



EXERCISE

Welcome to America.

Adjunctive Treatments for Tendinopathy



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About Me

- **Sports Physician**
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- **5 years Medical Officer NZ Army**



Tendinopathy: Where is the “Magic Bullet”?



Tendinopathy = Disease of the Tendon

- Over/under loading of tendon leads to microscopic failure with attempted healing
- Continued inappropriate loading impairs the healing process
- Tendon develops areas of:
 - Low collagen concentration
 - Thickening
 - Increased vascularity (+/- pain generating nerves?)



Initial Treatment Protocol

- Stop aggravating activities:
 - Minimise weight bearing/repetitive actions
 - Use unaffected side eg mouse/work station
 - Avoid prolonged rest
 - Regular stretch/ROM actions
- Settle pain:
 - Ice cup massage – 10-15 minutes 4 x daily + after activity
 - Elevate
 - Support – shoe; heel wedge; arch support OTC; orthotic; moonboot; brace;
 - Analgesia +/- topical NSAIDs (wrap in glad wrap at night)
 - Oral NSAIDs (?not to be used in acute injury setting)
- Restore ROM:
 - Flexibility
 - Joint mobilisations

Eccentric Strengthening is the Key

- **Add eccentric strengthening:**
 - **ALFREDSON PROGRAMME**
 - 90-180 per day in several session
 - Stimulates tenocyte production of collagen
 - 60-100% improved at 12 weeks
- **Add concentric/dynamic component:**
 - Gradually strengthen tendon mimicking desired action
- **Add sport specific actions:**
 - Gradual increase in duration/intensity

Physiotherapy

- Soft tissue manual therapies:
 - Releases
 - Needling
- Electrotherapies:
 - US & laser (?enhance proliferation/collagen orientation)
 - TENS, interferential stimulation (maintain muscle function)
- Eccentric strengthening:
 - Assess, correct, encourage...



RETARDS

We all know one.



Corticosteroid Injections

- Most common
- Injected adjacent to tendon, usually deep surface
- Mixed benefit:
 - Short term reduction in pain – “window of opportunity”
 - Inhibit cell activity
 - ?actually delay healing
 - Risk of tendon rupture (very low in controlled situations)
 - Other injection risks – infection, steroid flare, soft tissue atrophy
- **High volume injection under Ultra Sound guidance into layer between tendon covering and tendon “strips” neo-vessels and associated immature nerves:**
 - Success in tenosynovitis with increased vascularity on USS
- **Request Doppler USS to assess for neo-vessels**

Practice points (indications and contraindications for the use of corticosteroid injection in soft-tissue lesions¹⁶)

Indications

- reserve for chronic injuries, after a failure of intensive use of other approaches for at least 2 months
- use when rehabilitation is inhibited by symptoms

Contraindications

- if pain relief and anti-inflammatory effects can be achieved by other methods
- local or systemic infection
- coagulopathy
- tendon tear
- local corticosteroid injections are often unnecessary and should be avoided in the younger patient.

Practice points (potential unwanted effects of local corticosteroid injections¹⁶)

- hypersensitivity—local or systemic
- tissue atrophy
- tendon rupture
- infection—local or systemic
- post injection 'flare' of symptoms
- osteonecrosis/steroid arthropathy (intra-articular injections, weight-bearing joints)

Autologous Blood and PRP Injections

- Theory of platelet derived growth factors released and stimulate tendon healing
- 2-3 injections every 2-4 weeks **INTO** tendon +/- adjacent to tendon (2ml blood products + 2ml lignocaine)
- +/- Fenestration – multiple penetrations with needle after local anaesthetic working
- Anecdotal evidence and case reports
- RCT found no difference compared with eccentric exercise
- Low risk – painful

Sclerotherapy

- Theory of obliterating the neo-vessels and their immature nerves
- Inject polidoconol into neovessels under direct US guidance
- Some supporting evidence - RCT
- Technically challenging

Prolotherapy

- Theory of stimulating collagen deposition via irritation/inflammation to surrounding tissues +/- obliterating the neovessels
- Commonly use hypertonic glucose/lignocaine mix
- Injected alongside tendon directly into tender area
- Weekly injections for 3-12 weeks
- Some evidence of early improvement with Prolo+Eccentric vs Eccentric alone
- Low risk – painful

Other Injection Therapies

- **Actovegin:**
 - De-proteinised calf blood
 - Injected into tender areas
 - Commonly used in Germany for muscle injuries
 - No supporting high quality evidence
- **Traumeel:**
 - Herbal/homeopathic solution with purported anti-inflammatory effects
 - Often injected with Actovegin
 - Low risk – well tolerated
- **Aprotinin:**
 - Bovine derived protein that inhibits proteolytic enzymes
 - Purported to increase tendon collagen content and thus strength via inhibiting collagenases
 - Issues with anaphylaxis
 - Withdrawn from market – used in research only

Topical Treatments

- **NITRIC OXIDE DONOR PATCHES:**
 - Stimulate fibroblast/tenocyte proliferation and collagen formation
 - RCT evidence for effectiveness
 - Cause headaches in young
 - Start 1/8 or 1/4 patch directly over tender area per 24hrs
 - Replace every 24hrs, vary position slightly to minimise risk of skin irritation
- **Extracorporeal shock wave therapy (ESWT):**
 - Low energy pulses cause cavitation in tissues – thought to stimulate healing process
 - Recent evidence for improvement in early outcomes
 - Pain limiting application – does improve over several sessions
 - Not readily available
 - Not ACC funded - \$200-300 per treatment

Topical Treatments

- **Iontophoresis:**
 - Use NSAID/corticosteroid gel on pad applied directly over tender area
 - Electrical current drives medication into tissues over 20 minutes
 - Insertional tendinopathies – anecdotal reports of improvement
- **Balance and Power bands:**
 - Really....
 - Hologram channels and balances the body's "energy"
 - Australian manufacturer ordered by court to repay all users who request a refund



Other Treatment Options

- **Hyperbaric Oxygen**

- Increases the partial pressure of oxygen in the blood
- Medical uses:
 - Decompression sickness, gas emboli
 - Carbon monoxide poisoning
 - Problematic wound healing, eg diabetic foot, skin grafts, burns
 - Acute compartment syndrome
- Evidence for stem cell activation via nitric oxide mediated pathway
- Animal evidence for increased collagen synthesis and tissue strength in proven tendinopathy
- Cost and access are limiting factors

- **Surgery**

- Rarely performed now for pure tendinopathy
- Post-surgical rehabilitation protocols mimic tendinopathy treatments



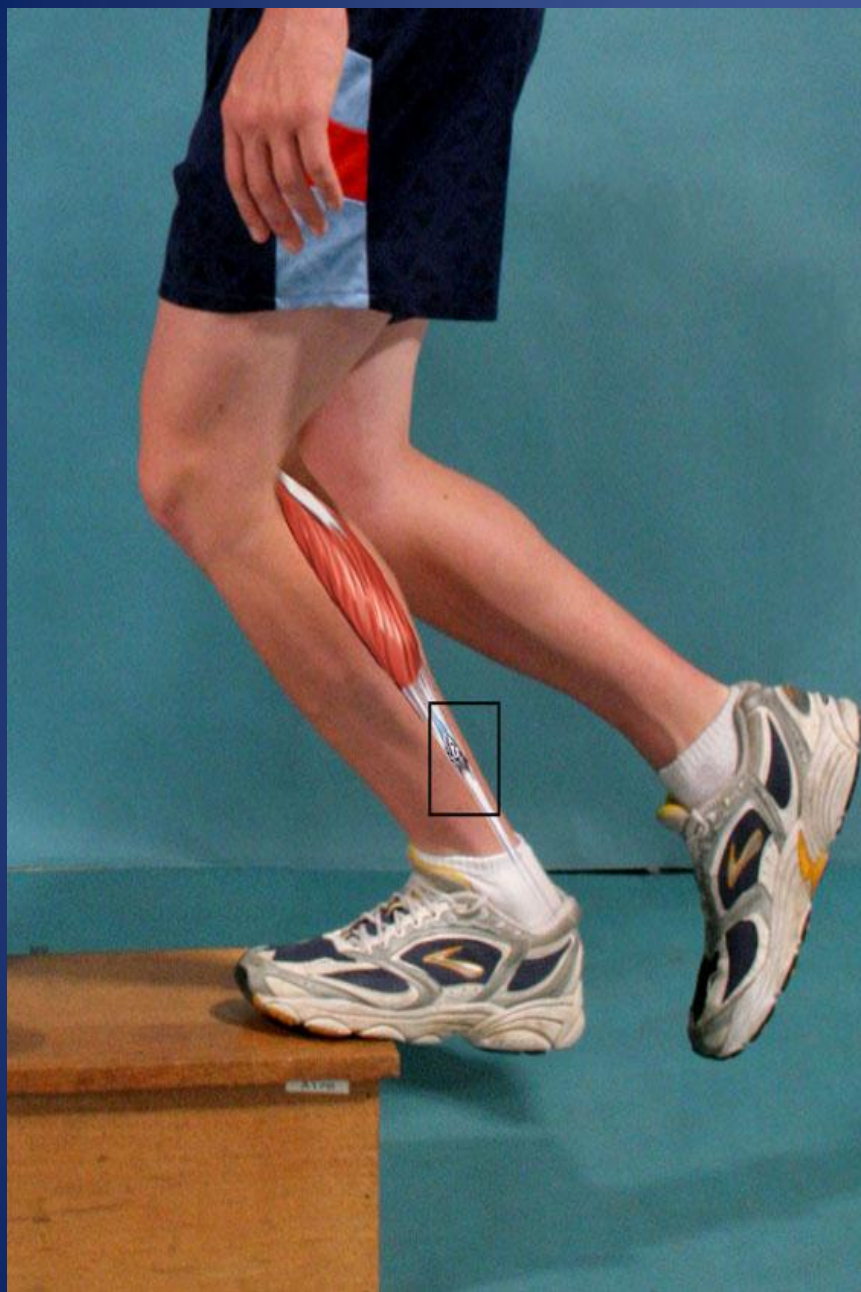
Consider our
patient with
Achilles tendon
pain as just one
example

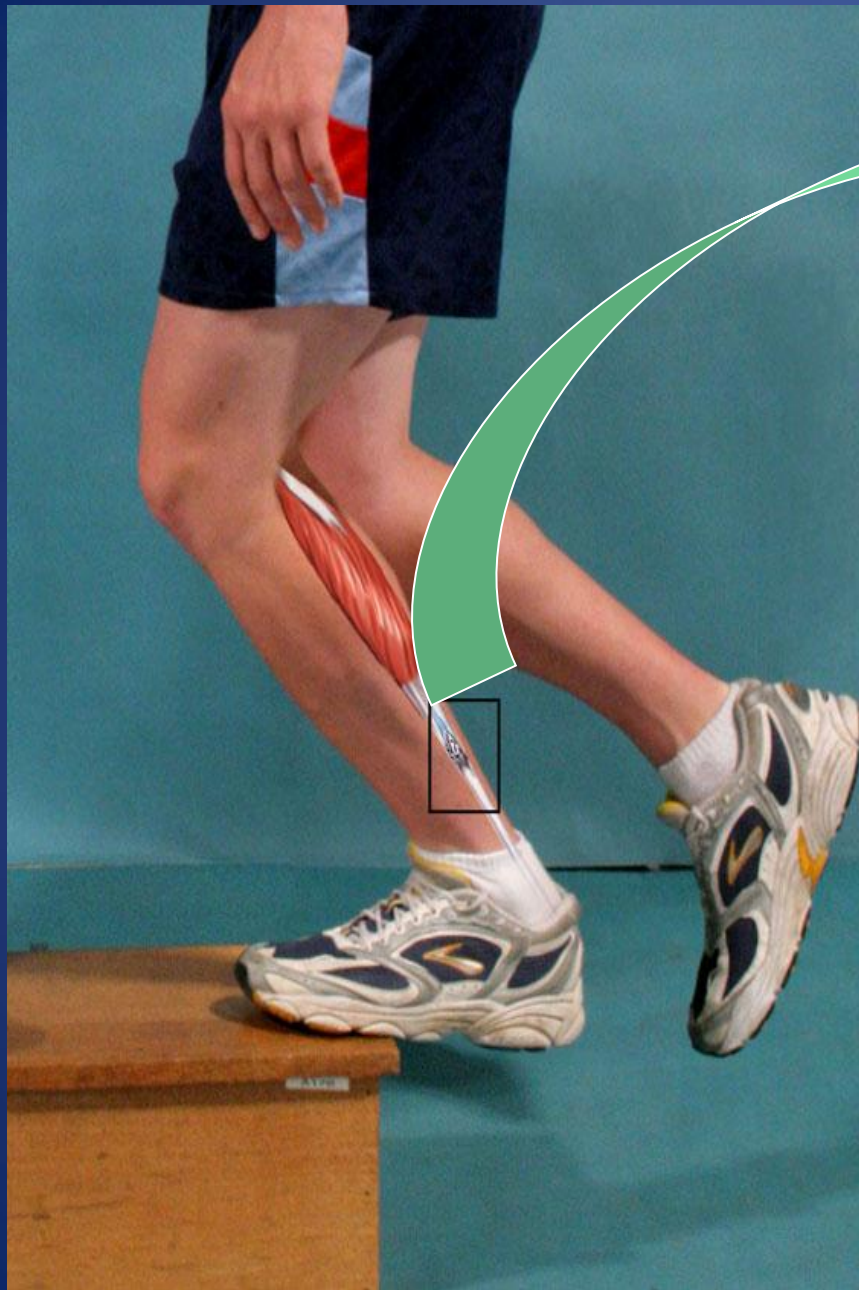
Consider our patient...

