus murinus insulin (INS), mRNA 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/XM_012743999.1
XM_012651969.1 PREDICTED: Propithecus coquereli insulin (INS)... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/XM_012651969.1
XM_007465953.1 PREDICTED: Lipotes vexillifer insulin (INS), mRNA 100 3e-18
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XM_006910977.1 PREDICTED: Pteropus alecto insulin (LOC1028811... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/XM_006910977.1
XM_006750095.1 PREDICTED: Leptonychotes weddellii insulin (IN... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/XM_006750095.1
XM_004317860.1 PREDICTED: Tursiops truncatus insulin (INS), mRNA 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/XM_004317860.1
AB649280.1 Suncus murinus mRNA for insulin, partial cds 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/AB649280.1
XM_002920120.1 PREDICTED: Ailuropoda melanoleuca insulin (INS... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/XM_002920120.1
BC145868.1 Mus musculus insulin I, mRNA (cDNA clone MGC:17575... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/BC145868.1
DQ250570.1 Niviventer coxingi preproinsulin 2 (Ins2) gene, co... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/DQ250570.1
DQ250566.1 Niviventer coxingi preproinsulin 1 (Ins1) gene, co... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/DQ250566.1
DQ250564.1 Apodemus semotus preproinsulin 1 (Ins1) gene, comp... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/DQ250564.1
DQ250563.1 Rattus losea preproinsulin 1 (Ins1) gene, complete... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/DQ250563.1
DQ479923.1 Mus musculus strain BTBR T+ tf/J insulin 1 precurs... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/DQ479923.1
AC163452.12 Mus musculus chromosome 19, clone RP23-405C7, com... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/AC163452.12
AK148541.1 Mus musculus adult pancreas islet cells cDNA, RIKE... 100 3e-18
https://www.ncbi.nlm.nih.gov/nuccore/AK148541.1

1.3 RISULTATI GRAFICI DELL'ANALISI

Attraverso il software della **T.T.E.S.**, la **sequenza acquisita** (o **sequenza originaria**) è sottoposta a un'analisi basata su uno dei suoi "Trend non manifesti": il **Trend n°1**.

Il grafico in Fig. 4 è relativo al **Profilo degli 8 Codici Principali** che descrivono *sinteticamente* la sequenza analizzata.

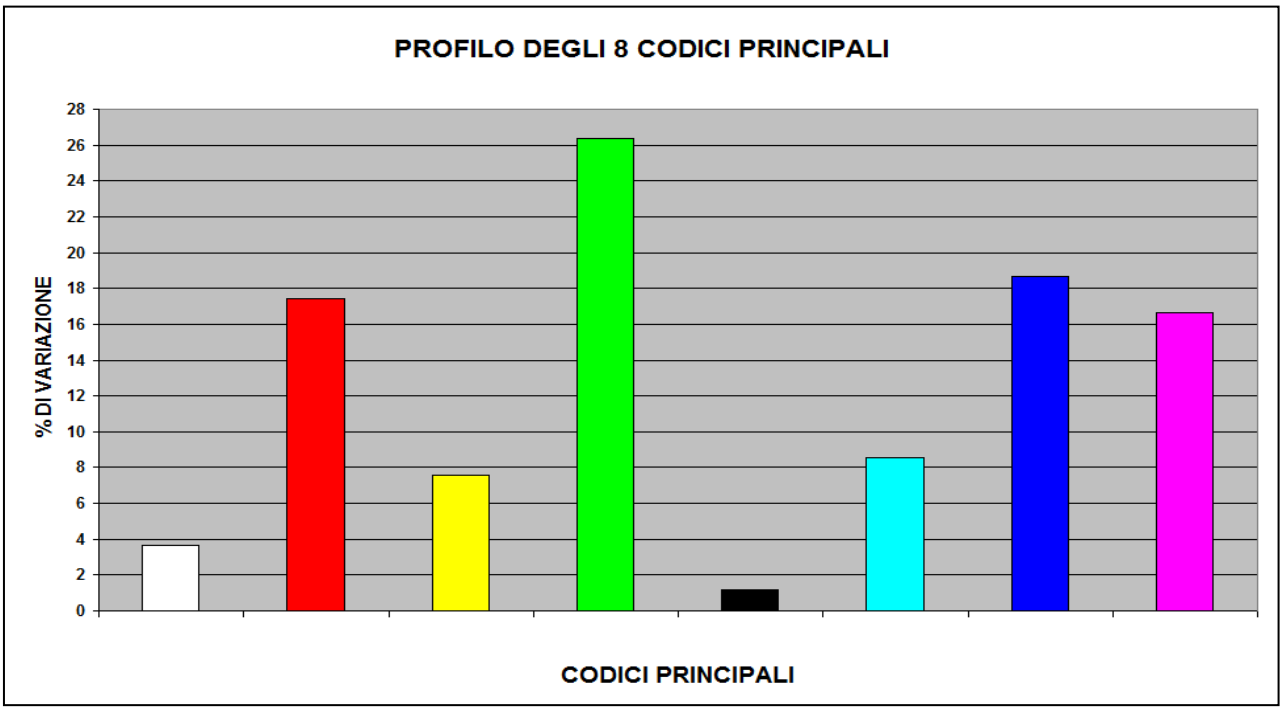

Fig. 4

Il grafico in Fig. 5 è relativo alla **Distribuzione della Percentuale di Variazione degli 8 Codici Principali** in riferimento alla sequenza analizzata.

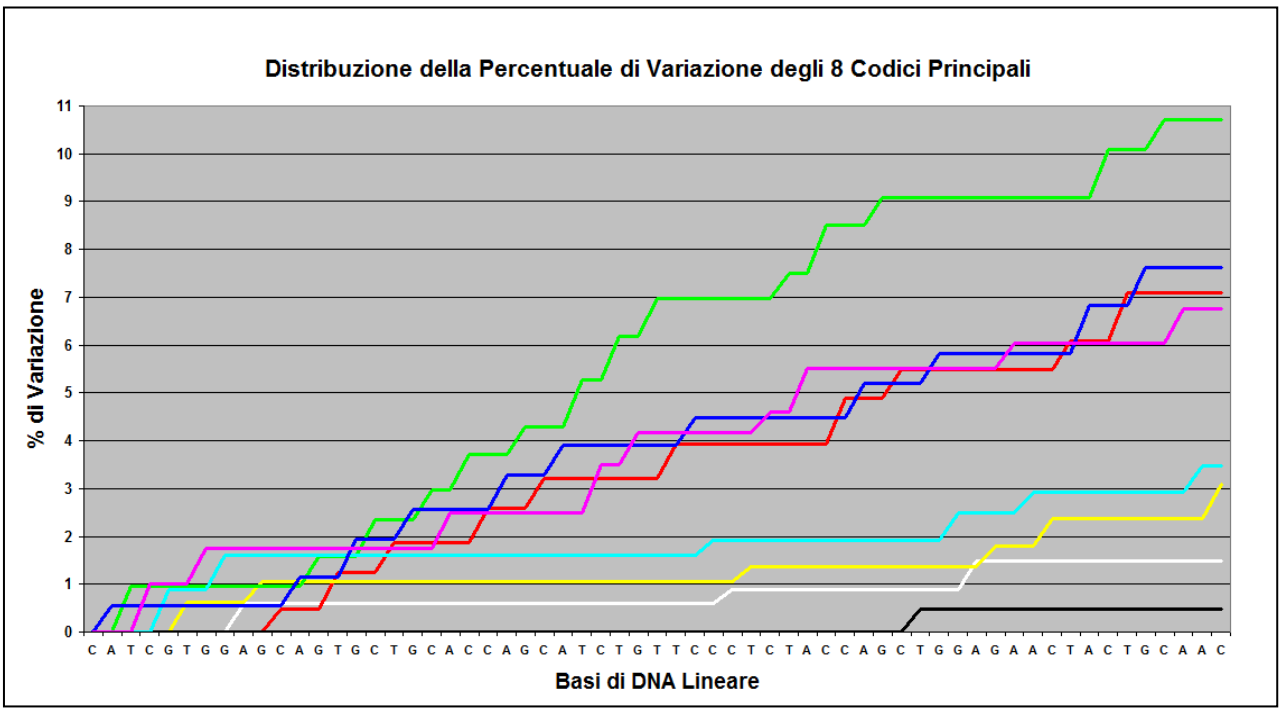

Fig. 5

Il grafico in Fig. 6 è relativo al profilo delle singole **Tonalità dei 64 Codici Totali** che descrivono *analiticamente* la sequenza analizzata.

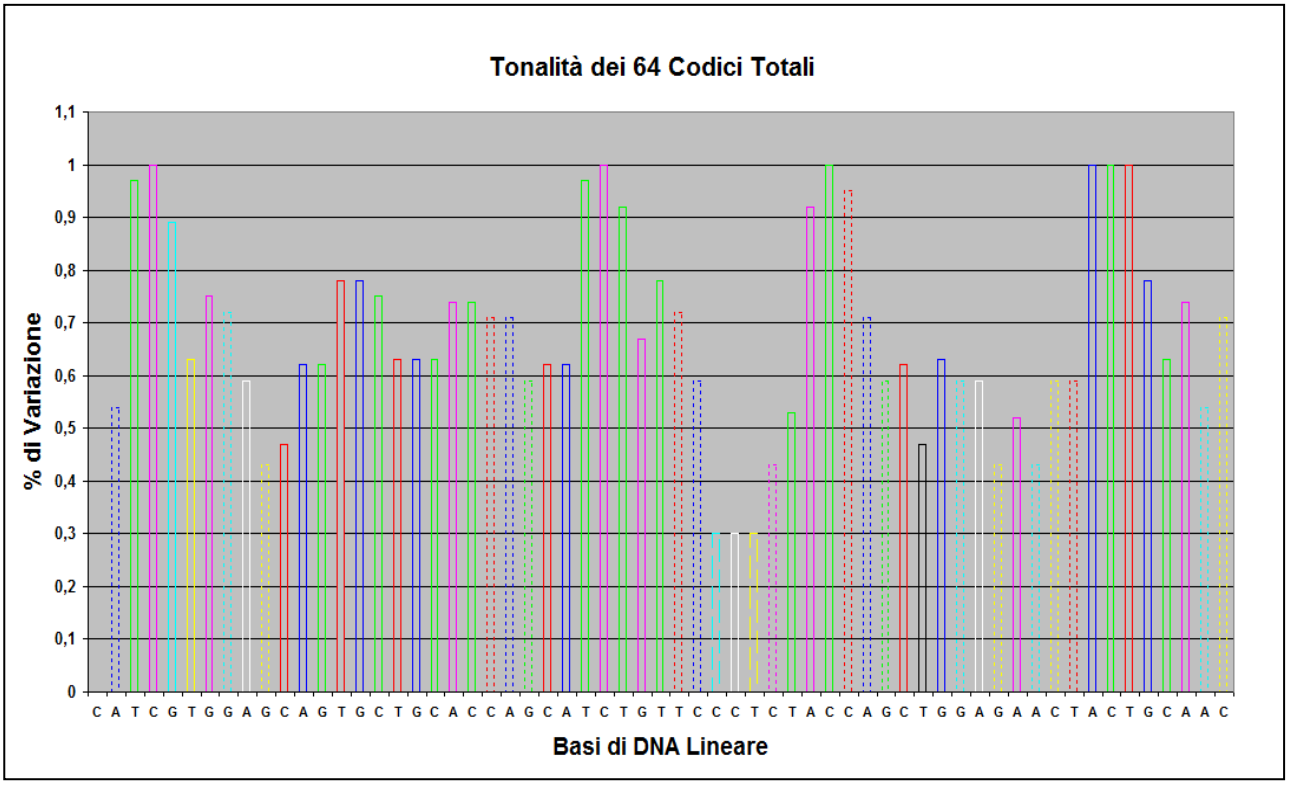

Fig. 6

Il grafico in Fig. 7 è relativo al **Profilo dei 64 Codici Totali** che descrivono *analiticamente* la sequenza analizzata.

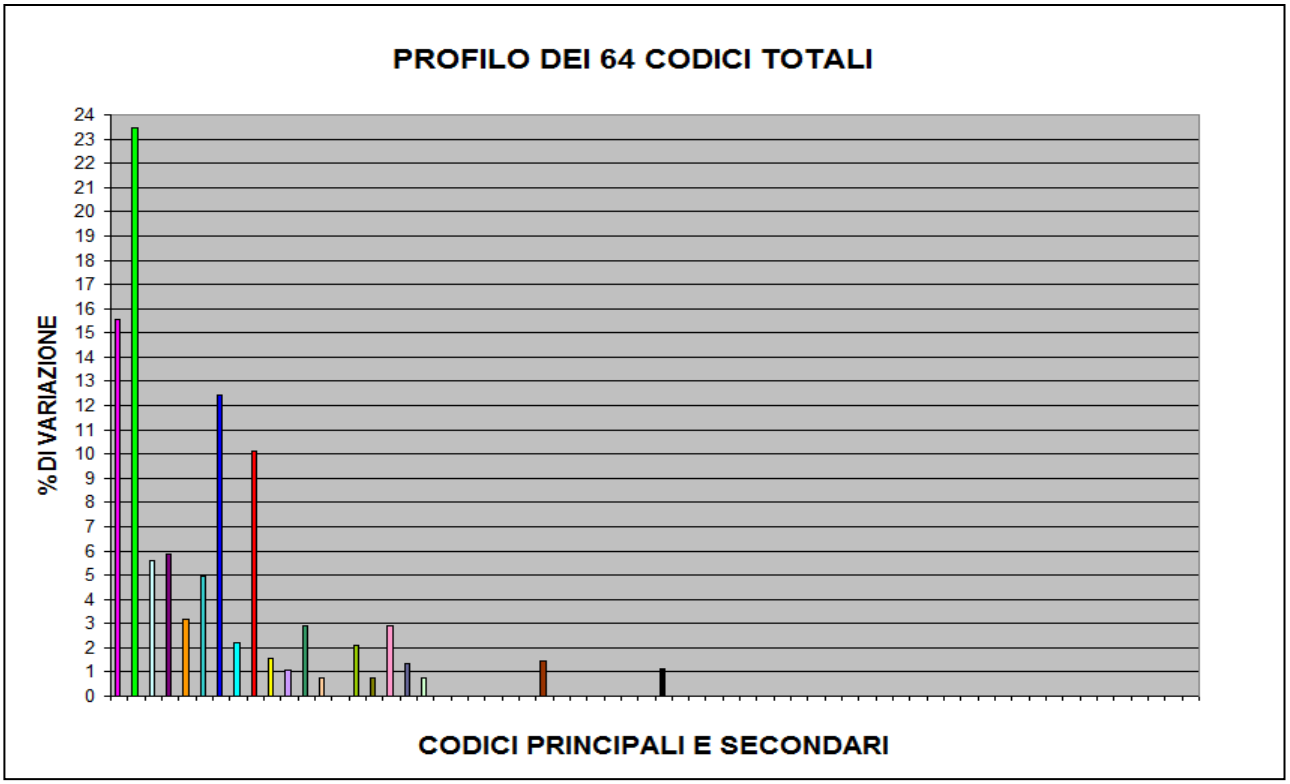

Fig. 7

1.4 RISULTATI GRAFICI DELL'ANALISI DELLA LETTURA NON CODIFICANTE E DI QUELLA CODIFICANTE DELLE BASI DI DNA

In Fig. 8 (A e B) sono confrontati due **Profili degli 8 Codici Principali**.

Nel grafico della Fig. 8 (A) la sequenza è analizzata **senza tenere conto** delle variazioni determinate dalla lettura CODIFICANTE (CDS <1..63) delle basi che codificano la **Catena A dell'Insulina**.

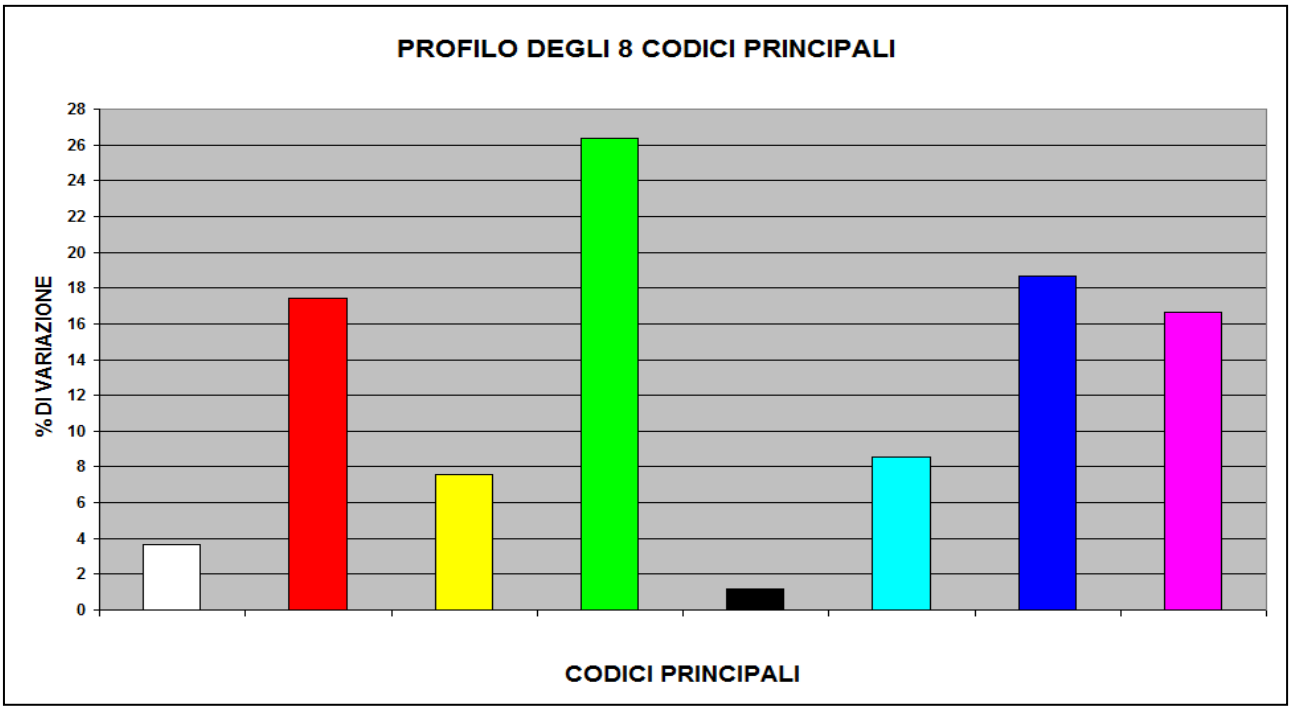

Fig. 8 (A)

Nel grafico in Fig. 8 (B) **se ne tiene invece conto**.

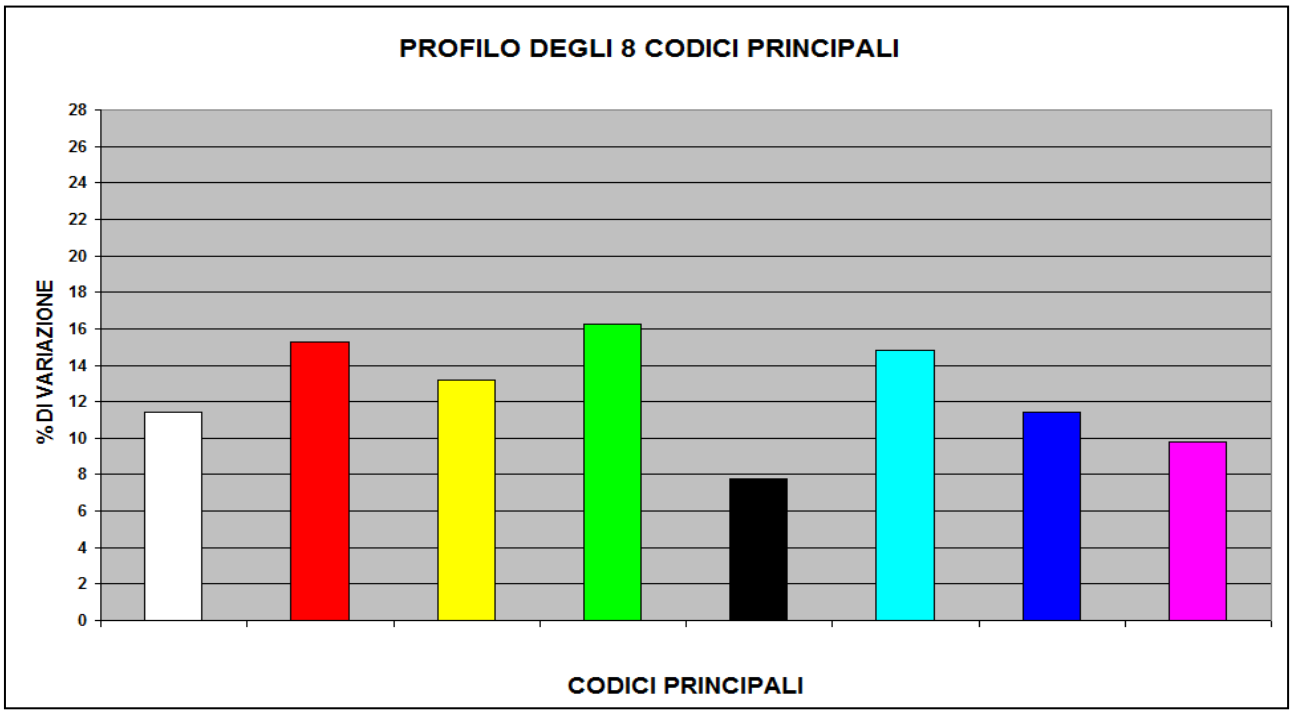

Fig. 8 (B)

In Fig. 9 (A e B) sono confrontati due grafici relativi alla **Distribuzione della Percentuale di Variazione degli 8 Codici Principali**.

Come nella figura precedente, nel grafico in Fig. 9 (A) **non si tiene conto** delle basi che CODIFICANO (CDS <1..63) la **Catena A dell'Insulina**.

