

## Tips and Tricks for Antibody Production and Validation Process - How to Obtain Good Results -

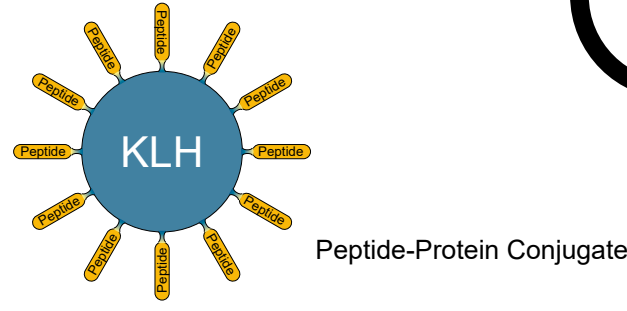


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### Three crucial components of successful antibody production

#### Antigen - peptide

Covers smaller epitope pool



- 7-30 amino acids long peptide, carrier conjugated (KLH, BSA) by Thiol group of cysteine
- Peptide will target: C or N-terminal; should not be located in parts of a protein which are going to be processed, as well as in domains repeated in other proteins
- Internal cysteine should be avoided since epitopes around this amino acid are going to be lost
- Consider if a peptide should target one specific isoform or can be repeated in all isoforms from a given protein family
- A peptide mix can be also used for immunization as it will cover more epitopes
- Immunization with a peptide without a carrier is possible for longer peptides (>30 aa)

Further reading:  
Peptide synthesis: [www.agrisera.com/peptide-synthesis](http://www.agrisera.com/peptide-synthesis)  
Epitope prediction: [epic.embl.de](http://epic.embl.de)

#### Antigen - protein

Covers a pool of various epitopes



##### Recombinant protein

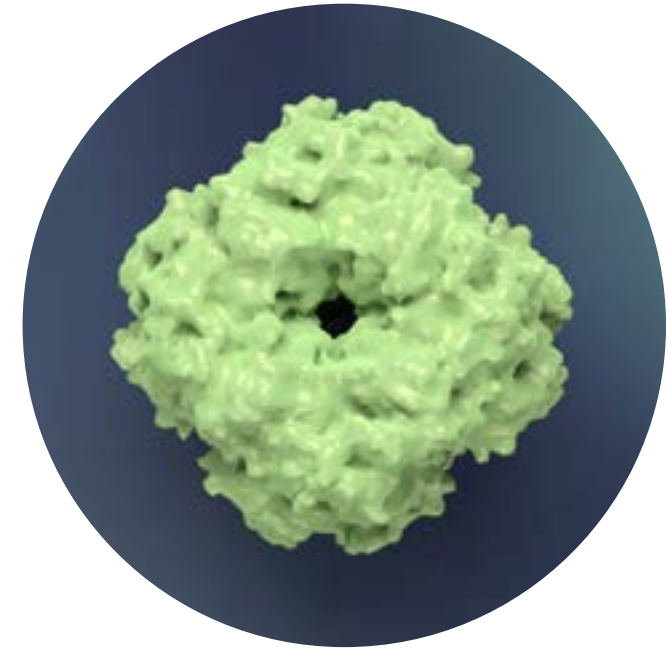
- Can be either tagged or cleaved
- Protein buffer composition should not be harmful to animals
- Ideal protein concentration: ~1 mg/ml
- For protein purity issues, the protein can be excised from a gel
- Required amount for immunization of two animals is 1 mg or less

##### Native protein purified from endogenous sample

- Risk for one or more isoforms present in such preparation

Further reading:  
FAQ about antibody production process: [www.agrisera.com/faq-antibody-production](http://www.agrisera.com/faq-antibody-production)  
Recombinant protein expression: [www.agrisera.com/recombinant-protein-expression](http://www.agrisera.com/recombinant-protein-expression)

