



Become a member

Renew my subscription
Sign up for newsletters

Log in | My account | Contact Us

SHARE REPORT



Cotranslational protein folding on the ribosome monitored in real time

Wolf Holtkamp^{1,*}, Goran Kokic^{1,†}, Marcus Jäger¹, Joerg Mittelstaet^{1,†}, Anton A. Komar², Marina V. Rodnina^{1,‡}

* See all authors and affiliations

Science 27 Nov 2015:
Vol. 350, Issue 6264, pp. 1104-1107
DOI: 10.1126/science.aad0344

Article Figures & Data Info & Metrics eLetters PDF

eLetters is an online forum for ongoing peer review. Submission of eLetters are open to all. eLetters are not edited, proofread, or indexed. Please read our [Terms of Service](#) before submitting your own eLetter.

[Submit a Response to This Article](#)

RE: Cotranslational protein folding on the ribosome monitored in real time. Science 350(6264):1104-1107

Saverio Alberti, Lab head,
CESI

(12 February 2016)

Protein-accessible N- and C-terminal ends underlie native folding

S. Alberti

Unit of Cancer Pathology, Department of Neuroscience and Imaging and CeSI, Foundation University 'G. d'Annunzio', Chieti Scalo, 66100, Italy.

Correspondence to:
Prof. Saverio Alberti
Unit of Cancer Pathology
Center for Excellence in Research on Aging
University "G. d' Annunzio"
Via Polacchi 11
66100 Chieti Scalo (Chieti), Italy
Phone: (+39) 0871-541.551
FAX: (+39) 0871-541.550



Science

Vol 350, Issue 6264
27 November 2015

- Table of Contents
- Print Table of Contents
- Advertising (PDF)
- Classified (PDF)
- Masthead (PDF)

ARTICLE TOOLS

- Email
- Print
- Alerts
- Citation tools
- Download PowerPoint
- Save to my folders
- Request Permissions
- Share

SIMILAR ARTICLES IN:

- PubMed
- Google Scholar

CITED BY...



CITING ARTICLES IN:

- Web of Science (56)
- Scopus (60)

Related Jobs

Project Development Scientist | Staff Scientist

City of Hope
California

Post Doctoral Researcher (m/f)

The Leibniz Institute for Natural Product Research and Infection Biology – Hans Knöll Institute
Jena, Thüringen (DE)

Postdoctoral Position in Neurophysiology

Cleveland Clinic's Lerner Research Institute
Cleveland, Ohio (US)

[MORE JOBS ►](#)



[Log in](#) | [My account](#) | [Contact Us](#)

Become a member [Renew my subscription](#) | [Sign up for newsletters](#)

REPORT

Cotranslational protein folding on the ribosome monitored in real time

Wolf Holtkamp^{1,*}, Goran Kokic^{1,*}, Marcus Jäger¹, Joerg Mittelstaet^{1,†}, Anton A. Komar², Marina V. Rodnina^{1,‡}

+ See all authors and affiliations

Science 27 Nov 2015:
Vol. 350, Issue 6264, pp. 1104-1107
DOI: 10.1126/science.aad0344

[Article](#)

[Figures & Data](#)

[Info & Metrics](#)

eLetters

[PDF](#)

eLetters is an online forum for ongoing peer review. Submission of eLetters are open to all. eLetters are not edited, proofread, or indexed. Please read our [Terms of Service](#) before submitting your own eLetter.

[Submit a Response to This Article](#)

RE: Cotranslational protein folding on the ribosome monitored in real time. *Science* 350(6264):1104-1107

Saverio Alberti, Lab head,
CESI

(12 February 2016)

Protein-accessible N- and C-terminal ends underlie native folding

S. Alberti

Unit of Cancer Pathology, Department of Neuroscience and Imaging and CeSI, Foundation University 'G. d'Annunzio', Chieti Scalo, 66100, Italy.

Correspondence to:

Prof. Saverio Alberti

Unit of Cancer Pathology

Center for Excellence in Research on Aging

f niye ' "CG+ Annunzio"

Via Poiracchi 11

66100 Chieti Scalo (Chieti), Italy

Phone: (+39) 0871-541.551

FAX: (+39) 0871-541.550

E-mail: s.alberti@unich.it

In a recent article, Holtkamp et al. (1) determined rates and structural outcomes of cotranslational protein folding in the ribosome. Cotranslational folding was suggested to be typical of small, intrinsically rapidly folding protein domains (1). Parallel mechanisms are here suggested to generally underlie protein folding.

Newly translated polypeptides are sequestered in a protected folding environment, by Hsc70 and TRiC/CCT chaperonins (2). Most polypeptides subsequently transit through the eukaryotic Hsp70, bacterial GroEs/GroEL cytosolic chaperones, for successive cycles of unfolding-refolding (3).