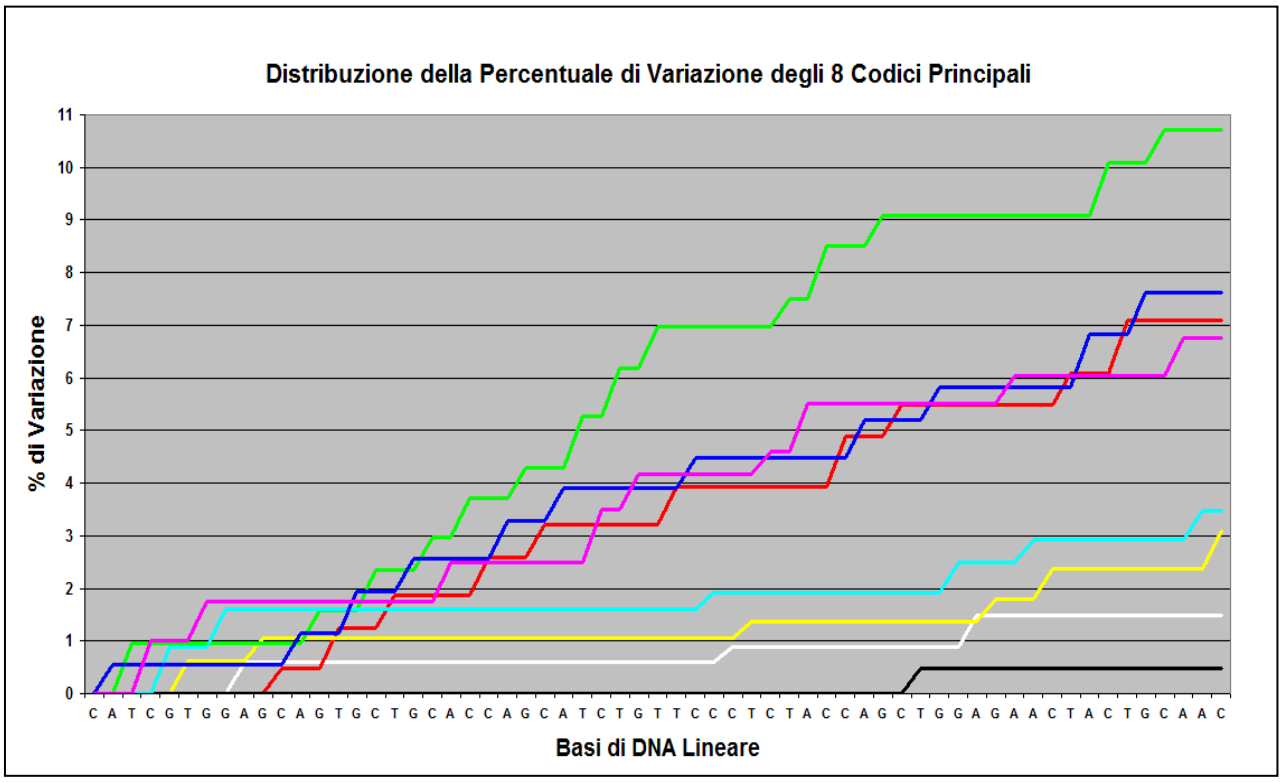

Fig. 9 (A)

Nel grafico in Fig. 9 (B) **se ne tiene invece conto**.

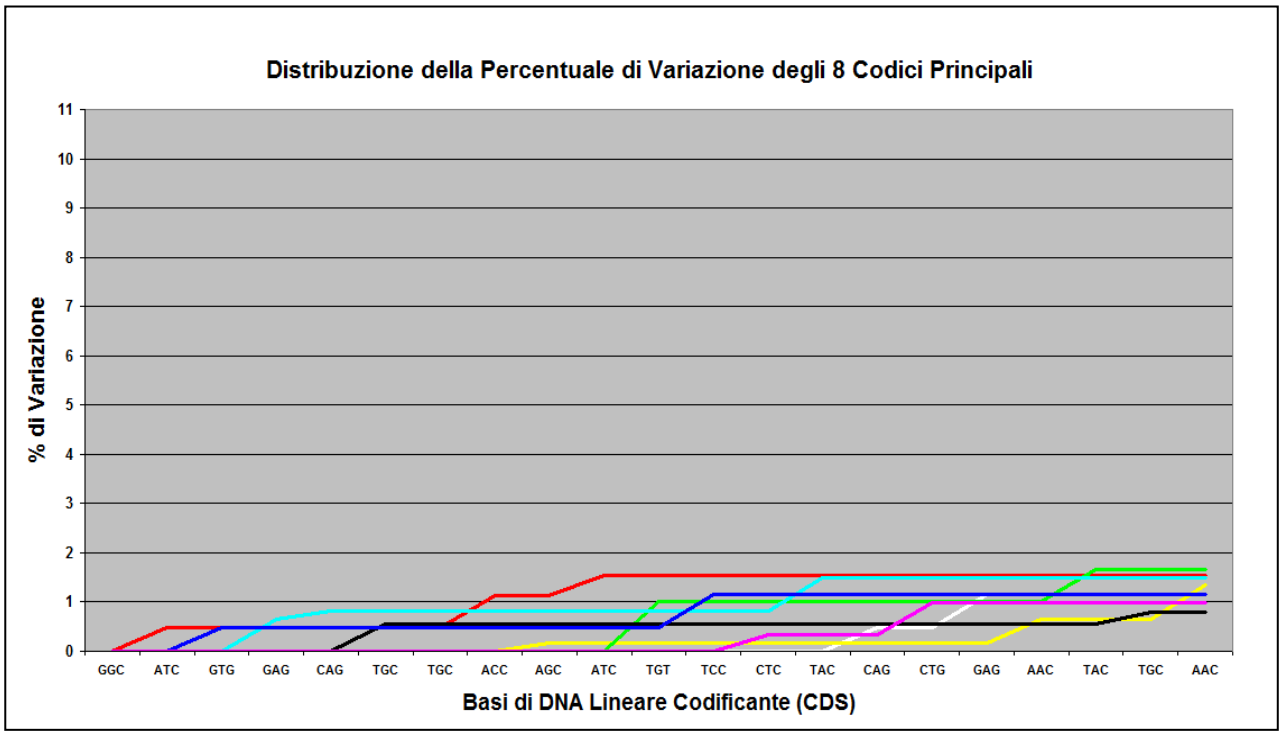

Fig. 9 (B)

In Fig. 10 (A e B) sono confrontati due grafici relativi alle singole **Tonalità dei 64 Codici Totali**.

Come nella figura precedente, nel grafico in Fig. 10 (A) **non si tiene conto** delle basi che CODIFICANO (CDS <1..63) la **Catena A dell'Insulina**.

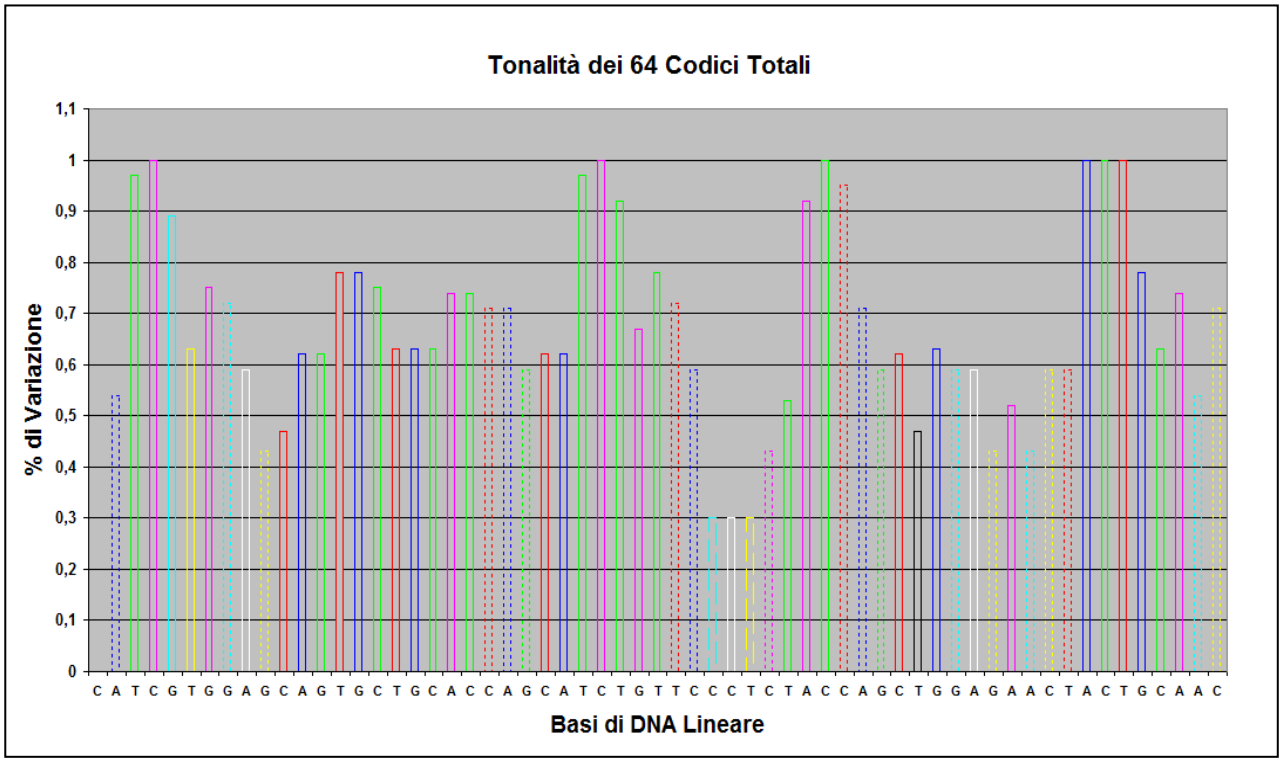

Fig. 10 (A)

Nel grafico in Fig. 10 (B) **se ne tiene invece conto**.

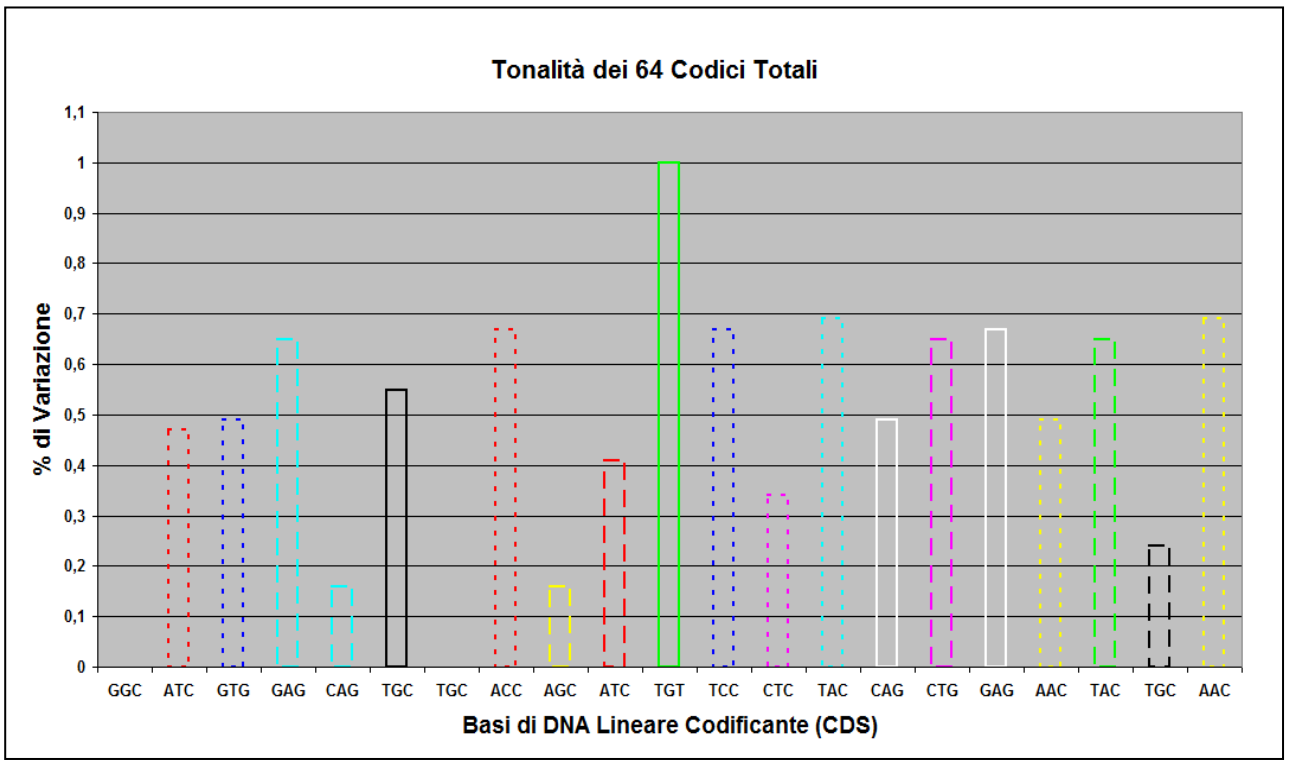

Fig. 10 (B)

In Fig. 11 (A e B) sono confrontati due grafici relativi al **Profilo dei 64 Codici Totali**.

Come nella figura precedente, nel grafico in Fig. 11 (A) **non si tiene conto** delle basi che CODIFICANO (CDS <1..63) la **Catena A dell'Insulina**.

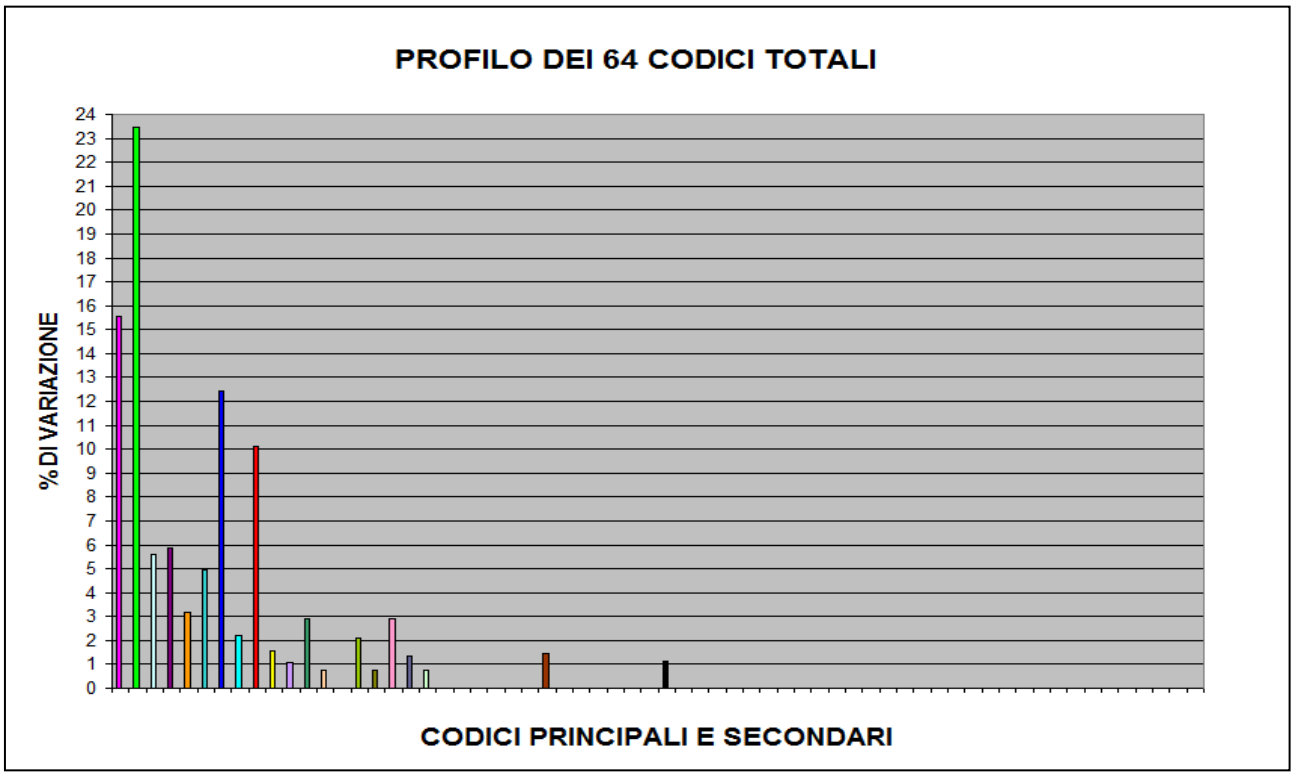

Fig. 11 (A)

Nel grafico in Fig. 11 (B) **se ne tiene invece conto**.

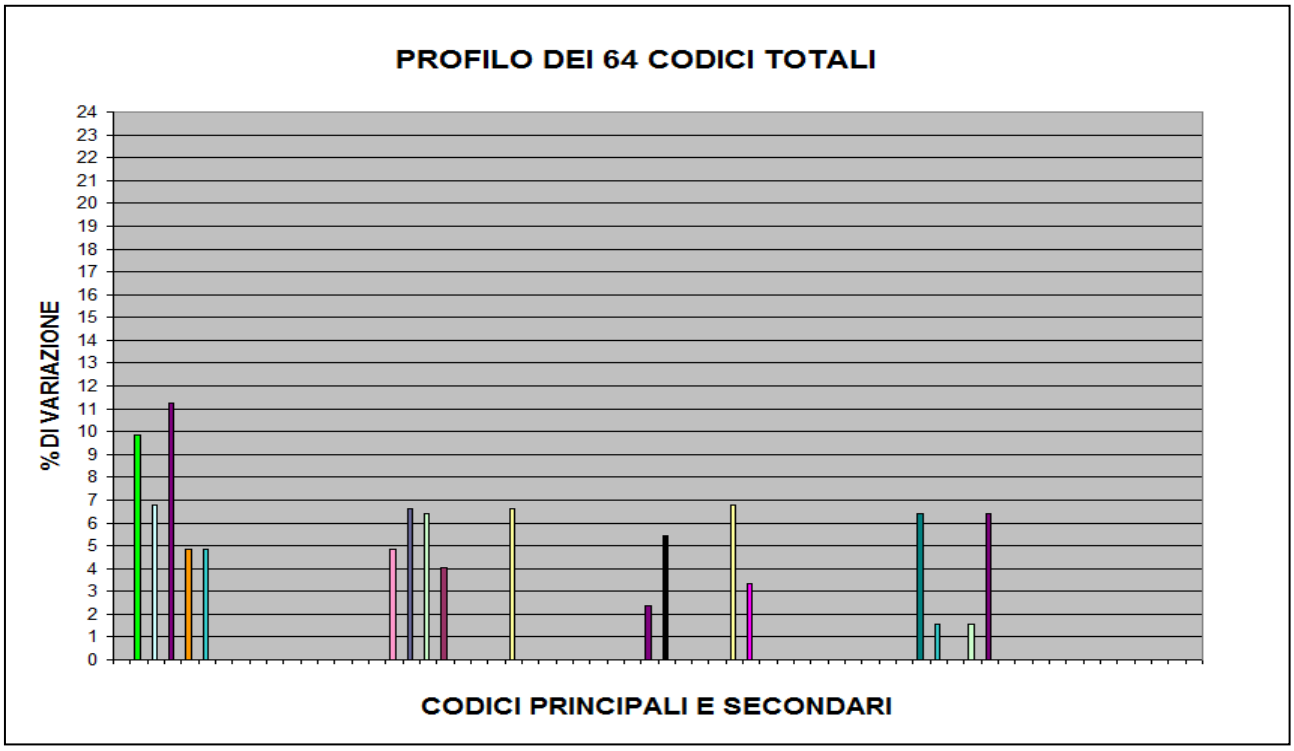

Fig. 11 (B)

Analisi della
Sequenza n°1/1
della
Catena A dell'Insulina

1.5 PREMESSE

Riconsideriamo la sequenza di **63** basi della **Catena A dell'Insulina** *già analizzata*:

ggcatcgtggagcagtgctgcaccagcatctgttccctctaccagctggagaactactgcaac

A partire da questa **sequenza originaria**, il software della T.T.E.S. genera numerose e diverse **nuove sequenze** che rispettano fedelmente i diversi e numerosi **"trend non manifesti"** della **sequenza originaria**.

Come è stato già accennato nell'**Introduzione**, in questo Capitolo, *che costituisce solo uno di molti altri che ne seguiranno*, delle numerose e diverse **nuove sequenze generate**, si è deciso di analizzarne solo una tra le possibili: la **Sequenza n°1/1**.

ATTENZIONE:

Per mantenere un interesse costante alla lettura complessiva di questo lavoro, nei risultati grafici qui di seguito presentati, sono state omesse alcune informazioni relative alla **nuova sequenza generata** (la **Sequenza n°1/1**).

Le informazioni totali riguardo tutte le **nuove sequenze generate** (compresa quindi la **Sequenza n°1/1**) e le loro corrispondenti *informazioni complete sugli* ***allineamenti significativi*** prodotti dalla *ricerca BLAST e i dati acquisiti da GenBank* (3) saranno pubblicate in **Appendice**, ovvero dopo la pubblicazione delle *Conclusioni generali*.

(3) Clark K., Karsch-Mizrachi I., Lipman D. J., Ostell J. and Sayers EW. GenBank. Nucleic Acids Res. 44(D1):D67-72 (2016). PMID: 26590407. PMCID: PMC4702903. https://doi.org/10.1093/nar/gkv1276

1.6 RISULTATI GRAFICI DELL'ANALISI DEL "TREND NON MANIFESTO"

Nella Fig. 12 (A e B) sono confrontati due **Profili degli 8 Codici Principali**.

Il grafico in Fig. 12 (A) si riferisce alla **sequenza originaria** di basi precedentemente analizzata.

