



International Conference on Advances in Bioprocess Engineering and Technology 2016 (ICABET 2016)

Bioprocess modeling and simulation of half subtractor using actin based quantum cellular automata

Debashis De*, Tapatosh Sadhu, Jadav Chandra Das

*Department of Computer Science and Engineering, West Bengal University of Technology
BF-142, Salt Lake, Sector -I, Kolkata-700064, India*

Abstract

Actin is a globular protein responsible for cell movement, inter cell signaling, decision making in dendritic trees. The signaling events in such bio-process can be imitated by molecular quantum cellular automata (QCA) network to achieve behaviors as Boolean logic functions. It has been proposed that one dimensional partitioned QCA network is powerful enough to simulate the nature of F-Actin. In this paper, half-subtractor has been considered for its design through the actin QCA. Basic logic gates, such as AND gate, OR gate, XOR gate and NOT gate has also been designed and utilized to design the proposed half-subtractor circuit.

© 2015 Elsevier Ltd. All rights reserved.

Selection and Peer-review under responsibility of the Committee Members of International Conference on Advances in Bioprocess Engineering and Technology 2016.

Keywords: Actin; QCA; PIQCA; Subtractor; Soliton; Ion-cloud

1. Introduction

F-Actin is an important cytoskeletal feature responsible for intracellular signaling events like electrical potentials, quantum events etc. Ion channel activity like ionic condensation and ion cloud propagation can also be studied for neural information processing and facilitation of logical computation in dendritic trees [1].

* Corresponding author. Tel.: +91-983-036-3215.

E-mail address: dr.debashis.de@gmail.com

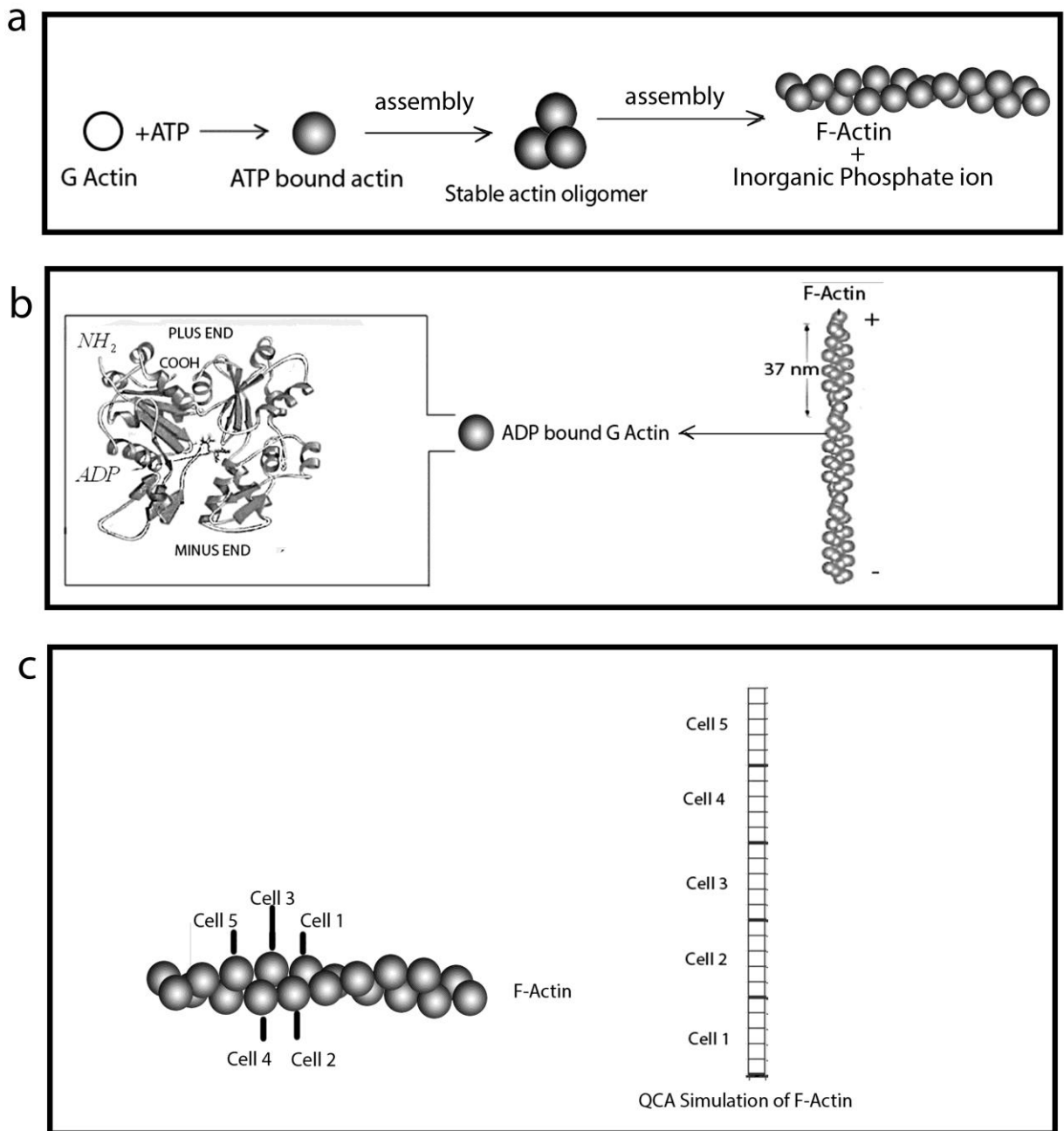


Fig.1. (a) Assembly of G-Actin to form Actin filament; (b) Basic structure of a monomer inside actin filament; (c) mapping of cells into QCA.

It is a double helix filamentous structure made up of globular actin (G-Actin) monomers. Actin has been studied for self-assembly features. Actin molecules can combine with Adenosine Triphosphate (ATP) and ATP bound actin can assemble together to form stable actin oligomer, which in turn can assemble into double helix Filamentous Actin (F-Actin) chains [2-3]. The process is detailed in Fig. 1a. From Fig. 1b it can further be observed that F-Actin is actually made of ADP bound actin monomers.

Download English Version:

<https://daneshyari.com/en/article/5462046>

Download Persian Version:

<https://daneshyari.com/article/5462046>

[Daneshyari.com](https://daneshyari.com)