A key shared feature of cotranslational protein folding in the ribosome, of translation-coupled chaperone-guided folding and of chaperone-guided cycles of unfolding-refolding is here indicated to be sequence-directional processivity. This structurally corresponds to a 'sequential sliding' of polypeptides over/within folding apparatuses. Such processes are bound to require fundamental, generally-shared structural determinants. Among them, that of unconstrained exposure of N- and C-terminal protein ends to the solvent. This was found to be the case across widely divergent protein classes (e.g. trans-membrane receptors, signaling molecules, immunoglobulins, cytoskeletal components, GFP, transcription factors and enzymes) (www.ebi.ac.uk/pdbe/).

Notably, such directional processing can also be observed in proteasomal degradation (4).

Thus, a broad, if not general, rule in protein folding appears to be that of protein-driven, N- to C-terminus-sequential folding. The corresponding mechanics are expected to be rate-limiting, which would allow for a generalization of the quasi-equilibrium, restricted sampling of the conformational space that is observed co-translationally on the ribosome (1). Thus, directional, protein-assisted protein folding is suggested to bear a fundamental role in protein structure acquisition.

References

1. Holtkamp W, et al. (2015) Cotranslational protein folding on the ribosome monitored in real time. *Science* 350(6264):1104-1107.
2. Thulasiraman V, Yang CF, & Frydman J (1999) In vivo newly translated polypeptides are sequestered in a protected folding environment. *EMBO J.* 18:85-95.
3. Willmund F, et al. (2013) The cotranslational function of ribosome-associated hsp70 in eukaryotic protein homeostasis. *Cell* 152(1-2):196-209.
4. Berko D, et al. (2012) The direction of protein entry into the proteasome determines the variety of products and depends on the force needed to unfold its two termini. *Mol Cell* 48(4):601-611.

Show Less

Competing Interests: None declared.

**Science**

Vol 350, Issue 6264
27 November 2015

[Table of Contents](#)[Print Table of Contents](#)[Advertising \(PDF\)](#)[Classified \(PDF\)](#)[Masthead \(PDF\)](#)**ARTICLE TOOLS**[✉ Email](#)[🖨️ Print](#)[🔔 Alerts](#)[🌐 Citation tools](#)[⬇️ Download Powerpoint](#)[📁 Save to my folders](#)[© Request Permissions](#)[↪️ Share](#)**SIMILAR ARTICLES IN:**

- [PubMed](#)
- [Google Scholar](#)

CITED BY...**CITING ARTICLES IN:**

- [Web of Science \(56\)](#)
- [Scopus \(60\)](#)



Related Jobs

Project Development Scientist | Staff Scientist

City of Hope
California

Post Doctoral Researcher (m/f)

The Leibniz Institute for Natural Product Research and Infection Biology – Hans Knöll Institute
Jena, Thüringen (DE)

Postdoctoral Position in Neurophysiology

Cleveland Clinic's Lerner Research Institute
Cleveland, Ohio (US)

[MORE JOBS ►](#)

Science

21 December 2018

Vol 362, Issue 6421



INTERNATIONAL SECURITY

Next-generation wargames

COMPUTER SCIENCE

The sex robots are here

SCI COMMUN

News at a glance

QUASICRYSTALS

Tessellating tiny tetrahedrons

WORKING LIFE**Forced to change—for good**

Table of Contents

Subscribe Today

Receive a year subscription to *Science* plus access to exclusive AAAS member resources, opportunities, and benefits.

Subscribe Today

Get Our Newsletters

Receive emails from *Science*. [See full list](#)

- Science* Table of Contents
- Science* Daily News
- Science* News This Week
- Science* Editor's Choice
- First Release Notification
- Science* Careers Job Seeker

I agree to receive emails from AAAS/*Science* and *Science* advertisers, including information on products, services, and special offers which may include but are not limited to news, career information, & upcoming events.

Click to view the [Privacy Policy](#).

Sign up today

Required fields are indicated by an asterisk (*)

About us**Journals****Leadership****Team members****Work at AAAS****Advertise****Advertising kits****Custom publishing****For subscribers**

Site license info

For members

International

Chinese

Japanese

Help

Access & subscriptions

Order a Single Issue

Reprints & permissions

Contact us

Accessibility

Stay Connected



© 2018 American Association for the Advancement of Science. All rights reserved. AAAS is a partner of HINARI, AGORA, OARE, CHORUS, CLOCKSS, CrossRef and COUNTER. *Science* ISSN 1095-9203.

Terms of Service

Privacy Policy

Contact Us