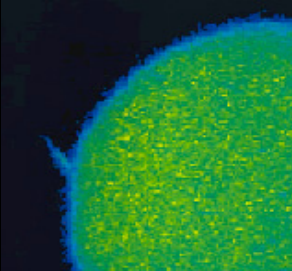


Calcium: Signalling the transition from egg to embryo

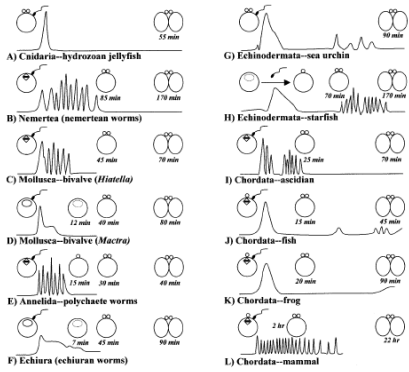


John Carroll
Division of Biosciences
UCL

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Lawrence et al

Calcium: a universal signal at fertilization

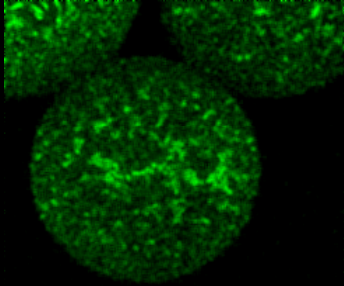


Stricker, Dev Biol 1999

Fertilization stimulates Ca^{2+} oscillations in mouse oocytes

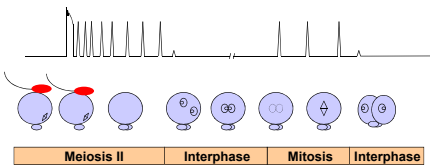


Ca²⁺ transients start again during the first mitotic division



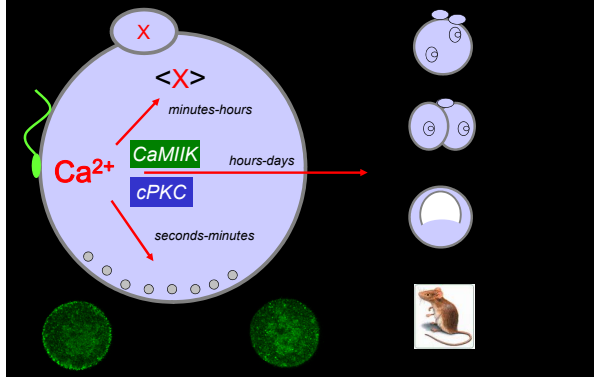
2 Photon imaging: Greg FitzHarris
Chris Richards