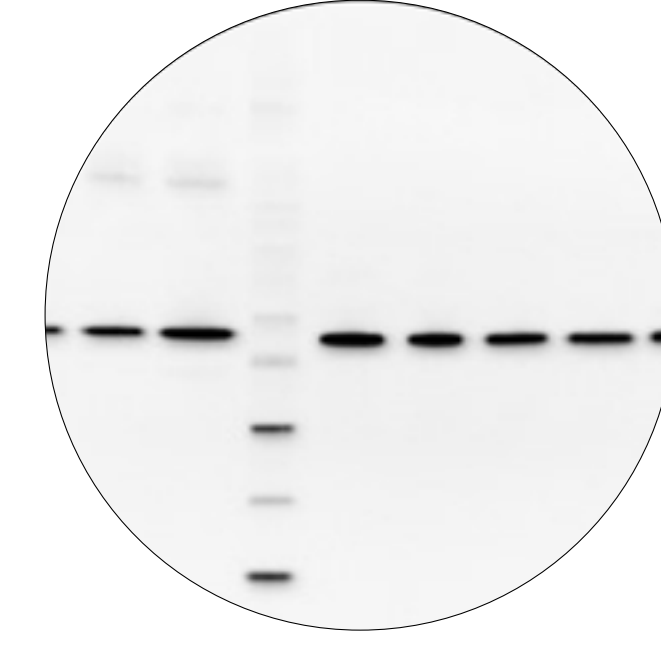
#### Antigen



#### Animal



#### Analysis



#### Sample extraction

Fast and efficient

Bead beater, sonication or mortar and pestle: the chosen method needs to be optimized for a given sample, to allow its prompt and efficient processing.

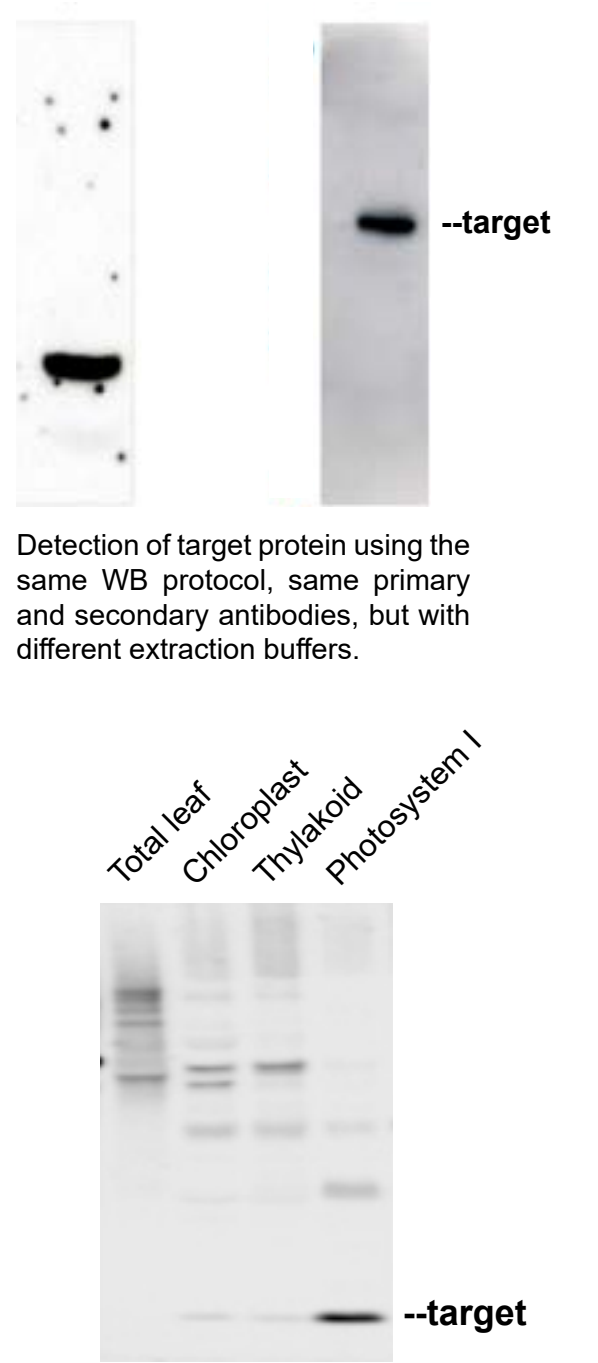
Extraction buffer containing LDS, HEPES or TRIS: analysis of freshly extracted samples and optimization of the extraction buffer are highly recommended. For some proteins HEPES may provide much better results.