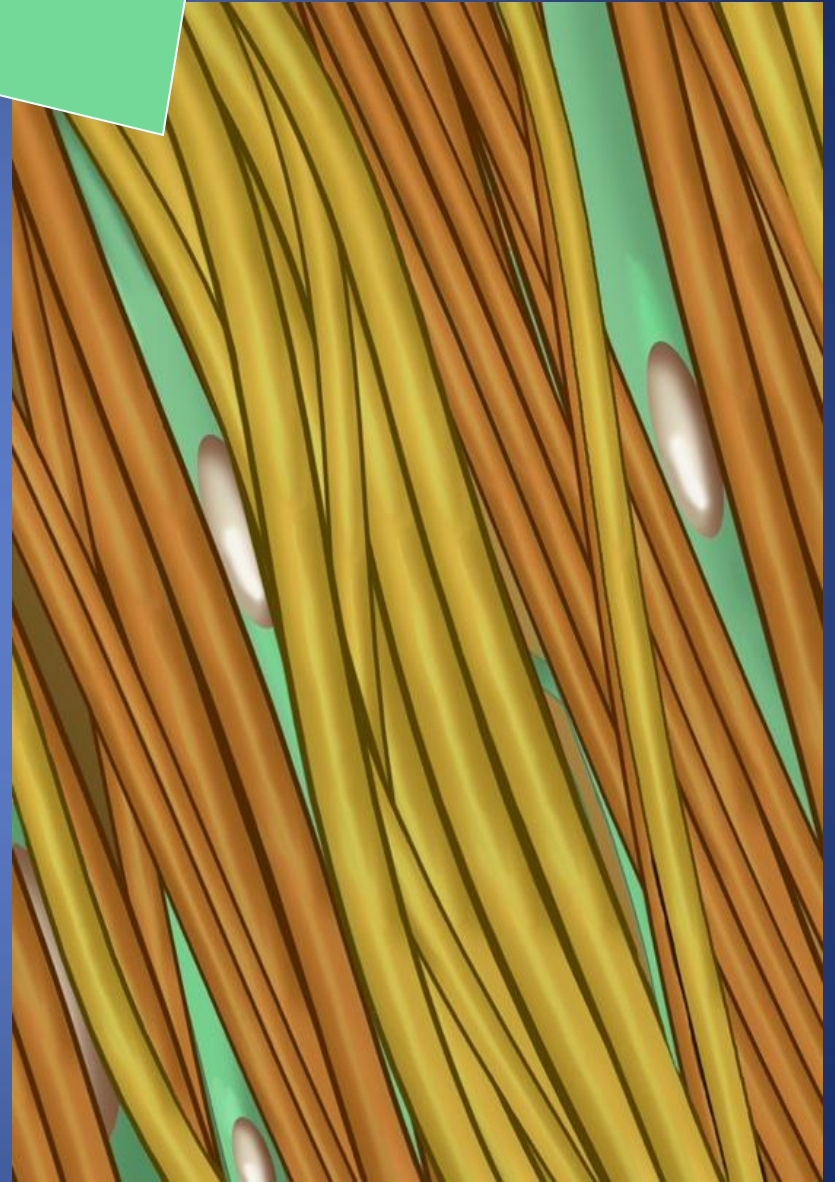
1. Mechanocoupling

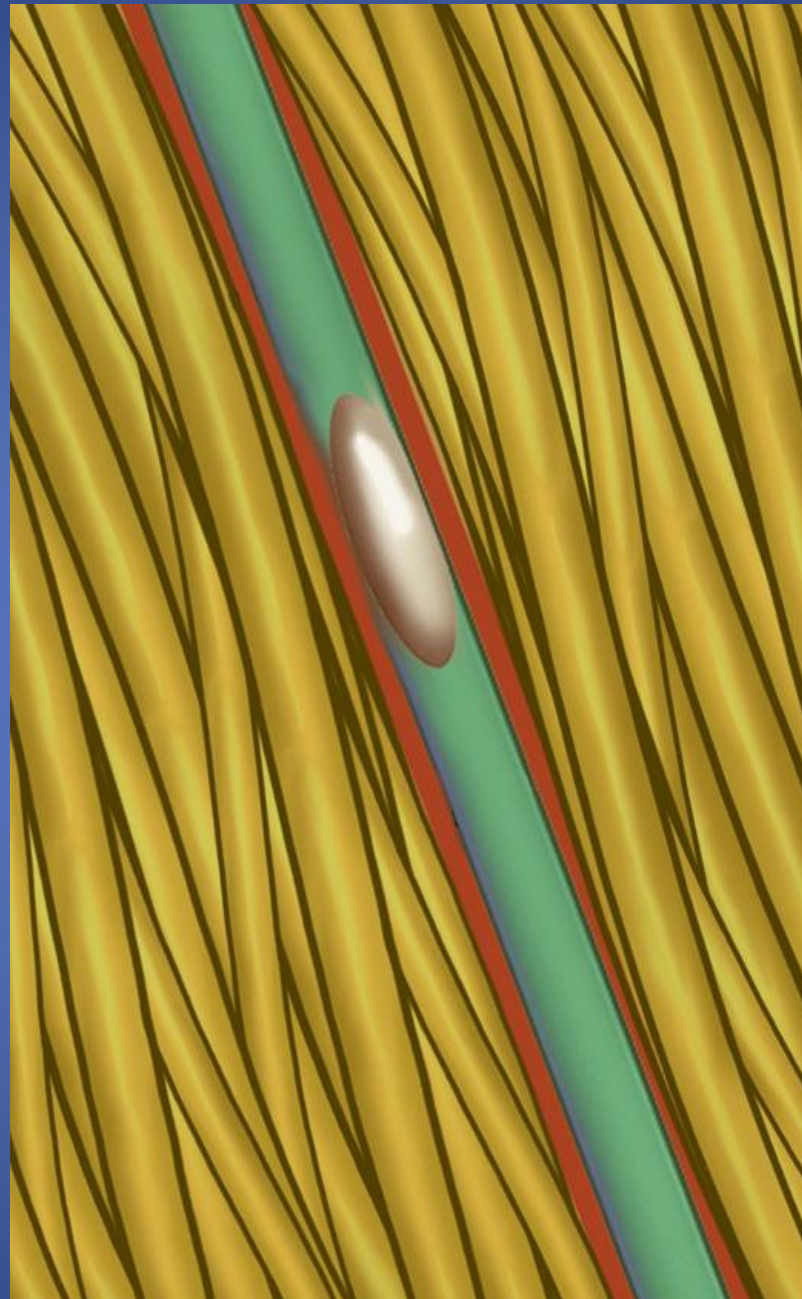
The loaded cell responds to tension, shear, contraction



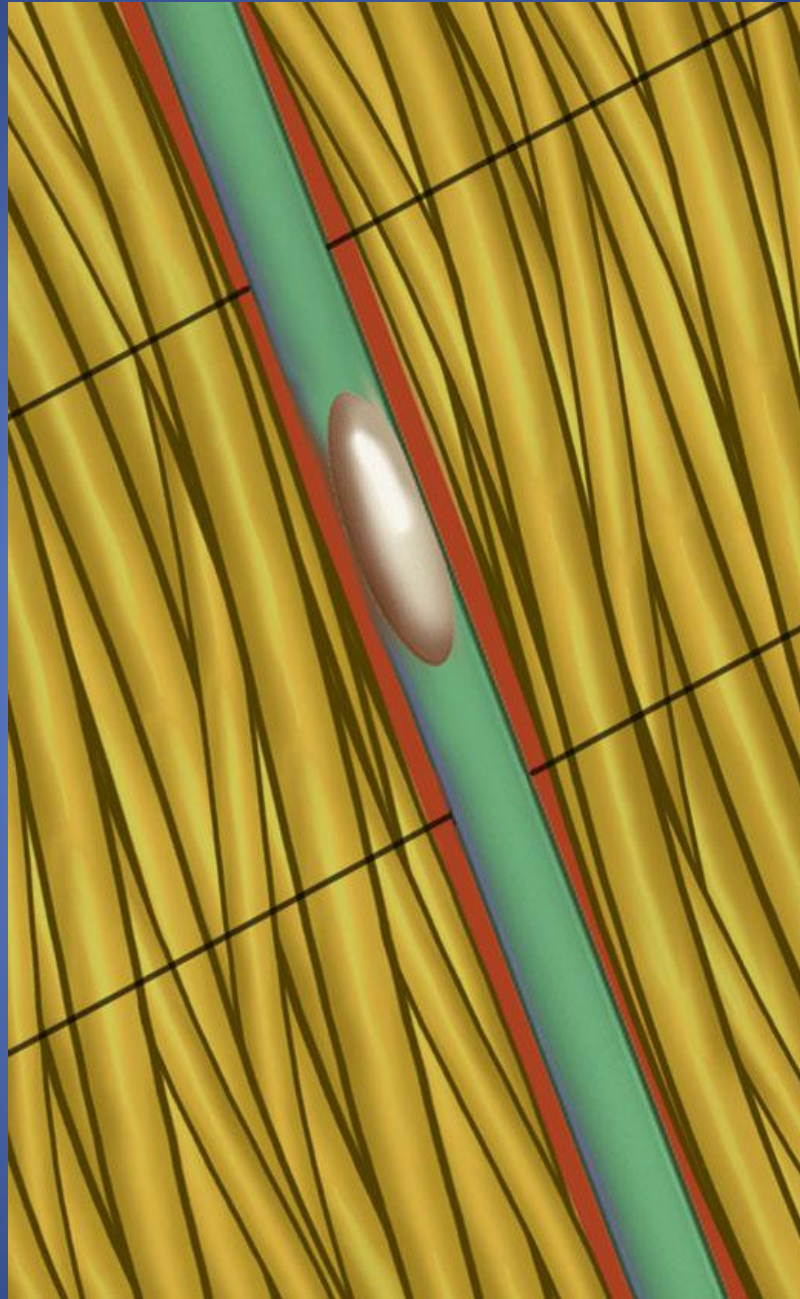




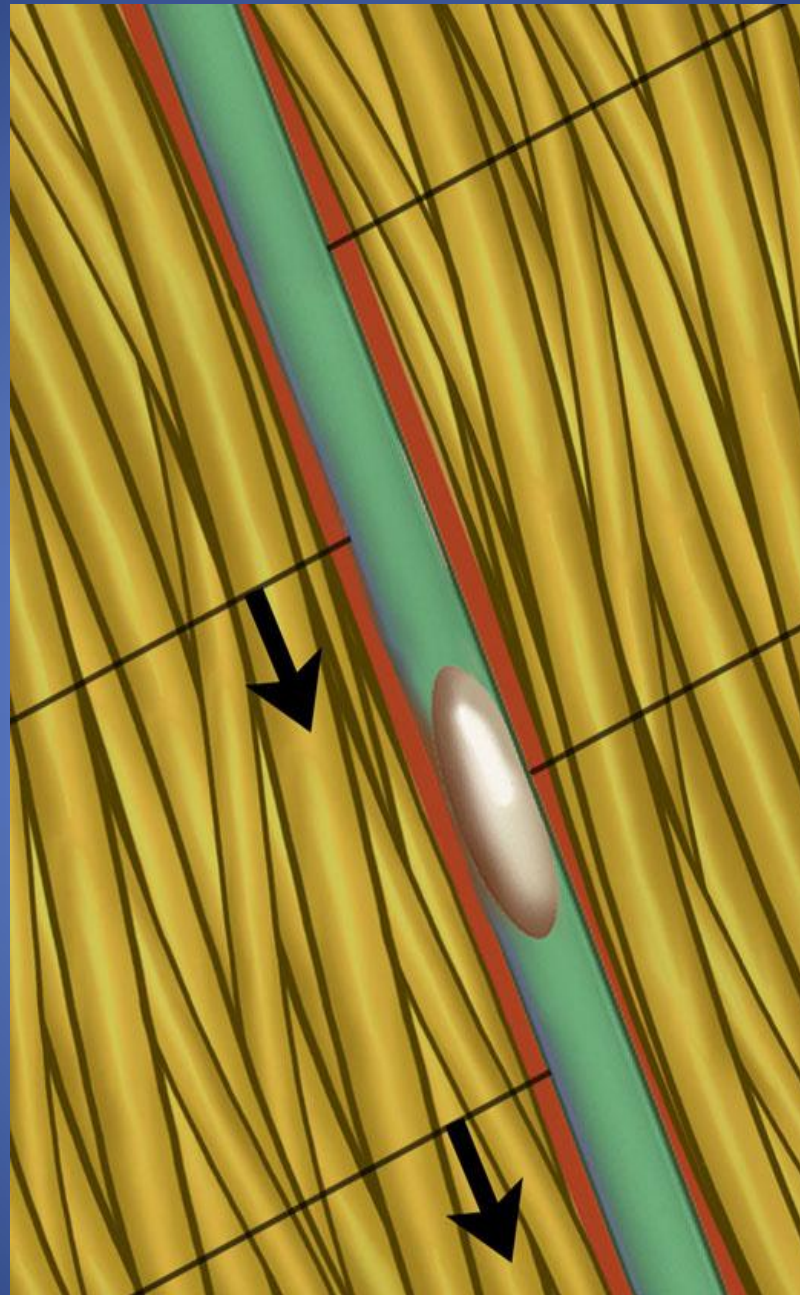




**t = before
contraction
or heel
drop**



Shear on
cell with
heel drop



That was
shearing...



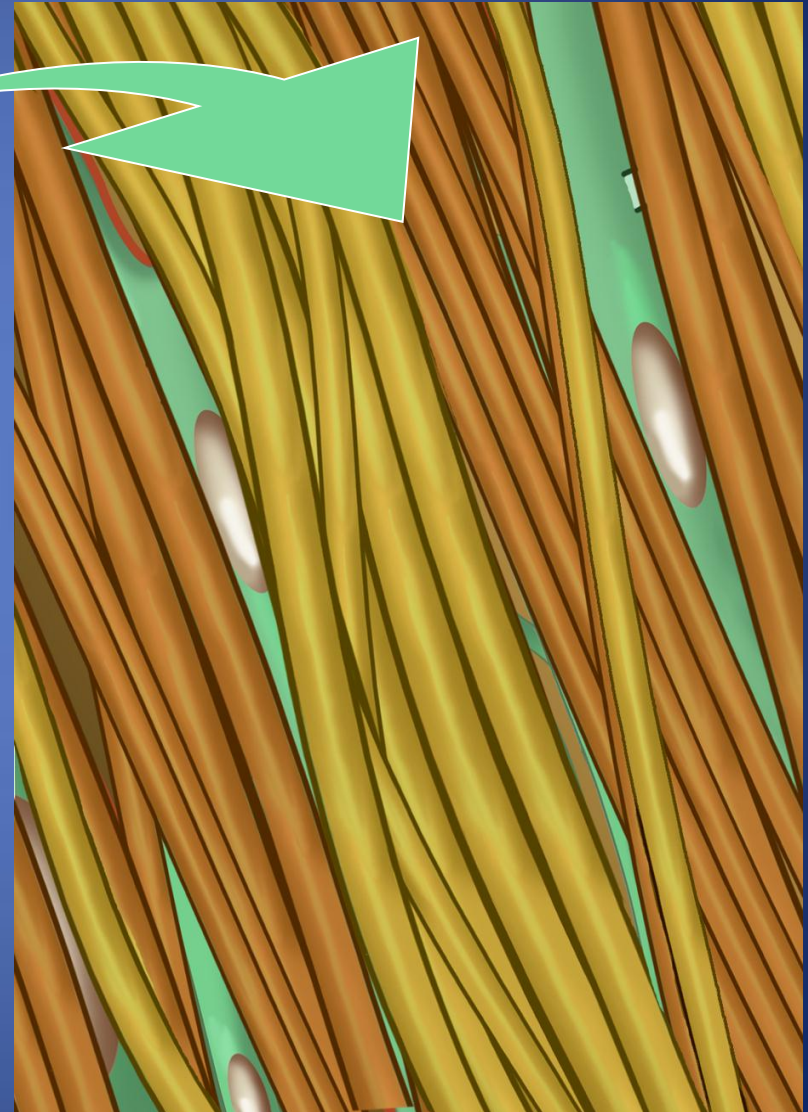
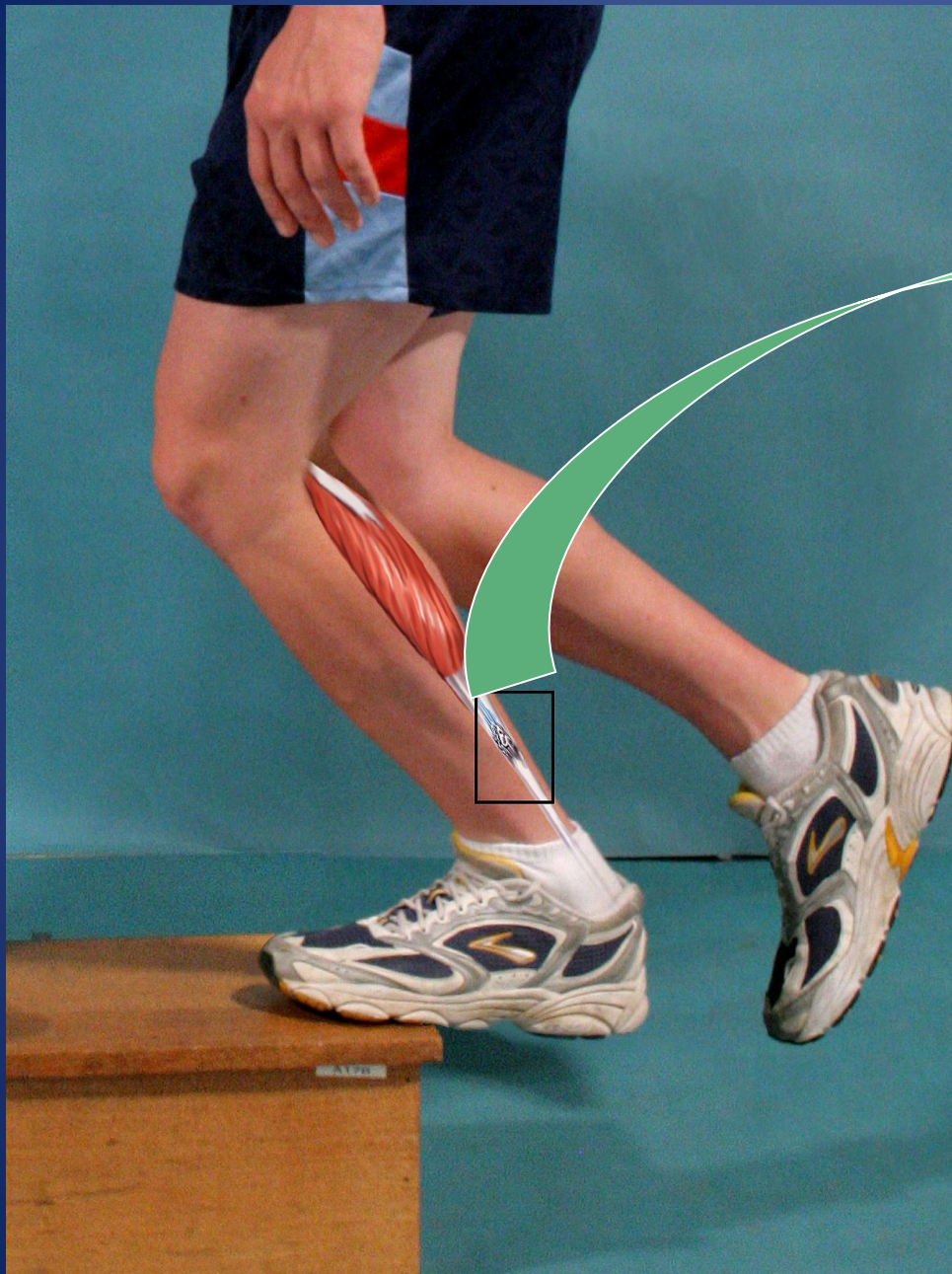
4 steps to understand mechanotransduction

