

I x q f w r q d e j h q r p l f v # a q #  
d v w k p d # h v h d u f k

J u } h j r u } # z r v } f } h n

**Division of Asthma, Allergy and Lung Biology, King's College London**

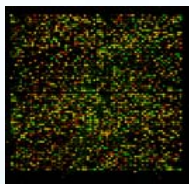
**MRC & Asthma UK Centre in Allergic Mechanisms of Asthma**



# Functional Genomics

- Ixqfwrqdc#jhqrp lf v#vwxg lhv#uhodwlrqvkl s#ehwz hhq#  
jhqrrw|sh#dgg#skhqrw|sh#r#q#d#jaredc#jhqrp h0z lgh,#  
vfddh

G Q D → U Q D → Surwh.lqv → E lrarj lfdc#surfhvv



# Gene expression

Transcription

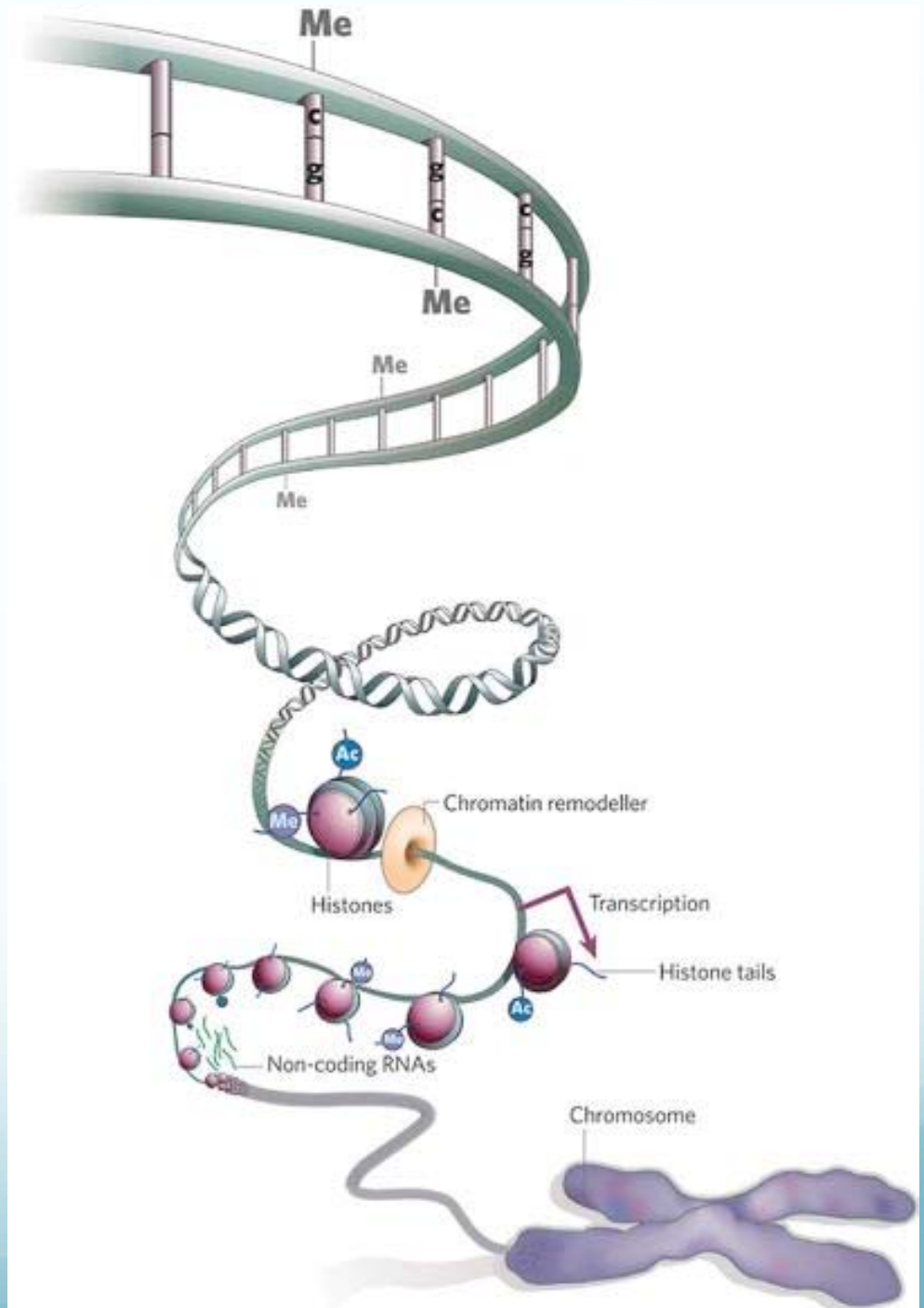
DNA methylation

Histone modifications

Non-coding RNAs

Translation

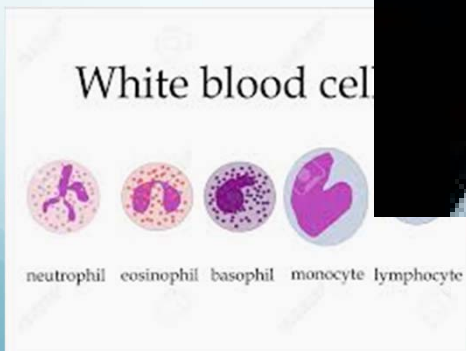
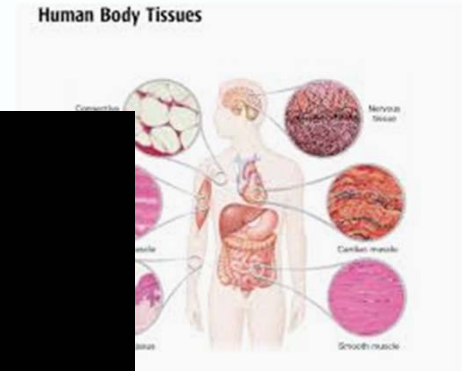
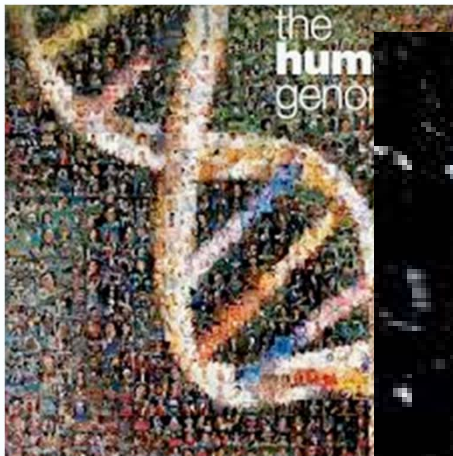
Proteins



# Technologies used in functional genomics

- P l f u r d u u d | v