Make sure your protein samples are of best quality as no target protein on a membrane means no antibody detection.

Concentrate your target protein

##### Example: fractionation

Epitope enrichment by fractionation: 10 µg of total protein from different cellular fractions (leaf, chloroplast, thylakoid and photosystem I) separated on 8-12% gradient gel.



#### Choice of host species

##### Polyclonal antibody

Will recognize a pool of several epitopes

Amount (ml) of produced antibody/animal:  
goat > hen > rabbit

##### Monoclonal antibody

Will recognize a single specific epitope (2-15 amino acids)

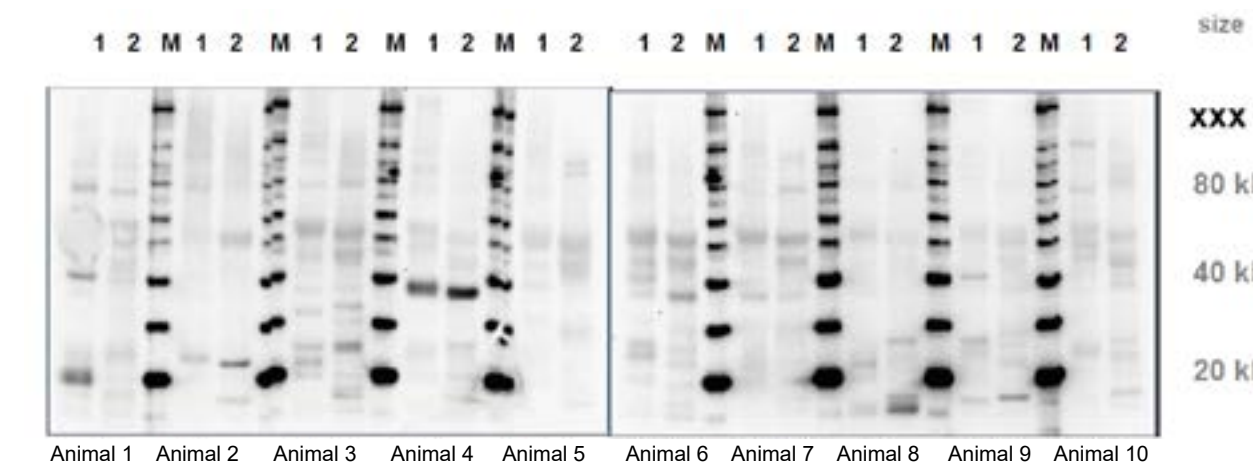
Important note: Only 1-10% of the total immunoglobulin IgG or IgY obtained in an immunization process is directed against the specific antigen.

Further reading:  
Rabbit, goat IgG antibodies: [www.agrisera.com/igG](http://www.agrisera.com/igG)  
Chicken IgY antibodies: [www.agrisera.com/igY](http://www.agrisera.com/igY)  
Agrisera's antibody production guide: [www.agrisera.com/antibody-production-guide](http://www.agrisera.com/antibody-production-guide)

#### Before immunization

Why is pre-immune serum screening important?

Some animals may already have antibodies that detect proteins with MW in close proximity to the target protein. Pre-immune serum screening helps with identifying these and choosing the animal with the lowest background.



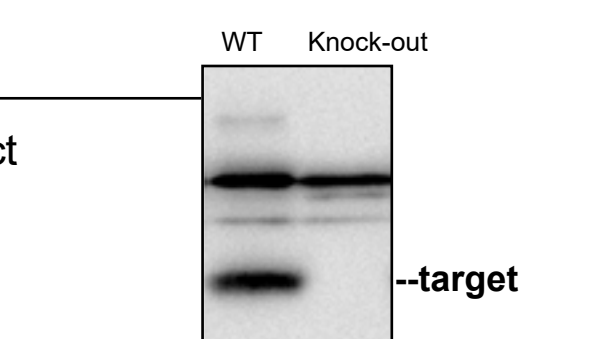
Sample load: 5-10 µg/well (1- *Arabidopsis thaliana*, 2- *Hordeum vulgare*).  
Blocking: 5-10% non-fat milk  
Primary antibody dilution: 1: 1 000 - 1: 10 000, incubation 1h/RT.  
Secondary antibody dilution: 1: 25 000, incubation 1h/RT (Goat anti-Rabbit, AS09 602)