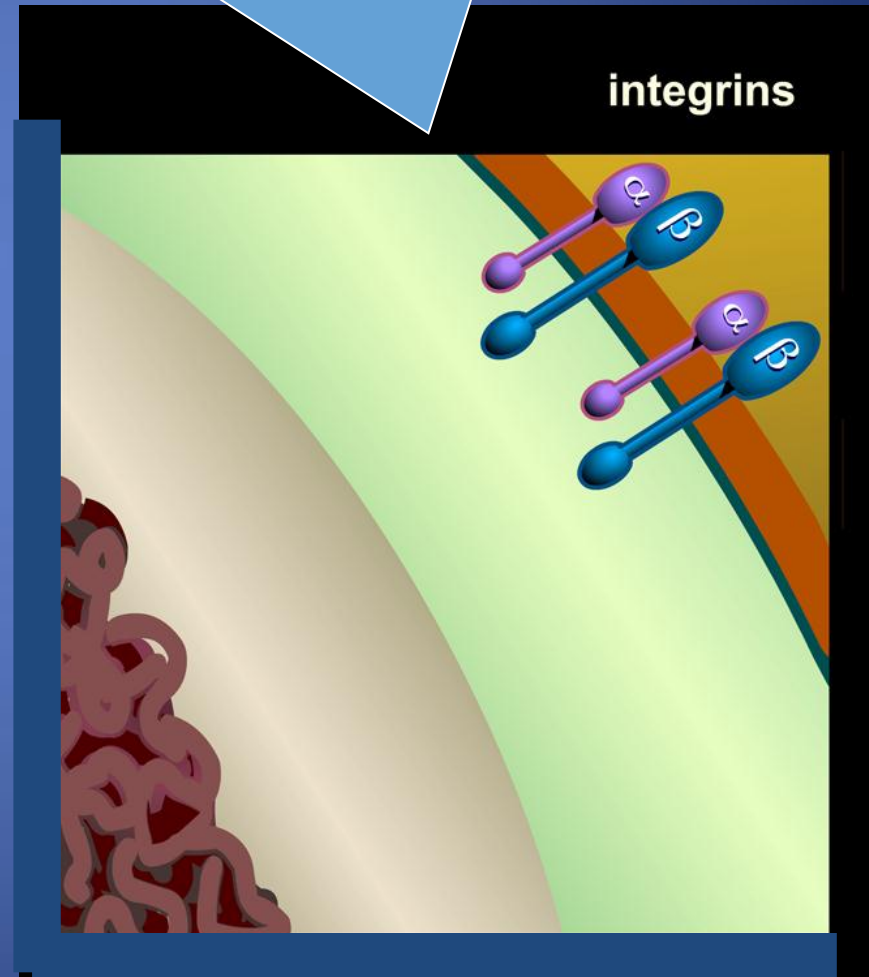
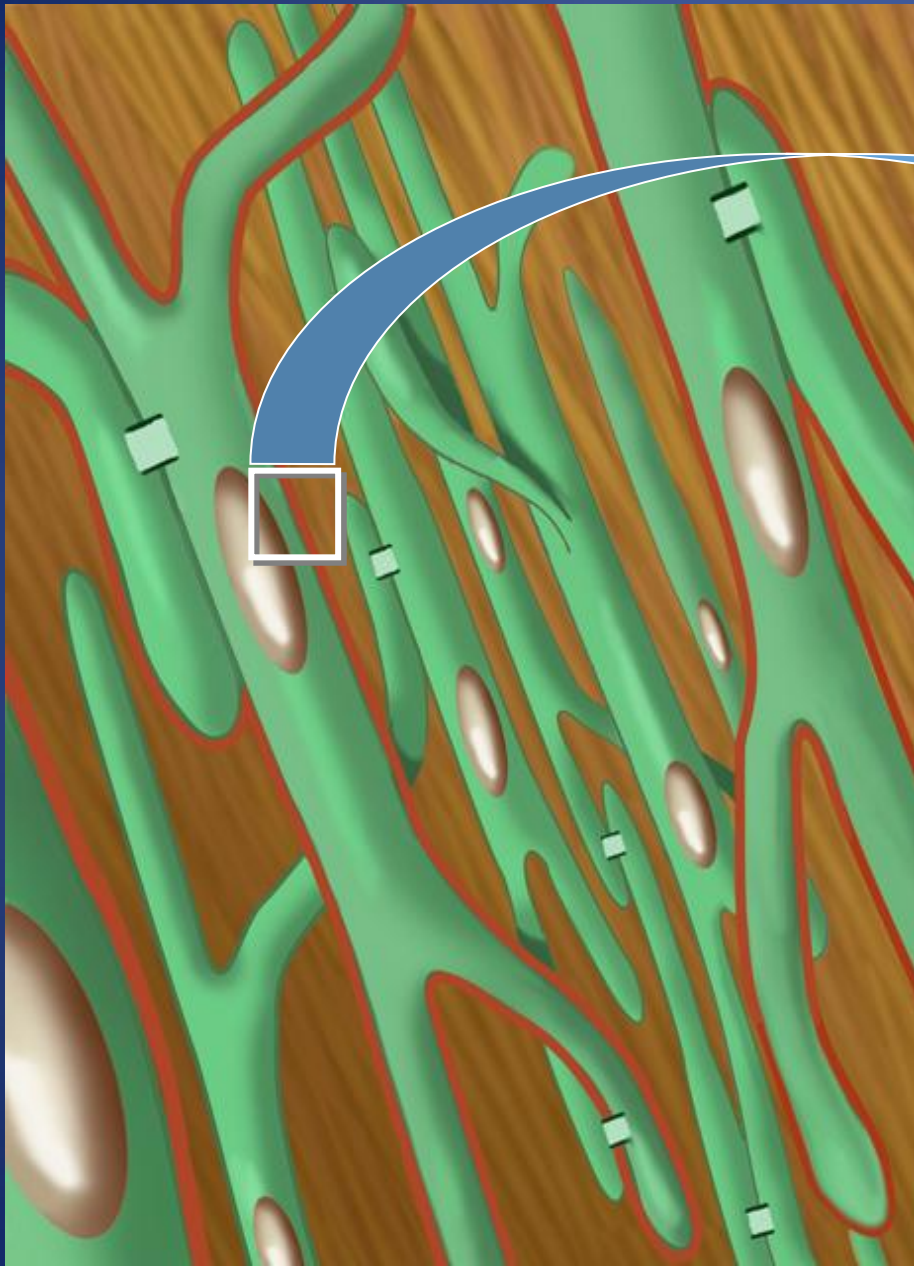
1. Cellular anatomy
 2. Mechanocoupling (initiation – mechanical load turns into biochemical signal)
 3. Gene upregulation and protein synthesis
 4. Cell-cell communication
- 







