

Contents lists available at ScienceDirect

Seminars in Cell & Developmental Biology

journal homepage: www.elsevier.com/locate/semcdb

Review

Role of fibroblast growth factors in organ regeneration and repair

Elie El Agha^a, Djuro Kosanovic^a, Ralph T. Schermuly^a, Saverio Bellusci^{a,b,*}

^a Universities of Giessen and Marburg Lung Center (UGMLC), Member of the German Center for Lung Research (DZL), Excellence Cluster Cardio-Pulmonary System (ECCPS), Justus-Liebig-University, Giessen, Hessen, Germany

^b Institute of Fundamental Medicine and Biology, Kazan Federal University, Kazan, Russia

ARTICLE INFO

Article history:

Received 5 May 2015
Accepted 8 October 2015
Available online xxx

Keywords:

Fibroblast growth factors
Organogenesis
Homeostatic balance
Regeneration
Repair

ABSTRACT

In its broad sense, regeneration refers to the renewal of lost cells, tissues or organs as part of the normal life cycle (skin, hair, endometrium *etc.*) or as part of an adaptive mechanism that organisms have developed throughout evolution. For example, worms, starfish and amphibians have developed remarkable regenerative capabilities allowing them to voluntarily shed body parts, in a process called autotomy, only to replace the lost parts afterwards. The bizarre myth of the fireproof homicidal salamander that can survive fire and poison apple trees has persisted until the 20th century. Salamanders possess one of the most robust regenerative machineries in vertebrates and attempting to draw lessons from their regeneration in these animals and extrapolate the knowledge to mammals is a never-ending endeavor.

Fibroblast growth factors are potent morphogens and mitogens that are highly conserved among animal kingdom. These growth factors play key roles in organogenesis during embryonic development as well as homeostatic balance during postnatal life. In this review, we provide a summary about the current knowledge regarding the involvement of fibroblast growth factor signaling in organ regeneration and repair. We also shed light on the use of these growth factors in previous and current clinical trials for a wide array of human diseases.

© 2015 Published by Elsevier Ltd

Contents

1.	Introduction.....	
1.1.	Historical background.....	
1.2.	Modes of action.....	
2.	FGFs in tissue regeneration and repair.....	
2.1.	Heart.....	
2.2.	Lung.....	
2.3.	Liver.....	
2.4.	Skeletal muscle.....	
2.5.	Adipose tissue.....	
3.	Clinical applications of recombinant FGFs in organ regeneration and repair.....	
4.	Conclusions.....	
	Acknowledgements.....	
	References.....	

1. Introduction

1.1. Historical background

Fibroblast growth factors (FGFs) constitute a family of evolutionarily conserved polypeptides that are involved in diverse morphogenic and organogenic programs during embryonic development as well as homeostatic balance during postnatal life.

* Corresponding author at: Universities of Giessen and Marburg Lung Center (UGMLC), Member of the German Center for Lung Research (DZL), Excellence Cluster Cardio-Pulmonary System (ECCPS), Justus-Liebig-University, Giessen, Hessen, Germany.

E-mail address: Saverio.Bellusci@innere.med.uni-giessen.de (S. Bellusci).

<http://dx.doi.org/10.1016/j.semcdb.2015.10.009>

1084-9521/© 2015 Published by Elsevier Ltd.