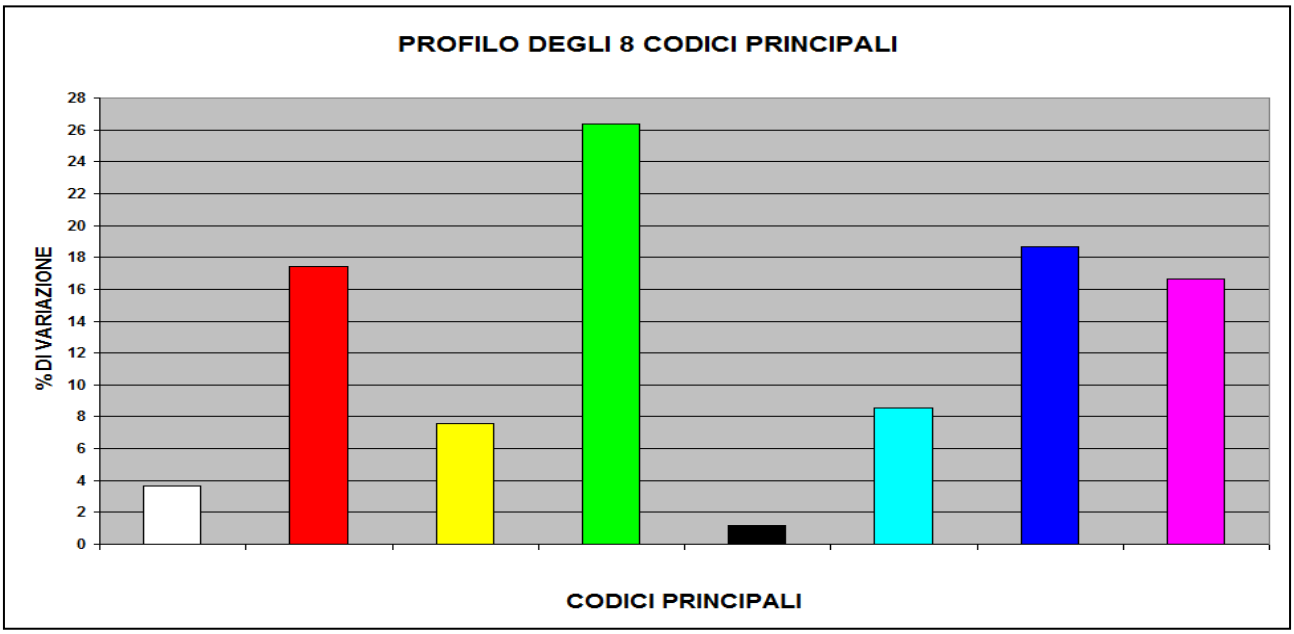

Fig. 12 (A)

Il grafico in Fig. 12 (B) si riferisce alla **"nuova sequenza generata"** a partire da quella originaria.

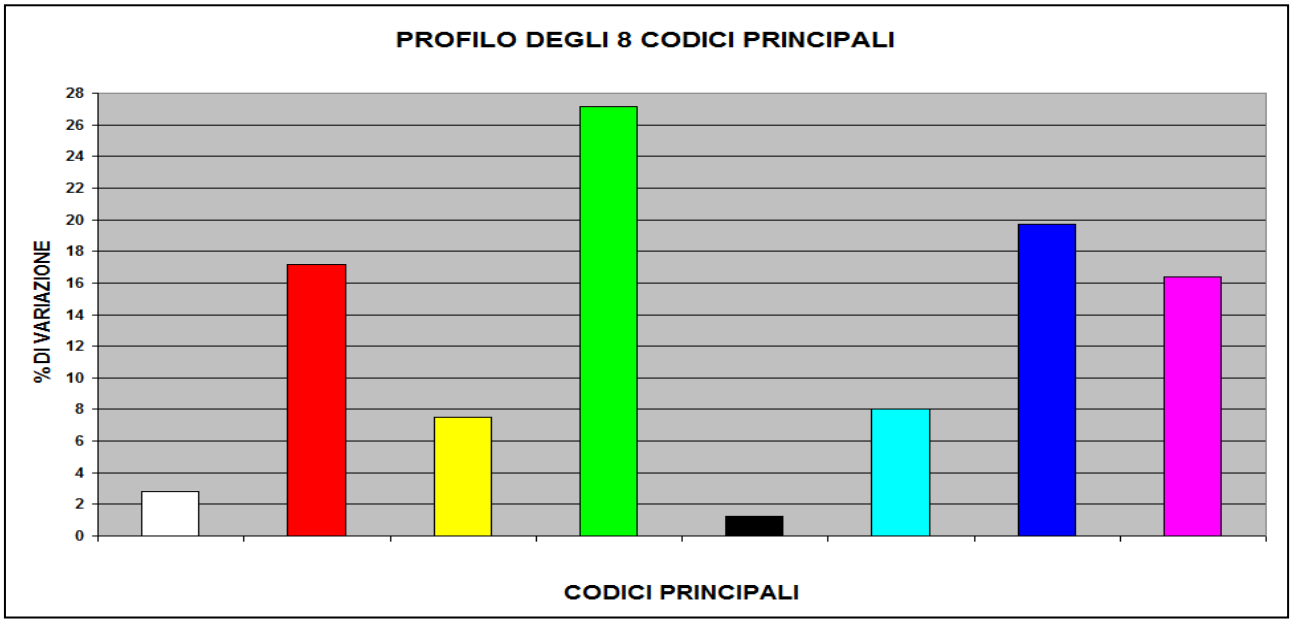

Fig. 12 (B)

Come si nota osservando i due grafici, i due **Profili degli 8 Codici Principali**, rispettivamente della **sequenza originaria** e della **nuova sequenza generata** a partire da quella originaria, SONO QUASI IDENTICI.
In Fig. 13 (A e B) sono confrontati due grafici relativi alla **Distribuzione della Percentuale di Variazione degli 8 Codici Principali**.

Il grafico in Fig. 13 (A) si riferisce alla **sequenza originaria** di basi precedentemente analizzata.

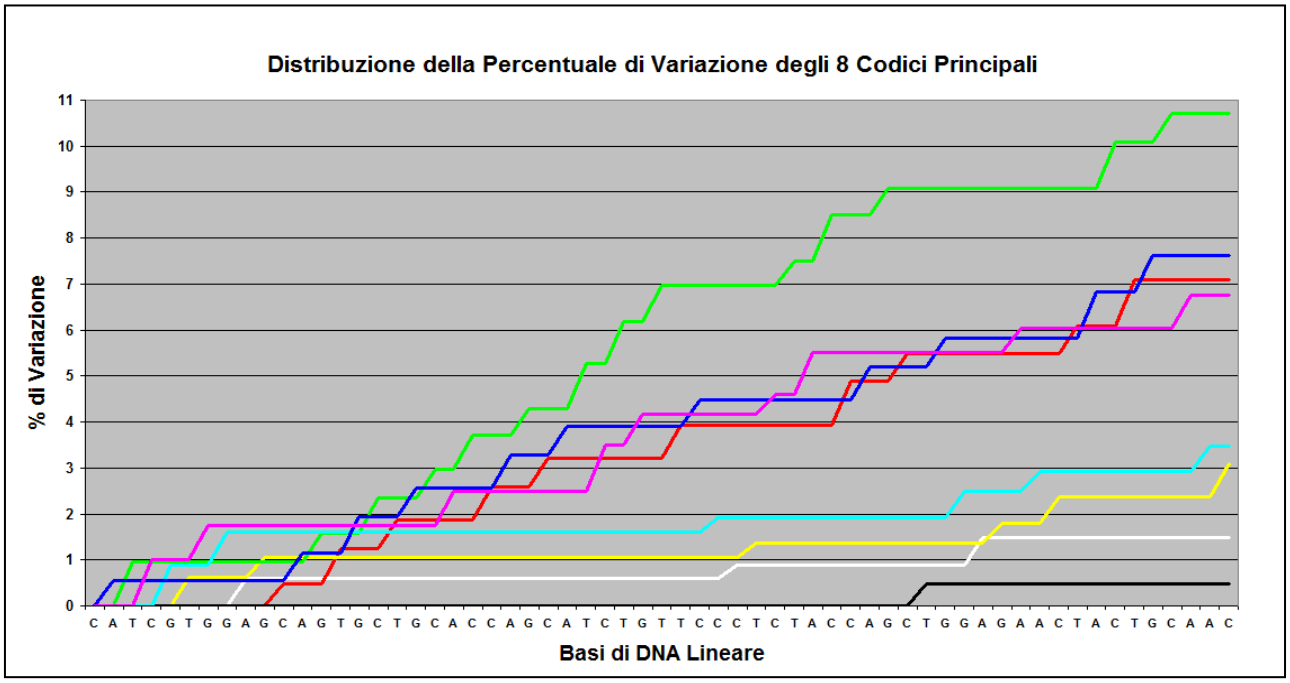

Fig. 13 (A)

Il grafico in Fig. 13 (B) si riferisce alla **"nuova sequenza generata"** a partire da quella originaria.

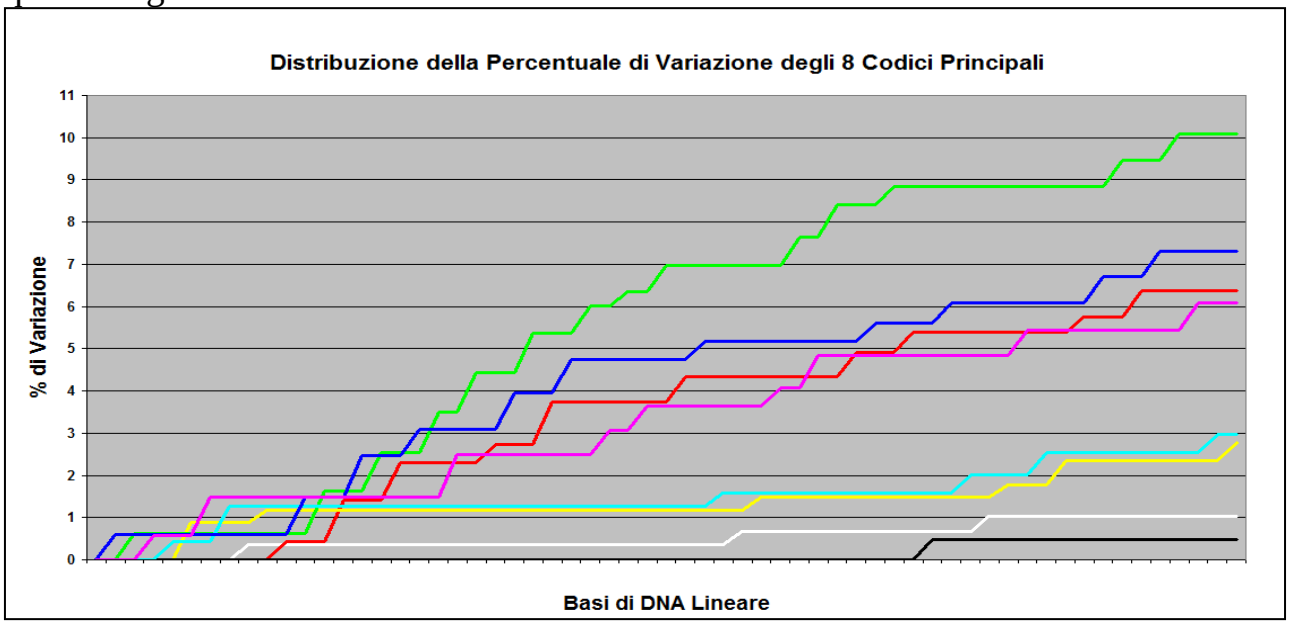

Fig. 13 (B)

Come per i due grafici della Fig. 12, anche in questo caso, i due grafici della **Distribuzione della Percentuale di Variazione degli 8 Codici Principali**, rispettivamente della **sequenza originaria** e della **nuova sequenza generata** a partire da quella originaria, SONO QUASI IDENTICI.
In Fig. 14 (A e B) sono confrontati due grafici relativi alle singole **Tonalità dei 64 Codici Totali.**

Il grafico in Fig. 14 (A) si riferisce alla **sequenza originaria** di basi precedentemente analizzata.

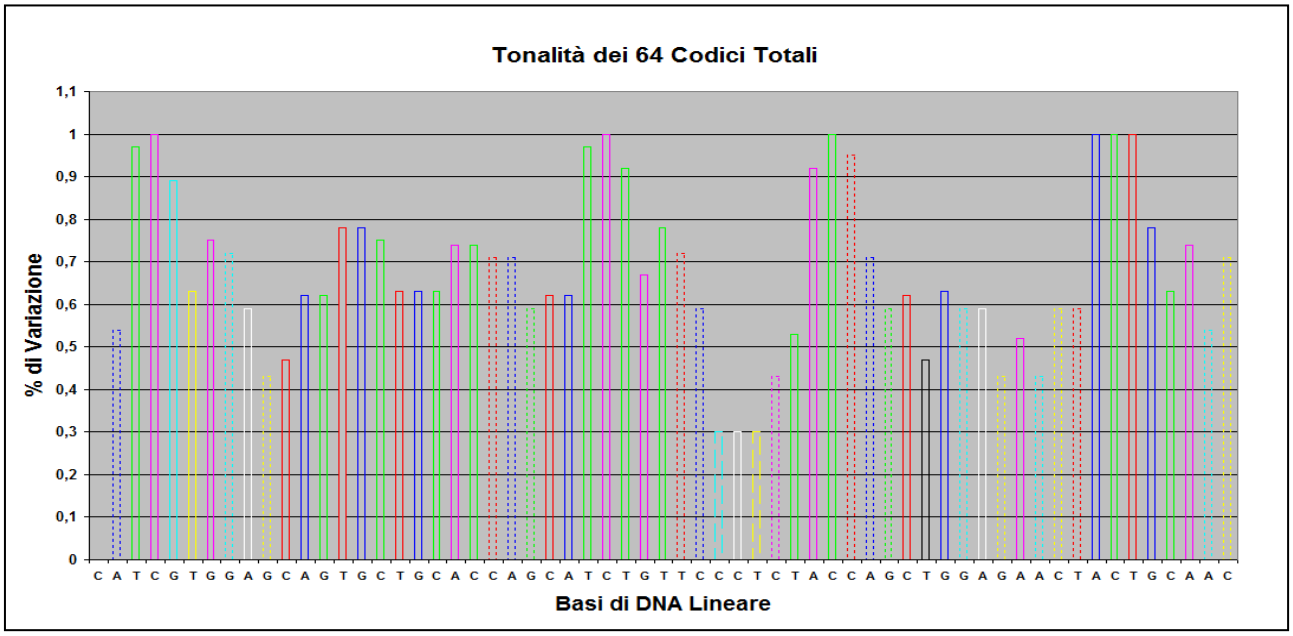

Fig. 14 (A)

Il grafico in Fig. 14 (B) si riferisce alla **"nuova sequenza generata"** a partire da quella originaria.

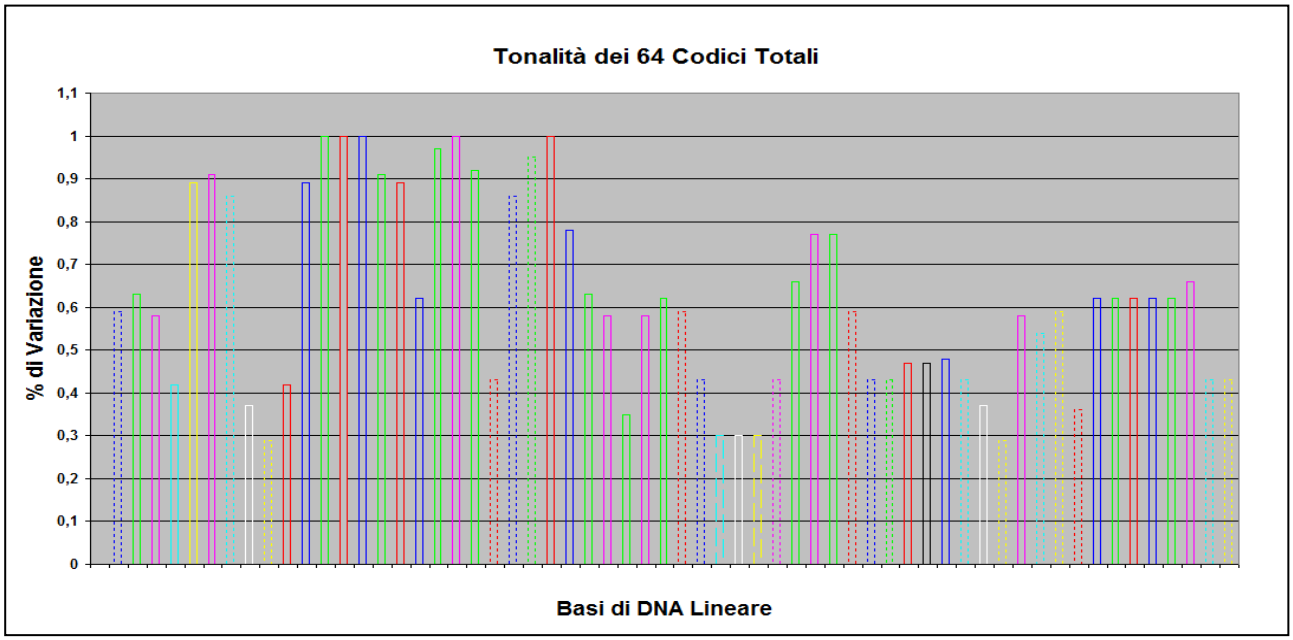

Fig. 14 (B)

A DIFFERENZA DEI GRAFICI PRECEDENTI, i due grafici delle singole **Tonalità dei 64 Codici Totali**, rispettivamente della **sequenza originaria** e della **nuova sequenza generata** a partire da quella originaria, SONO MOLTO DIVERSI TRA LORO.
In Fig. 15 (A e B) sono confrontati due grafici relativi al **Profilo dei 64 Codici Totali.**

Il grafico in Fig. 15 (A) si riferisce alla **sequenza originaria** di basi precedentemente analizzata.

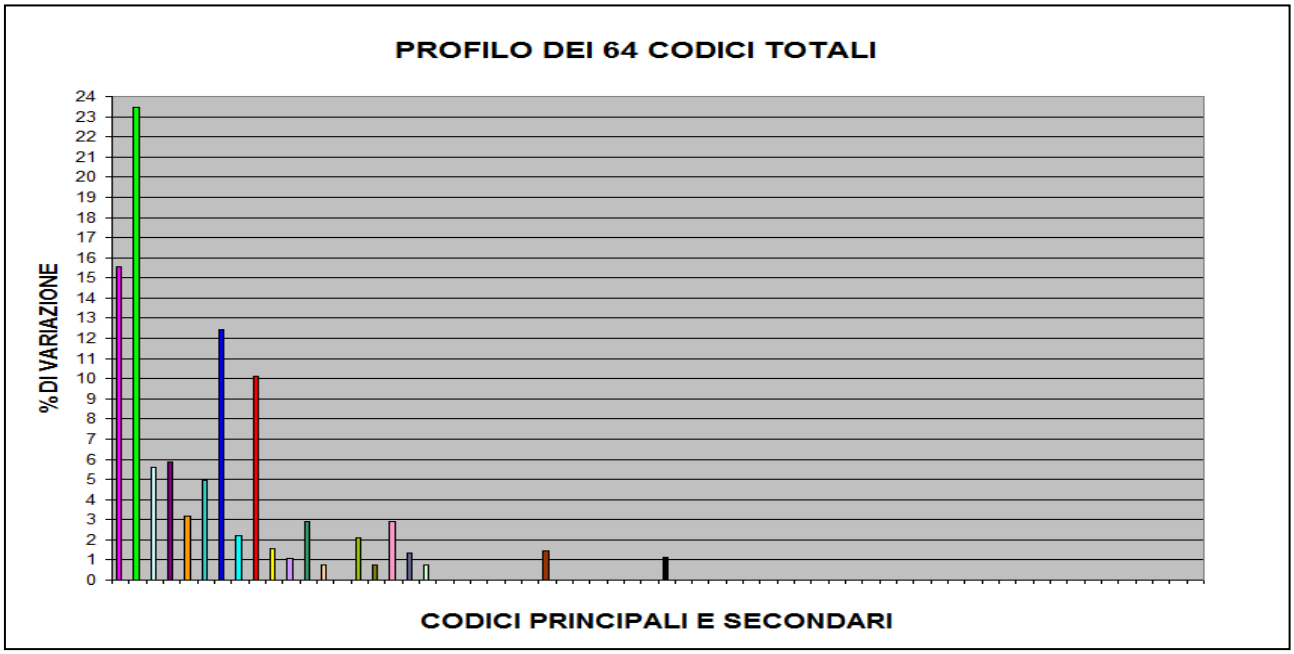

Fig. 15 (A)

Il grafico in Fig. 15 (B) si riferisce alla **"nuova sequenza generata"** a partire da quella originaria.

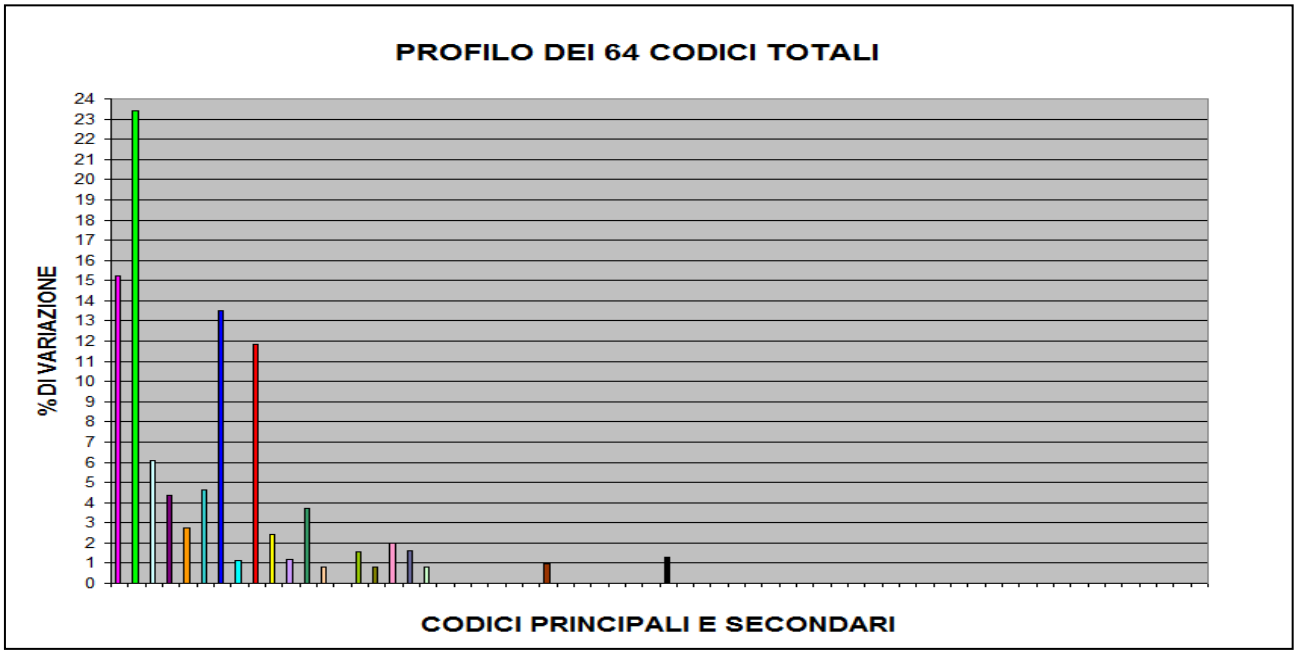

Fig. 15 (B)

A differenza dei due grafici precedenti, i due grafici relativi al **Profilo dei 64 Codici Totali**, rispettivamente della **sequenza originaria** e della **nuova sequenza generata** a partire da quella originaria, SONO IN PARTE SIMILI.
Dall'analisi della **T.T.E.S.** emerge che le differenze tra le "caratteristiche" della **sequenza originaria** e quelle della **nuova sequenza generata** a partire da quella originaria sono evidenziate in maniera rilevante dai grafici delle singole **Tonalità dei 64 Codici Totali** (Fig. 14 A e B).