Further reading: Agrisera protocol upon request to [support@agrisera.com](mailto:support@agrisera.com)

#### Antibody validation check list

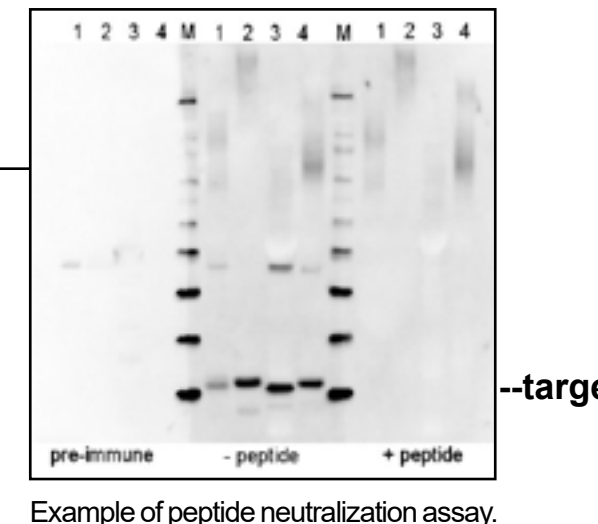
##### Direct approach

- Reliable knockout/knockdown mutant
- Immunoprecipitation and MS of its product confirms protein identity (IP-MS)



##### Indirect approach

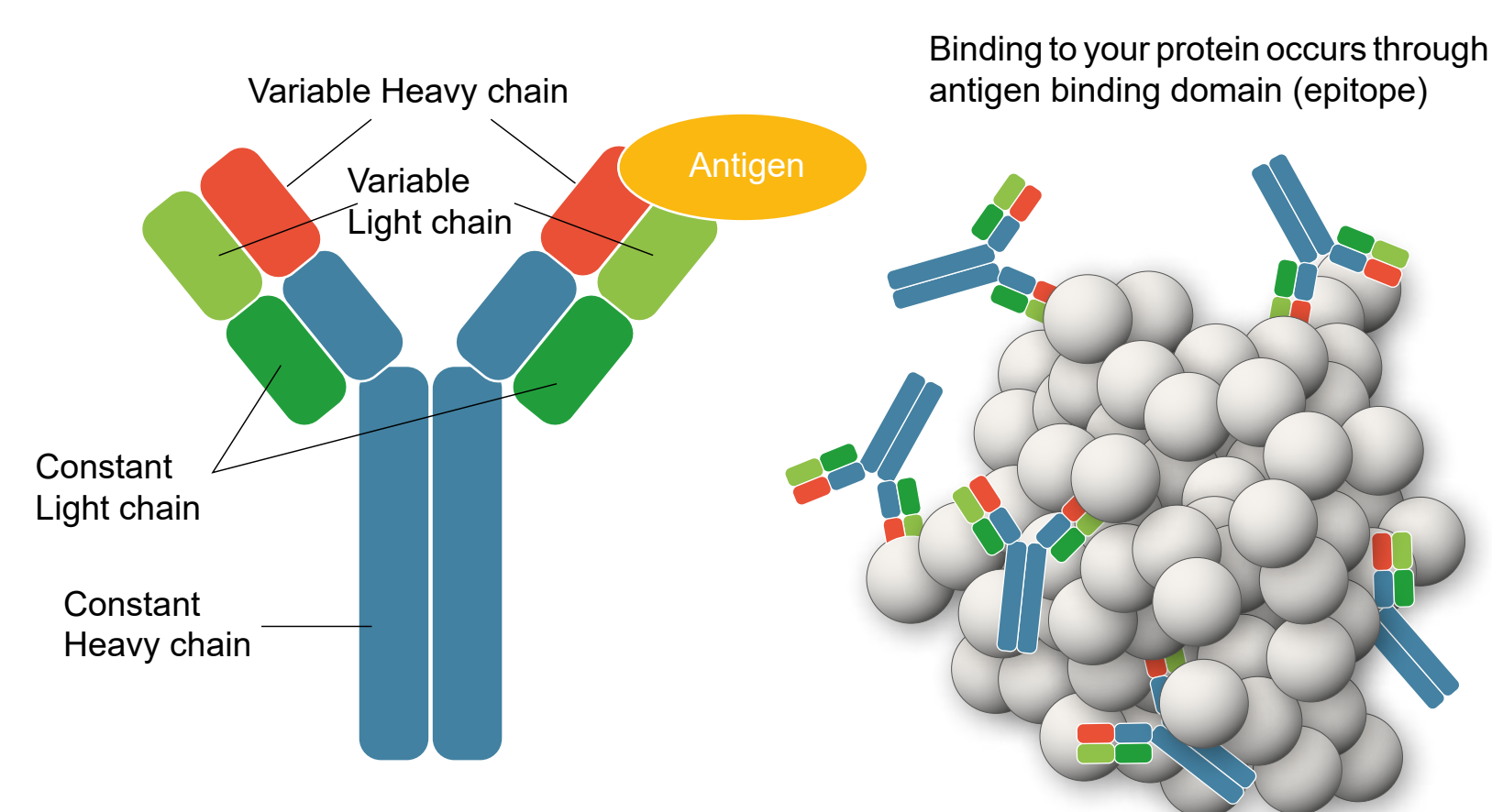
- Antibody is recognizing recombinant protein
- Band of the same MW as the target protein is not present in pre-immune
- Peptide neutralization
- Detection of protein at the correct MW (processing sites and modifications can affect apparent MW)
- Low cross-reactivity
- Samples from specific conditions, up or down regulating expression of target protein, are used
- Same band is recognized by two independent antibodies to the same target