Ca²⁺ signalling at fertilization

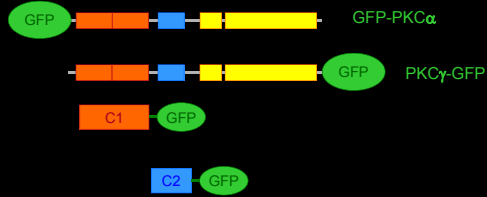


1. How is the pattern of Ca²⁺ oscillations generated?
2. How does Ca²⁺ co-ordinate events of egg activation?

Downstream of Calcium at fertilization

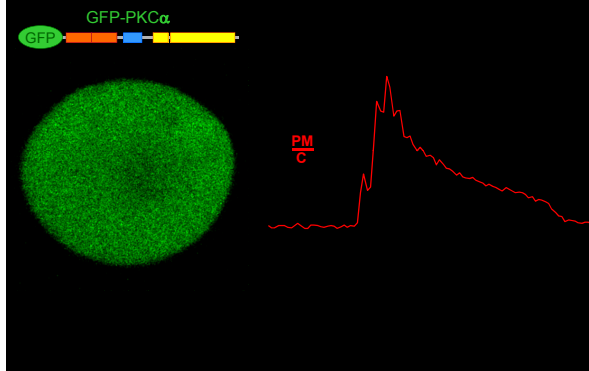


Monitoring cPKC activation at fertilization

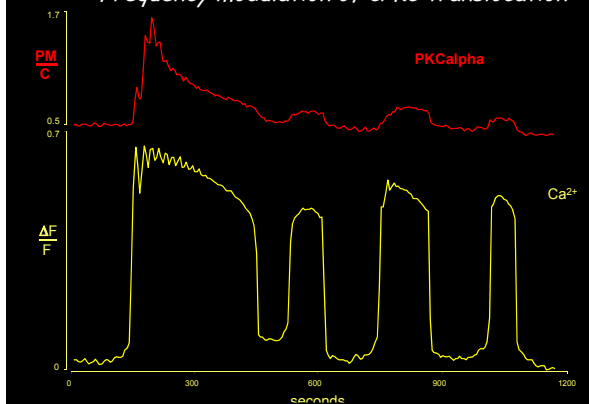


Guillaume Halet

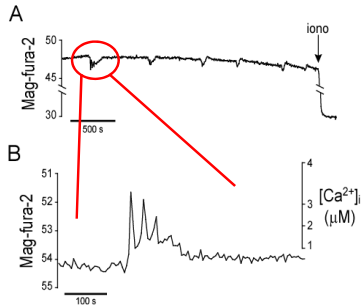
cPKC translocation at fertilization.



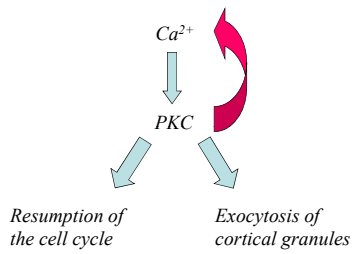
Frequency modulation of cPKC translocation



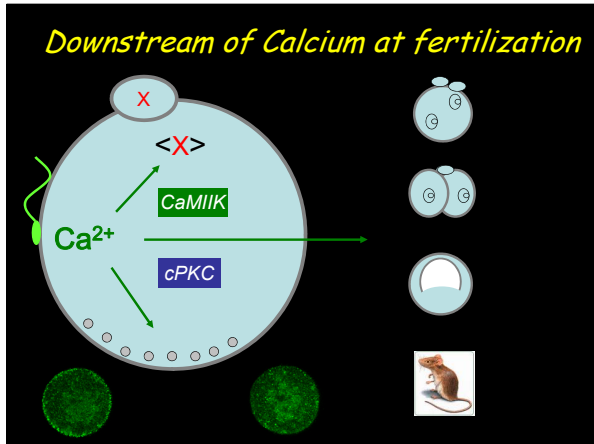
Recruitment of cPKC is sensitive to the amplitude and frequency of Ca^{2+} transients.

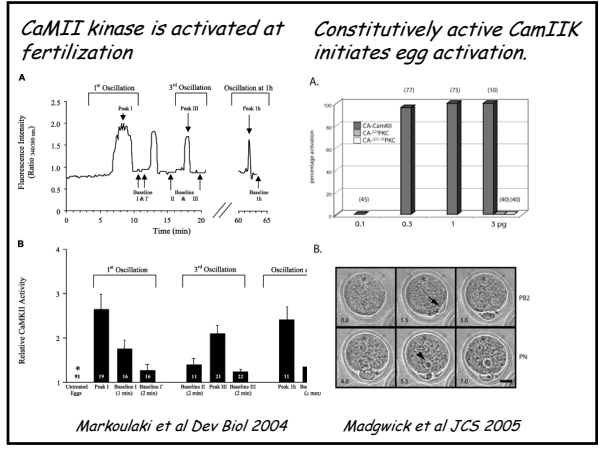


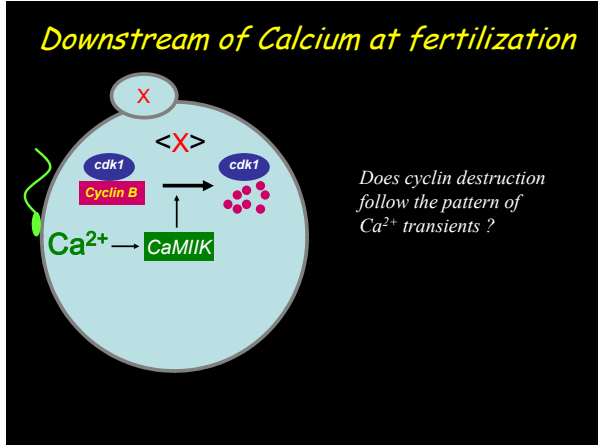
A role for PKC in egg activation?