Questo risultato è comprensibile se si considera che i grafici delle singole **Tonalità dei 64 Codici Totali** (Fig. 14 A e B), rispetto agli altri grafici, **sono *molto più sensibili alle singole basi delle sequenze* che al "trend non manifesto" delle sequenze stesse**.

Anche i grafici relativi ai **Profili dei 64 Codici Totali** (Fig. 15 A e B) evidenziano delle differenze, ma esse sono meno evidenti rispetto a quelle emerse dall'analisi dei grafici delle singole **Tonalità dei 64 Codici Totali** (Fig. 14 A e B).

Dagli altri grafici (Fig. 12 A e B, Fig. 13 A e B) emerge invece una quasi totale identità tra le "caratteristiche" della **sequenza originaria** e quelle della **nuova sequenza generata** a partire da quella originaria.

Questo risultato è notevole se si considera che **le 63 basi di DNA della nuova sequenza generata** sono QUASI TOTALMENTE DIVERSE DA QUELLE ORIGINARIE.

In conclusione, il grado di somiglianza delle "caratteristiche" della **nuova sequenza generata** alle "caratteristiche" della **sequenza originaria** è tanto maggiore quanto più simili sono rispettivamente i corrispondenti **Profili degli 8 Codici Principali** (Fig. 12 A e B) e quelli relativi alla **Distribuzione della Percentuale di Variazione degli 8 Codici Principali** (Fig. 13 A e B), ***grafici entrambi molto sensibili al* "trend non manifesto" *delle sequenze***.

1.7 IMPLICAZIONI RELATIVE AI RISULTATI GRAFICI DELL'ANALISI DEL "TREND NON MANIFESTO"

Le **63** basi di DNA della **nuova sequenza generata** a partire da quella **originaria** sono state oggetto di ricerca ***BLAST***.

Attenzione:

I risultati della *ricerca BLAST* saranno presentati gradualmente nei diversi capitoli che seguiranno. Nella *parte prima* del presente capitolo (Capitolo I°), sono presentati *parzialmente* solo i risultati relativi agli allineamenti con alcune specie di batteri **Pseudomonas** e con il nematoda **Heligmosomoides polygyrus**.
Le ***informazioni totali sugli allineamenti significativi*** prodotti dalla *ricerca BLAST* riguardo la **nuova sequenza generata** (**Sequenza n°1/1**) e le altre informazioni rilevanti ricavate da *GenBank* saranno pubblicate in **Appendice**, ovvero dopo la pubblicazione delle *Conclusioni generali*.

Query = NUOVA SEQUENZA GENERATA (Sequenza n°1/1)

Length = 63

Parametri della ricerca BLAST

Programma	*Blastn*
Word size	*11*
Expect value	*10*
Hitlist size	*100*
Match/Mismatch scores	*2,-3*
Gapcosts	*5,2*
Low Complexity Filter	*Yes*
Filter string	*L;m;*
Genetic Code	*1*

Sequences producing significant alignments:	Score (Bits)	E Value	Identit.
CP010359.1 Pseudomonas plecoglossicida strain NyZ12, complete... https://www.ncbi.nlm.nih.gov/nuccore/CP010359.1	44.6	0.18	85%
LL188962.1 Heligmosomoides polygyrus genome assembly H_bak.. https://www.ncbi.nlm.nih.gov/nuccore/LL188962.1	44.6	0.18	93%
CP007620.1 Pseudomonas putida strain DLL-E4, complete genome https://www.ncbi.nlm.nih.gov/nuccore/CP007620.1	44.6	0.18	85%
LT629788.1 Pseudomonas moraviensis strain BS3668 genome ass.... https://www.ncbi.nlm.nih.gov/nuccore/LT629788.1	39.2	7.6	82%
LL194531.1 Heligmosomoides polygyrus genome assembly H_bak.. https://www.ncbi.nlm.nih.gov/nuccore/LL194531.1	39.2	7.6	87%
CP003961.1 Pseudomonas sp. VLB120, complete genome https://www.ncbi.nlm.nih.gov/nuccore/CP003961.1	39.2	7.6	83%

ALLINEAMENTI SIGNIFICATIVI

1.8 ALLINEAMENTI PSEUDOMONAS

>CP010359.1
Pseudomonas plecoglossicida strain NyZ12, complete genome
Length=6233254
Features in this part of subject sequence: **cystathionine gamma-synthase**
https://www.ncbi.nlm.nih.gov/nucleotide/752308899?report=gbwithparts&from=5560737&to=5562680&RID=1ZXSZEJC014

>CP007620.1
Pseudomonas putida strain DLL-E4, complete genome
Length=6484062
Features in this part of subject sequence**: cystathionine gamma-synthase**
https://www.ncbi.nlm.nih.gov/nucleotide/635291785?report=gbwithparts&from=176815&to=178758&RID=1ZXSZEJC014

>LT629788.1
Pseudomonas moraviensis strain BS3668 genome assembly, chromosome:I
Length=6092541
Features in this part of subject sequence: **high-affinity iron transporter**
https://www.ncbi.nlm.nih.gov/nucleotide/1086004611?report=gbwithparts&from=4649680&to=4651578&RID=1ZXSZEJC014

>CP003961.1
Pseudomonas sp. VLB120, complete genome
Length=5644569
Features in this part of subject sequence: **cytochrome c class I**
https://www.ncbi.nlm.nih.gov/nucleotide/556072477?report=gbwithparts&from=5441006&to=5442901&RID=1ZXSZEJC014

1.9 ALLINEAMENTI HELIGMOSOMOIDES POLYGYRUS

>LL188962.1
Heligmosomoides polygyrus genome assembly H_bakeri_Edinburgh, scaffold HPBE_scaffold0000593
Length=94530
https://www.ncbi.nlm.nih.gov/nucleotide/688429340?report=genbank&log$=nuclalign&blast_rank=2&RID=27MWTXV3014

>LL194531.1
Heligmosomoides polygyrus genome assembly H_bakeri_Edinburgh, scaffold HPBE_contig0000102
Length=27221
https://www.ncbi.nlm.nih.gov/nucleotide/688443549?report=genbank&log$=nuclalign&blast_rank=23&RID=27MWTXV3014

1.10 PSEUDOMONAS

La ricerca BLAST evidenzia *allineamenti significativi di basi di DNA* tra la **nuova sequenza generata** e diverse specie del genere dei **batteri PSEUDOMONAS**.

[**Pseudomonas** è un genere di batteri (Gram-negativi, aerobi obbligati ossidasi positivi, catalasi positivi e capaci di muoversi) appartenenti alla famiglia delle *Pseudomonadaceae*. Sono presenti sopratutto nel terreno, negli ambienti umidi e nelle acque (piscine) e sulle piante. Producono la *piocianina* (un tipo di pigmento) che altera la funzione ciliare, stimola la risposta infiammatoria e provoca danno ai tessuti. Una particolare sostanza prodotta da molte specie di Pseudomonas in condizioni di carenza di ferro è la *pioverdina* (un *sideroforo giallo-verde* o molecola ad alta affinità per il ferro capace di chelarlo efficacemente). I principali fattori di virulenza sono l'*esotossina A* e l'*endotossina*. Aderendo alle cellule dell'ospite possono formare *biofilm* (biopellicole protette da matrici di esopolisaccaridi) che inibiscono la fagocitosi e limitano l'attività antibiotica. Nell'uomo, la specie **Pseudomonas aeuriginosa** è probabilmente la più diffusa (feci, ma anche ascelle, inguine e, più raramente, unghie). Nei nosocomi con carenze igieniche possono aversi epidemie con conseguenze potenzialmente gravi (infezioni osteoarticolari, otite esterna, polmonite, follicoliti cutanee, infezioni oculari ed endocardite). *Essendo poco permeabili, resistono alla maggior parte degli antibiotici o li espellono, inattivano le penicilline e gli aminoglicosidi producendo enzimi specifici*. Recentemente, per contrastare la virulenza di Pseudomonas, i ricercatori hanno sfruttato la sua forte avidità per il ferro. Gli *ioni di gallio* interagiscono con i processi cellulari in modo simile al *ferro (III)*. Quando batteri come *Pseudomonas* scambiano per errore gli *ioni di gallio* con il *ferro (III)*, gli ioni interferiscono con la ***respirazione*** e i batteri muoiono. Ciò accade perché il ***ferro è attivo redox***, consentendo il trasferimento di elettroni durante la respirazione, mentre il ***gallio*** è ***inattivo redox***](4).

Il **primo allineamento significativo** della ricerca BLAST riguarda il **batterio PSEUDOMONAS** della specie ***Plecoglossicida***.
Dalla stessa ricerca emergono successivi *altri allineamenti significativi* con altre 3 specie di **batteri PSEUDOMONAS**: ***Putida***, ***Sp.*** *e* ***Moraviensis***.
In particolare, nei **batteri PSEUDOMONAS** delle specie **Plecoglossicida Nyz12** e **Putida DLL-E4** gli *allineamenti di basi* hanno riguardato l'**enzima** CYSTATHIONINE GAMMA-SYNTHASE.
Invece, nei **batteri PSEUDOMONAS Moraviensis BS3668** l'*allineamento* ha evidenziato un HIGH-AFFINITY IRON TRANSPORTER, mentre nei **batteri PSEUDOMONAS** della specie **Sp. VLB120** l'*allineamento* di basi ha riguardato il CYTOCHROME C CLASS 1.

(4) Tratto e modificato da: https://it.wikipedia.org/wiki/Pseudomonas

https://en.wikipedia.org/wiki/Pseudomonas

1.11 HELIGMOSOMOIDES POLYGYRUS

[***Heligmosomoides polygyrus*** (conosciuto anche come *Nematospiroides dubius*) è un nematoda intestinale dei roditori selvatici (in particolare, dei topi selvatici *Apodemus sylvaticus*). Esso ha la capacità di stabilire infezioni croniche nei roditori e alterarne le risposte immunitarie. Per questo motivo, *Heligmosomoides polygyrus* è ampiamente usato (soprattutto sul topo di laboratorio *Mus musculus*) come modello parassitario gastrointestinale in studi immunologici, farmacologici e tossicologici. Il roditore infetto scatena una forte risposta immunitaria innata e adattiva, generata per prevenire la formazione del parassita nell'intestino e per guarire le ferite (immunità tipo Th2) associate alla patologia intestinale. Tuttavia, nonostante questa impressionante risposta immunitaria, *H. polygyrus* è in grado di dirottare la risposta immunitaria dell'ospite, di attenuare la risposta Th2 e di causare un'infezione cronica] (5).

(5) Tratto e modificato da: https://en.wikipedia.org/wiki/Heligmosomoides_polygyrus

1.12 PRESUPPOSTI PER LE RICERCHE BIBLIOGRAFICHE MIRATE

In questo capitolo, come negli altri capitoli che seguiranno, saranno fatte delle **ricerche bibliografiche mirate** finalizzate a trovare le possibili relazioni tra l'**insulina** e i diversi e numerosi *organismi* identificati dalle ricerche *BLAST* sulle diverse **nuove sequenze generate**.

Nella prima parte di questo capitolo, le ricerche riguarderanno i batteri del genere **Pseudomonas** e il nematoda **Heligmosomoides polygyrus**.
Nella seconda parte di questo capitolo, le ricerche saranno effettuate su tutti i restanti *organismi* per i quali sono stati riscontrati allineamenti significativi con la **Sequenza n°1/1**.

I risultati delle ricerche bibliografiche saranno consultabili direttamente dai **link** ad **abstract di articoli** (o a **interi articoli**) **scientifici** pubblicati su **PubMed** (https://www.ncbi.nlm.nih.gov/pubmed/), [una risorsa gratuita sviluppata e gestita dal **NCBI** (National Center for Biotechnology Information), presso la **NLM** (National Library of Medicine) degli Stati Uniti, situata presso il **NIH** (National Institutes of Health)](si veda anche ***PubMed Help***: *How to Get the Journal Article*).

La trattazione degli articoli esula dalle finalità del lavoro qui proposto e, dato che **non sempre dal titolo dell'articolo si evincono le importanti relazioni, dirette o indirette, tra l'insulina e i diversi organismi**, *si rimanda il lettore interessato al loro studio e approfondimento.*

Il principale obiettivo, nell'elencare questi articoli scientifici, è quello di accumulare prove (e materiale da approfondire) che sostengano come scientificamente plausibile l'*ipotesi* che le **nuove sequenze generate** abbiano ragionevoli **forti relazioni** con le **caratteristiche** della **sequenza originaria** (nello specifico con la **Catena A dell'Insulina**).

Questa ipotesi sarebbe sostenibile e verosimile se le ricerche bibliografiche **confermassero** che la **sequenza originaria** fosse in qualche modo implicata con alcune caratteristiche degli *organismi* costituiti da basi di DNA (o RNA) delle diverse nuove sequenze generate.

1.13 LA RICERCA RIGUARDANTE PSEUDOMONAS

I risultati della ricerca BLAST (presentati a pagina 33) hanno stimolato un'opportuna ricerca bibliografica per studiare le **possibili relazioni** tra le **caratteristiche** della **sequenza originaria di DNA** (**63** basi della **Catena A dell'Insulina**) e le **caratteristiche** dei batteri **Pseudomonas**.
Dalla lettura degli articoli selezionati (presentati dalla pagina 51 alla pagina 156) sono state riscontrate importanti relazioni, *dirette* o *indirette*, tra l'**insulina** e diverse specie di batteri del genere **Pseudomonas**.
Queste forti relazioni tra l'**insulina** e **Pseudomonas** avvalorano l'ipotesi che la **Sequenza n°1/1**, cioè la **nuova sequenza generata** rispettando fedelmente il **Trend n°1** (che è uno tra i possibili specifici "trend non manifesti" della *sequenza originaria*), abbia **forti relazioni** con le **caratteristiche** della **sequenza originaria** (nello specifico con la **Catena A dell'Insulina**).

In generale e molto sommariamente, tra le altre prove di minore importanza non citate, **esistono prove di forti legami** tra *Insulina*, *Pseudomonas* (o *Burkholderia*, una specie del genere di batteri Pseudomonas) e:

1) *Diabete*;
2) *Melioidosi*;
3) *Fibrosi Cistica*;
4) *Infezioni Polmonari*;
5) *Obesità*;
6) *Otite Esterna Maligna;*
7) *Endocardite;*
8) *Sistema Immunitario*;
9) *Apoptosi*.

Più precisamente, *Pseudomonas* è molto più presente e causa conseguenze molto più gravi [tra le quali l'Otite Esterna Maligna e l'Endocardite (quest'ultima soprattutto nei tossicodipendenti)] in soggetti immunodepressi e/o affetti da Diabete, Fibrosi Cistica, Infezioni Polmonari e Obesità, che in soggetti che non sono affetti da queste patologie. L'attività infettiva di *Pseudomonas* può indebolire le difese immunitarie dell'ospite e favorire il processo dell'apoptosi (morte cellulare programmata) e il cancro.
La **melioidosi** è invece un'infezione causata dal batterio *Burkholderia* (*o Pseudomonas*) *pseudomallei*. Anch'essa è molto più presente e grave quando i soggetti sono affetti sopratutto da Diabete, Fibrosi Cistica e Infezioni Polmonari.

1.14 CYSTATHIONINE GAMMA-SYNTHASE

Il risultato della ricerca BLAST identifica allineamenti significativi di basi con l'enzima CYSTATHIONINE GAMMA-SYNTHASE dei batteri **Pseudomonas**. Questo risultato ha stimolato una **ricerca bibliografica specifica** sulle relazioni tra **Insulina**, **Pseudomonas** e **Cystathionine Gamma-Synthase**.

[L'enzima **CYSTATHIONINE GAMMA-SYNTHASE (CGS)** è un enzima che catalizza una reazione chimica. I due substrati di questo enzima sono O 4 succinyl-L-homoserine + L-cysteine, mentre i suoi due prodotti sono L-cystathionine + succinate. Questo enzima partecipa a 4 percorsi metabolici: il *metabolismo della metionina*, il *metabolismo della cisteina*, il *metabolismo dei seleno-aminoacidi* e il *metabolismo dello zolfo*](6).

La ricerca bibliografica su tutti gli **articoli scientifici** pubblicati su **PubMed** in cui figurano insieme i termini "*Insulin*", "*Pseudomonas*" e "*Cystathionine Gamma-Synthase*" **non ottiene risultati**.
(https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+PSEUDOMONAS+CYSTATHIONINE+GAMMA-SYNTHASE).

Questa constatazione fa ipotizzare possibili **relazione indirette** tra *Insulin*, *Pseudomonas* e *Cystathionine Gamma-Synthase*.

Per indagare su queste **ipotetiche relazioni** si è proseguito facendo delle **ricerche mirate** sugli accoppiamenti dei termini *"Insulin* e *Cystathionine Gamma-Synthase"* e *"Pseudomonas* e *Cystathionine Gamma-Synthase"*.

Dagli articoli che riguardano la **ricerca mirata** sugli accoppiamenti dei termini *"Insulin e Cystathionine Gamma-Synthase"* emergono principalmente **prove di forti legami** tra *Insulin*, *Cystathionine Gamma-Synthase* e:

1) *Diabete*;
2) *Obesità*;
3) *Solfato di Idrogeno (H_2S)*;
4) *Omocisteina*;
5) *Cisteina.*

(6) Tratto e modificato da:
https://en.wikipedia.org/wiki/Cystathionine_gamma-synthase

Fondamentale appare il ruolo dell'**Omocisteina** e della **Cisteina** e dei loro rapporti con il **Solfato di Idrogeno** (sintetizzato nell'uomo soprattutto dagli enzimi *cistationina-γ-liasi e cistationina*-β-*sintasi* degli amminoacidi cistationina, omocisteina e cisteina) nel ***Diabete*** e nell'***Obesità***.

Esiste quindi un evidente legame (diretto e indiretto) tra l'**Insulina** e più di un **percorso metabolico in cui è implicato l'enzima CYSTATHIONINE GAMMA-SYNTHASE** (metabolismo della *metionina,* metabolismo della *cisteina,* metabolismo dei *seleno-aminoacidi* e metabolismo dello *zolfo*).

In particolare, il coinvolgimento del **Solfato di Idrogeno** sposta l'attenzione sulla sua attività **antiossidante** e sulla sua capacità di influenzare lo **stato redox delle cellule** [inibendo l'azione fisiologicamente disfunzionale delle **ROS** (*Reactive Oxygen Species*), **S**pecie chimiche **R**eattive chimicamente contenenti **O**ssigeno, quali i *peroxides*, *superoxide*, *hydroxyl radical* e *singlet oxygen*].

[Nei processi biologici, le **ROS** sono formate come sottoprodotto naturale del normale metabolismo dell'**ossigeno** e hanno ruoli importanti nella **segnalazione cellulare** e nell'**omeostasi**. In seguito allo **stress ossidativo** (dovuto a vari fattori ambientali), i *livelli delle ROS* possono aumentare molto e causare danni significativi alle strutture cellulari. Le ROS sono prodotti intracellulari e le fonti principali sono i complessi enzimatici **NADPH ossidasi** (NOX) presenti nelle *membrane cellulari*, nei *mitocondri*, nei *perossisomi* e nel *reticolo endoplasmatico*. Nei mitocondri, la **fosforilazione ossidativa**, comporta il trasporto di protoni (ioni idrogeno) mediante la **catena di trasporto** degli **elettroni**. L'ultima destinazione di un elettrone lungo questa catena è una molecola di *ossigeno*. In condizioni normali, l'ossigeno viene ridotto per produrre acqua; tuttavia, in una percentuale bassissima di elettroni che passano attraverso la catena, l'ossigeno è invece prematuramente e in modo incompleto ridotto e si ottiene un **radicale superossido**. Esso può inattivare specifici enzimi o iniziare la perossidazione lipidica nella sua forma protonata, producendo dei danni. Se nei mitocondri è presente un danno eccessivo, la *cellula* subisce l'**apoptosi** (*morte cellulare programmata*). Le **proteine Bcl-2** sono stratificate sulla superficie dei mitocondri, rilevano il danno e attivano una classe di proteine chiamate **Bax** che causando la fuoriuscita del **Citocromo c**, il quale verrà coinvolto in altri processi che si concluderanno con la morte della cellula. Le ROS hanno però diversi effetti positivi sul metabolimo e, nell'ospite dei mammiferi, possono proteggerlo dall'invasione dei **microbi**, probabilmente danneggiando il loro DNA mitocondriale. Per la loro capacità di danneggiare proteine, lipidi, DNA e RNA, esse sono coinvolte anche nel processo dell'invecchiamento, nella formazione delle cellule cancerogene, ma anche nella loro **necrosi** (una forma di morte cellulare incontrollata) e nell'*autofagia*](7).