Example of peptide neutralization assay.

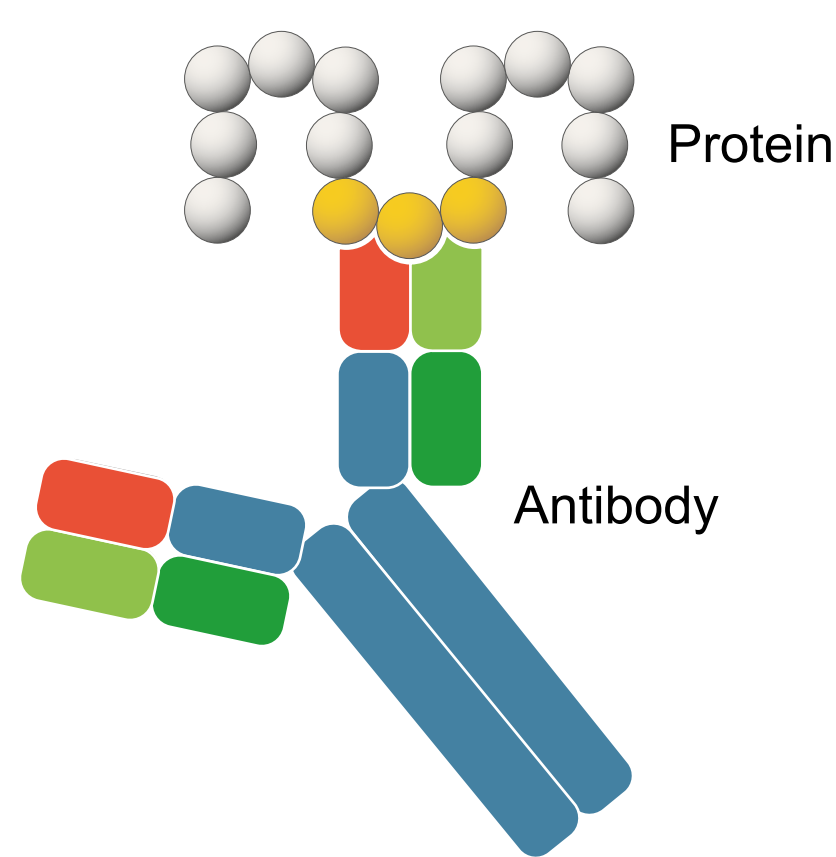
Detailed description of peptide neutralization assay: [www.agrisera.com/neutralization-assay](http://www.agrisera.com/neutralization-assay)