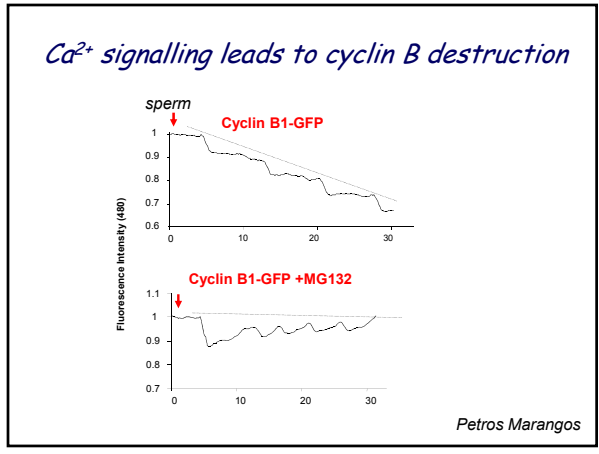


Downstream of Calcium at fertilization

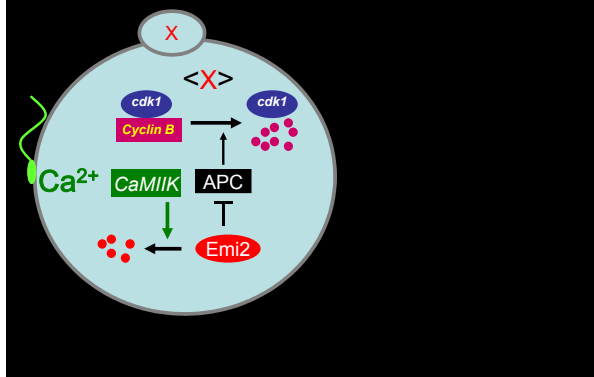




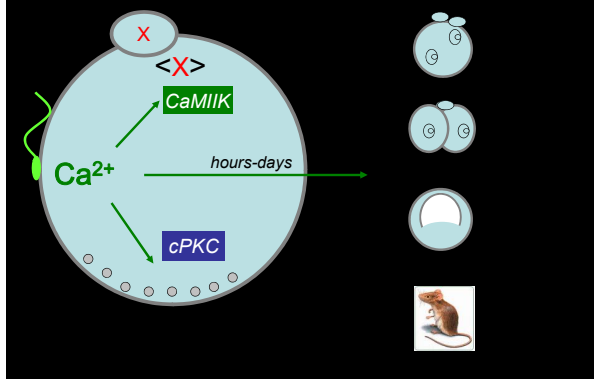




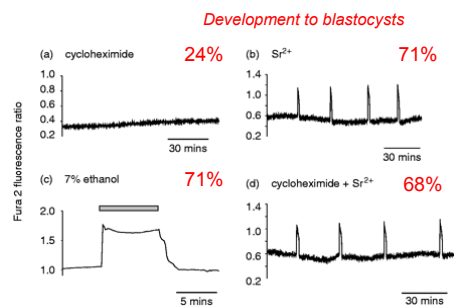
Downstream of Calcium at fertilization



Downstream of Calcium at fertilization

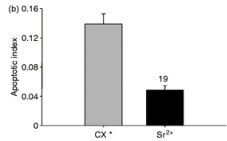
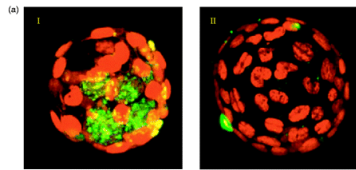


Egg activation in the absence of Ca^{2+}



Nina Rogers/Karl Swann

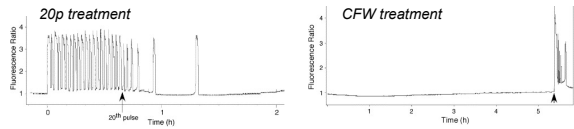
.....increases the rate of apoptosis,



.....and alters gene expression

Micro-array analysis:
239 genes were increased in Sr²⁺
568 genes were increased in CX

More subtle changes to Ca²⁺ signalling also impacts on later development



Effects on development.