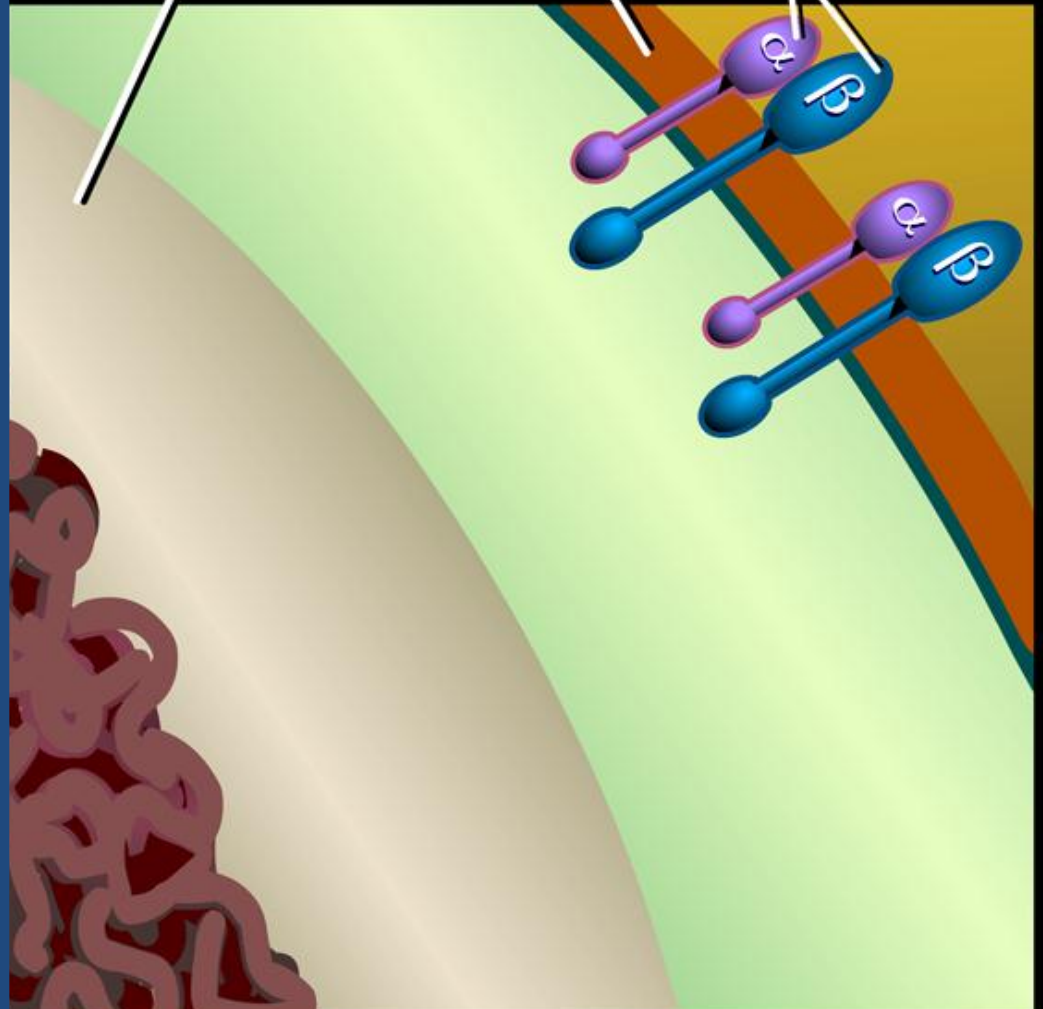




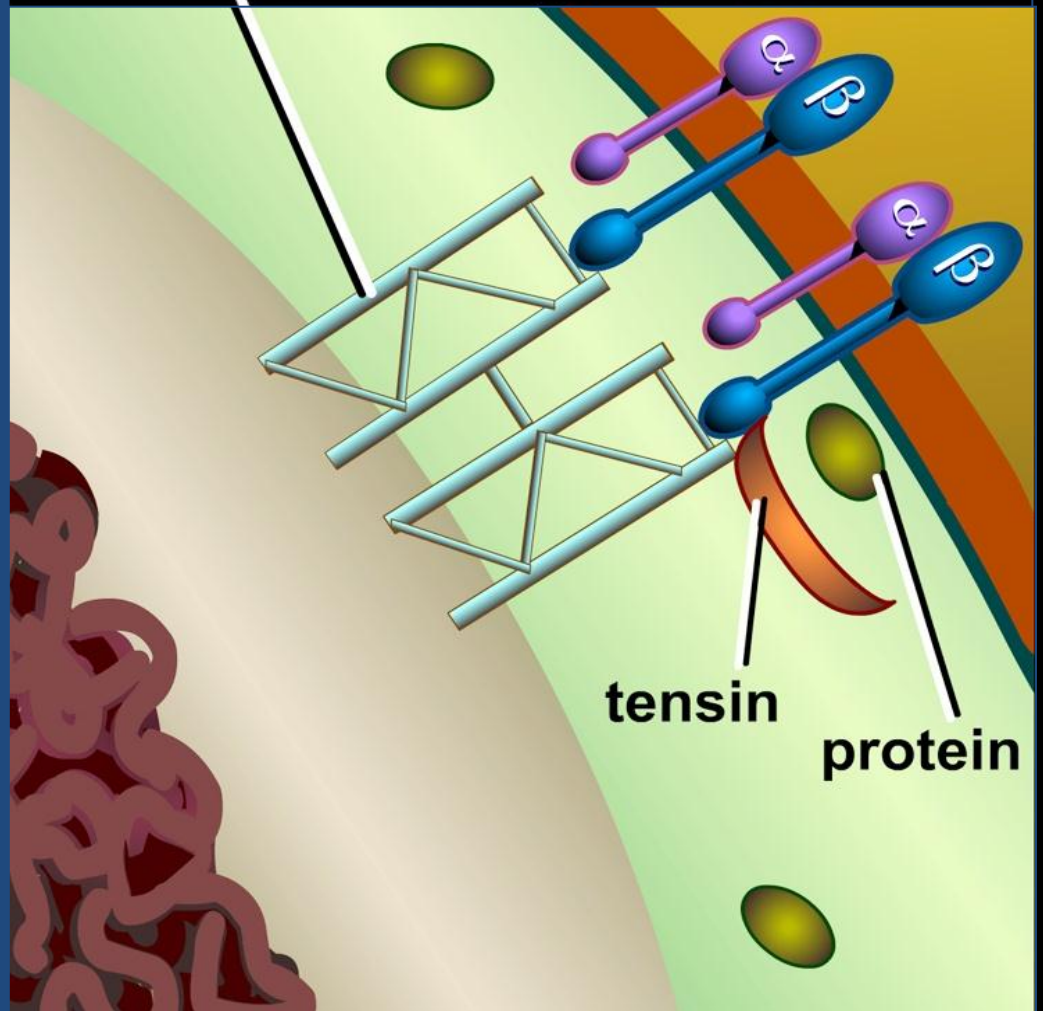
cell membrane

nucleus

integrins

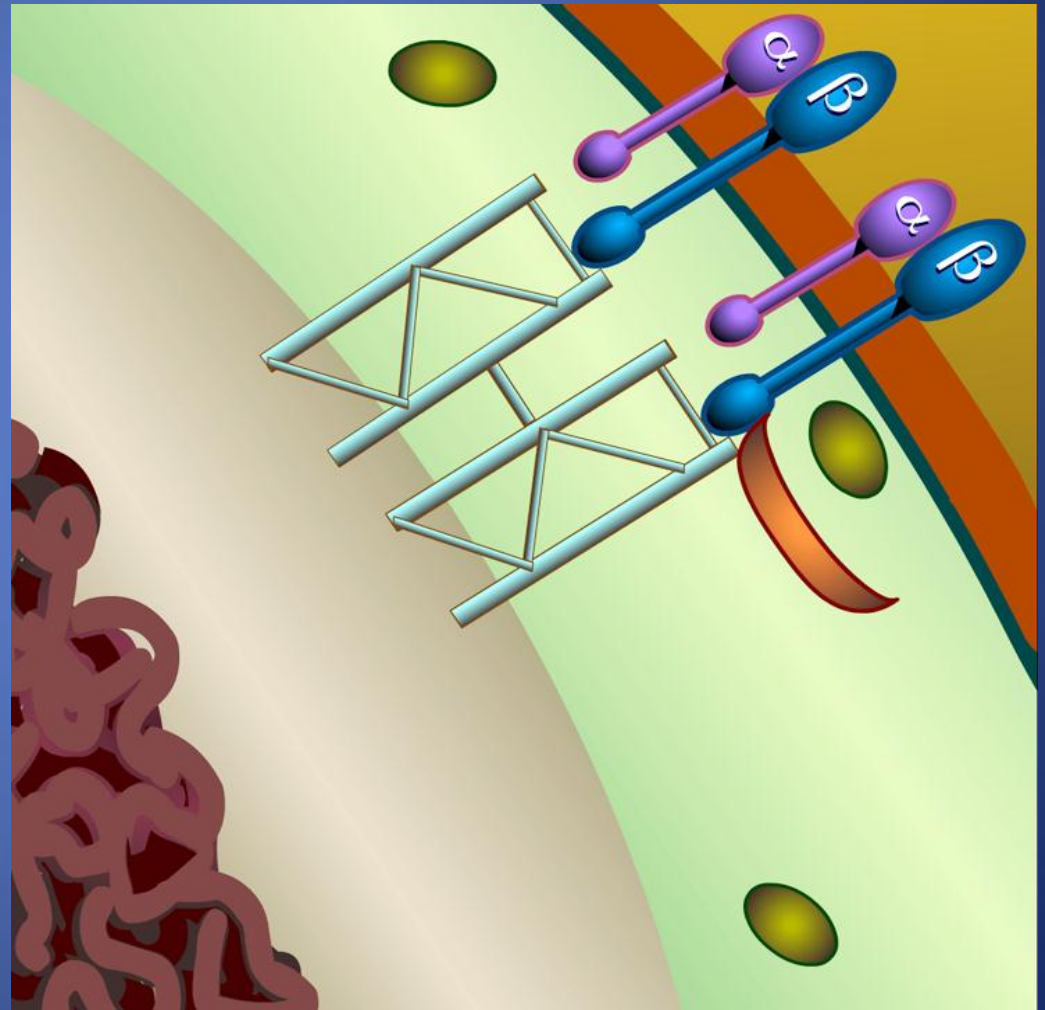


cytoskeleton



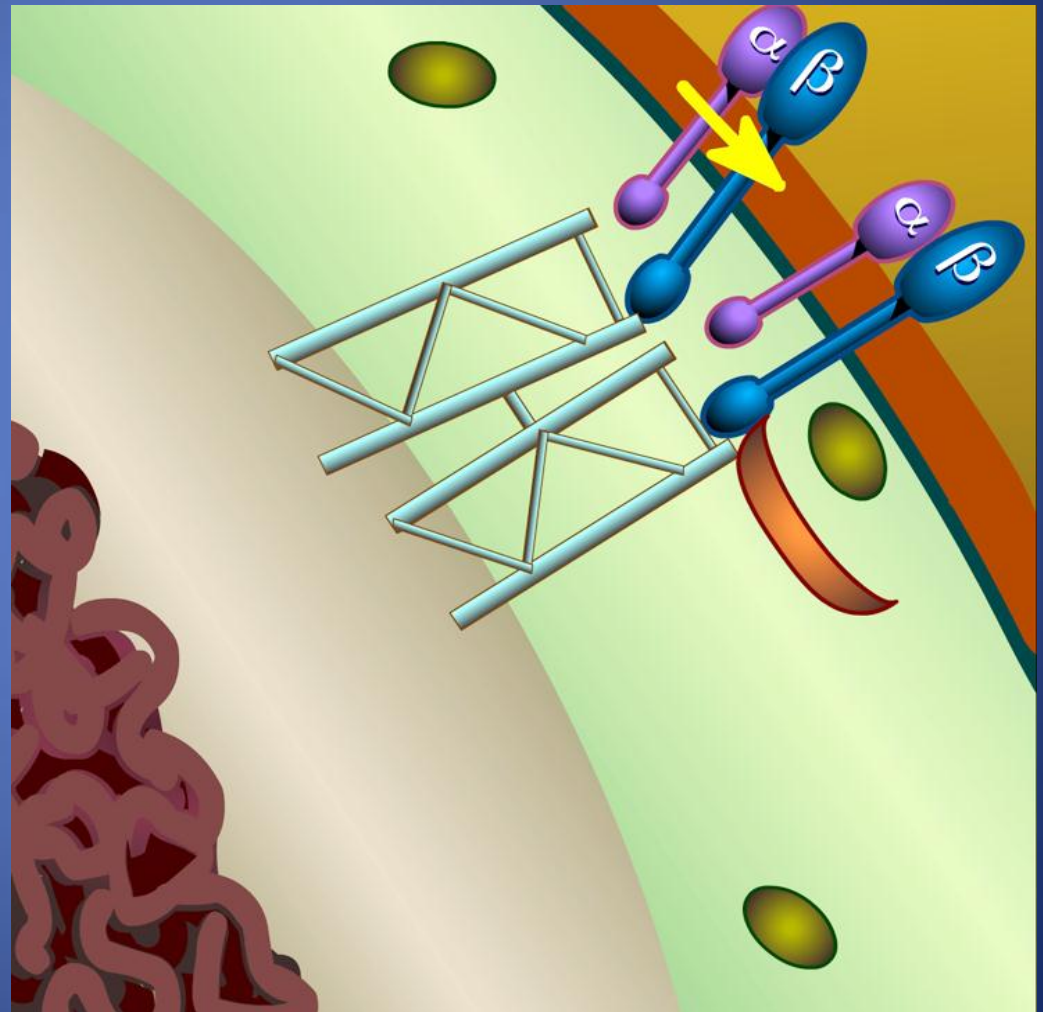


The **heel drop** stimulates **integrins** to flip and this triggers signaling pathways



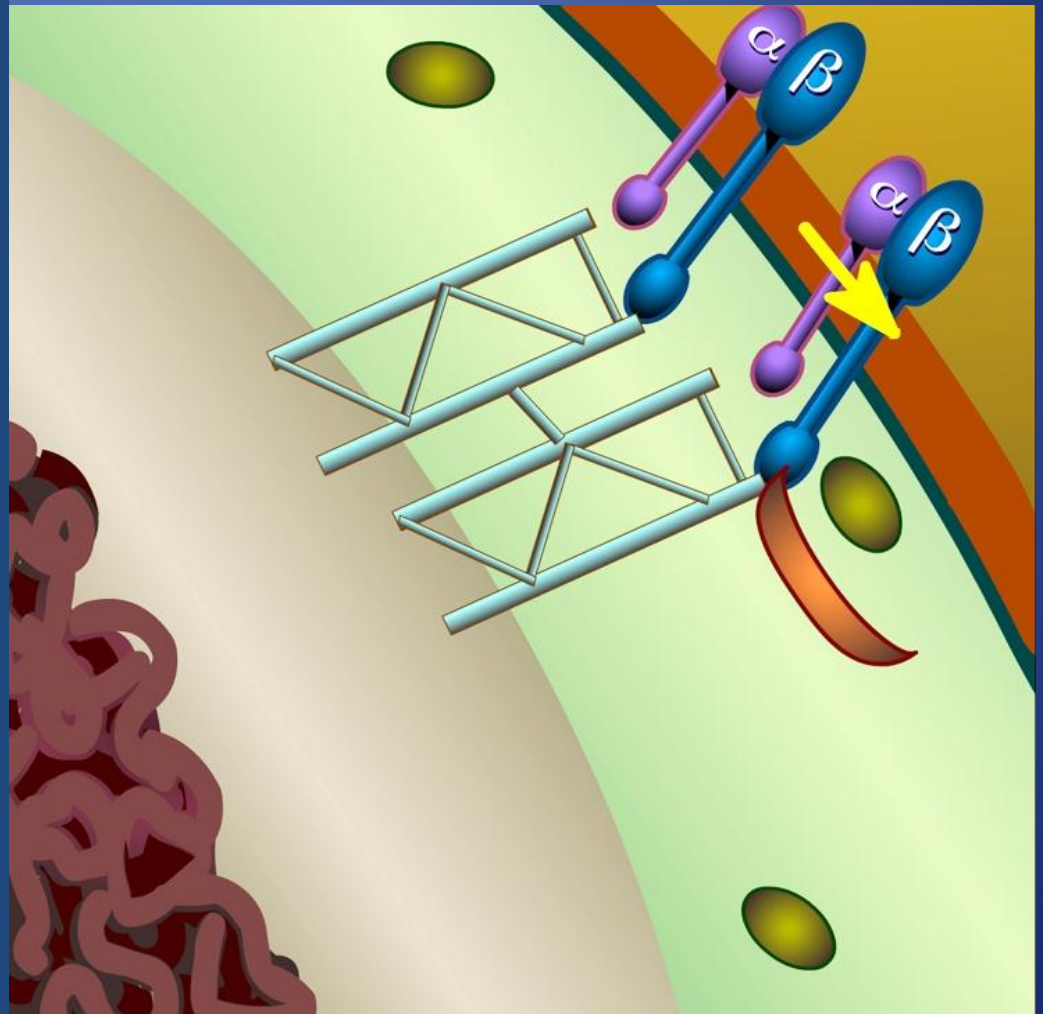


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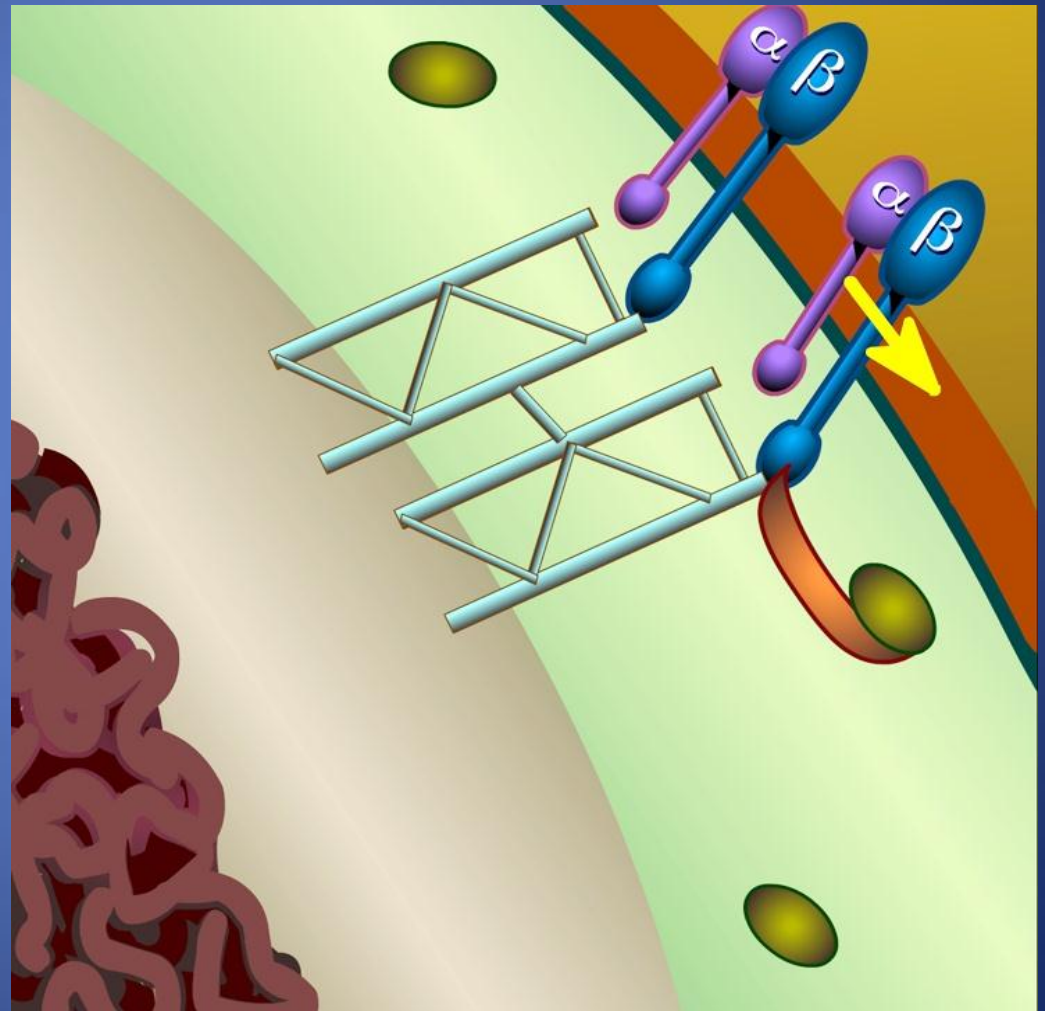