(7) Tratto e modificato da: https://en.wikipedia.org/wiki/Reactive_oxygen_species

La grande importanza delle ROS nel nostro studio sull'**insulina** è comprensibile, in quanto la **produzione di insulina** e la **sua segnalazione** sono **processi redox sensibili** e la **compromissione della segnalazione fisiologica** da parte delle **ROS/RNS** (***R**eactive **N**itrogen **S**pecies*) è implicata nell'eziopatologia del *diabete* [**Rochette L., Zeller M., Cottin Y., Vergely C**. *Diabetes, oxidative stress and therapeutic strategies*. Biochim. Biophys. Acta. 2014; 1840:2709–2729. PMID: 24905298. DOI: 10.1016/j.bbagen.2014.05.017. https://www.ncbi.nlm.nih.gov/pubmed/24905298].

Per inciso, per una trattazione approfondita sulle ROS si consiglia lo studio del seguente articolo:

Egea J, Fabregat I, Frapart YM, et al. European contribution to the study of ROS: A summary of the findings and prospects for the future from the COST action BM1203 (EU-ROS). Redox Biol. 2017 Oct; 13: 94–162. PMCID: PMC5458069. doi: 10.1016/j.redox.2017.05.007
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5458069

Dagli articoli che invece riguardano la **ricerca mirata** sugli accoppiamenti dei termini *"Pseudomonas e Cystathionine Gamma-Synthase"* emergono principalmente **prove di forti legami** tra *Pseudomonas*, *Cystathionine Gamma-Synthase* e:

1) *Solfato di Idrogeno (H_2S)*;
2) *Metabolismo della Metionina.*

In conclusione, esistono **collegamenti indiretti** tra "*Insulin*" e "*Pseudomonas*" riconducibili a uno o più **percorsi metabolici** in cui è implicato **l'enzima CYSTATHIONINE GAMMA-SYNTHASE** (in particolare il metabolismo della *metionina* e quello dello *zolfo*).

1.15 CYTOCHROME C

Il risultato della ricerca BLAST identifica allineamenti significativi di basi con il CYTOCHROME C CLASS 1 dei batteri **Pseudomonas**. Questo risultato ha stimolato una **ricerca bibliografica specifica** sulle relazioni tra **Insulina**, **Pseudomonas** e **Cytochrome c**.

[Il **Cytochrome c** è una *emoproteina* (contenente ***ferro***) capace di diffondere tra la membrana interna ed esterna dei *mitocondri*. Il gruppo *eme* è legato alla catena proteica tramite due legami covalenti con la ***cisteina***. Il *Cytochrome c* è un componente essenziale della catena di trasporto degli elettroni dalla *Q-citochrome c ossidoreduttasi* alla *citochrome C ossidasi*. Il *Cytochrome c* ha anche un importante ruolo nel processo di *apoptosi* una forma di morte cellulare controllata finalizzata al ricambio cellulare o attivata in presenza di infezioni o danni del DNA. Esso è rilasciato dai mitocondri in risposta agli stimoli *pro-apoptotici*.](8). [Ad esempio, *Bax*, *BAD*, *Bak*, *Bok*, *etc*. (membri *pro-apoptotici* della famiglia genica *Bcl-2*), controllando la permeabilità della membrana mitocondriale, possono indurre il rilascio di **Cytochrome c** nel *citosol* (fluido intracellulare). Al contrario, *Bcl-2*, *Bcl-xL*, *Bcl-w*, *etc*. (membri *anti-apoptotici* della famiglia genica *Bcl-2*) possono invece inibirlo. La proteina *anti-apoptotica Bcl-2* impedisce il rilascio di **Cytochrome c** dai mitocondri e porta all'inibizione dell'apoptosi (probabilmente inibendo la proteina Bax). Al contrario, la proteina Bax consentendo un influsso di ioni attraverso la membrana mitocondriale esterna, favorisce il rilascio del **Cytochrome c** e incrementa l'apoptosi](9).

[Il **Cytochrome c1** è una proteina codificata dal **gene *CYC1*** e appartiene alla famiglia delle proteine del **Cytochrome c**. Il **Cytochrome c1** svolge un ruolo nel *trasferimento di elettroni* durante la *fosforilazione ossidativa* (il ***Cytochrome c1***, insieme al *Cytocrome b*, trasferisce gli elettroni da $CoQH_2$ al *Cytochrome c*)](10).

[La **fosforilazione ossidativa** è un processo biochimico cellulare per la *produzione di ATP nei mitocondri*, fondamentale e ubiquitario. Si tratta della **fase finale della *respirazione cellulare***. Essa è composta di due parti: la *catena di trasporto degli elettroni* e la *sintesi di ATP*](11).

(8) Tratto e modificato da: https://it.wikipedia.org/wiki/Citocromo_c
(9) Tratto e modificato da: https://it.wikipedia.org/wiki/Bcl-2
(10) Tratto e modificato da: https://en.wikipedia.org/wiki/Cytochrome_C1
(11) Tratto e modificato da: https://it.wikipedia.org/wiki/Fosforilazione_ossidativa

La ricerca bibliografica su tutti gli **articoli scientifici** pubblicati su **PubMed** in cui figurano insieme i termini "*Insulin*", "*Pseudomonas*" e "*Cytochrome c*" **non ottiene risultati** (https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+PSEUDOMONAS+CYTOCHROME+C).

Questa constatazione fa ipotizzare possibili **relazioni indirette** tra *Insulin*, *Pseudomonas* e *Cytochrome C*.

Per indagare su queste **ipotetiche relazioni** si è proseguito facendo delle **ricerche mirate** sugli accoppiamenti dei termini *"Insulin e Cytochrome c (c1 e sue definizioni alternative)"* e *"Pseudomonas* e *Cytochrome c (c1 e sue definizioni alternative)"*.

Dagli articoli che riguardano la **ricerca mirata** sugli accoppiamenti dei termini *"Insulin e Cytochrome c (c1 e sue definizioni alternative)"*emergono principalmente **prove di forti legami** tra *Insulin*, *Cytochrome c* e:

1) *Apoptosi*;
2) *Stress ossidativo e le ROS (Reactive Oxygen Species);*
3) *Diabete*;
4) *Obesità*.

Dagli articoli che riguardano la **ricerca mirata** sugli accoppiamenti dei termini *"Pseudomonas* e *Cytochrome c (c1 e sue definizioni alternative)"* emergono principalmente **prove di forti legami** tra *Pseudomonas*, *Cytochrome c* e:

1) *Apoptosi;*
2) *Stress ossidativo e le ROS (Reactive Oxygen Species);*
3) *Fibrosi Cistica* e *Infezioni polmonari*.

Complessivamente, dai risultati della ricerca bibliografica presentata nelle pagine seguenti, si evidenzia, come fondamentale fattore comune tra **Insulina**, **Pseudomonas** e **Cytochrome c** (**c1 e su definizioni alternative**), il ruolo determinante svolto dall'**attività mitocondriale,** soprattutto (ma non soltanto) in relazione allo ***Stress Ossidativo***, alle ***ROS*** e all'***Apoptosi***.

1.16 HIGH-AFFINITY IRON TRASPORTER

Il risultato della ricerca BLAST identifica allineamenti significativi di basi con un HIGH-AFFINITY IRON TRANSPORTER dei batteri **Pseudomonas**. Questo risultato ha stimolato una **ricerca bibliografica specifica** sulle relazioni tra **Insulina**, **Pseudomonas** e **Ferro**.

[Il **ferro** è presente abbondantemente nella Terra e rappresenta un micronutriente fondamentale per i vegetali e gli animali. Nel mondo animale, il ferro è inglobato nel *complesso eme*, un componente indispensabile delle proteine implicate nell'ossidoriduzione (**reazioni redox**). Una tra le *reazioni redox* più importanti è la ***respirazione cellulare***. Nel mondo inorganico il ferro si trova anche nelle azotasi e nelle idrogenasi (aggregati ferro-zolfo di vari enzimi). Altri *enzimi*, in cui il ferro è fondamentale, sono implicati in diverse funzioni, tra cui la *conversione del metano in metanolo* (*metano-monoossigenasi*) e la conversione del *ribosio in desossiribosio* (*ribonucleotide riduttasi*). Nel nostro organismo, per evitare un eccesso tossico, il ferro è *legato a proteine* che regolano il suo stato di ossidazione. La distribuzione degli *ioni ferro* nei mammiferi è quindi regolata in maniera molto precisa. Se, ad esempio, il corpo è soggetto a un'infezione, l'organismo **sottrae il ferro** rendendolo meno disponibile anche ai *batteri*. Alcune *proteine* che contengono ferro svolgono le funzioni principali di trasportare e conservare ossigeno e di trasferire elettroni. Il *ferro*, legato a **specifiche proteine di trasporto**, come l'*apoferritina* (che si trasforma in *ferritina*) e la *transferrina* (la principale *proteina* che lega il *ferro extracellulare* e lo trasporta nel sangue), è distribuito ai vari organi. Un tipo di ferro è idrosolubile (*ferro ferroso*) e più facilmente assorbibile dalle piante, mentre l'altro tipo è difficilmente solubile e assorbibile (*ferro ferrico*). Alla presenza di una concentrazione di ferro adeguata, i ***trasportatori di ferro a bassa affinità*** trasportano il *ferro ferroso* all'interno della cellula. Quando, invece, la concentrazione di ferro è scarsa, intervengono i ***trasportatori di ferro ad alta affinità***. Esistono dei *recettori* (Recettori TfR1) per la *transferrina* ad **alta affinità** e dei *recettori* (Recettori TfR2) per la *transferrina* a **bassa affinità**. I Recettori TfR1 sono presenti negli *epatociti*, negli *enterociti* e nelle *cellule eritroidi*, mentre i Recettori TfR2 sono invece *ubiquitari*](12).

Per quello che riguarda le argomentazioni che si stanno sostenendo in questo lavoro, è necessario evidenziare lo **stretto rapporto** tra il **ferro** e i **citocromi**. Come già detto nel paragrafo 1.15 (pagina 42), i *citocromi* sono proteine che contengono *ferro* e sono deputate al ***trasporto degli elettroni***, in particolare nel processo di fosforilazione ossidativa che porta alla produzione di diverse molecole di ATP. Il *ferro* e i *citocromi* sono quindi entrambi implicati nella ***respirazione cellulare***.

(12) Tratto e modificato da: https://it.wikipedia.org/wiki/Ferro
https://en.wikipedia.org/wiki/Iron

Nel paragrafo 1.10 (pagina 35), è stato già evidenziato che, recentemente, per contrastare la virulenza di **Pseudomonas**, i ricercatori hanno sfruttato la sua forte avidità per il *ferro*. I *batteri* (compreso **Pseudomonas**) hanno sviluppato i *siderofori*, agenti che sequestrano il ferro ad **altissima affinità**. Gli *ioni di gallio* interagiscono con i processi cellulari in modo simile al *ferro (III)*. Quando gli *ioni di gallio* vengono scambiati per errore al posto del *ferro (III)* da batteri come *Pseudomonas*, gli ioni, **interagendo con l'attività dei citocromi,** interferiscono con la ***respirazione cellulare*** e causano la morte dei batteri. Ciò accade perché il *ferro è attivo redox*, consentendo il trasferimento di elettroni durante la respirazione, mentre il *gallio è inattivo redox*](13).

Questo argomento è possibile approfondirlo adeguatamente consultando il recentissimo lavoro di **Hijazi S., Visca P. e Frangipani E.** [*Gallium-Protoporphyrin IX Inhibits Pseudomonas aeruginosa Growth by Targeting Cytochromes*. Front Cell Infect Microbiol. 2017 Jan 26;7:12. doi: 10.3389/fcimb.2017.00012. eCollection 2017. PubMed PMID: 28184354; PubMed Central PMCID: PMC5266731. https://www.ncbi.nlm.nih.gov/pubmed/28184354].

La ricerca bibliografica su tutti gli **articoli scientifici** pubblicati su **PubMed** in cui figurano insieme i termini "*Insulin*", "*Pseudomonas*" e "*Iron*" **non ottiene risultati** (https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+PSEUDOMONAS+IRON).

Anche la ricerca bibliografica su tutti gli **articoli scientifici** pubblicati su **PubMed** in cui figurano insieme i termini "*Insulin*", "*Burkholderia*" e "*Iron*" **non ottiene risultati** (https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+PSEUDOMONAS+IRON).

Queste constatazioni fanno ipotizzare possibili **relazioni indirette** tra *Insulin*, *Pseudomonas* (o *Burkholderia*) e *Iron*.

Per indagare su queste **ipotetiche relazioni** si è proseguito facendo delle **ricerche mirate** sugli accoppiamenti dei termini *"Insulin e Iron"*, *"Pseudomonas* e *Iron"* e *"Burkholderia* e *Iron"*.

La quantità di articoli individuati dalle ricerche su questi accoppiamenti di termini è **enorme**. Per ridurre il campo d'indagine e rendere più agevole l'identificazione di relazioni significative (in riferimento agli scopi prefissi dal nostro lavoro) tra *Insulin* e *Iron*, tra *Pseudomonas* e *Iron*, e tra *Burkholderia* e *Iron*, sono stati inseriti altri termini chiave considerati importanti per delle **ricerche mirate**.

(13) Tratto e modificato da: https://en.wikipedia.org/wiki/Pseudomonas

Dagli articoli che riguardano i termini chiave, relativi agli accoppiamenti *Insulin/ Iron*, *Pseudomonas*/*Iron e Burkholderia*/*Iron*, emergono principalmente **prove di forti legami** tra ognuno di questi accoppiamenti e i seguenti termini:

1) *Transporter;*
2) *Melioidosi;*
3) *Diabete;*
4) *Fibrosi Cistica;*
5) *Sistema Immunitario;*
6) *Apoptosi;*
7) *Cytochrome c;*
8) *Reactive Oxygen Species;*

Solo l'accoppiamento dei termini *Insulin* e *Iron*, **oltre ai risultati sopra esposti**, ha mostrato **prove di forti legami** con i seguenti termini:

1) *Obesità;*

2) *Insulite.*

In conclusione, per quel che riguarda i possibili legami tra *Insulina* e *Pseudomonas*, sembra essere **fondamentale anche il ruolo del *ferro*, dei suoi valori e del suo trasporto**.

1. 17 LA RICERCA RIGUARDANTE HELIGMOSOMOIDES POLYGYRUS

I risultati della ricerca BLAST (presentati a pagina 34) hanno stimolato un'opportuna ricerca bibliografica per studiare le **possibili relazioni** tra le **caratteristiche** della **sequenza originaria di DNA** (**63** basi della **Catena A dell'Insulina**) e le **caratteristiche** del nematoda **Heligmosomoides polygyrus** (o *Nematospiroides dubius*).

Dalla lettura degli articoli selezionati (presentati dalla pagina 157 alla 168) sono state riscontrate importanti relazioni, *dirette* o *indirette*, tra l'**insulina** e il nematoda **Heligmosomoides polygyrus**.

Queste importanti relazioni tra l'**insulina** e **Heligmosomoides polygyrus** avvalorano l'ipotesi che la **Sequenza n°1/1**, cioè la **nuova sequenza generata** rispettando fedelmente il **Trend n°1** (che è uno tra i possibili specifici "trend non manifesti" della *sequenza originaria*), abbia **forti relazioni** con le **caratteristiche** della **sequenza originaria** (nello specifico con la **Catena A dell'Insulina**).

In generale e molto sommariamente, tra le altre prove di minore importanza non citate, **esistono prove di forti legami** (anche se il numero di articoli, in alcuni casi, è scarso) tra *Insulina*, *Heligmosomoides polygyrus* e:

1) *Sistema Immunitario;*
2) *Apoptosi;*
3) *Infezioni Polmonari*;
4) *Diabete*;
5) *Obesità*;
6) *Insulite*.

Sono state fatte anche delle **ricerche mirate** sulle relazioni esistenti tra *Heligmosomoides polygyrus* e i singoli **termini rilevanti** evidenziati ai punti 1, 2, 3, 4, 5 e 6.

In un articolo (**non consultabile online**) è stata trovata una corrispondenza tra i termini *Heligmosomoides polygyrus* e *Pseudomonas*.

In linea generale, i **risultati conclusivi** di queste ricerche, provano che l'infezione da ***Heligmosomoides polygyrus*** può ridurre, attraverso una forte risposta immunitaria dell'ospite, il *diabete di tipo 1*, la tendenza a prendere eccessivo peso (*obesità*), molte *infezioni polmonari* (ad eccezione della polmonite da pneumococco causata da Streptococcus pneumoniae) e l'*apoptosi*.

RISULTATI DELLA RICERCA BIBLIOGRAFICA SU PSEUDOMONAS E SU HELIGMOSOMOIDES POLYGYRUS

1.18 CONCLUSIONI CAPITOLO I° (PARTE PRIMA)

Nell'insieme, rispetto ai batteri **Pseudomonas**, dalla ricerca bibliografica emergono numerose e importanti relazioni tra diverse specie di batteri **Pseudomonas** (identificati dalla ricerca BLAST per gli allineamenti significativi tra la **Sequenza n°1/1** e alcune loro *basi di DNA* inerenti la *Cystathionine Gamma-Synthase*, i *Citocromi C classe 1* e un *High-Affinity Iron Transporter*) e l'**insulina**, il **diabete mellito**, la **melioidosi**, l'**obesità**, la **fibrosi cistica**, diversi tipi d'**infezioni** (soprattutto **polmonari**), l'**otite esterna maligna**, l'**endocardite**, il **sistema immunitario**, l'**apoptosi** e i **valori del ferro** e il suo **trasporto**.

Anche riguardo, il nemoda **Heligmosomoides polygyrus**, la ricerca bibliografica evidenzia numerose e importanti relazioni tra questo *parassita intestinale* (identificato dalla ricerca BLAST per gli allineamenti significativi tra la **Sequenza n°1/1** e alcune sue *basi di DNA*) e l'**insulina**, il **sistema immunitario**, l'**apoptosi,** il **diabete di tipo I**, l'**obesità** e l'**insulite**.

Non è stato invece possibile indagare sulle relazioni tra *Pseudomonas e Heligmosomoides polygyrus*, perché in rete è stato rintracciato un solo articolo, peraltro molto datato e non consultabile online.

Sarebbero augurabili futuri studi specifici, soprattutto perché alcune caratteristiche inerenti *Pseudomonas* appaiono **speculari** e **opposte** a quelle manifestate da *Heligmosomoides polygyrus*; infatti, correlata alla sua infezione, si riscontra nell'ospite una riduzione della gravità del *diabete di tipo 1*, dell'*obesità*, dell'*insulite* e dell'*apoptosi* (mentre, al contrario, l'infezione da *Pseudomonas* è correlata al loro incremento di gravità).

Prima di passare alla seconda parte di questo capitolo, si sottolinea l'importanza evidenziata dalla ricerca bibliografica riguardo alla **respirazione cellulare**, le **ROS** (*Reactive Oxygen Species*)**,** i **valori del ferro** e il suo **trasporto**, i quali (insieme o separatamente) sembrano rappresentare *un punto di contatto importante* tra i diversi aspetti dei fenomeni e delle patologie considerate in questa prima parte del capitolo.

L'**ipotesi** che s'intendeva avvalorare, cioè che la **nuova sequenza** (generata rispettando fedelmente uno tra i possibili specifici "trend non manifesti" della **sequenza originaria**) avesse forti relazioni con le *caratteristiche* della **sequenza originaria** (nello specifico con la **Catena A dell'insulina**) sembra essere sostenibile e verosimile.
La ricerca bibliografica sembra confermare che l'**insulina** (e, quindi, anche la **Catena A dell'insulina**) è in vari modi *molto implicata con alcune caratteristiche* sia dei batteri **Pseudomonas**, sia del nemoda **Heligmosomoides polygyrus** (*organismi* entrambi costituiti da basi di DNA della nuova sequenza generata).

In conclusione, l'analisi (attraverso la **T.T.E.S.**) della *sequenza originaria* basata su uno dei suoi "trend non manifesti" (*il **Trend n°1***), la creazione di una *nuova sequenza* di DNA (la **Sequenza n°1/1**) a partire dal ***Trend n°1*** della *sequenza originaria* e la *congruenza* con i dati ottenuti dall'*approfondimento bibliografico* aprono prospettive totalmente inesplorate riguardo all'ambito della ricerca genetica e delle sue innumerevoli applicazioni.

1.19 LE PROSPETTIVE DI RICERCA DEI PROSSIMI CAPITOLI

La ricerca BLAST della *nuova sequenza di DNA* analizzata in questo capitolo, generata rispettando fedelmente uno tra i possibili "trend non manifesti" (cioè *il **Trend n°1***), ha dato anche altri risultati di *allieneamenti significativi di basi* oltre i batteri **Pseudomonas** e il nemoda **Heligmosomoides polygyrus**.

Nelle altre parti di questo capitolo, lo stesso tipo di ricerca bibliografica sarà quindi eseguita su tutti gli altri *organismi* per i quali si sono evidenziati, dalla ricerca BLAST, allineamenti significati alla **Sequenza n°1/1**.

Dal nostro punto di vista, ogni *organismo* per il quale è stato riscontrato un allineamento significativo con la **nuova sequenza generata** (**Sequenza n°1/1**) dovrebbe, a ragion veduta, essere in qualche modo legato (direttamente o indirettamente) alla **sequenza originaria** (nello specifico alla **Catena A dell'Insulina**), agli *organismi* identificati con la ricerca Blast eseguita sulla **Catena A dell'Insulina** e, in parte, anche agli altri *organismi* per i quali saranno riscontrati allineamenti significativi con **altre sequenze generate**.
Indagare anche su questi legami sarà un *obiettivo* dei prossimi capitoli di questa *nuova e affascinante prospettiva d'indagine genetica*.

Un *altro obiettivo*, molto più arduo, lungo e impegnativo, sarà quello di analizzare i risultati di ***tutti gli allineamenti significativi*** ottenuti da ***tutte le possibili sequenze generate*** rispettando fedelmente ***tutti i possibili specifici*** "trend non manifesti" della *sequenza originaria* (nello specifico la **Catena A dell'Insulina**).

Bibliografia scientifica selezionata

BIBLIOGRAFIA RIGUARDANTE PSEUDOMONAS

1.20 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA E PSEUDOMONAS (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*" e "*Pseudomonas*".