  - H { s u h v v l r q # s u r i l d q j # j h q h # d u u d | v / # n { r q d u u d | v ,
  - W l d q j # p l f u r d u u d | v # k l w r q h # p r g l i l f d w l r q v / # W I # e l q g l q j / # G Q D # p h w k | a d w l r q ,
- K l j k 0 k u r x j k s x w # v h t x h q f l q j # K W V ,
  - U Q D # v h t x h q f l q j # U Q D 0 w h t ,
  - F k I S 0 v h t x h q f l q j # F k I S 0 w h t ,
  - E l v x o i w h v h t x h q f l q j # G Q D # p h w k | a d w l r q ,
- S u r w h l q # d u u d | v
  - S u r w h l q # f d s w x u h # d u u d | v
  - K l j k # s h u i r u p d q f h # o t x l g # f k u r p d w r j u d s k | # K S O F 2 P V ,
  - P d v v # v s h f w r p h w u | # P D O G I W R I , #

# Functional genomics - heterogeneity



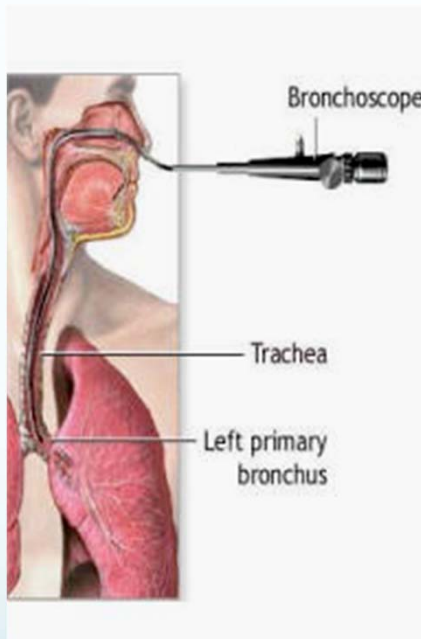
# Functional genomics - gene expression study