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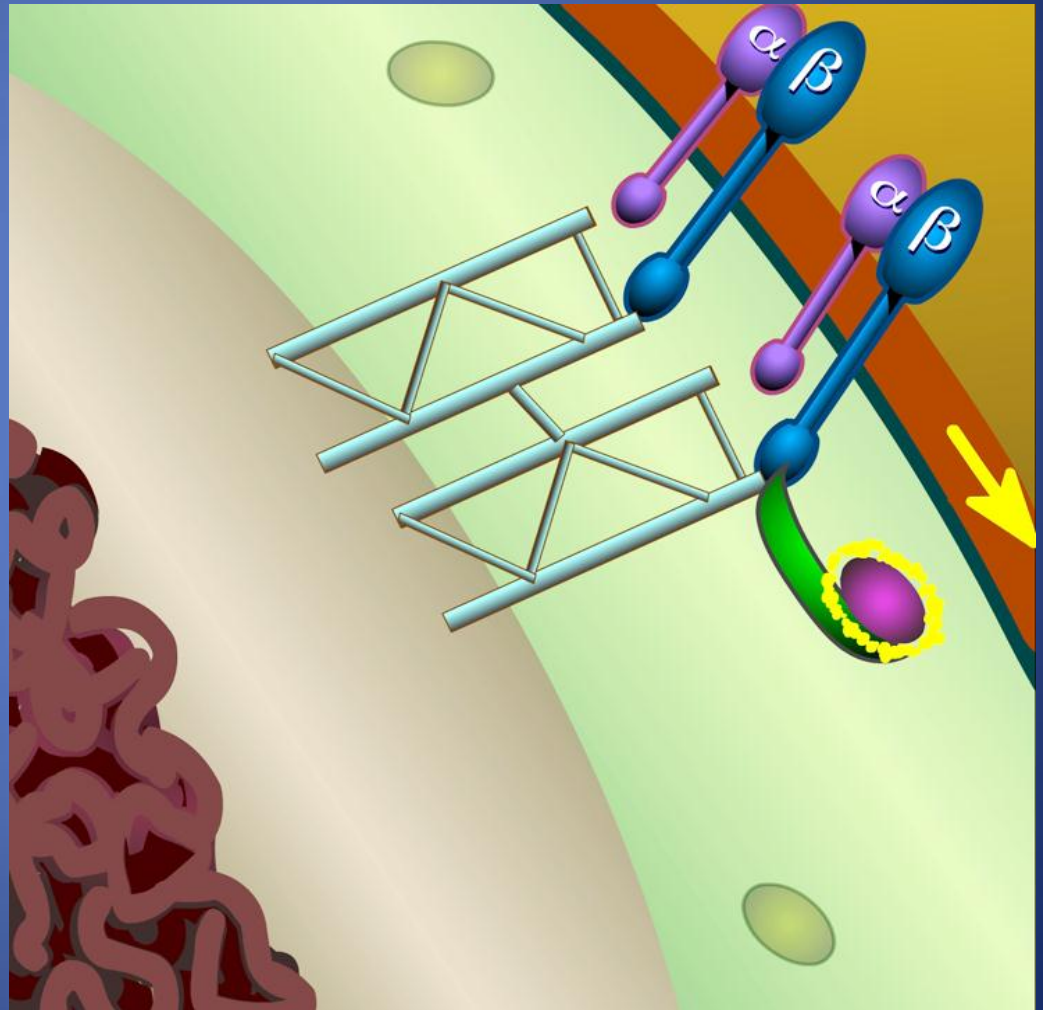


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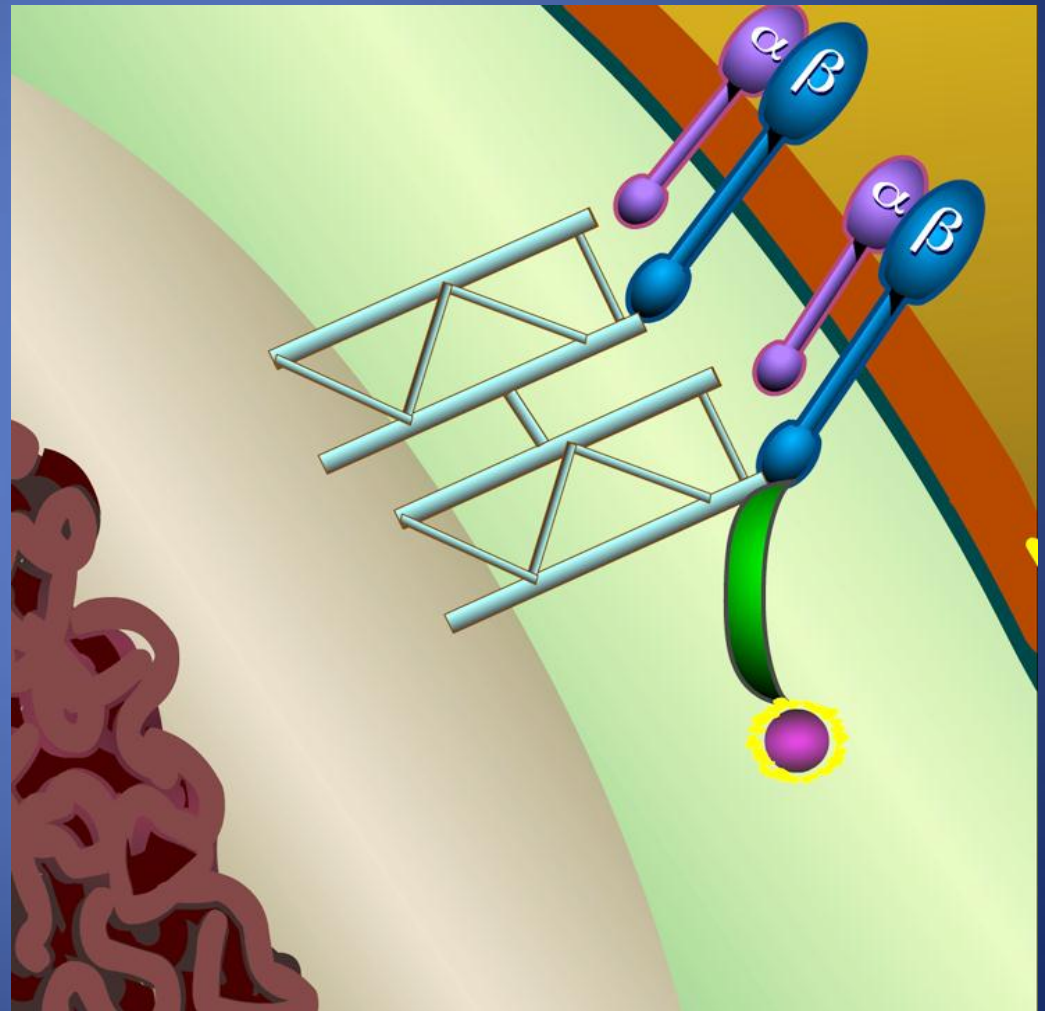


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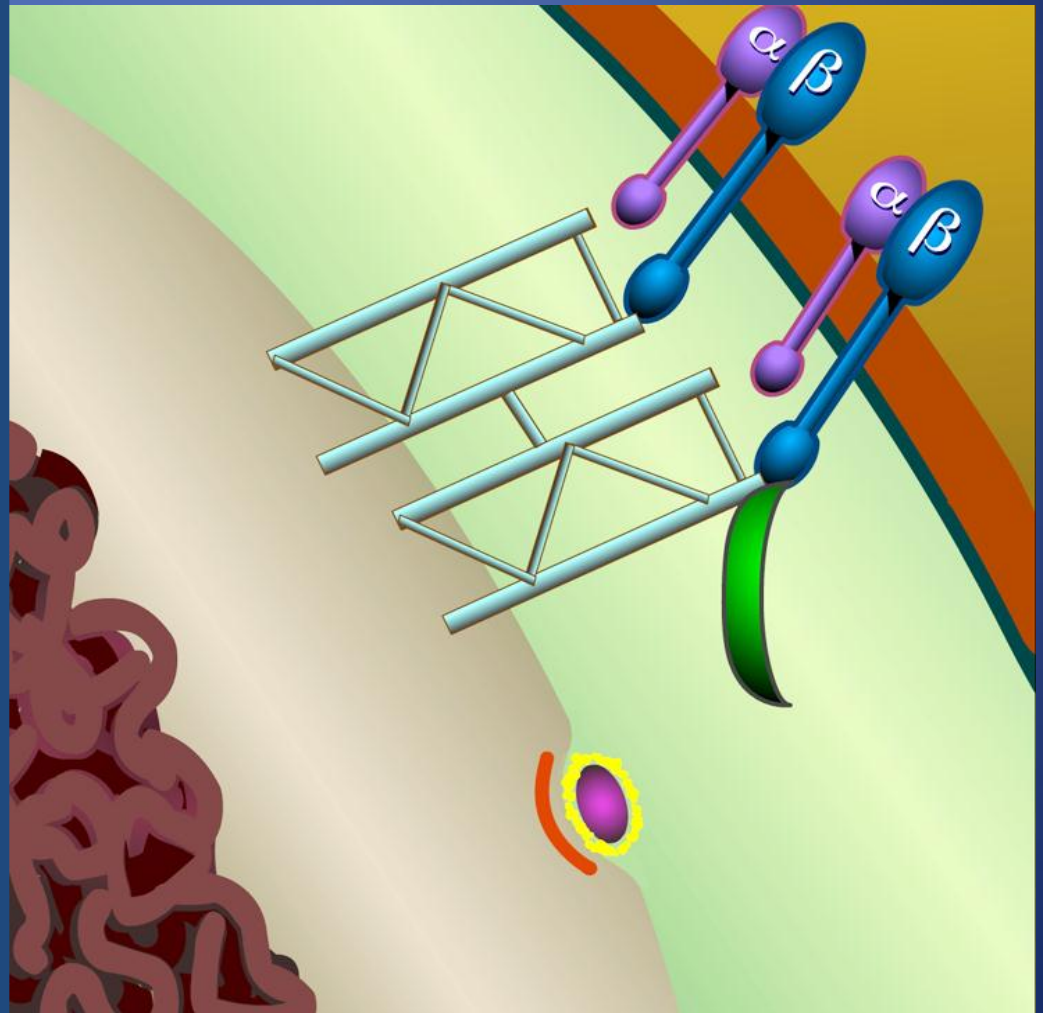


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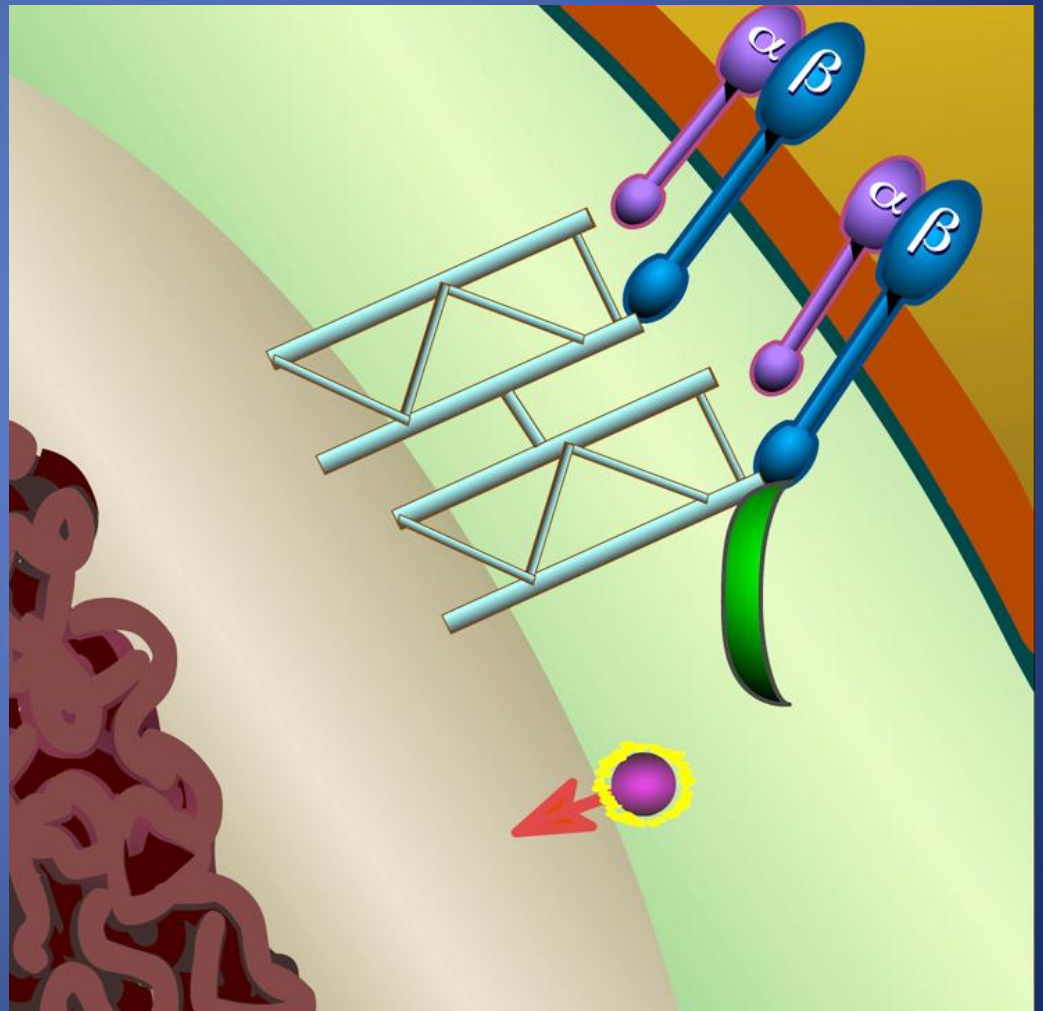