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+PSEUDOMONAS

Sort by: Most Recent - Search results = Items: 147

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1.21 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA E PSEUDOMONAS (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle migliori corrispondenze tra i termini "*Insulina*" e "*Pseudomonas*" (**Attenzione:** gli articoli già citati nella ricerca precedente non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+PSEUDOMONAS

Sort by: Best Match - Search results = Item: 134

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1. 22 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, PSEUDOMONAS E DIABETE (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*", *"Pseudomonas"* e *"Diabete"* (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+PSEUDOMONAS+DIABETES

Sort by: Most Recent - ***Search results = Items: 49***

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

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1.23 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA E BURKHOLDERIA (UNA SELEZIONE DELLE PIU' *RECENTI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*" e "*Burkholderia*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+BURKHOLDERIA

Sort by: Most Recent - *Search results = Items: 23*

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1.24 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA E CYSTATHIONINE GAMMA-SYNTHASE

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) dei termini "*Insulina"* e "*Cystathionine Gamma-Synthase*".

https://www.ncbi.nlm.nih.gov/pmc/?term=INSULIN+CYSTATHIONINE+GAMMA-SYNTHASE

Search results = Items: 16

Dai risultati della ricerca sono stati selezionati gli **articoli ritenuti più significativi**:

Hak Joo Lee, Meenalakshmi M. Mariappan, Denis Feliers, Rita C. Cavaglieri, Kavithalakshmi Sataranatarajan, Hanna E. Abboud, Goutam Ghosh Choudhury, Balakuntalam S. Kasinath. *Hydrogen Sulfide Inhibits High Glucose-induced Matrix Protein Synthesis by Activating AMP-activated Protein Kinase in Renal Epithelial Cells*. J Biol Chem. 2012 Feb 10; 287(7): 4451–4461. Published online 2011 Dec 9. doi: 10.1074/jbc.M111.278325 PMCID: PMC3281646. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3281646/

Roderick N Carter, Nicholas M Morton. *Cysteine and hydrogen sulphide in the regulation of metabolism: insights from genetics and pharmacology*. J Pathol. 2016 Jan; 238(2): 321–332. Published online 2015 Nov 13. doi: 10.1002/path.4659 PMCID: PMC4832394. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4832394

Shaimaa S. El-Sayed, Mohamed NM. Zakaria, Rasha H. Abdel-Ghany, Abdel A. Abdel-Rahman. *Cystathionine-γ lyase-derived hydrogen sulfide mediates the cardiovascular protective effects of moxonidine in diabetic rats*. Eur J Pharmacol. Author manuscript; available in PMC 2017 Jul 15.Published in final edited form as: Eur J Pharmacol. 2016 Jul 15; 783: 73–84. Published online 2016 Apr 29. doi: 10.1016/j.ejphar.2016.04.054 PMCID: PMC4893977. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4893977

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Oksana Tehlivets, Nermina Malanovic, Myriam Visram, Tea Pavkov-Keller, Walter Keller. *S-adenosyl-L-homocysteine hydrolase and methylation disorders: Yeast as a model system*. Biochim Biophys Acta. 2013 Jan; 1832(1): 204–215. doi: 10.1016/j.bbadis.2012.09.007 PMCID: PMC3787734. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3787734

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Heidi M. Blank, Shefali Gajjar, Andrey Belyanin, Michael Polymenis. *Sulfur Metabolism Actively Promotes Initiation of Cell Division in Yeast.* PLoS One. 2009; 4(11): e8018. Published online 2009 Nov 24. doi: 10.1371/journal.pone.0008018 PMCID: PMC2776973. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2776973

Matthew Whiteman, Philip K Moore. *Hydrogen sulfide and the vasculature: a novel vasculoprotective entity and regulator of nitric oxide bioavailability?* J Cell Mol Med. 2009 Mar; 13(3): 488–507. Published online 2009 Mar 24. doi: 10.1111/j.1582-4934.2009.00645.x PMCID: PMC3822510. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3822510

1.25 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, HOMOCYSTEINE E HYDROGEN SULFIDE SYSTEM

Per lo studio di questi argomenti si consultino i risultati della ricerca ottenuta usando il **Link** mostrato qui di seguito:

https://www.ncbi.nlm.nih.gov/pubmed?db=pubmed&cmd=link&linkname=pubmed_pubmed&uid=10470367

Search results = Items: 91

Concludo con **due articoli** e con la tesi di dottorato di **Ling Zhang** (2012), entrambi interessati al rapporto tra *Insulina*, metabolismo della *Cisteina* e ruolo del *Solfato di Idrogeno*:

Kimura H. *Hydrogen sulfide: its production, release and functions.* Amino Acids. 2011 Jun;41(1):113-21. PMID: 20191298. DOI: 10.1007/s00726-010-0510-x. https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+HOMOCYSTEINE+HYDROGEN+SULFIDE+SYSTEM

Yukiko Kaneko, Yuka Kimura, Hideo Kimura, Ichiro Niki. *l-Cysteine Inhibits Insulin Release From the Pancreatic β-Cell. Possible Involvement of Metabolic Production of Hydrogen Sulfide, a Novel Gasotransmitter*. Diabetes May 2006, 55 (5) 1391-1397. PMID: 16644696. DOI: 10.2337/db05-1082. https://www.ncbi.nlm.nih.gov/pubmed/16644696

L. Zhang. *Cystathionine gamma-lyase/hydrogen sulfide system and glucose homeostasis.* Lakehead University. 12-Feb-2013. http://knowledgecommons.lakeheadu.ca/handle/2453/443

1.26 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS E CYSTATHIONINE GAMMA-SYNTHASE

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica su tutti gli **articoli scientifici** pubblicati su **PubMed** in cui figurano insieme i termini "*Pseudomonas*" e "*Cystathionine Gamma-Synthase*".

https://www.ncbi.nlm.nih.gov/pubmed/?term=Pseudomonas+CYSTATHIONINE+GAMMA-SYNTHASE

Search results = Items: 6

Motoshima H, Inagaki K, Kumasaka T, Furuichi M, Inoue H, Tamura T, Esaki N, Soda K, Tanaka N, Yamamoto M, Tanaka H. *Crystal structure of the pyridoxal 5'-phosphate dependent L-methionine gamma-lyase from Pseudomonas putida*. J Biochem. 2000 Sep;128(3):349-54. PubMed PMID: 10965031. https://www.ncbi.nlm.nih.gov/pubmed/10965031

Vermeij P, Kertesz MA. *Pathways of assimilative sulfur metabolism in Pseudomonas putida*. J Bacteriol. 1999 Sep;181(18):5833-7. PubMed PMID: 10482527; PubMed Central PMCID: PMC94106. https://www.ncbi.nlm.nih.gov/pubmed/10482527

Taté R, Riccio A, Caputo E, Iaccarino M, Patriarca EJ. *The Rhizobium etli metZ gene is essential for methionine biosynthesis and nodulation of Phaseolus vulgaris*. Mol Plant Microbe Interact. 1999 Jan;12(1):24-34. PubMed PMID: 9885190.
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Inoue H, Inagaki K, Sugimoto M, Esaki N, Soda K, Tanaka H. *Structural analysis of the L-methionine gamma-lyase gene from Pseudomonas putida*. J Biochem. 1995 May;117(5):1120-5. PubMed PMID: 8586629. https://www.ncbi.nlm.nih.gov/pubmed/8586629

Foglino M, Borne F, Bally M, Ball G, Patte JC. *A direct sulfhydrylation pathway is used for methionine biosynthesis in Pseudomonas aeruginosa*. Microbiology. 1995 Feb;141 (Pt 2):431-9. PubMed PMID: 7704274. https://www.ncbi.nlm.nih.gov/pubmed/7704274

Nagasawa T, Kanzaki H, Yamada H. *Cystathionine gamma-lyase of Streptomyces phaeochromogenes. The occurrence of cystathionine gamma-lyase in filamentous bacteria and its purification and characterization*. J Biol Chem. 1984 Aug 25;259(16):10393-403. PubMed PMID: 6432781. https://www.ncbi.nlm.nih.gov/pubmed/6432781

Prima di concludere, presento altri **due interessanti articoli** sull'argomento:

G L Andersen, G A Beattie and S E Lindow. *Molecular Characterization and Sequence of a Methionine Biosynthetic Locus from Pseudomonas syringae.* Journal of Bacteriology, 1998. Vol. 180 Iss. 17 (1998) p. 4497 - 4507. PMCID: PMC107460.
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Hacham Y., Gophna U. e Amir R. *In vivo analysis of various substrates utilized by cystathionine gamma-synthase and O-acetylhomoserine sulfhydrylase in methionine biosynthesis.* Molecular Biology and Evolution, Volume 20, Issue 9, 1 September 2003, Pages 1513–1520. PMID: 12832650. https://doi.org/10.1093/molbev/msg169

1.27 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA E CYTOCHROME C (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*" e "*Cytochrome c*".

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+CYTOCHROME+C

Sort by: Most Recent - Search results = Items: 745

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

Beyfuss K, Hood DA. *A systematic review of p53 regulation of oxidative stress in skeletal muscle*. Redox Rep. 2018 Jan 3:1-18. doi: 10.1080/13510002.2017.1416773. [Epub ahead of print] PubMed PMID: 29298131. https://www.ncbi.nlm.nih.gov/pubmed/29298131

Yuan F, Woollard JR, Jordan KL, Lerman A, Lerman LO, Eirin A. *Mitochondrial Targeted Peptides Preserve Mitochondrial Organization and Decrease Reversible Myocardial Changes in Early Swine Metabolic Syndrome*. Cardiovasc Res. 2017 Dec 18. doi: 10.1093/cvr/cvx245. [Epub ahead of print] PubMed PMID: 29267873. https://www.ncbi.nlm.nih.gov/pubmed/29267873

Sadighara M, Joktaji JP, Hajhashemi V, Minaiyan M. *Protective effects of coenzyme Q(10) and L-carnitine against statin-induced pancreatic mitochondrial toxicity in rats*. Res Pharm Sci. 2017 Dec;12(6):434-443. doi: 10.4103/1735-5362.217424. PubMed PMID: 29204172; PubMed Central PMCID: PMC5691570. https://www.ncbi.nlm.nih.gov/pubmed/29204172

Park HS, Cho HS, Kim TW. *Physical exercise promotes memory capability by enhancing hippocampal mitochondrial functions and inhibiting apoptosis in obesity-induced insulin resistance by high fat diet*. Metab Brain Dis. 2017 Nov 29. doi: 10.1007/s11011-017-0160-8. [Epub ahead of print] PubMed PMID: 29185193. https://www.ncbi.nlm.nih.gov/pubmed/29185193

Feng CC, Pandey S, Lin CY, Shen CY, Chang RL, Chang TT, Chen RJ, Viswanadha VP, Lin YM, Huang CY. *Cardiac apoptosis induced under high glucose condition involves activation of IGF2R signaling in H9c2 cardiomyoblasts and streptozotocin-induced diabetic rat hearts*. Biomed Pharmacother. 2017 Nov 6;97:880-885. doi: 10.1016/j.biopha.2017.11.020. [Epub ahead of print] PubMed PMID: 29136764. https://www.ncbi.nlm.nih.gov/pubmed/29136764

Zhang Y, Wang M, Dong H, Yu X, Zhang J. *Anti-hypoglycemic and hepatocyte-protective effects of hyperoside from Zanthoxylum bungeanum leaves in mice with high-carbohydrate/high-fat diet and alloxan-induced diabetes*. Int J Mol Med. 2018 Jan;41(1):77-86. doi: 10.3892/ijmm.2017.3211. Epub 2017 Oct 25. PubMed PMID: 29115390. https://www.ncbi.nlm.nih.gov/pubmed/29115390

Liu CM, Ma JQ, Sun JM, Feng ZJ, Cheng C, Yang W, Jiang H. *Association of changes in ER stress-mediated signaling pathway with lead-induced insulin resistance and apoptosis in rats and their prevention by A-type dimeric epigallocatechin-3-gallate*. Food Chem Toxicol. 2017 Dec;110:325-332. doi: 10.1016/j.fct.2017.10.040. Epub 2017 Oct 27. PubMed PMID: 29107025. https://www.ncbi.nlm.nih.gov/pubmed/29107025

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Onyango AN. *The Contribution of Singlet Oxygen to Insulin Resistance*. Oxid Med Cell Longev. 2017;2017:8765972. doi: 10.1155/2017/8765972. Epub 2017 Sep 7. Review. PubMed PMID: 29081894; PubMed Central PMCID: PMC5610878.
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Jiménez-Maldonado A, Ying Z, Byun HR, Gomez-Pinilla F. *Short-term fructose ingestion affects the brain independently from establishment of metabolic syndrome*. Biochim Biophys Acta. 2018 Jan;1864(1):24-33. doi: 10.1016/j.bbadis.2017.10.012. Epub 2017 Oct 7. PubMed PMID: 29017895; PubMed Central PMCID: PMC5705281.
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Mulder H. *Transcribing β-cell mitochondria in health and disease*. Mol Metab. 2017 May 31;6(9):1040-1051. doi: 10.1016/j.molmet.2017.05.014. eCollection 2017 Sep. Review. PubMed PMID: 28951827; PubMed Central PMCID: PMC5605719.
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Chandirasegaran G, Elanchezhiyan C, Ghosh K, Sethupathy S. *Berberine chloride ameliorates oxidative stress, inflammation and apoptosis in the pancreas of Streptozotocin induced diabetic rats*. Biomed Pharmacother. 2017 Nov;95:175-185. doi: 10.1016/j.biopha.2017.08.040. Epub 2017 Sep 12. PubMed PMID: 28843149.https://www.ncbi.nlm.nih.gov/pubmed/28843149

Aghanoori MR, Smith DR, Roy Chowdhury S, Sabbir MG, Calcutt NA, Fernyhough P. *Insulin prevents aberrant mitochondrial phenotype in sensory neurons of type 1 diabetic rats*. Exp Neurol. 2017 Nov;297:148-157. doi: 10.1016/j.expneurol.2017.08.005. Epub 2017 Aug 10. PubMed PMID: 28803751; PubMed Central PMCID: PMC5612919.
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https://www.ncbi.nlm.nih.gov/pubmed/28666985

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https://www.ncbi.nlm.nih.gov/pubmed/28655753

Wei XB, Guo L, Liu Y, Zhou SR, Liu Y, Dou X, Du SY, Ding M, Peng WQ, Qian SW, Huang HY, Tang QQ. *Synthesis of cytochrome c oxidase 1 (SCO1) inhibits insulin sensitivity by decreasing copper levels in adipocytes*. Biochem Biophys Res Commun. 2017 Sep 23;491(3):814-820. doi: 10.1016/j.bbrc.2017.06.124. Epub 2017 Jun 21. PubMed PMID: 28647369. https://www.ncbi.nlm.nih.gov/pubmed/28647369

Martín-Montañez E, Millon C, Boraldi F, Garcia-Guirado F, Pedraza C, Lara E, Santin LJ, Pavia J, Garcia-Fernandez M. *IGF-II promotes neuroprotection and neuroplasticity recovery in a long-lasting model of oxidative damage induced by glucocorticoids*. Redox Biol. 2017 Oct;13:69-81. doi: 10.1016/j.redox.2017.05.012. Epub 2017 May 26. PubMed PMID: 28575743; PubMed Central PMCID: PMC5454142. https://www.ncbi.nlm.nih.gov/pubmed/28575743

Candeias E, Sebastião I, Cardoso S, Carvalho C, Santos MS, Oliveira CR, Moreira PI, Duarte AI. *Brain GLP-1/IGF-1 Signaling and Autophagy Mediate Exendin-4 Protection Against Apoptosis in Type 2 Diabetic Rats*. Mol Neurobiol. 2017 Jun 2. doi: 10.1007/s12035-017-0622-3. [Epub ahead of print] PubMed PMID: 28573460. https://www.ncbi.nlm.nih.gov/pubmed/28573460

Hill S, Deepa SS, Sataranatarajan K, Premkumar P, Pulliam D, Liu Y, Soto VY, Fischer KE, Van Remmen H. *Sco2 deficient mice develop increased adiposity and insulin resistance*. Mol Cell Endocrinol. 2017 Nov 5;455:103-114. doi: 10.1016/j.mce.2017.03.019. Epub 2017 Apr 18. PubMed PMID: 28428045; PubMed Central PMCID: PMC5592144. https://www.ncbi.nlm.nih.gov/pubmed/28428045

Zhao B, Zheng Z. *Insulin Growth Factor 1 Protects Neural Stem Cells Against Apoptosis Induced by Hypoxia Through Akt/Mitogen-Activated Protein Kinase/Extracellular Signal-Regulated Kinase (Akt/MAPK/ERK) Pathway in Hypoxia-Ishchemic Encephalopathy*. Med Sci Monit. 2017 Apr 19;23:1872-1879. PubMed PMID: 28420864; PubMed Central PMCID: PMC5405785. https://www.ncbi.nlm.nih.gov/pubmed/28420864

Holvoet P, Vanhaverbeke M, Geeraert B, De Keyzer D, Hulsmans M, Janssens S. *Low Cytochrome Oxidase 1 Links Mitochondrial Dysfunction to Atherosclerosis in Mice and Pigs*. PLoS One. 2017 Jan 25;12(1):e0170307. doi: 10.1371/journal.pone.0170307. eCollection 2017. PubMed PMID: 28122051; PubMed Central PMCID: PMC5266248. 10.1371/journal.pone.0170307. eCollection 2017. PubMed PMID: 28122051; PubMed Central PMCID: PMC5266248. https://www.ncbi.nlm.nih.gov/pubmed/28122051

1.28 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA E CYTOCHROME C (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle migliori corrispondenze tra i termini "*Insulina*" e "*Cytochrome c*" (**Attenzione:** gli articoli già citati nella ricerca precedente non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+CYTOCHROME+C

Sort by: Best Match - Search results = Item: 626

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

Rountree AM, Neal AS, Lisowski M, Rizzo N, Radtke J, White S, Luciani DS, Kim F, Hampe CS, Sweet IR. *Control of insulin secretion by cytochrome C and calcium signaling in islets with impaired metabolism*. J Biol Chem. 2014 Jul 4;289(27):19110-9. doi: 10.1074/jbc.M114.556050. Epub 2014 May 19. PubMed PMID: 24841202; PubMed Central PMCID: PMC4081948. https://www.ncbi.nlm.nih.gov/pubmed/24841202

Sanderson TH, Mahapatra G, Pecina P, Ji Q, Yu K, Sinkler C, Varughese A, Kumar R, Bukowski MJ, Tousignant RN, Salomon AR, Lee I, Hüttemann M. *Cytochrome C is tyrosine 97 phosphorylated by neuroprotective insulin treatment*. PLoS One. 2013 Nov 5;8(11):e78627. doi: 10.1371/journal.pone.0078627. eCollection 2013. PubMed PMID: 24223835; PubMed Central PMCID: PMC3818486. https://www.ncbi.nlm.nih.gov/pubmed/24223835

Jung SR, Kuok IT, Couron D, Rizzo N, Margineantu DH, Hockenbery DM, Kim F, Sweet IR. *Reduced cytochrome C is an essential regulator of sustained insulin secretion by pancreatic islets*. J Biol Chem. 2011 May 20;286(20):17422-34. doi: 10.1074/jbc.M110.202820. Epub 2011 Mar 10. PubMed PMID: 21393241; PubMed Central PMCID: PMC3093816. https://www.ncbi.nlm.nih.gov/pubmed/21393241

Sanderson TH, Kumar R, Sullivan JM, Krause GS. *Insulin blocks cytochrome c release in the reperfused brain through PI3-K signaling and by promoting Bax/Bcl-XL binding*. J Neurochem. 2008 Aug;106(3):1248-58. doi: 10.1111/j.1471-4159.2008.05473.x. Epub 2008 Jun 2. PubMed PMID: 18518905; PubMed Central PMCID: PMC4441329. https://www.ncbi.nlm.nih.gov/pubmed/18518905

Weksler-Zangen S, Aharon-Hananel G, Mantzur C, Aouizerat T, Gurgul-Convey E, Raz I, Saada A. *IL-1β hampers glucose-stimulated insulin secretion in Cohen diabetic rat islets through mitochondrial cytochrome c oxidase inhibition by nitric oxide*. Am J Physiol Endocrinol Metab. 2014 Mar; 306 (6): E648-57. doi: 10.1152/ajpendo.00451.2013. Epub 2014 Jan 14. PubMed PMID: 24425765. https://www.ncbi.nlm.nih.gov/pubmed/24425765

P. Gaignard, M. Menezes, M. Schiff, A. Bayot, M. Rak, Ogier de Baulny, C, Su, M. Gilleron, A. Lombes, H. Abida, A. Tzagoloff, L. Riley, S. T. Cooper, K. Mina, P. Sivadorai, M, R. Davis, R. J. N. Allcock, N. Kresoje, N. G. Laing, D. R. Thorburn, A. Slama, J. Christodoulou and P. Rustin. ***Mutations in CYC1, Encoding Cytochrome c1 Subunit of Respiratory Chain Complex III, Cause Insulin-Responsive Hyperglycemia.*** AJHG, 8 August 2013, Volume 93, Issue 2, p 384–389. doi: 10.1016/j.ajhg.2013.06.015. Epub 2013 Aug 1. PubMed PMID: 23910460; PubMed C. PMCID: PMC3738829. https://www.ncbi.nlm.nih.gov/pubmed/23910460

Naia L, Ferreira IL, Cunha-Oliveira T, Duarte AI, Ribeiro M, Rosenstock TR, Laço MN, Ribeiro MJ, Oliveira CR, Saudou F, Humbert S, Rego AC. *Activation of IGF-1 and insulin signaling pathways ameliorate mitochondrial function and energy metabolism in Huntington's Disease human lymphoblasts*. Mol Neurobiol. 2015 Feb;51(1):331-48. doi: 10.1007/s12035-014-8735-4. Epub 2014 May 20. PubMed PMID: 24841383. https://www.ncbi.nlm.nih.gov/pubmed/24841383

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Liang Y, Zhang M, Xia N, Yang Y, Feng L. *Effects of high concentration glucose on the expression of NF-kappaB, Bax and cytochrome C and apoptosis of islet cells in mice***.** J Huazhong Univ Sci Technolog Med Sci. 2009 Aug;29(4):439-44. doi: 10.1007/s11596-009-0410-z. Epub 2009 Aug 7. PubMed PMID: 19662359. https://www.ncbi.nlm.nih.gov/pubmed/19662359