#### What an antibody looks like



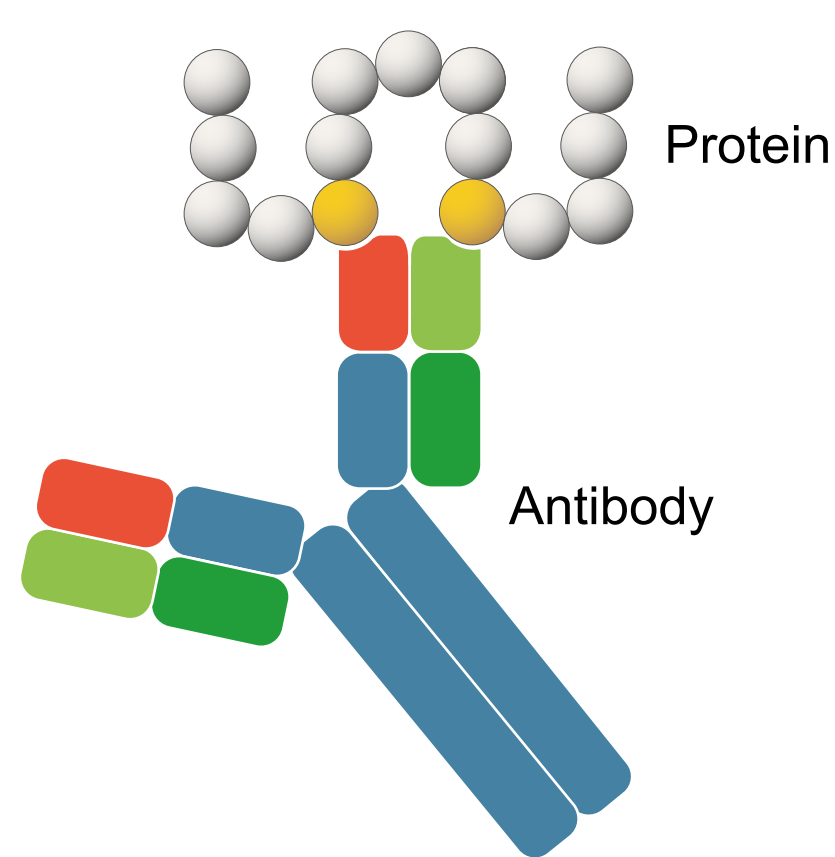
#### Linear Epitope

Recognized in WB, IHC (denatured)



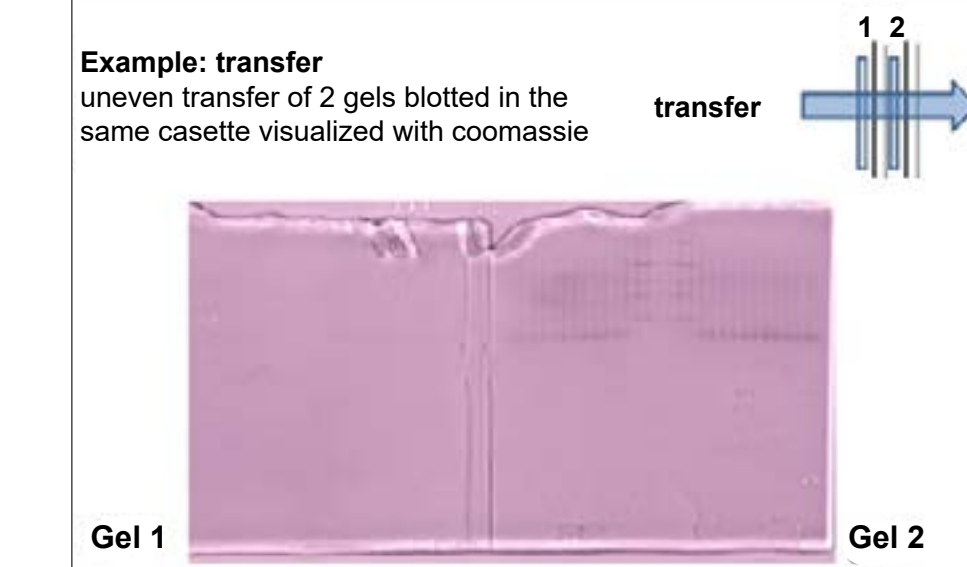
#### Discontinuous Epitope

Recognized in IP, WB, ChIP (native)