**The nucleus is signaled to
create mRNA**



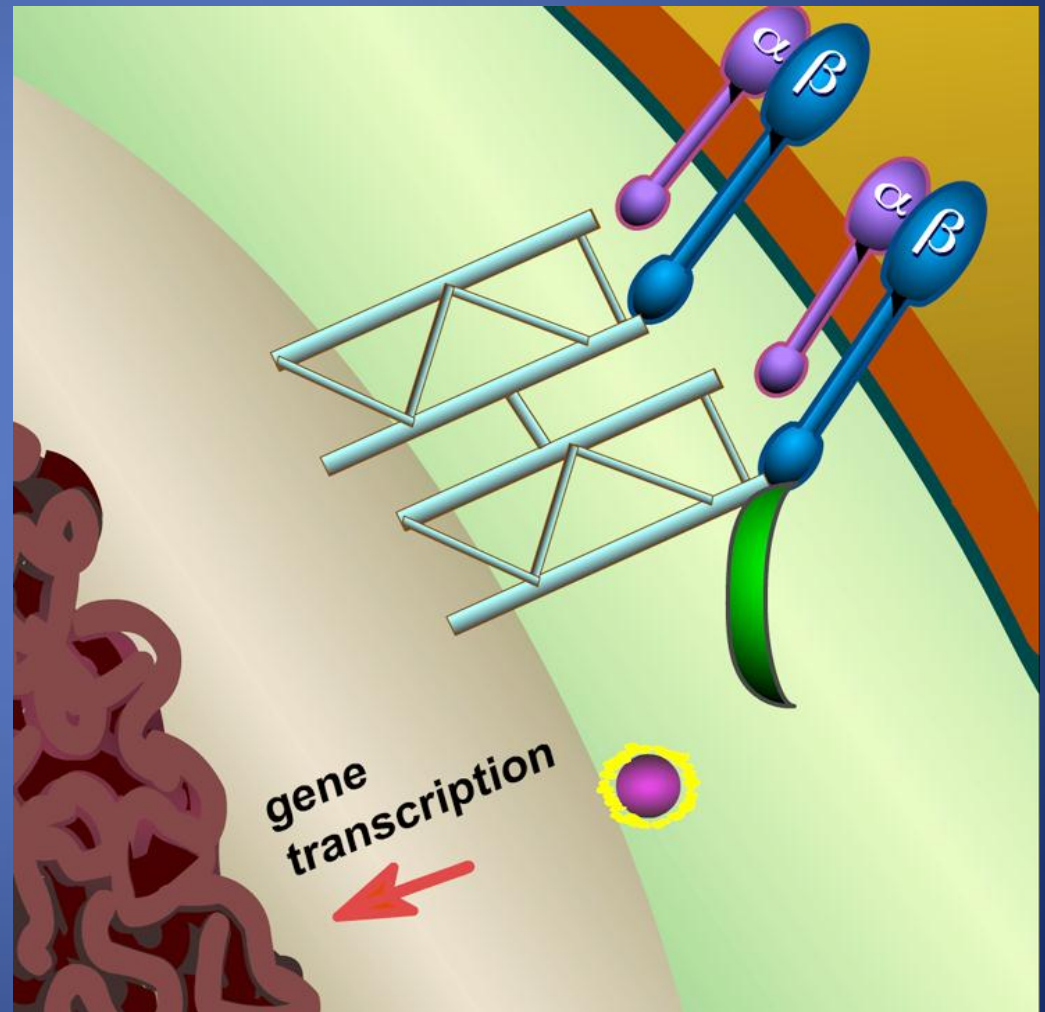


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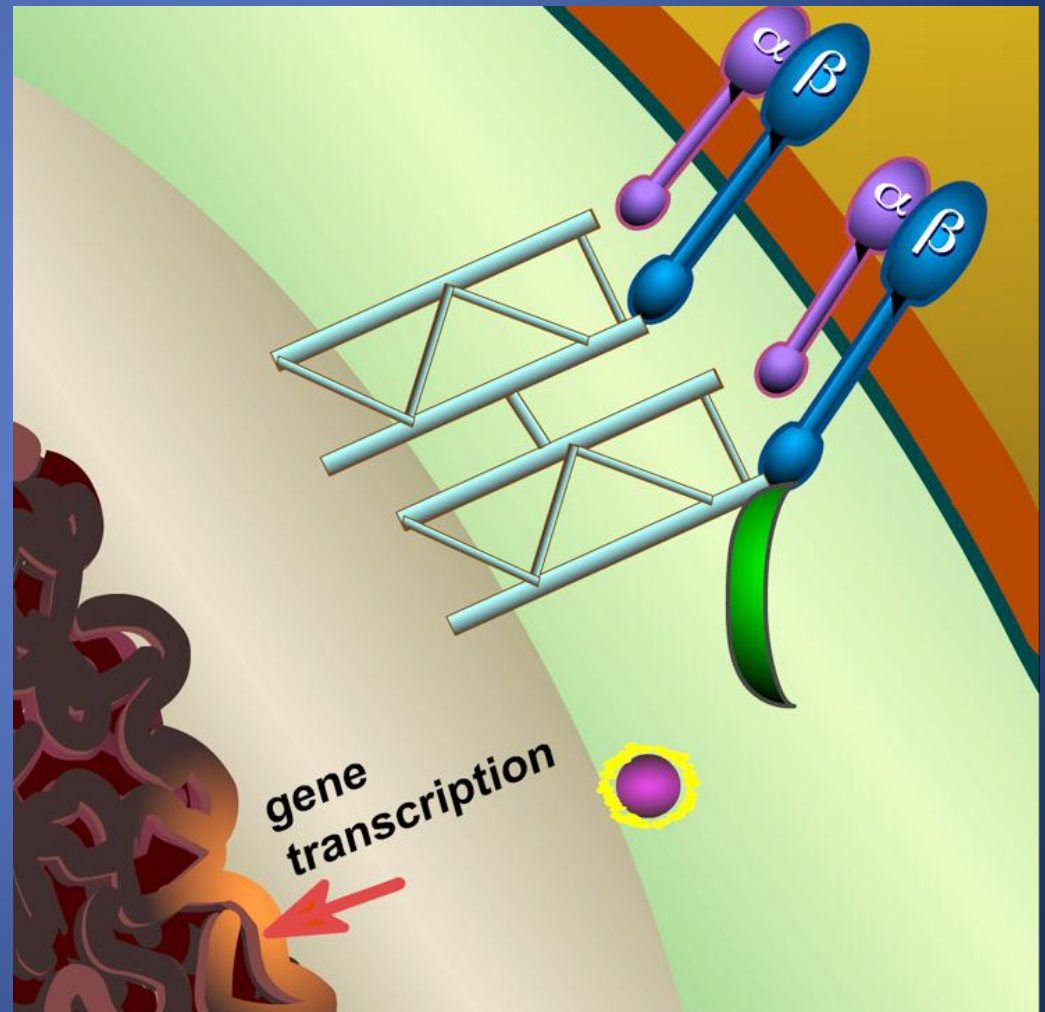


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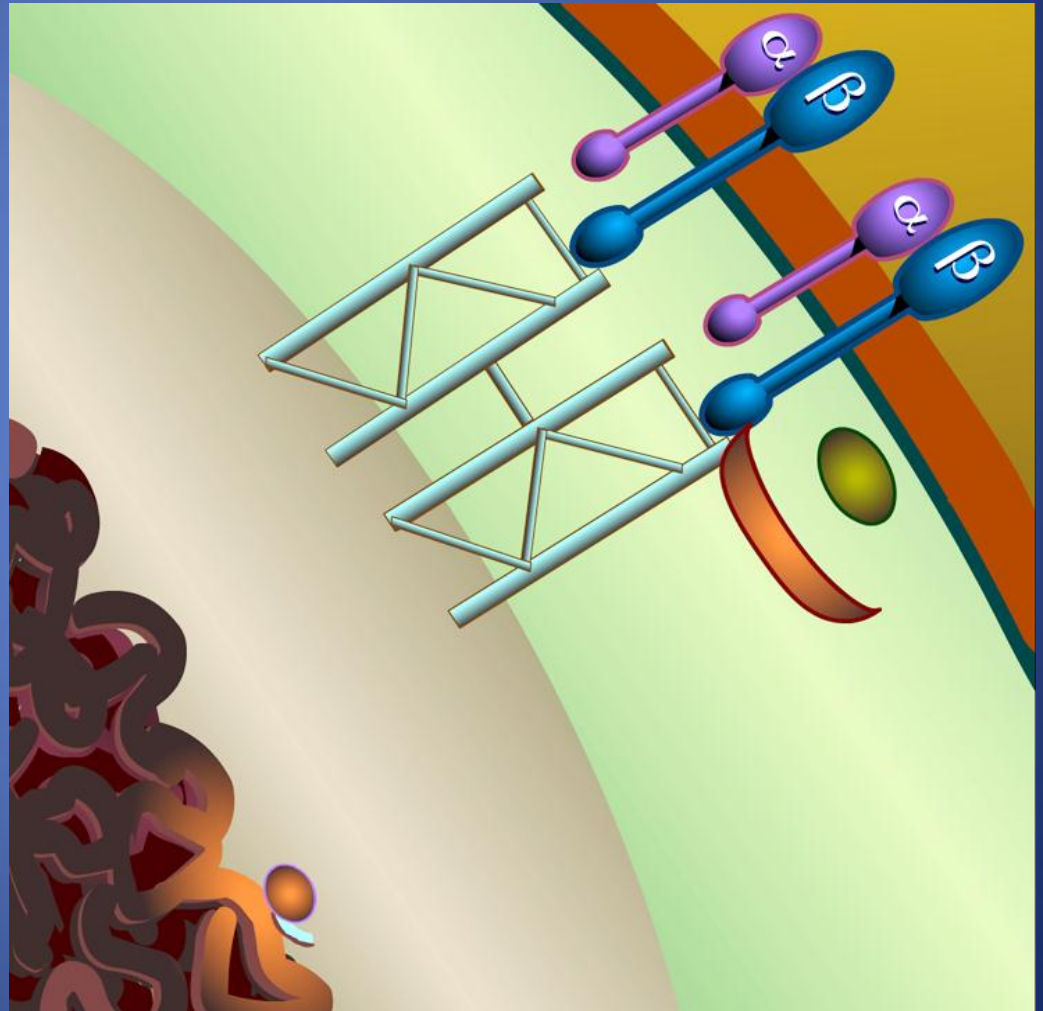


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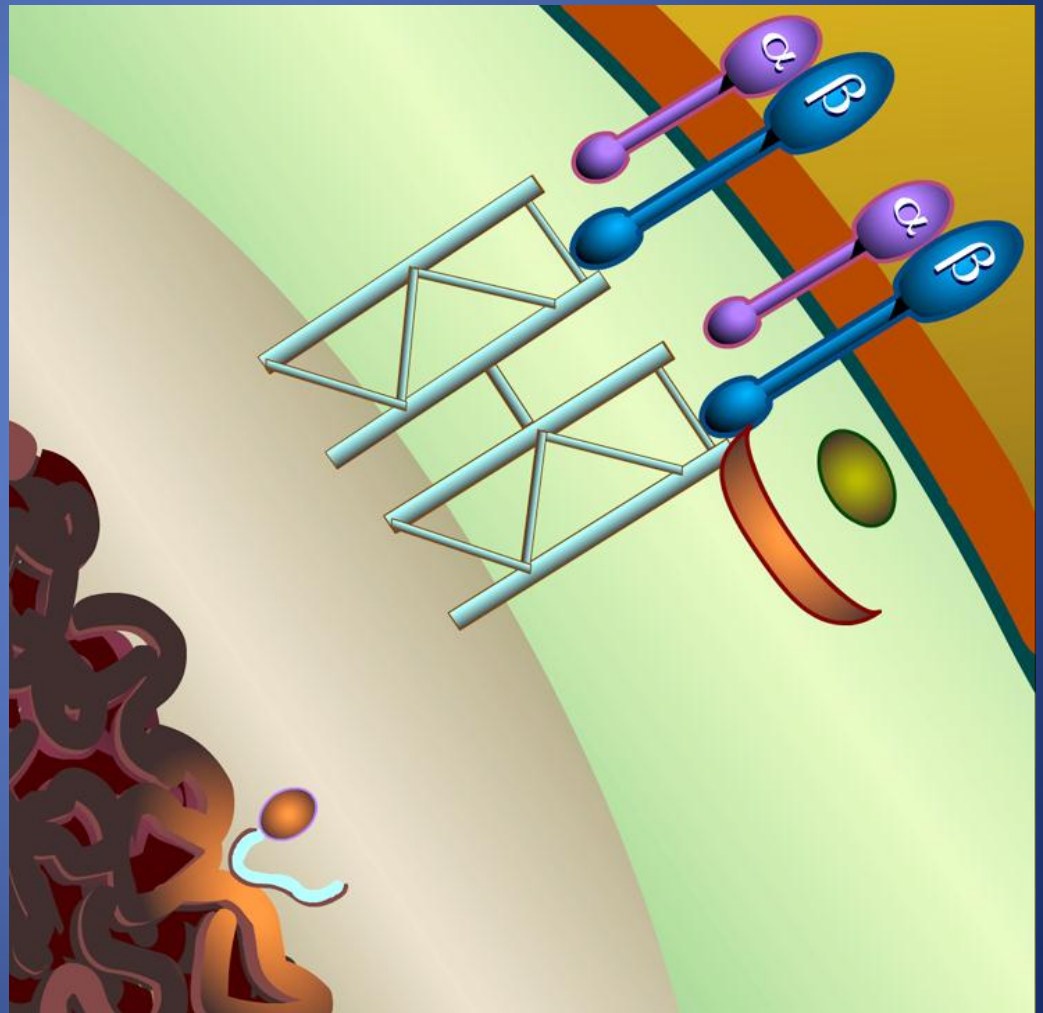