Li Y, Wu H, Khardori R, Song YH, Lu YW, Geng YJ. *Insulin-like growth factor-1 receptor activation prevents high glucose-induced mitochondrial dysfunction, cytochrome-c release and apoptosis***.** Biochem Biophys Res Commun. 2009 Jun 26;384(2):259-64. doi: 10.1016/j.bbrc.2009.04.113. Epub 2009 May 4. PubMed PMID: 19406106. https://www.ncbi.nlm.nih.gov/pubmed/19662359

Lin Y, Sun X, Qiu L, Wei J, Huang Q, Fang C, Ye T, Kang M, Shen H, Dong S. *Exposure to bisphenol A induces dysfunction of insulin secretion and apoptosis through the damage of mitochondria in rat insulinoma (INS-1) cells*. Cell Death Dis. 2013 Jan 17;4:e460. doi: 10.1038/cddis.2012.206. PubMed PMID: 23328667; PubMed Central PMCID: PMC3563994. https://www.ncbi.nlm.nih.gov/pubmed/23328667

Zhao Z, Zhao C, Zhang XH, Zheng F, Cai W, Vlassara H, Ma ZA. *Advanced glycation end products inhibit glucose-stimulated insulin secretion through nitric oxide-dependent inhibition of cytochrome c oxidase and adenosine triphosphate synthesis*. Endocrinology. 2009 Jun;150(6):2569-76. doi: 10.1210/en.2008-1342. Epub 2009 Feb 26. PubMed PMID: 19246537; PubMed Central PMCID: PMC2689792. https://www.ncbi.nlm.nih.gov/pubmed/19246537

Rountree AM, Reed BJ, Cummings BP, Jung SR, Stanhope KL, Graham JL, Griffen SC, Hull RL, Havel PJ, Sweet IR. *Loss of coupling between calcium influx, energy consumption and insulin secretion associated with development of hyperglycaemia in the UCD-T2DM rat model of type 2 diabetes*. Diabetologia. 2013 Apr;56(4):803-13. doi: 10.1007/s00125-012-2808-6. Epub 2013 Feb 13. PubMed PMID: 23404441; PubMed Central PMCID: PMC3855025. https://www.ncbi.nlm.nih.gov/pubmed/23404441

Francés DE, Ronco MT, Monti JA, Ingaramo PI, Pisani GB, Parody JP, Pellegrino JM, Sanz PM, Carrillo MC, Carnovale CE. *Hyperglycemia induces apoptosis in rat liver through the increase of hydroxyl radical: new insights into the insulin effect*. J Endocrinol. 2010 May;205(2):187-200. doi: 10.1677/JOE-09-0462. Epub 2010 Feb 17. PubMed PMID: 20164374. https://www.ncbi.nlm.nih.gov/pubmed/20164374

Litwiniuk A, Pijet B, Pijet-Kucicka M, Gajewska M, Pająk B, Orzechowski A. *FOXO1 and GSK-3β Are Main Targets of Insulin-Mediated Myogenesis in C2C12 Muscle Cells*. PLoS One. 2016 Jan 19;11(1):e0146726. doi: 10.1371/journal.pone.0146726. eCollection 2016. PubMed PMID: 26785133; PubMed Central PMCID: PMC4718532. https://www.ncbi.nlm.nih.gov/pubmed/26785133

Deepa SS, Pulliam D, Hill S, Shi Y, Walsh ME, Salmon A, Sloane L, Zhang N, Zeviani M, Viscomi C, Musi N, Van Remmen H. *Improved insulin sensitivity associated with reduced mitochondrial complex IV assembly and activity*. FASEB J. 2013 Apr;27(4):1371-80. doi: 10.1096/fj.12-221879. Epub 2012 Dec 14. PubMed PMID: 23241310.
https://www.ncbi.nlm.nih.gov/pubmed/23241310

Sweet IR, Gilbert M, Jensen R, Sabek O, Fraga DW, Gaber AO, Reems J. *Glucose stimulation of cytochrome C reduction and oxygen consumption as assessment of human islet quality. Transplantation*. 2005 Oct 27;80(8):1003-11. PubMed PMID: 16278578.
https://www.ncbi.nlm.nih.gov/pubmed/16278578

Wu H, Xu G, Liao Y, Ren H, Fan J, Sun Z, Zhang M. *Supplementation with antioxidants attenuates transient worsening of retinopathy in diabetes caused by acute intensive insulin therapy*. Graefes Arch Clin Exp Ophthalmol. 2012 Oct;250(10):1453-8. doi: 10.1007/s00417-012-2079-4. Epub 2012 Jun 14. PubMed PMID: 22695936. https://www.ncbi.nlm.nih.gov/pubmed/22695936

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https://www.ncbi.nlm.nih.gov/pubmed/14551153

1.29 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA E CYTOCHROME C1 (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*" e "*Cytochrome c1*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+CYTOCHROME+C1

Sort by: Most Recent - Search results = Item: 12

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

Alecu I, Othman A, Penno A, Saied EM, Arenz C, von Eckardstein A, Hornemann T. *Cytotoxic 1-deoxysphingolipids are metabolized by a cytochrome P450-dependent pathway*. J Lipid Res. 2017 Jan;58(1):60-71. doi: 10.1194/jlr.M072421. Epub 2016 Nov 21. PubMed PMID: 27872144; PubMed Central PMCID: PMC5234722.
https://www.ncbi.nlm.nih.gov/pubmed/27872144

Sugizaki T, Watanabe M, Horai Y, Kaneko-Iwasaki N, Arita E, Miyazaki T, Morimoto K, Honda A, Irie J, Itoh H. *The Niemann-Pick C1 like 1 (NPC1L1) inhibitor ezetimibe improves metabolic disease via decreased liver X receptor (LXR) activity in liver of obese male mice*. Endocrinology. 2014 Aug;155(8):2810-9. doi: 10.1210/en.2013-2143. Epub 2014 Apr 28. PubMed PMID: 24773344. https://www.ncbi.nlm.nih.gov/pubmed/24773344

Shertzer HG, Krishan M, Genter MB. *Dietary whey protein stimulates mitochondrial activity and decreases oxidative stress in mouse female brain*. Neurosci Lett. 2013 Aug 26;548:159-64. doi: 10.1016/j.neulet.2013.05.061. Epub 2013 Jun 6. PubMed PMID: 23748211; PubMed Central PMCID: PMC3749878. https://www.ncbi.nlm.nih.gov/pubmed/23748211

Sharma TS, Jacobson DL, Anderson L, Gerschenson M, Van Dyke RB, McFarland EJ, Miller TL; Pediatric HIV/AIDS Cohort Study (PHACS). *Short communication: The relationship between mitochondrial dysfunction and insulin resistance in HIV-infected children receiving antiretroviral therapy. AIDS Res Hum Retroviruses*. 2013 Sep;29(9):1211-7. PubMed PMID: 23742635; PubMed Central PMCID: PMC3749716.
https://www.ncbi.nlm.nih.gov/pubmed/23742635

M. H. Holmström, R. Z. Tom, M. Björnholm, P. M. Garcia-Roves and J. R. Zierath. *Effect of leptin treatment on mitochondrial function in obese leptin-deficient ob/ob mice*. Metabolism. 2013 Sep; 62(9): 1258-67. doi: 10.1016/j.metabol.2013.04.001. Epub 2013 May 8. PubMed PMID: 23664724. https://www.ncbi.nlm.nih.gov/pubmed/23664724

A. Gesing, M. M. Masternak, F. Wang, M. Karbownik-Lewinska and A. Bartke. *Deletion of growth hormone receptor gene but not visceral fat removal decreases expression of apoptosis-related genes in the kidney-potential mechanism of lifespan extension*. Age (Dordr). 2012 Apr; 34(2): 295-304. doi: 10.1007/s11357-011-9232-6. Epub 2011 Mar 23. PubMed PMID: 21431351; PubMed Central PMCID: PMC3312636. https://www.ncbi.nlm.nih.gov/pubmed/21431351

E. J. Wilson and W. C. McMurray. *Effects of hormones on the maintenance and mitochondrial functions of rat hepatocytes cultured in serum-free medium*. Can J Biochem Cell Biol., 1983 Jul; 61(7):636-43. PMID: 6354397.
https://www.ncbi.nlm.nih.gov/pubmed/6354397

Y. Ogawa, K. Matsumoto and S. Ofuji. *Changes in adenine nucleotide and mitochondrial metabolism of the kidney of burned rats and their relation to insulin.* J Lab Clin Med. 1977 Sep; 90(3): 457-65. PMID: 894101. https://www.ncbi.nlm.nih.gov/m/pubmed/894101/

1.30 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA E LE DENOMINAZIONI ALTERNATIVE DEL CYTOCHROME C1 (UNA SELEZIONE DELLE *PIU' RECENTI* E *MIGLIORI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* o *migliori* corrispondenze tra i termini "*Insulina*" e le denominazioni alternative del "**Cytochrome c1**": "*Cytochrome c-1*", "*Complex III Subunit IV*" e "*Complex III Subunit 4*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

1) Cytochrome c-1:

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+CYTOCHROME+C-1

Sort by: Best Match - Search results = Item: 13

Anastasio N, Tarailo-Graovac M, Al-Khalifah R, Legault L, Drogemoller B, Ross CJ, Wasserman WW, van Karnebeek C, Buhas D. *Mitochondrial Complex III Deficiency with Ketoacidosis and Hyperglycemia Mimicking Neonatal Diabetes.* JIMD Rep. 2017;31:57-62. doi: 10.1007/8904_2016_557. Epub 2016 Apr 14. PubMed PMID: 27074787; PubMed Central PMCID: PMC5388639. https://www.ncbi.nlm.nih.gov/pubmed/27074787

2) Complex III Subunit IV:

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+COMPLEX+III+SUBUNIT+IV

Sort by: Most Recent - Search results = Item: 18

Rowley TJ 4th, Bitner BF, Ray JD, Lathen DR, Smithson AT, Dallon BW, Plowman CJ, Bikman BT, Hansen JM, Dorenkott MR, Goodrich KM, Ye L, O'Keefe SF, Neilson AP, Tessem JS. *Monomeric cocoa catechins enhance β-cell function by increasing mitochondrial respiration*. J Nutr Biochem. 2017 Nov;49:30-41. doi: 10.1016/j.jnutbio.2017.07.015. Epub 2017 Jul 27. PubMed PMID: 28863367. https://www.ncbi.nlm.nih.gov/pubmed/28863367

Shiba S, Ikeda K, Horie-Inoue K, Nakayama A, Tanaka T, Inoue S. *Deficiency of COX7RP, a mitochondrial supercomplex assembly promoting factor, lowers blood glucose level in mice*. Sci Rep. 2017 Aug 8;7(1):7606. doi: 10.1038/s41598-017-08081-z. PubMed PMID: 28790391; PubMed Central PMCID: PMC5548899. https://www.ncbi.nlm.nih.gov/pubmed/28790391

Stefano GB, Challenger S, Kream RM. *Hyperglycemia-associated alterations in cellular signaling and dysregulated mitochondrial bioenergetics in human metabolic disorders*. Eur J Nutr. 2016 Dec;55(8):2339-2345. Epub 2016 Apr 15. Review. PubMed PMID: 27084094; PubMed Central PMCID: PMC5122622. https://www.ncbi.nlm.nih.gov/pubmed/27084094

Amengual-Cladera E, Capllonch-Amer G, Lladó I, Gianotti M, Proenza AM. *Proteomic study of periovarian adipose tissue in 17β-estradiol-treated and untreated ovariectomized rats*. Biochem Cell Biol. 2016 Apr;94(2):167-75. doi: 10.1139/bcb-2015-0077. Epub 2016 Feb 25. PubMed PMID: 26914441. https://www.ncbi.nlm.nih.gov/pubmed/26914441

Ma Z, Moruzzi N, Catrina SB, Grill V, Björklund A. *Hyperoxia inhibits glucose-induced insulin secretion and mitochondrial metabolism in rat pancreatic islets*. Biochem Biophys Res Commun. 2014 Jan 3;443(1): 223-8. doi: 10.1016/j.bbrc.2013.11.088. Epub 2013 Dec 2. PubMed PMID: 24299957. https://www.ncbi.nlm.nih.gov/pubmed/24299957

Gao CL, Liu GL, Liu S, Chen XH, Ji CB, Zhang CM, Xia ZK, Guo XR. *Overexpression of PGC-1β improves insulin sensitivity and mitochondrial function in 3T3-L1 adipocytes*. Mol Cell Biochem. 2011 Jul;353(1-2):215-23. doi: 10.1007/s11010-011-0789-2. Epub 2011 Apr 16. PubMed PMID: 21499715. https://www.ncbi.nlm.nih.gov/pubmed/21499715

Brown-Borg HM, Johnson WT, Rakoczy SG. *Expression of oxidative phosphorylation components in mitochondria of long-living Ames dwarf mice*. Age (Dordr). 2012 Feb;34(1):43-57. doi: 10.1007/s11357-011-9212-x. Epub 2011 Feb 16. PubMed PMID: 21327718; PubMed Central PMCID: PMC3260352. https://www.ncbi.nlm.nih.gov/pubmed/21327718

Yechoor VK, Patti ME, Saccone R, Kahn CR. *Coordinated patterns of gene expression for substrate and energy metabolism in skeletal muscle of diabetic mice*. Proc Natl Acad Sci U S A. 2002 Aug 6;99(16):10587-92. Epub 2002 Jul 29. PubMed PMID: 12149437; PubMed Central PMCID: PMC124982. https://www.ncbi.nlm.nih.gov/pubmed/12149437

Mingrone G, Manco M, Calvani M, Castagneto M, Naon D, Zorzano A. *Could the low level of expression of the gene encoding skeletal muscle mitofusin-2 account for the metabolic inflexibility of obesity?* Diabetologia. 2005 Oct; 48(10): 2108-14. Epub 2005 Sep 14. PubMed PMID: 16160866. DOI: 10.1007/s00125-005-1918-9
https://www.ncbi.nlm.nih.gov/pubmed/16160866

Yoshioka S, Okimura Y, Takahashi Y, Iida K, Kaji H, Matsuo M, Chihara K. *Up-regulation of mitochondrial transcription factor 1 mRNA levels by GH in VSMC***.** Life Sci. 2004 Mar 12;74(17):2097-109. PubMed PMID: 14969715. DOI: 10.1016/j.lfs.2003.07.057.
https://www.ncbi.nlm.nih.gov/pubmed/14969715

3) Complex III Subunit 4:

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+COMPLEX+III+SUBUNIT+4

Sort by: Most Recent - Search results = Item: 18

Shelley P, Martin-Gronert MS, Rowlerson A, Poston L, Heales SJ, Hargreaves IP, McConnell JM, Ozanne SE, Fernandez-Twinn DS. *Altered skeletal muscle insulin signaling and mitochondrial complex II-III linked activity in adult offspring of obese mice*. Am J Physiol Regul Integr Comp Physiol. 2009 Sep; 297(3) :R675-81. doi: 10.1152/ajpregu.00146.2009. Epub 2009 Jun 17. PubMed PMID: 19535678; PubMed Central PMCID: PMC2739782.
https://www.ncbi.nlm.nih.gov/pubmed/19535678

Lee B, Srinivasan M, Aalinkeel R, Patel MS, Laychock SG. *Mitochondrial-encoded gene regulation in rat pancreatic islets*. Lee Metabolism. 2001 Feb;50(2):200-6. PubMed PMID: 11229430. DOI: 10.1053/meta.2001.17714. https://www.ncbi.nlm.nih.gov/pubmed/11229430

4) Complex III Subunit 4:

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+COMPLEX+III+SUBUNIT+4

Sort by: Best Match - Search results = Item: 12

Balhara B, Burkart A, Topcu V, Lee YK, Cowan C, Kahn CR, Patti ME. *Severe insulin resistance alters metabolism in mesenchymal progenitor cells*. Endocrinology. 2015 Jun;156(6):2039-48. doi: 10.1210/en.2014-1403. Epub 2015 Mar 26. PubMed PMID: 25811318; PubMed Central PMCID: PMC4430624. https://www.ncbi.nlm.nih.gov/pubmed/25811318

Heilbronn LK, Gan SK, Turner N, Campbell LV, Chisholm DJ. *Markers of mitochondrial biogenesis and metabolism are lower in overweight and obese insulin-resistant subjects*. J Clin Endocrinol Metab. 2007 Apr;92(4):1467-73. Epub 2007 Jan 23. PubMed PMID: 17244782. https://www.ncbi.nlm.nih.gov/pubmed/17244782

1.31 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS E CYTOCHROME C (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Pseudomonas*" e "*Cytochrome c*".

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+CYTOCHROME+C

Sort by: Most Recent - Search results = Items: 726

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

Jo J, Cortez KL, Cornell WC, Price-Whelan A, Dietrich LE. *An orphan cbb(3)-type cytochrome oxidase subunit supports Pseudomonas aeruginosa biofilm growth and virulence*. Elife. 2017 Nov 21;6. pii: e30205. doi: 10.7554/eLife.30205. PubMed PMID: 29160206.
https://www.ncbi.nlm.nih.gov/pubmed/29160206

Calero P, Jensen SI, Bojanovič K, Lennen RM, Koza A, Nielsen AT. *Genome-wide identification of tolerance mechanisms toward p-coumaric acid in Pseudomonas putida*. Biotechnol Bioeng. 2017 Nov 13. doi: 10.1002/bit.26495. [Epub ahead of print] PubMed PMID: 29131301. https://www.ncbi.nlm.nih.gov/pubmed/29131301

Albada B, Metzler-Nolte N. *Highly Potent Antibacterial Organometallic Peptide Conjugates*. Acc Chem Res. 2017 Oct 17; 50(10): 2510-2518. doi: 10.1021/acs.accounts.7b00282. Epub 2017 Sep 27. PubMed PMID: 28953347. https://www.ncbi.nlm.nih.gov/pubmed/28953347

Jiang T, Guo X, Yan J, Zhang Y, Wang Y, Zhang M, Sheng B, Ma C, Xu P, Gao C. *A Bacterial Multidomain NAD-Independent d-Lactate Dehydrogenase Utilizes Flavin Adenine Dinucleotide and Fe-S Clusters as Cofactors and Quinone as an Electron Acceptor for d-Lactate Oxidization*. J Bacteriol. 2017 Oct 17;199(22). pii: e00342-17. doi: 10.1128/JB.00342-17. Print 2017 Nov 15. PubMed PMID: 28847921; PubMed Central PMCID: PMC5648861.
https://www.ncbi.nlm.nih.gov/pubmed/28847921

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1.32 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS E CYTOCHROME C (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle migliori corrispondenze tra i termini "*Pseudomonas*" e "*Cytochrome c*" (**Attenzione:** gli articoli già citati nella ricerca precedente non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+CYTOCHROME+C

Sort by: Best Match - Search results = Item: 634

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

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Xie H, Buschmann S, Langer JD, Ludwig B, Michel H. *Biochemical and biophysical characterization of the two isoforms of cbb3-type cytochrome c oxidase from Pseudomonas stutzeri*. J Bacteriol. 2014 Jan;196(2):472-82. doi: 10.1128/JB.01072-13. Epub 2013 Nov 8. PubMed PMID: 24214947; PubMed Central PMCID: PMC3911263. https://www.ncbi.nlm.nih.gov/pubmed/24214947

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1.33 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS E CYTOCHROME C1 (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Pseudomonas*" e "*Cytochrome c1*".

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+CYTOCHROME+C1

Sort by: Most Recent - Search results = Items: 18

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

García I, Rosas T, Bejarano ER, Gotor C, Romero LC. *Transient transcriptional regulation of the CYS-C1 gene and cyanide accumulation upon pathogen infection in the plant immune response*. Plant Physiol. 2013 Aug;162(4):2015-27. doi: 10.1104/pp.113.219436. Epub 2013 Jun 19. PubMed PMID: 23784464; PubMed Central PMCID: PMC3729779.
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Wazawa T, Miyazaki T, Sambongi Y, Suzuki M. *Hydration analysis of Pseudomonas aeruginosa cytochrome c551 upon acid unfolding by dielectric relaxation spectroscopy*. Biophys Chem. 2010 Oct;151(3):160-9. doi: 10.1016/j.bpc.2010.06.008. Epub 2010 Jun 30. PubMed PMID: 20630646. https://www.ncbi.nlm.nih.gov/pubmed/20630646

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Anthony C. *Cytochrome c and the oxidation of C1 compounds in Pseudomonas AM1*. Biochem J. 1970 Oct;119(5):54P-55P. PubMed PMID: 5492832; PubMed Central PMCID: PMC1179533. https://www.ncbi.nlm.nih.gov/pubmed/5492832

1.34 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS E CYTOCHROME C1 (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle migliori corrispondenze tra i termini "*Pseudomonas*" e "*Cytochrome c1*" (**Attenzione:** gli articoli già citati nella ricerca precedente non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+CYTOCHROME+C1

Sort by: Best Match - Search results = Item: 20

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

Yamaguchi M, Fujisawa H. *Reconstitution of iron-sulfur cluster of NADH-cytochrome c reductase, a component of benzoate 1,2-dioxygenase system from Pseudomonas arvilla C-1*. J Biol Chem. 1981 Jul 10;256(13):6783-7. PubMed PMID: 7240244.
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1. 35 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA BURKHOLDERIA E CYTOCHROME C (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Burkholderia*" e "*Cytochrome c*".

https://www.ncbi.nlm.nih.gov/pubmed/?term=BURKHOLDERIA+CYTOCHROME+C

Sort by: Most Recent - Search results = Items: 13

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

Jones-Carson J, Zweifel AE, Tapscott T, Austin C, Brown JM, Jones KL, Voskuil MI, Vázquez-Torres A. *Nitric oxide from IFNγ-primed macrophages modulates the antimicrobial activity of β-lactams against the intracellular pathogens Burkholderia pseudomallei and Nontyphoidal Salmonella*. PLoS Negl Trop Dis. 2014 Aug 14;8(8):e3079. doi: 10.1371/journal.pntd.0003079. eCollection 2014 Aug. PubMed PMID: 25121731; PubMed Central PMCID: PMC4133387. https://www.ncbi.nlm.nih.gov/pubmed/25121731

Wagley S, Hemsley C, Thomas R, Moule MG, Vanaporn M, Andreae C, Robinson M, Goldman S, Wren BW, Butler CS, Titball RW. *The twin arginine translocation system is essential for aerobic growth and full virulence of Burkholderia thailandensis*. J Bacteriol. 2014 Jan;196(2):407-16. doi: 10.1128/JB.01046-13. Epub 2013 Nov 8. PubMed PMID: 24214943; PubMed Central PMCID: PMC3911251. https://www.ncbi.nlm.nih.gov/pubmed/24214943

Okuda K, Hasui K, Abe M, Matsumoto K, Shindo M. *Molecular design, synthesis, and evaluation of novel potent apoptosis inhibitors inspired from bongkrekic acid*. Chem Res Toxicol. 2012 Oct 15;25(10):2253-60. doi: 10.1021/tx300315h. Epub 2012 Oct 4. PubMed PMID: 22998163. https://www.ncbi.nlm.nih.gov/pubmed/22998163

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Tsuya T, Ferri S, Fujikawa M, Yamaoka H, Sode K. *Cloning and functional expression of glucose dehydrogenase complex of Burkholderia cepacia in Escherichia coli*. J Biotechnol. 2006 May 17;123(2):127-36. Epub 2005 Dec 6. PubMed PMID: 16337300**.**
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1. 36 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA BURKHOLDERIA E CYTOCHROME C1

https://www.ncbi.nlm.nih.gov/pubmed/?term=BURKHOLDERIA+CYTOCHROME+C1

Search results = Items: 1

Kang MJ, Lee MH, Shim JK, Seo ST, Shrestha R, Cho MS, Hahn JH, Park DS. *PCR-based specific detection of Ralstonia solanacearum by amplification of cytochrome c1 signal peptide sequences*. J Microbiol Biotechnol. 2007 Nov;17(11):1765-71. PubMed PMID: 18092459.
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1.37 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E TRANSPORTER, (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Transporter*".