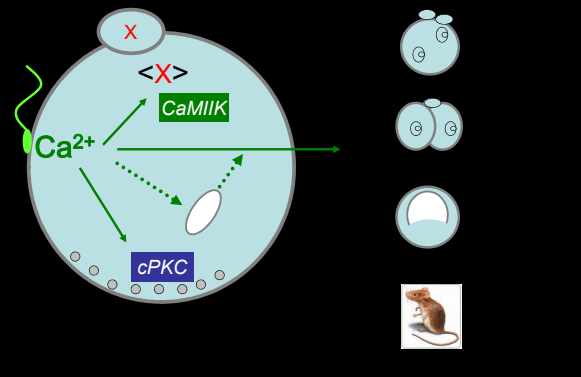
- | | |
|---------------------------|------------------------------|
| •Reduced implantation | •Normal implantation |
| •Normal post-implantation | •Reduced post-implantation |
| | •Decreased post-natal growth |

Micro-array analysis (2 fold change v control).

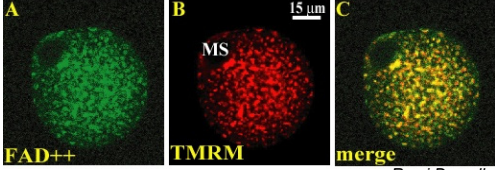
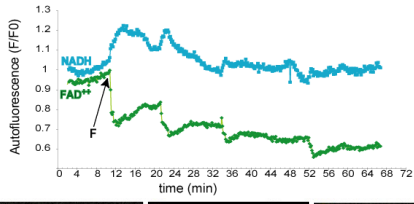
Increase: 73	Increase: 82
Decrease: 6	Decrease: 158

Ozil et al., Dev Biol 2006

Downstream of Calcium at fertilization

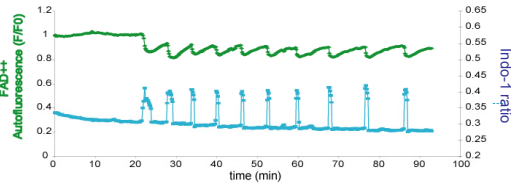


Fertilization stimulates mitochondrial activity

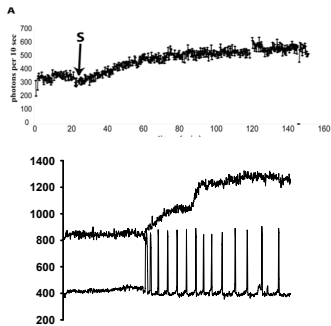


Remi Dumollard

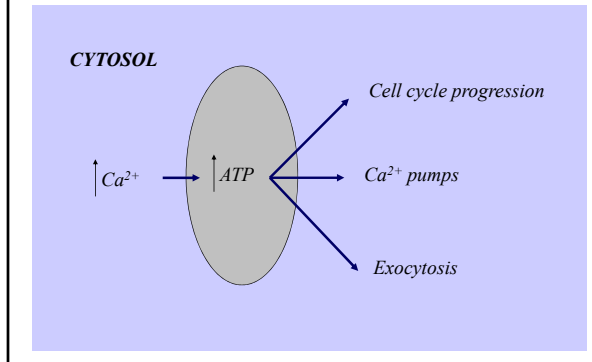
.....in a calcium-dependent manner



Fertilization stimulates ATP production.



ATP production - Ca^{2+} matches supply with demand.



Ca^{2+} : Co-ordinating egg activation