- **Purpose of the study (question)**
- **Study design**
  - Group selection
  - Sample selection (e.g. RNA isolation)
- **Platform selection**
- **Data analysis**

**... it is just the beginning ...**

# Functional genomics in asthma

Khawk | 2Dvwp dwlfv

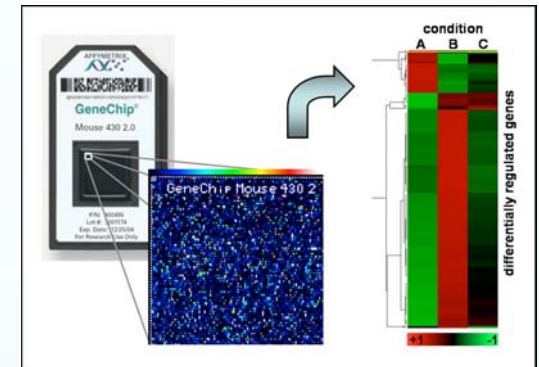


Hggreurqfkldoelrsv |

Hs lwholddeuxvk lqjv

Eurqfkrdoyhrou dydjh +EDO,

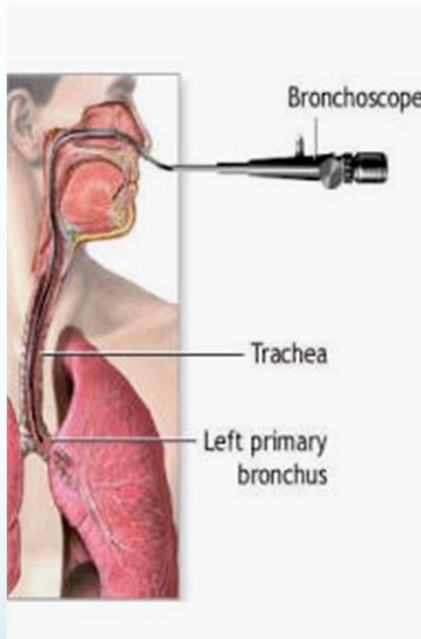
Ileuhrswlf eurqfkrvfrs |



J hqrp lfv

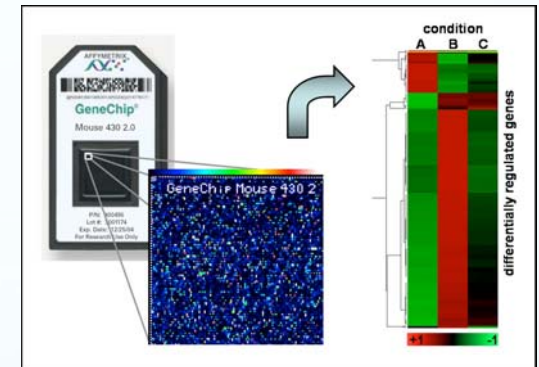
# Functional genomics in asthma

Khawk | 2Dvwp dwlfv