#### Every step of Western blotting is important for data quality

#### Consider MW of your target protein



##### High MW proteins (>20 kDa)

Can be retained in a gel  
Require longer transfer time

- Recommended conditions:
- 0.45 µm membrane
  - Lower MEOH (10%)
  - Increase SDS
  - Wet (tank) transfer

##### Low MW proteins (<20 kDa)

Easily migrates from a gel  
Require shorter transfer time

- Recommended conditions:
- 0.20 µm membrane
  - Increase MEOH (20%)
  - Decrease SDS
  - Semi-dry transfer

#### Include loading controls

- Cytoplasm**  
Anti-ACTIN  
AS13 2640 (IF, WB)  
AS10 680 (IF, WB)
- Nuclei**  
Anti-H3  
AS10 710 (ChIP-qPCR, ICC, IF, WB)
- Chloroplasts**  
Anti-RbcL (Rubisco large subunit)  
AS03 037 (IF, IG, IL, TP, WB)  
PsbA | D1 protein of PSII, C-terminal  
AS05 084 (IF, IG, WB)

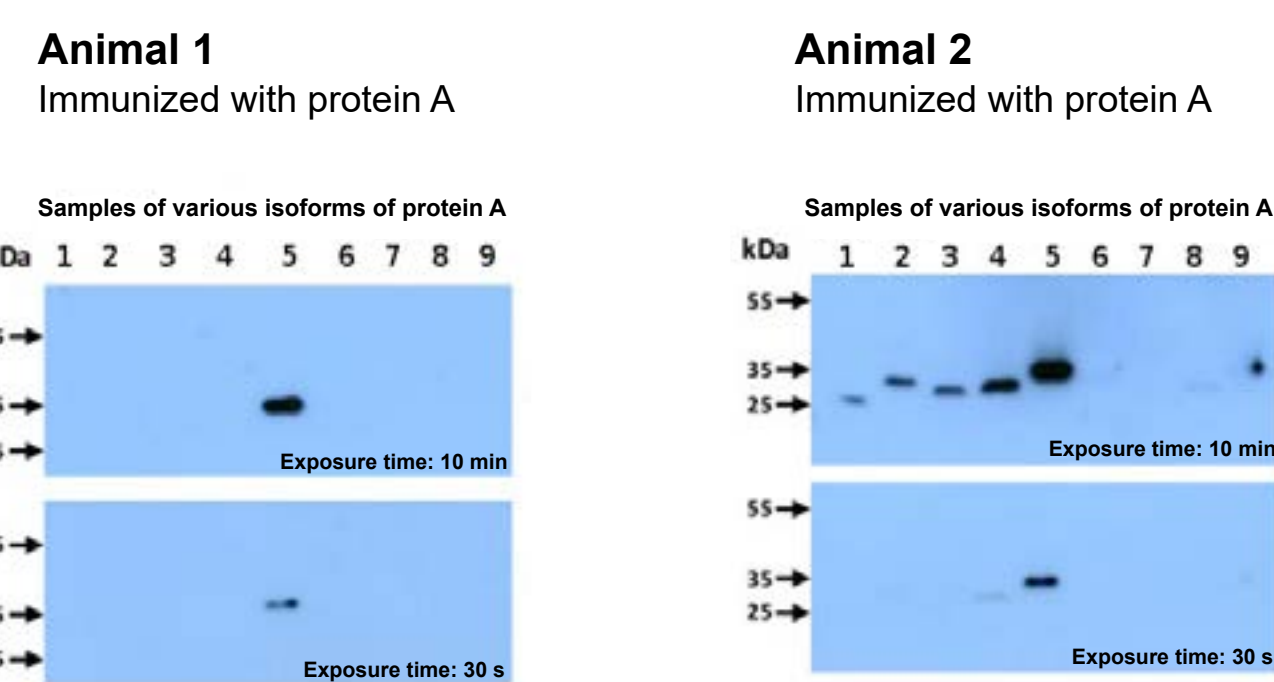


Important note: These controls are not universal to ALL experimental conditions

Further reading: [www.agrisera.com/loadingcontrols](http://www.agrisera.com/loadingcontrols)