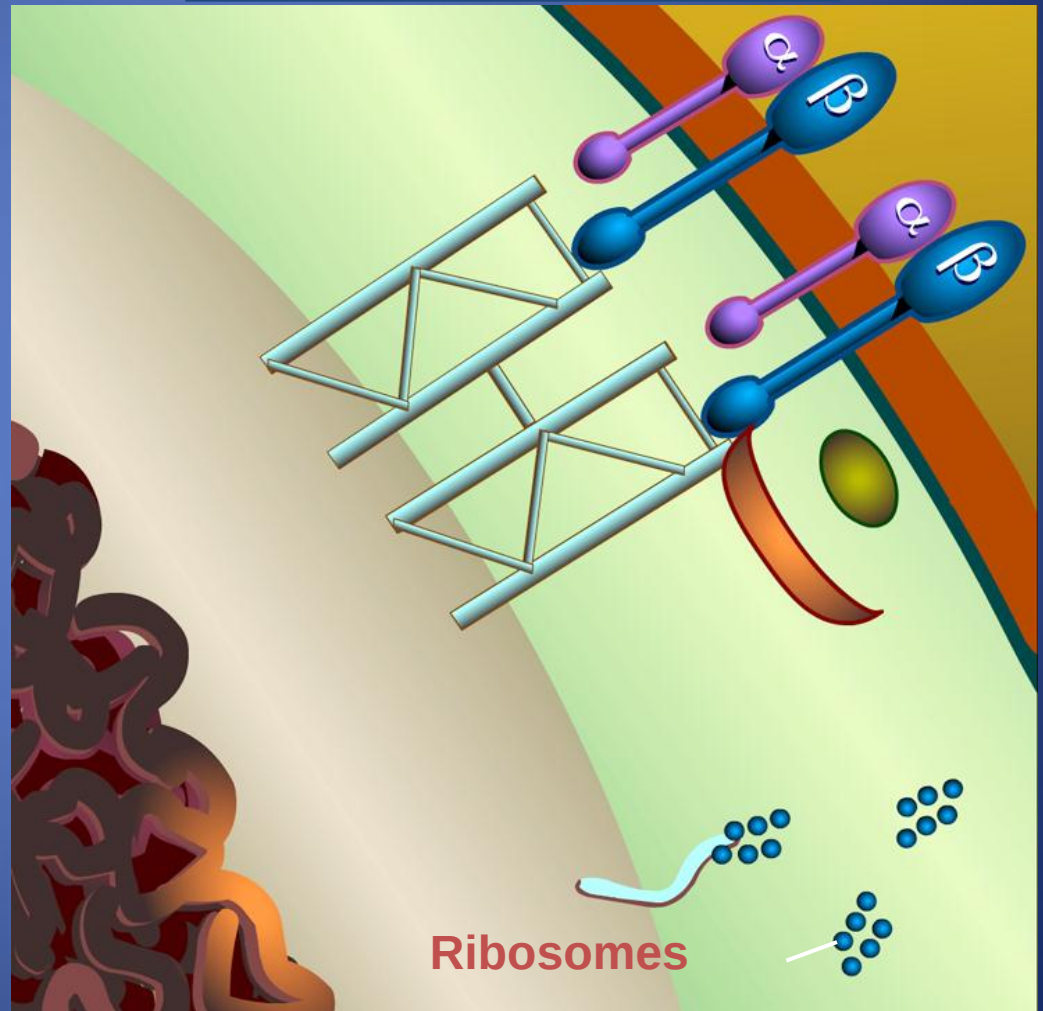
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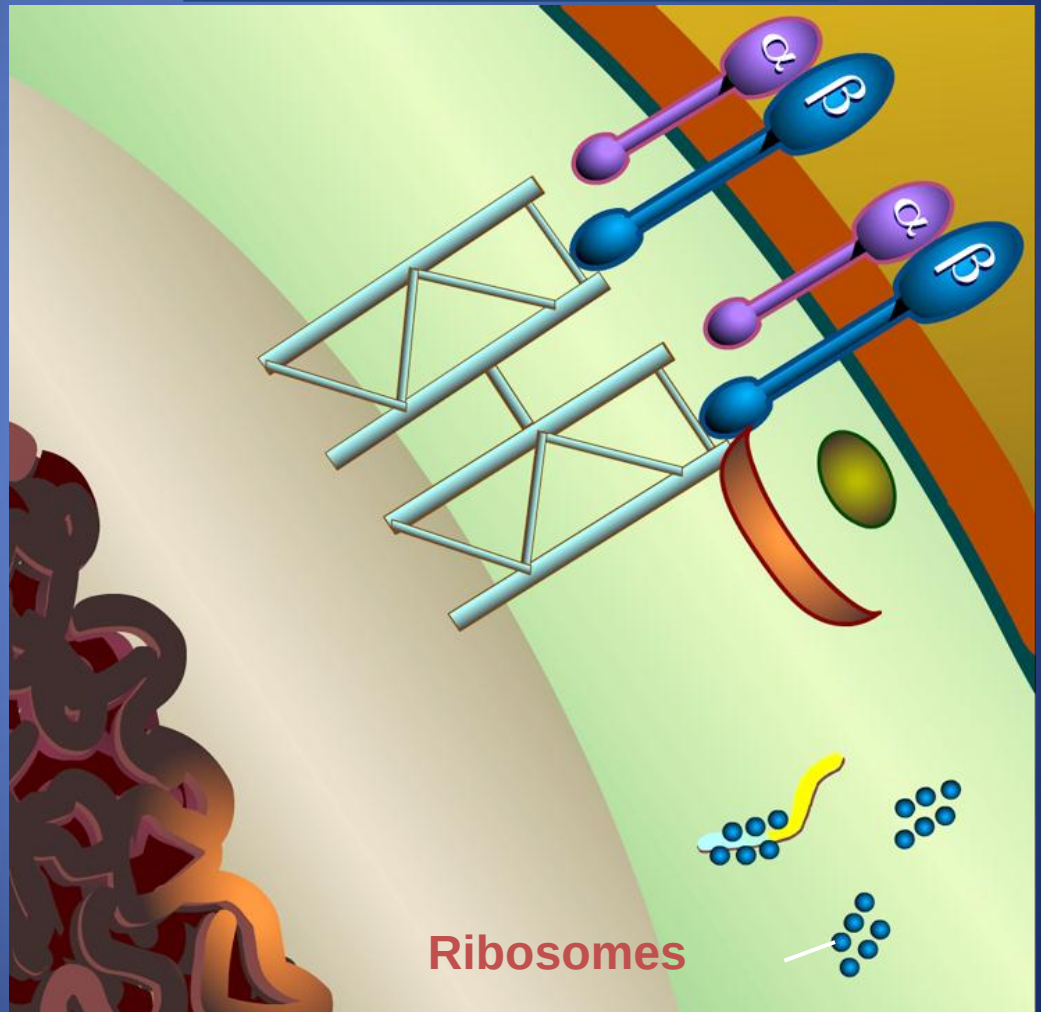
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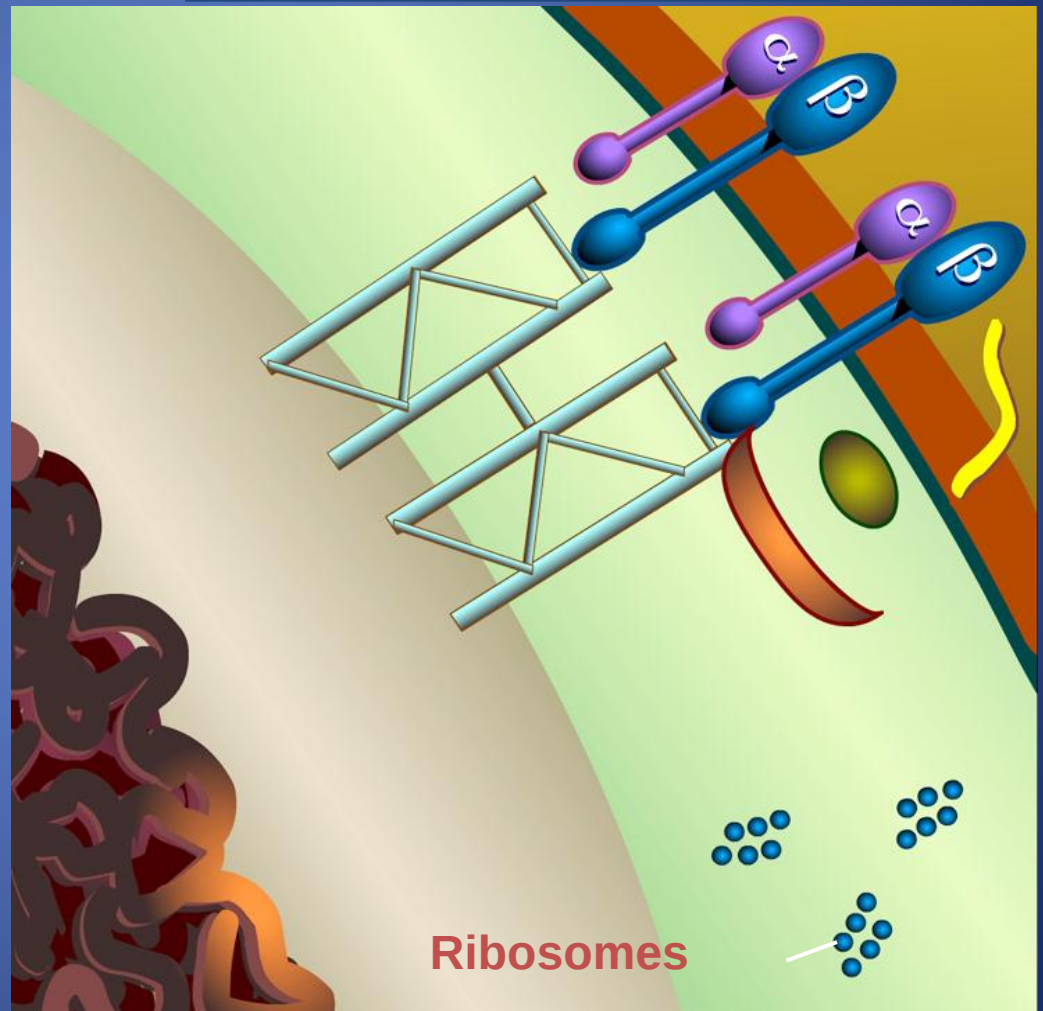
Ribosomes create protein



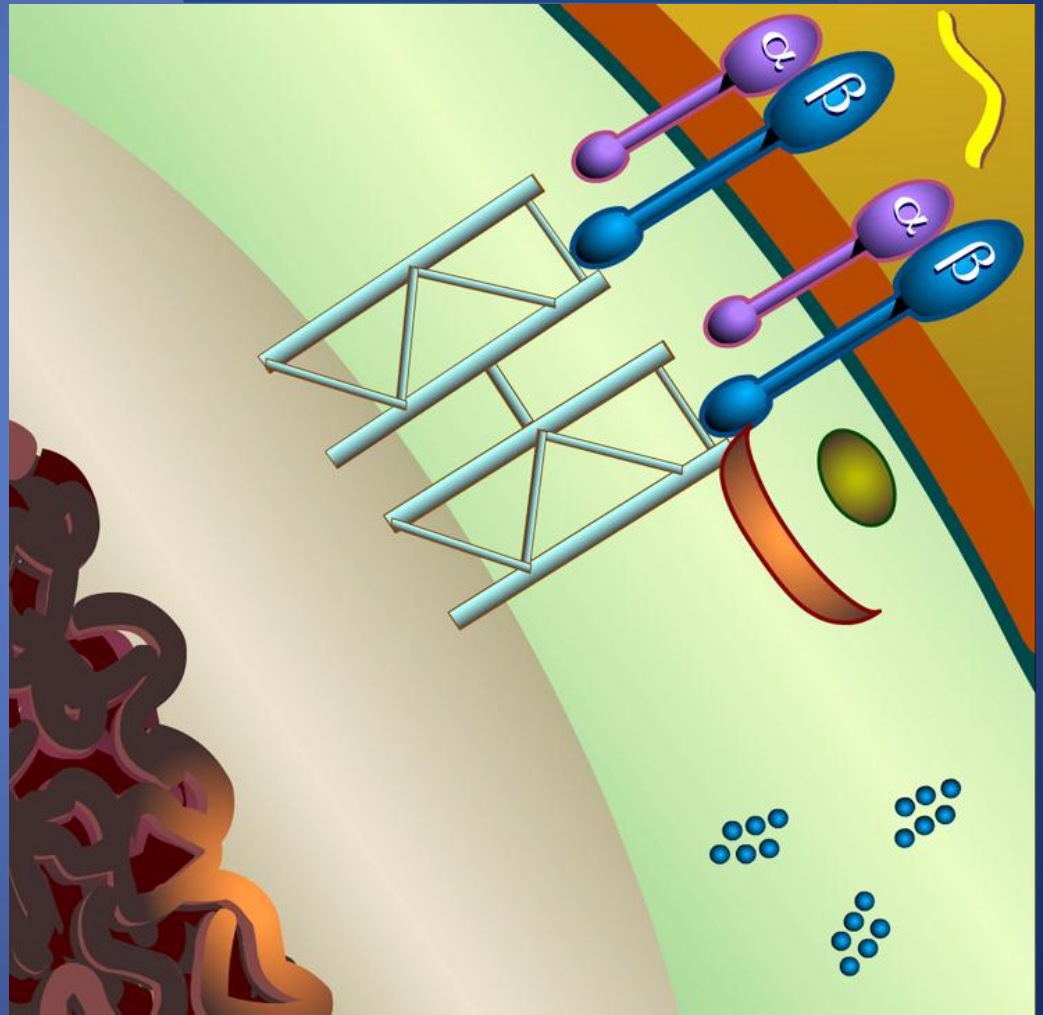
Ribosomes create protein

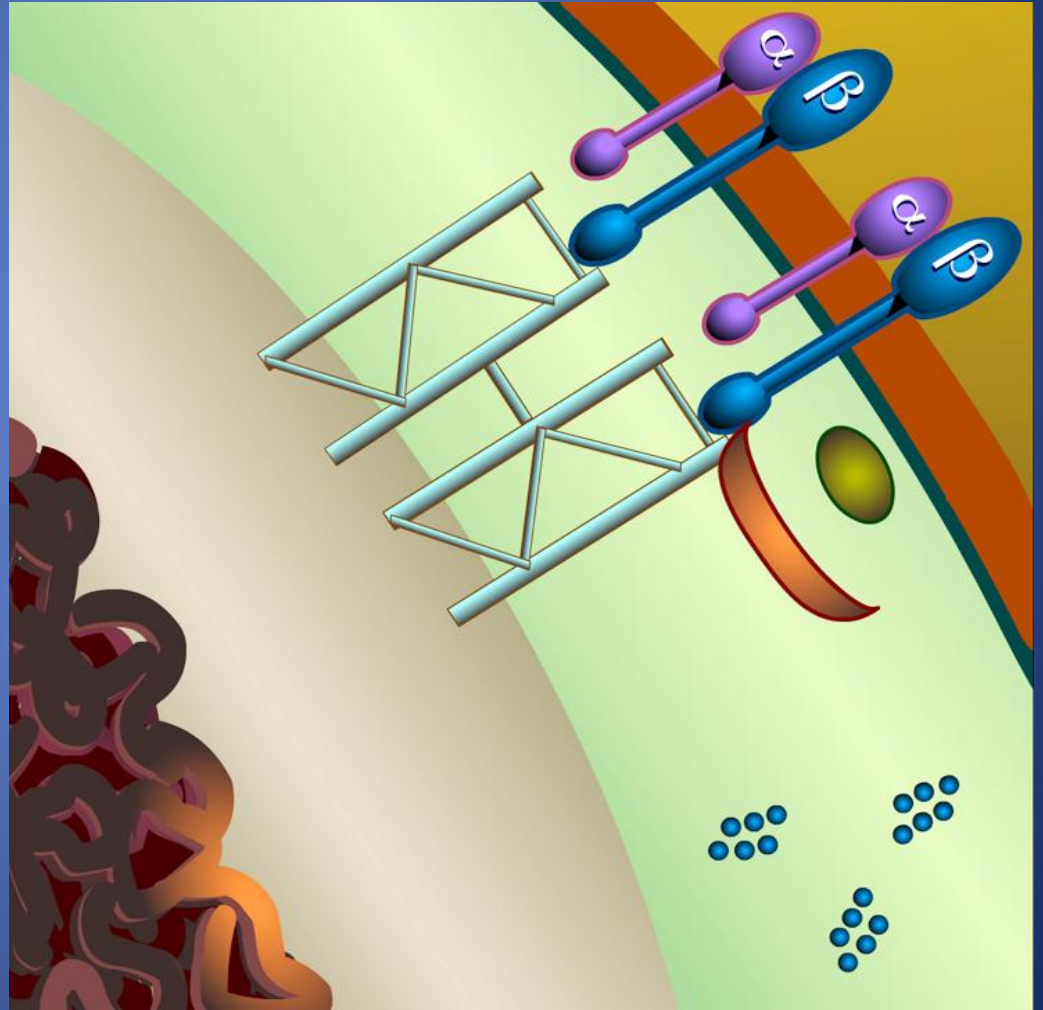


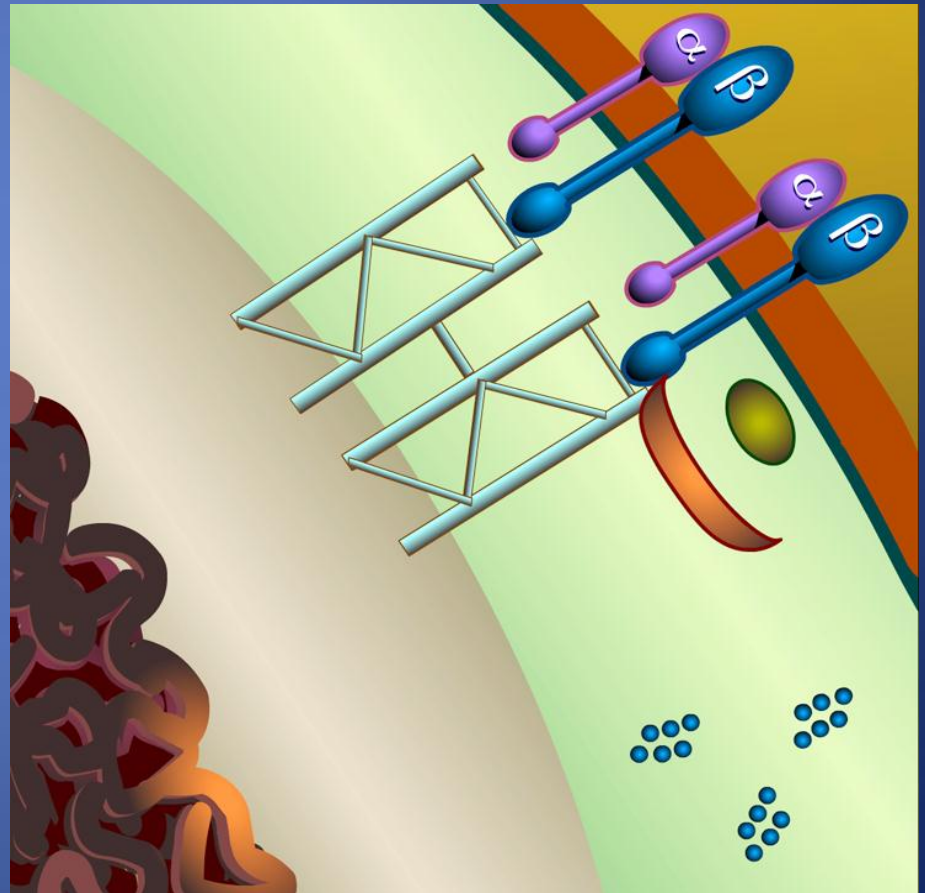
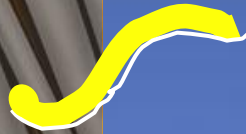
Collagen extrudes from matrix