Hs lkhodd# uxvk lqj v

Hs lkhodd# how# :æ6 ( ,



1. Healthy (28) vs asthmatics (42)
2. Asthmatics (42) – response to treatment

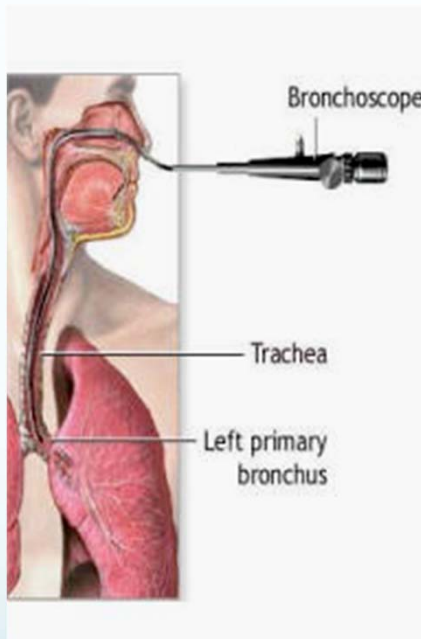
J hqrp lf v



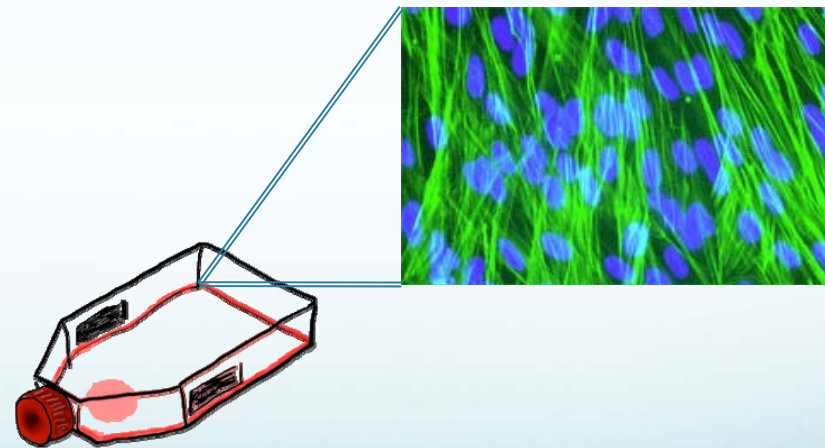


# Functional genomics - airway cell culture

K h d o k | 2 D v k p d w l f v



H q g r e u r q f k l d o e l r s v |

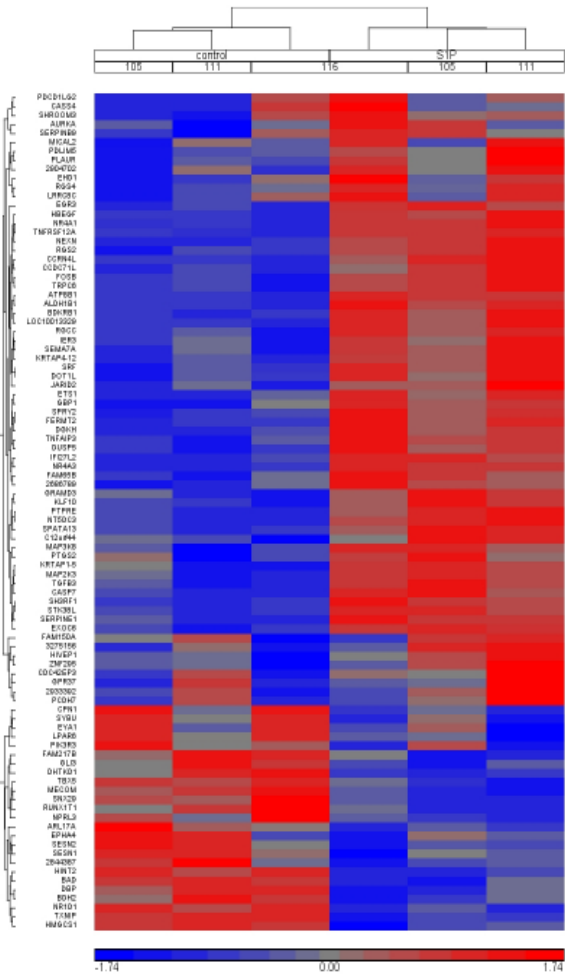


I l e u h r s w l f e u r q f k r v f r s |

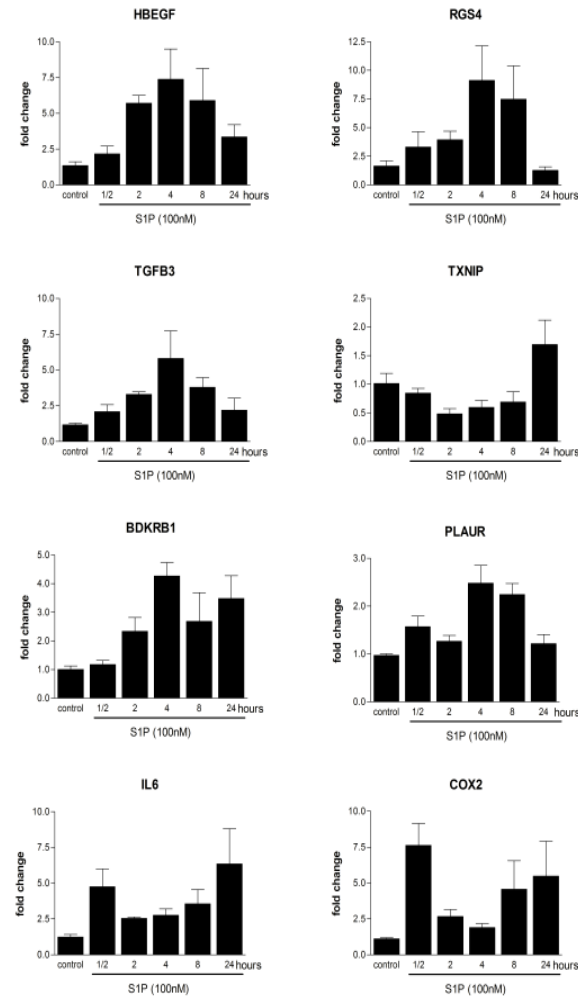
D l u z d | # p r r w k # p x v f c h # f x o w u h