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+TRANSPORTER

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Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

Stechemesser L, Eder SK, Wagner A, Patsch W, Feldman A, Strasser M, Auer S, Niederseer D, Huber-Schönauer U, Paulweber B, Zandanell S, Ruhaltinger S, Weghuber D, Haschke-Becher E, Grabmer C, Rohde E, Datz C, Felder TK, Aigner E. *Metabolomic profiling identifies potential pathways involved in the interaction of iron homeostasis with glucose metabolism*. Mol Metab. 2016 Oct 31;6(1):38-47. doi: 10.1016/j.molmet.2016.10.006. eCollection 2017 Jan. PubMed PMID: 28123936; PubMed Central PMCID: PMC5220278.
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1.38 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E TRANSPORTER, (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *migliori* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Transporter*" (**Attenzione:** gli articoli già citati nella ricerca precedente non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+TRANSPORTER

Sort by: Best Match - Search results = Item: 68

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1.39 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E DIABETE (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Transporter*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+DIABETES

Sort by: Most Recent - Search results = Items: 650

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1.40 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E DIABETE (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *migliori* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Diabete*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+DIABETES

Sort by: Best Match - Search results = Items: 585

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

Sen S, Ghatak SK, Majumdar D, Sen K, Bhattacharya B. *Free iron status & insulin resistance in type 2 diabetes mellitus: Analyzing the probable role of a peanut protein*. Indian J Med Res. 2015 Nov;142(5):606-9. doi: 10.4103/0971-5916.171291. PubMed PMID: 26658597; PubMed Central PMCID: PMC4743349. https://www.ncbi.nlm.nih.gov/pubmed/26658597

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1.41 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E OBESITA' (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Obesità*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+OBESITY

Sort by: Most Recent - Search results = Items: 207

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Stankowiak-Kulpa H, Kargulewicz A, Styszyński A, Swora-Cwynar E, Grzymisławski M. *Iron status in obese women*. Ann Agric Environ Med. 2017 Dec 23;24(4):587-591. doi: 10.5604/12321966.1232092. Epub 2017 May 11. PubMed PMID: 29284229.
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1.42 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E OBESITA' (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *migliori* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Obesità*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+OBESITY

Sort by: Best Match - Search results = Items: 189

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

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1.43 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E INSULITE (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Insulite*".

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+INSULITIS

Sort by: Most Recent - Search results = Items: 4

Van den Driessche A, Eenkhoorn V, Van Gaal L, De Block C. *Type 1 diabetes and autoimmune polyglandular syndrome: a clinical review*. Neth J Med. 2009 Dec;67(11):376-87. Review. PubMed PMID: 20009114. https://www.ncbi.nlm.nih.gov/pubmed/20009114

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https://www.ncbi.nlm.nih.gov/pubmed/11948737

Olejnicka BT, Andersson A, Tyrberg B, Dalen H, Brunk UT. *Beta-cells, oxidative stress, lysosomal stability, and apoptotic/necrotic cell death*. Antioxid Redox Signal. 1999 Fall;1(3):305-15. PubMed PMID: 11229442. https://www.ncbi.nlm.nih.gov/pubmed/11229442

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1.44 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E FIBROSI CISTICA (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Fibrosi Cistica*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+CYSTIC+FIBROSIS

Sort by: Most Recent - Search results = Items: 4

Kessler L, Abély M. [*Pancreatic infringement exocrine and endocrine in cystic fibrosis*]. Arch Pediatr. 2016 Dec;23(12S):12S21-12S32. doi: 10.1016/S0929-693X(17)30059-3. French. PubMed PMID: 28231890. https://www.ncbi.nlm.nih.gov/pubmed/28231890

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1.45 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E INFEZIONI POLMONARI (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Infezioni Polmonari*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+PULMONARY+INFECTION

Sort by: Most Recent - Search results = Items: 4

Tomita T, Ho H, Allen M, Diaz J. *Zygomycosis involving lungs, heart and brain, superimposed on pulmonary edema*. Pathol Int. 2005 Apr;55(4):202-5. PubMed PMID:15826246. https://www.ncbi.nlm.nih.gov/pubmed/15826246

1.46 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E SISTEMA IMMUNITARIO (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Sistema Immunitario*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+IMMUNE+SYSTEM

Sort by: Most Recent - Search results = Items: 57

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

Hubler MJ, Peterson KR, Hasty AH. *Iron homeostasis: a new job for macrophages in adipose tissue?* Trends Endocrinol Metab. 2015 Feb;26(2):101-9. doi: 10.1016/j.tem.2014.12.005. Epub 2015 Jan 16. Review. PubMed PMID: 25600948; PubMed Central PMCID: PMC4315734. https://www.ncbi.nlm.nih.gov/pubmed/25600948

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Krośniak M, Francik R, Kowalska J, Gryboś R, Blusz M, Kwiatek WM. *Effects of vanadium complexes supplementation on V, Fe, Cu, Zn, Mn, Ca and K concentration in STZ diabetic rat's spleen*. Acta Pol Pharm. 2013 Jan-Feb;70(1):71-7. PubMed PMID: 23610961.
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1.47 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E APOPTOSI (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Apoptosi*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+APOPTOSIS

Sort by: Most Recent - Search results = Items: 57

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

Backe MB, Moen IW, Ellervik C, Hansen JB, Mandrup-Poulsen T. *Iron Regulation of Pancreatic Beta-Cell Functions and Oxidative Stress*. Annu Rev Nutr. 2016 Jul 17;36:241-73. doi: 10.1146/annurev-nutr-071715-050939. Epub 2016 May 4. Review. PubMed PMID: 27146016. https://www.ncbi.nlm.nih.gov/pubmed/27146016

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Singh B, Charkowicz D, Mascarenhas D. *Insulin-like growth factor-independent effects mediated by a C-terminal metal-binding domain of insulin-like growth factor binding protein-3*. J Biol Chem. 2004 Jan 2;279(1):477-87. Epub 2003 Oct 22. PubMed PMID: 14576163. https://www.ncbi.nlm.nih.gov/pubmed/14576163

1.48 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E APOPTOSI (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *migliori* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Apoptosi*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+APOPTOSIS

Sort by: Best Match - Search results = Items: 48

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

Ryu BR, Ko HW, Jou I, Noh JS, Gwag BJ. *Phosphatidylinositol 3-kinase-mediated regulation of neuronal apoptosis and necrosis by insulin and IGF-I. J Neurobiol*. 1999 Jun 15;39(4):536-46. PubMed PMID: 10380075. https://www.ncbi.nlm.nih.gov/pubmed/10380075

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1.49 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E CYTOCHROME C (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Cytochrome c*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+CYTOCHROME+C

Sort by: Most Recent - Search results = Items: 16

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

Zou C, Liu X, Xie R, Bao Y, Jin Q, Jia X, Li L, Liu R. *Deferiprone attenuates inflammation and myocardial fibrosis in diabetic cardiomyopathy rats*. Biochem Biophys Res Commun. 2017 May 13;486(4):930-936. doi: 10.1016/j.bbrc.2017.03.127. Epub 2017 Mar 24. PubMed PMID: 28347819. https://www.ncbi.nlm.nih.gov/pubmed/28347819

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1.50 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E LE REACTIVE OXYGEN SPECIES (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Reactive Oxygen Species*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+REACTIVE+OXYGEN+SPECIES

Sort by: Most Recent - Search results = Items: 92

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

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1.51 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA, IRON E LE REACTIVE OXYGEN SPECIES (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *migliori* corrispondenze tra i termini "*Insulina*", "*Iron*" e "*Reactive Oxygen Species* " (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+IRON+REACTIVE+OXYGEN+SPECIES

Sort by: Best Match - Search results = Items: 78

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

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1.52 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E TRANSPORTER (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Transporter*".

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+IRON+TRANSPORTER

Sort by: Most Recent - Search results = Items: 247

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

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1.53 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E TRANSPORTER (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *migliori* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Transporter*" (**Attenzione:** gli articoli già citati nella ricerca precedente non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+IRON+TRANSPORTER

Sort by: Best Match - Search results = Items: 212

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

Seyedmohammad S, Born D, Venter H. *Expression, purification and functional reconstitution of FeoB, the ferrous iron transporter from Pseudomonas aeruginosa*. Protein Expr Purif. 2014 Sep;101:138-45. doi: 10.1016/j.pep.2014.06.012. Epub 2014 Jun 30. PubMed PMID: 24993789. https://www.ncbi.nlm.nih.gov/pubmed/24993789

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1.54 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E MELIOIDOSI (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Melioidosi*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+IRON+MELIOIDOSIS

Sort by: Most Recent - Search results = Items: 3

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1.55 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E DIABETE (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Diabete*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+IRON+DIABETES

Sort by: Most Recent - Search results = Items: 10

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

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1.56 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E FIBROSI CISTICA (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Fibrosi Cistica*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+IRON+CYSTIC+FIBROSIS

Sort by: Most Recent - Search results = Items: 148

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1.57 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E FIBROSI CISTICA (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *migliori* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Fibrosi Cistica*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

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1.58 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E INFEZIONI POLMONARI (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Infezioni Polmonari*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+IRON+PULMONARY+INFECTION

Sort by: Most Recent - Search results = Items: 74

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

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1.59 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E INFEZIONI POLMONARI (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *migliori* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Infezioni Polmonari*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+IRON+PULMONARY+INFECTION

Sort by: Best Match - Search results = Items: 100

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

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1.60 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E SISTEMA IMMUNITARIO (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Sistema Immunitario*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

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1.61 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E SISTEMA IMMUNITARIO (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *migliori* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Sistema Immunitario*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+IRON+IMMUNE+SYSTEM

Sort by: Best Match - Search results = Items: 62

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1.62 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E APOPTOSI (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Apoptosi*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+IRON+APOPTOSIS

Sort by: Most Recent - Search results = Items: 8

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1.63 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E LE REACTIVE OXYGEN SPECIES (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Reactive Oxygen Species*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+IRON+REACTIVE+OXYGEN+SPECIES

Sort by: Most Recent - Search results = Items: 111

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

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1.64 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E LE REACTIVE OXYGEN SPECIES (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *migliori* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Reactive Oxygen Species*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+IRON+REACTIVE+OXYGEN+SPECIES

Sort by: Best Match - Search results = Items: 108

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1.65 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E CYTOCHROME C (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Cytochrome c*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+IRON+CYTOCHROME+C

Sort by: Most Recent - Search results = Items: 108

Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

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1.66 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA PSEUDOMONAS, IRON E CYTOCHROME C (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *migliori* corrispondenze tra i termini "*Pseudomonas*", "*Iron*" e "*Cytochrome c*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=PSEUDOMONAS+IRON+CYTOCHROME+C

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1.67 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA BURKHOLDERIA, IRON E TRANSPORTER (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Burkholderia*, "*Iron*" e "*Transporter*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

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1.68 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA BURKHOLDERIA, IRON E TRANSPORTER (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *migliori* corrispondenze tra i termini "*Burkholderia*, "*Iron*" e "*Transporter*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

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Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

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1.69 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA BURKHOLDERIA, IRON E FIBROSI CISTICA (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Burkholderia*, "*Iron*" e "*Fibrosis Cystic*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=BURKHOLDERIA+IRON+FIBROSIS+CYSTIC

Sort by: Most Recent - Search results = Items: 29

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1.70 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA BURKHOLDERIA, IRON E SISTEMA IMMUNITARIO (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Burkholderia*, "*Iron*" e "*Immune System*".

https://www.ncbi.nlm.nih.gov/pubmed/?term=BURKHOLDERIA+IRON+IMMUNE+SYSTEM

Sort by: Most Recent - Search results = Items: 4

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1.71 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA BURKHOLDERIA, IRON E CYTOCHROME C (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Burkholderia*, "*Iron*" e "*Cytochrome c*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=BURKHOLDERIA+IRON+CYTOCHROME+C

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1.72 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA BURKHOLDERIA, IRON E LE REACTIVE OXYGEN SPECIES (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Burkholderia*, "*Iron*" e "*Reactive Oxygen Species*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=BURKHOLDERIA+IRON+REACTIVE+OXYGEN+SPECIES

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1.73 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA BURKHOLDERIA, IRON E MELIOIDOSI (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

I **Link** mostrati qui di seguito effettuano ricerche bibliografiche (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Burkholderia*, "*Iron*" e "*Melioidosi*" (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=BURKHOLDERIA+IRON+MELIOIDOSIS

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Dai risultati della ricerca sono stati selezionati **alcuni articoli ritenuti significativi**:

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BIBLIOGRAFIA RIGUARDANTE HELIGMOSOMOIDES POLYGYRUS

1. 74 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA INSULINA E HELIGMOSOMOIDES POLYGYRUS (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Insulin*" e "*Heligmosomoides polygyrus*".

https://www.ncbi.nlm.nih.gov/pubmed/?term=INSULIN+HELIGMOSOMOIDES+POLYGYRUS

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1.75 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA HELIGMOSOMOIDES POLYGYRUS E SISTEMA IMMUNITARIO (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Heligmosomoides polygyrus*" e "*Immune system"*.

https://www.ncbi.nlm.nih.gov/pubmed/?term=HELIGMOSOMOIDES+POLYGYRUS+IMMUNE+SYSTEM

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Considerato il notevole numero di articoli trovati, allo scopo di restringere maggiormente il campo di ricerca, dai risultati ottenuti sono stati selezionati gli **articoli ritenuti più significativi** attraverso un'ulteriore inserimento di **termini specifici**. (**Attenzione:** gli articoli già citati nella ricerca precedente non vengono citati).

1) "*Heligmosomoides polygyrus*, *Immune system*, ***TH2***, ***CD4***, ***IL-4****"*:

https://www.ncbi.nlm.nih.gov/pubmed/?term=HELIGMOSOMOIDES+POLYGYRUS+IMMUNE+SYSTEM+TH2+CD4+IL+4

Sort by: Most Recent - Search results = Items: 26

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1.76 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA HELIGMOSOMOIDES POLYGYRUS E APOPTOSI (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

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https://www.ncbi.nlm.nih.gov/pubmed/?term=HELIGMOSOMOIDES+POLYGYRUS+APOPTOSIS

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1.77 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA HELIGMOSOMOIDES POLYGYRUS E INFEZIONI POLMONARI (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

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1.78 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA HELIGMOSOMOIDES POLYGYRUS E INFEZIONI POLMONARI (UNA SELEZIONE DELLE *MIGLIORI* CORRISPONDENZE)

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *migliori* corrispondenze tra i termini "*Heligmosomoides polygyrus*" e "*Pulmonary Infection"* (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=HELIGMOSOMOIDES+POLYGYRUS+PULMONARY+INFECTION

Sort by: Best Match - Search results = Items: 21

Ovington KS, Behm CA. *The enigmatic eosinophil: investigation of the biological role of eosinophils in parasitic helminth infection*. Mem Inst Oswaldo Cruz. 1997;92 Suppl 2:93-104. Review. PubMed PMID: 9698920. https://www.ncbi.nlm.nih.gov/pubmed/9698920

Naradikian MS, Myles A, Beiting DP, Roberts KJ, Dawson L, Herati RS, Bengsch B, Linderman SL, Stelekati E, Spolski R, Wherry EJ, Hunter C, Hensley SE, Leonard WJ, Cancro MP. *Cutting Edge: IL-4, IL-21, and IFN-γ Interact To Govern T-bet and CD11c Expression in TLR-Activated B Cells*. J Immunol. 2016 Aug 15;197(4):1023-8. doi: 10.4049/jimmunol.1600522. Epub 2016 Jul 18. PubMed PMID: 27430719; PubMed Central PMCID: PMC4975960. https://www.ncbi.nlm.nih.gov/pubmed/27430719

Price P, Turner KJ. *Immunological consequences of intestinal helminth infections in C57BL mice. The effects on lymphoid tissue and reticuloendothelial function*. Aust J Exp Biol Med Sci. 1983 Aug;61 (Pt 4):371-82. PubMed PMID: 6651642. https://www.ncbi.nlm.nih.gov/pubmed/6651642

1.79 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA HELIGMOSOMOIDES POLYGYRUS E DIABETE (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

l **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Heligmosomoides polygyrus*" e "*Diabetes"* (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=HELIGMOSOMOIDES+POLYGYRUS+DIABETES

Sort by: Most Recent - Search results = Items: 5

Osada Y, Yamada S, Nabeshima A, Yamagishi Y, Ishiwata K, Nakae S, Sudo K, Kanazawa T. *Heligmosomoides polygyrus infection reduces severity of type 1 diabetes induced by multiple low-dose streptozotocin in mice via STAT6- and IL-10-independent mechanisms*. Exp Parasitol. 2013 Oct;135(2):388-96. doi: 10.1016/j.exppara.2013.08.003. Epub 2013 Aug 19. PMID: 23968688. https://www.ncbi.nlm.nih.gov/pubmed/23968688

1.80 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA HELIGMOSOMOIDES POLYGYRUS E OBESITA' (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

l **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Heligmosomoides polygyrus*" e "*Obesity"* (**Attenzione:** gli articoli già citati nelle ricerche precedenti non vengono citati).

https://www.ncbi.nlm.nih.gov/pubmed/?term=HELIGMOSOMOIDES+POLYGYRUS+OBESITY

Sort by: Most Recent - Search results = Items: 2

Wong T, Hildebrandt MA, Thrasher SM, Appleton JA, Ahima RS, Wu GD. *Divergent metabolic adaptations to intestinal parasitic nematode infection in mice susceptible or resistant to obesity*. Gastroenterology. 2007 Dec;133(6):1979-88. Epub 2007 Sep 14. DOI: 10.1053/j.gastro.2007.09.006. PMCID: PMC2180166. PMID: 18054569. https://www.ncbi.nlm.nih.gov/pubmed/18054569

1.81 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA HELIGMOSOMOIDES POLYGYRUS E CYTOCHROME C (UNA SELEZIONE DELLE *PIU' RECENTI* CORRISPONDENZE)

l **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) delle *più recenti* corrispondenze tra i termini "*Heligmosomoides polygyrus*" e "*Cytochrome c".*

https://www.ncbi.nlm.nih.gov/pubmed/?term=HELIGMOSOMOIDES+POLYGYRUS+CYTOCHROME+C

Sort by: Most Recent - Search results = Items: 2

Cable J, Harris PD, Lewis JW, Behnke JM. *Molecular evidence that Heligmosomoides polygyrus from laboratory mice and wood mice are separate species*. Parasitology. 2006 Jul;133(Pt 1):111-22. Epub 2006 Mar 15. PubMed PMID: 16536883.
https://www.ncbi.nlm.nih.gov/pubmed/16536883

Preston CM, Barrett J. *Heligmosomoides polygyrus: peroxidase activity*. Exp Parasitol. 1987 Aug;64(1):24-8. PubMed PMID: 3609227. https://www.ncbi.nlm.nih.gov/pubmed/3609227

1.82 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA HELIGMOSOMOIDES POLYGYRUS E IRON

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica (su tutti gli **articoli scientifici** pubblicati su **PubMed**) in cui figurano insieme i termini "*Heligmosomoides polygyrus*" e "*Iron".*

https://www.ncbi.nlm.nih.gov/pubmed/?term=HELIGMOSOMOIDES+POLYGYRUS+IRON

Minkus TM, Koski KG, Scott ME. *Marginal zinc deficiency has no effect on primary or challenge infections in mice with Heligmosomoides polygyrus (Nematoda).* J Nutr. 1992 Mar;122(3):570-9. PMID: 1542014

1.83 ARTICOLI SCIENTIFICI CHE STUDIANO LE RELAZIONI TRA HELIGMOSOMOIDES POLYGYRUS E PSEUDOMONAS

Il **Link** mostrato qui di seguito effettua una ricerca bibliografica su tutti gli **articoli scientifici** pubblicati su **PubMed** in cui figurano insieme i termini "*Heligmosomoides polygyrus*" e "*Pseudomonas".*

https://www.ncbi.nlm.nih.gov/pubmed/?term=HELIGMOSOMOIDES+POLYGYRUS+PSEUDOMONAS

Search results = Items: 1

Przyjalkowski Z, Wescott RB. *Effect of bacterial infection on the development of Nematospiroides dubius in gnotobiotic mice*. Bull Acad Pol Sci Biol. 1969; 17(1):57-60. PMID: 5399483.

FINE CAPITOLO I ° (Parte Prima)

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Corrispondenza: ***nunzio.bonaventura@libero.it***

9 Gennaio 2018