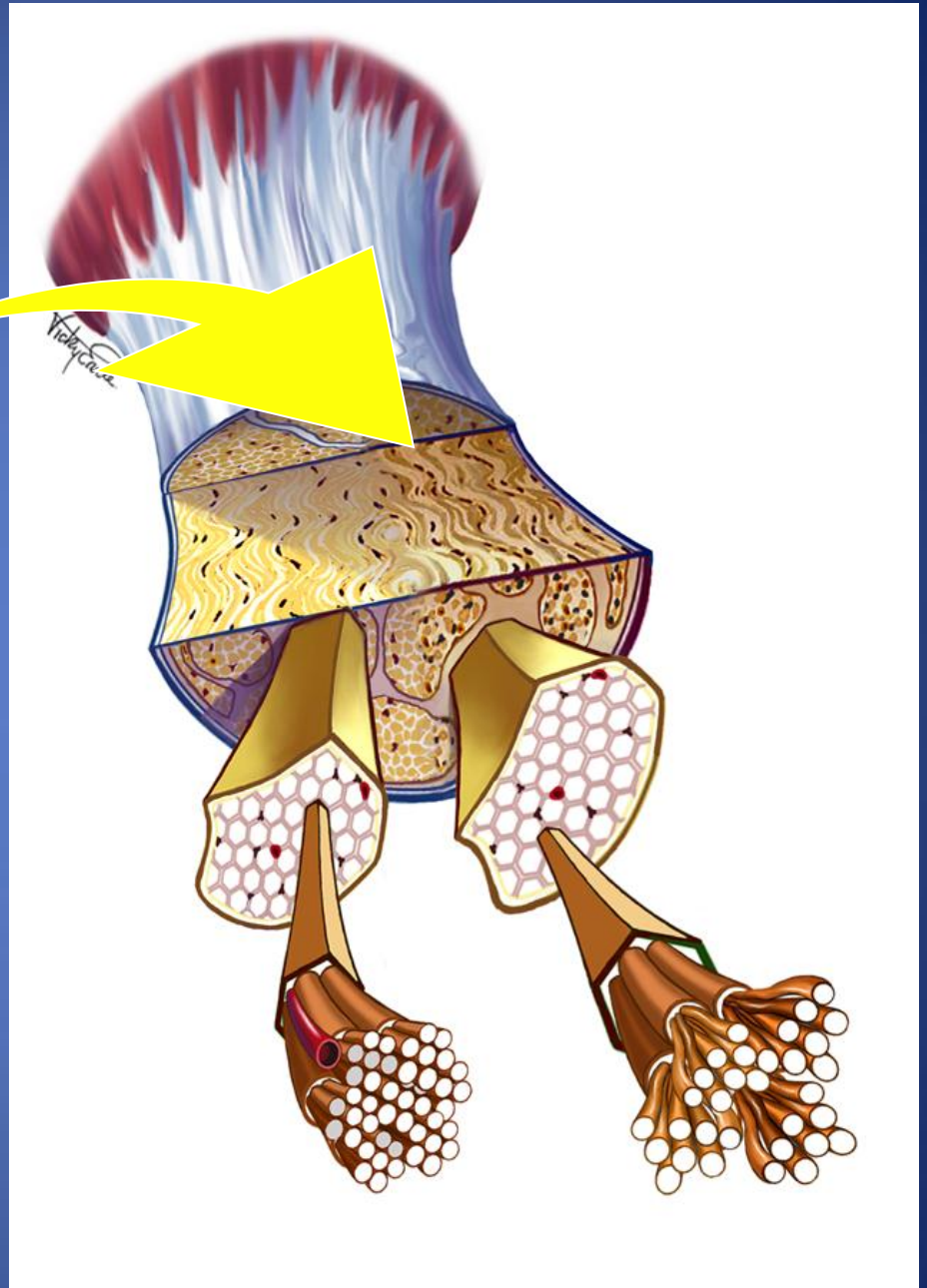
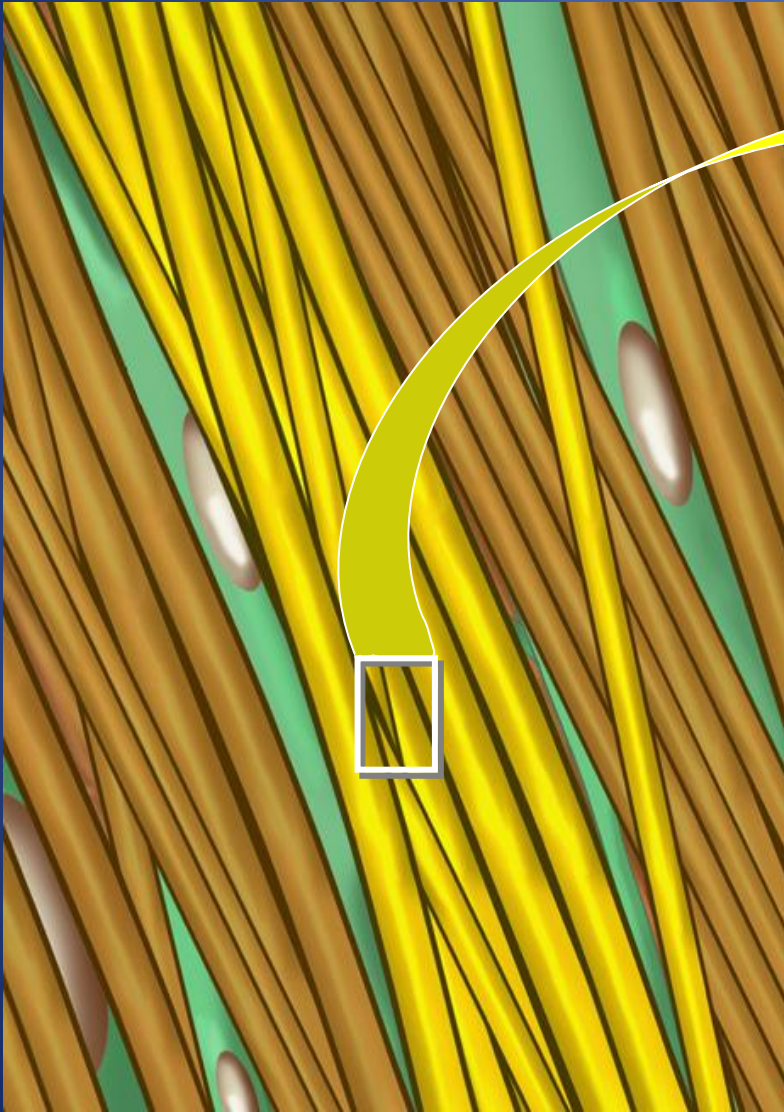
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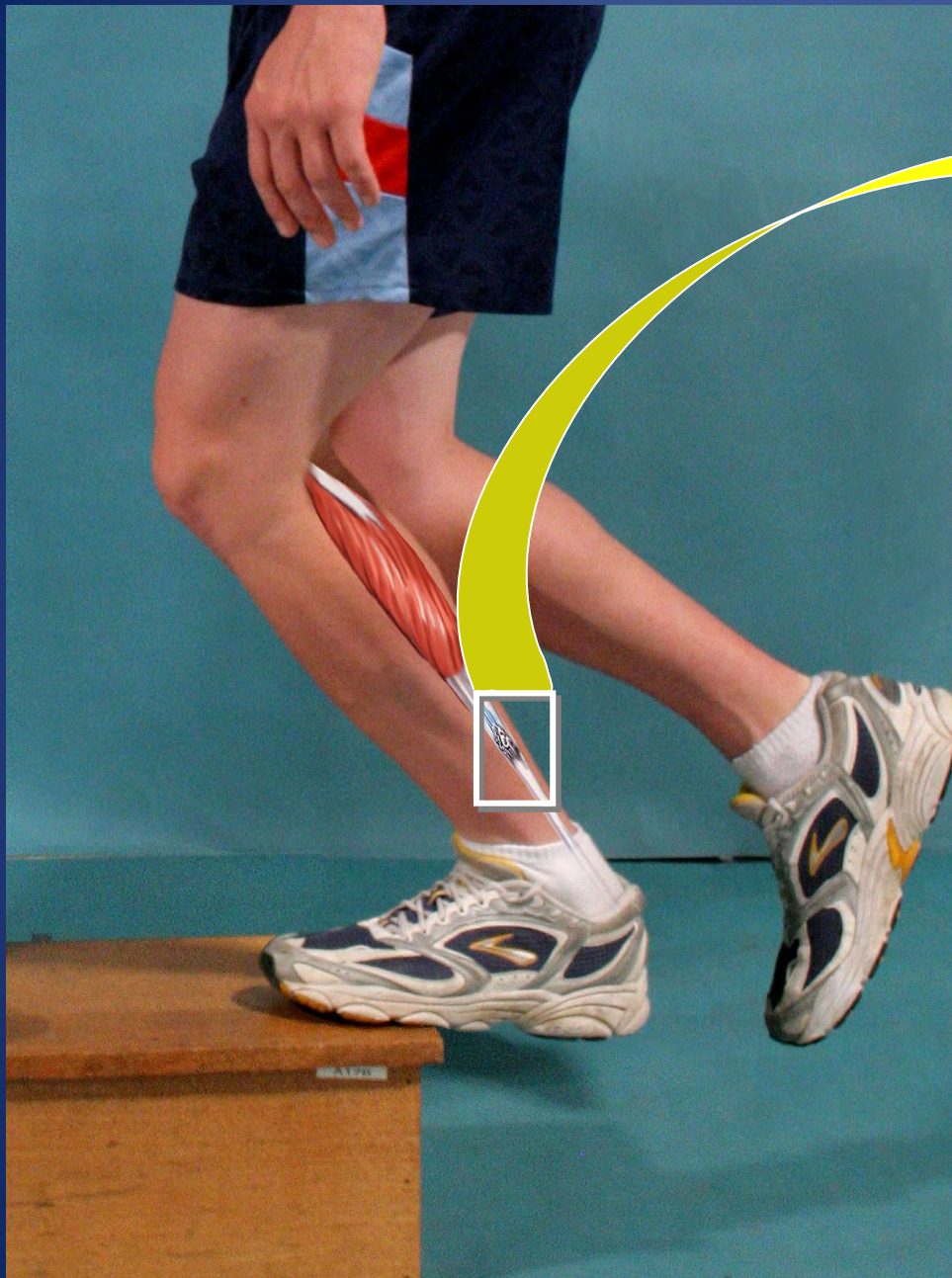


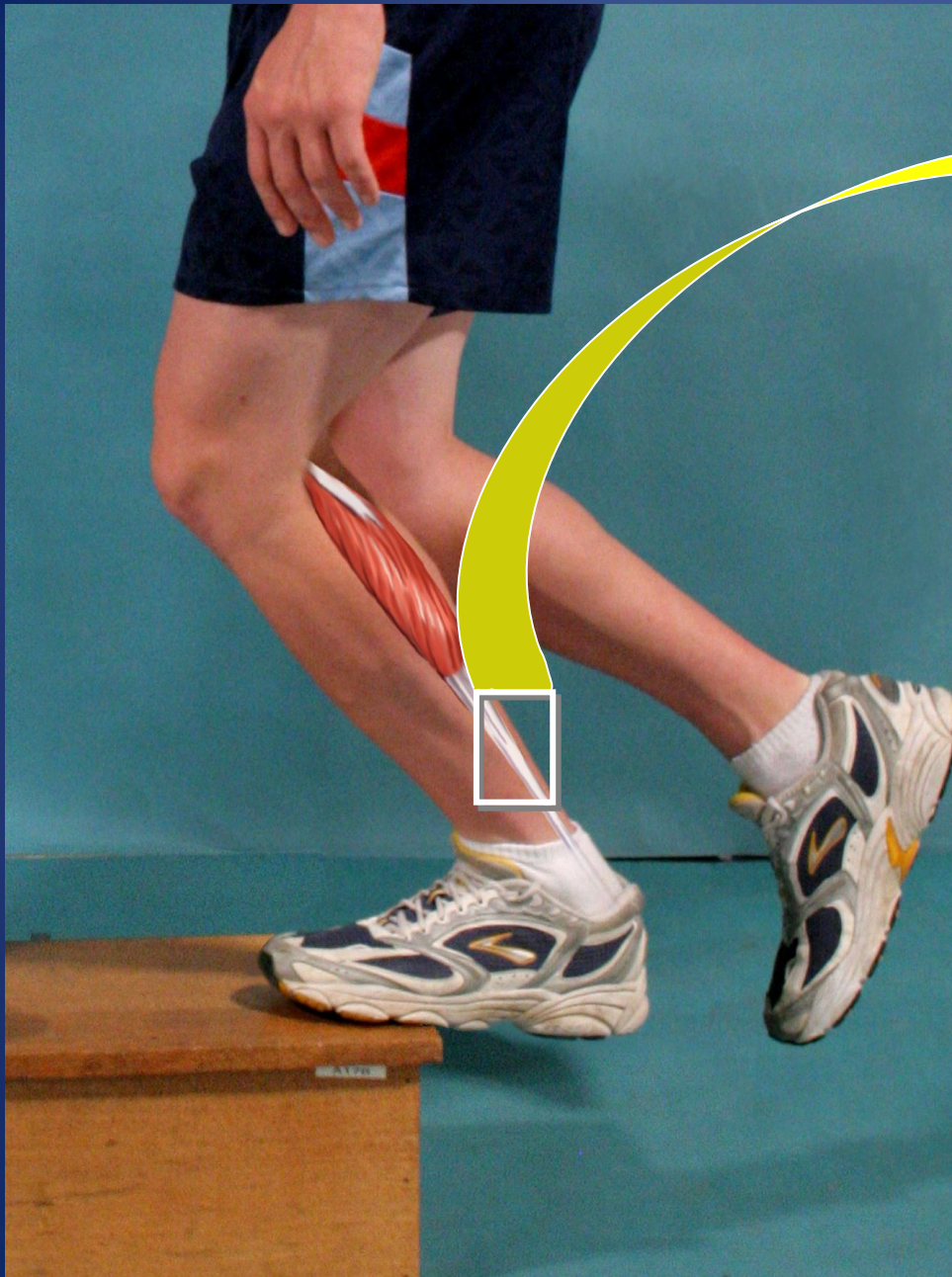




Collagen is repaired







Tendinopathy Conditions

- Achilles
- Lateral and Medical Epicondylitis
- Patella/Quadriceps Tendon
- Hamstring Origin
- Tibialis Posterior Tendon
- Gluteal Medius/Minimis Tendons

A photograph of two black and white cows in a green field under a blue sky. The cow on the left is looking towards the camera, and the cow on the right is looking slightly to the side. Both have speech bubbles above them. The cow on the left's bubble says "Doesn't bother me because I'm a helicopter". The cow on the right's bubble says "Do you worry about Mad Cow Disease?".

Doesn't bother me because
I'm a *helicopter*

Do you worry about
Mad Cow Disease?

The End