# Sphingosine-1-phosphate induces pro-remodelling response in human airway smooth muscle cells

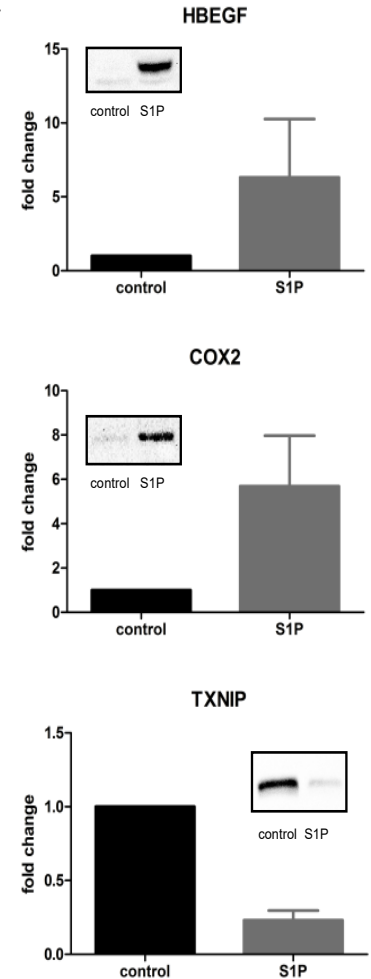
**A**



**B**

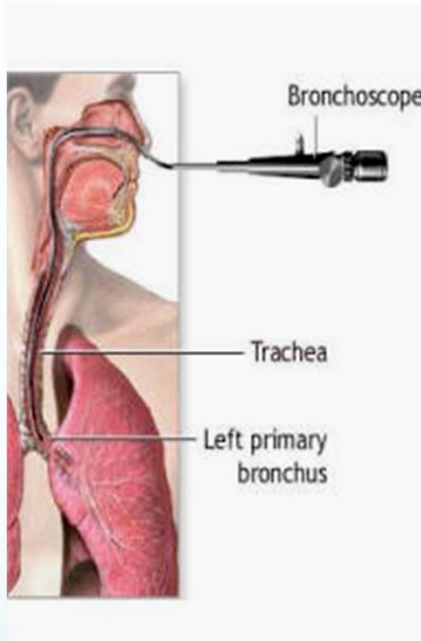


**C**

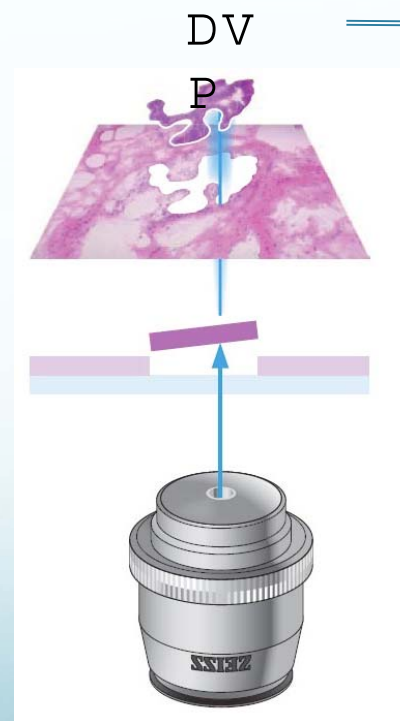


# Functional genomics – laser capture microdissection

K h d o w k | 2 D v w k p d w l f v



H q g r e u r q f k l d o e l r s v |

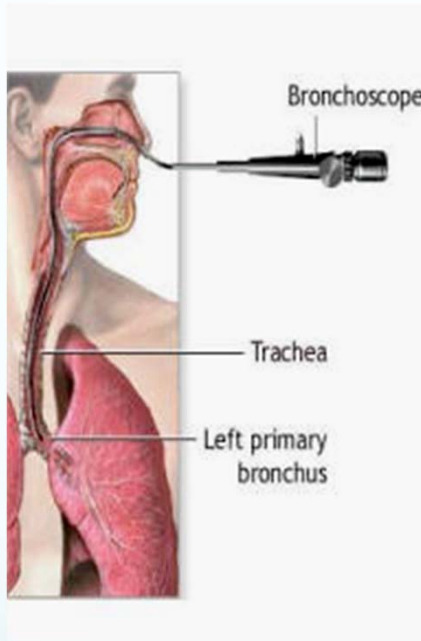


RNA seq

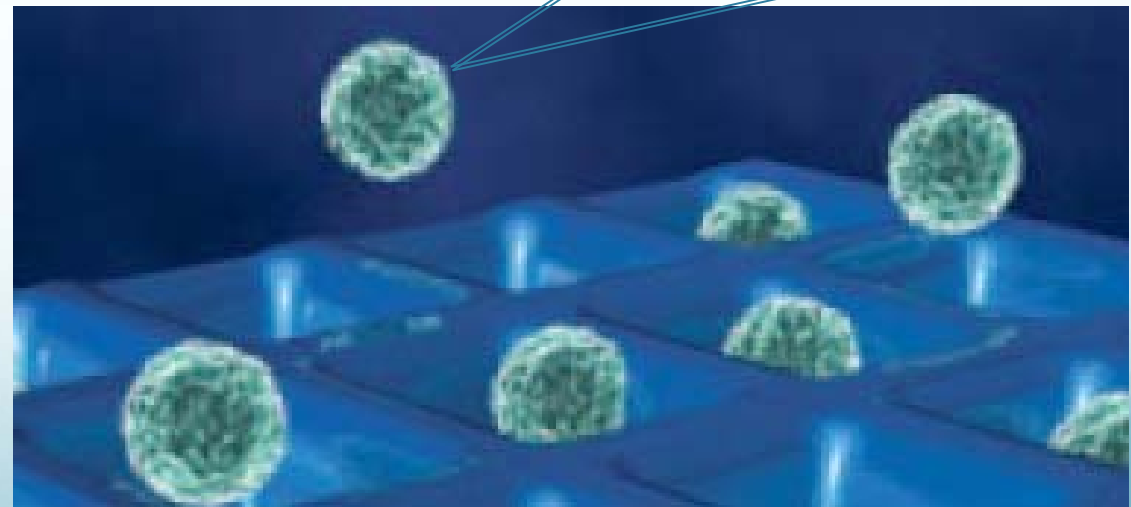
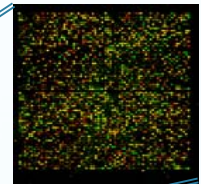
Laser capture microdissection

# Functional genomics – single cell genomics

Khdk | 2Dvwp dlfv



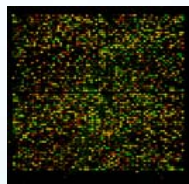
Hggrerqfkldoelrsv |  
Hs lkhldd#euvklqv  
Eurqfkrdoyhrou dydjh



Single cell analysis

# Functional Genomics

- `wrrc#r#ghflskhu#p rdnfxo#p hfkdg|vp v/#s dwkz d|v#  
dgg#j hqhwlf2hqylurqp hqwd2skhqrw|s lf#lqwhudfwlrqv#`
- `wrrc#r#j hqhudwh#gryhok |s rwkhvhv`
- `wrrc#iru#g ldj qrvwlfv#B,`



E lrarj lfd#  
h{shulp hqw

K ljk#kurxjksxw  
whfkqrarjlv

E lrlqirup dwlf  
dqdo|vlv

U hvxow

