

Bioseparation of Recombinant Proteins from Plant Extract with Hydrophobin Fusion Technology

Jussi J. Joensuu, Andrew J. Conley, Markus B. Linder,
and Rima Menassa

Abstract

Two main hurdles hinder the widespread acceptance of plants as a preferred protein expression platform: low accumulation levels and expensive chromatographic purification methods. Fusion of proteins of interest to fungal hydrophobins has provided a tool to address both accumulation and purification issues. In this method, we describe the one-step purification of a GFP-HFB1 fusion from crude plant extract using an aqueous two-phase system (ATPS). ATPS can be carried out in a very short time frame, yields relatively pure protein with very few contaminants, and does not require any chromatographic column steps. This purification system takes advantage of the affinity of hydrophobins to the micellar phase of widely available nonionic surfactants, such as Triton X-114, and can be easily scaled up for industrial-scale protein purification.

Key words: Aqueous two-phase system, ATPS, Hydrophobin, HFB1, Protein purification, Protein fusion, Molecular farming

1. Introduction

1.1. Rationale

For the past two decades, plants have shown promise as bioreactors for the large-scale production of various therapeutic and industrially important recombinant proteins (1). To obtain high-recombinant protein yields, *Agrobacterium* infiltration in *Nicotiana benthamiana* leaves (2), when combined with the coexpression of a suppressor of gene silencing (3), has widely established itself as the most utilized transient expression system in plants. Furthermore, this flexible technology allows for rapid gram-quantity production of recombinant protein within a couple of weeks (4, 5), which is a significant advantage over conventional production technologies.

Bioseparation Of Proteins

Mark Steyvers



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hierbei werden kleine botox mengen mit feiner nadel in die muskulatur an stirn kopf und nacken injiziert meist sind es insgesamt 30 40 injektionpunkte details zur migräne behandlung behandlungsdauer 15 25 minuten für wem ist eine migränen behandlung geeignet für personen die unter dauerhafter starker migräne leiden

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objective the relation between migraine and vascular risk factors is an unclear issue furthermore the reasons for chronification are still unknown probably the age related risk and other factors leading to migraine progression will also change in the future under these questions we aimed to investigate whether or not there is a specific

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may 12 2015 eine reihe von techniken steht zur verfügung je nach ursache der kopfschmerzen und der erfahrungen und präferenzen vergangener behandlungen weichteil therapie für die muskeln und faszien der hws zielt auf das loslassen der verspannten muskeln und faszien in der folge hat sich eine mobilisierung bzw

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erfolgreich gegen kopfschmerzen und migräne kopfschmerzen und migräne das Übungsbuch physiotherapie bei chronischen schmerzen eine studie zur multimodalen schmerztherapie handbuch der psychoedukation evidenzbasierte therapie leitlinien dynamische und energetische techniken in physiotherapie und manueller medizin Übungen

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physiotherapie bei kopfschmerzen und migräne autor kerstin lüdtke benjamin schäfer verlag thieme auflage 1 auflage 2019 sofort verfügbar die autoren haben jahrelange erfahrung in der behandlung von patienten mit kopfschmerzen und therapieren auf basis der aktuellen evidenz

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jan 19 2022 bei patienten mit migräne werden zur bestimmung der indikation für physiotherapie lediglich fünf dieser elf tests empfohlen die untersuchung von myofaszialen triggerpunkten die kopfposition nach anterior das zervikale bewegungsausmaß die untersuchung von segmentalen hws hypomobilitäten und der flexions rotations test 4