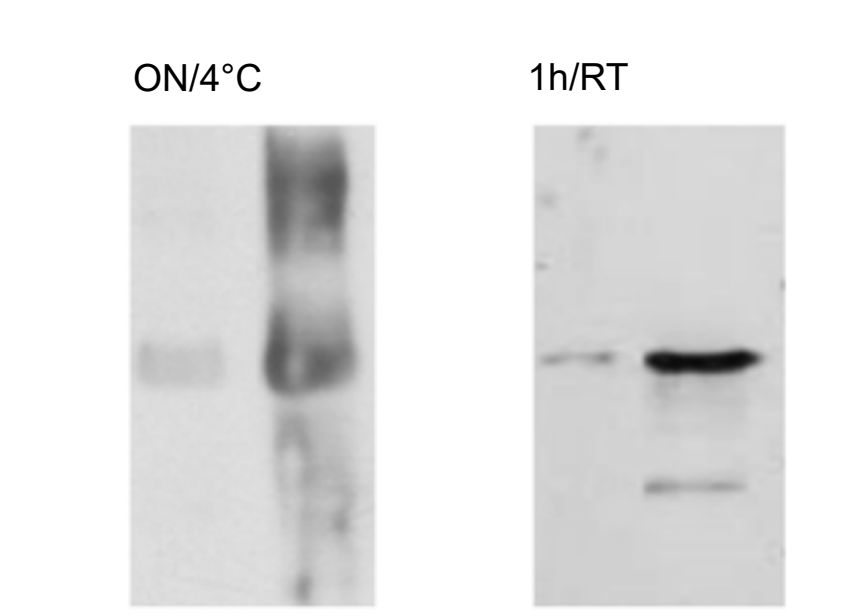
#### Testing - variability in obtained results

Why more than one animal should be immunized



Each animal, injected with the same antigen will produce a unique set of antibodies, in this case to various isoforms of the same protein.

#### Primary antibody incubation time

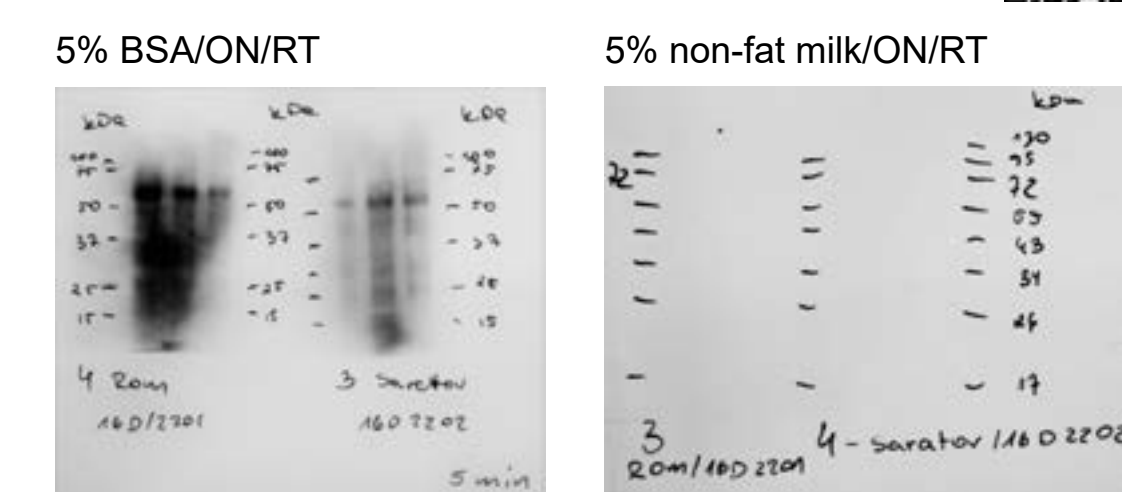


Same sample, primary antibody and Western blot protocol

In case of background: shorten incubation time with primary antibody.

#### Blocking reagent

Comparison

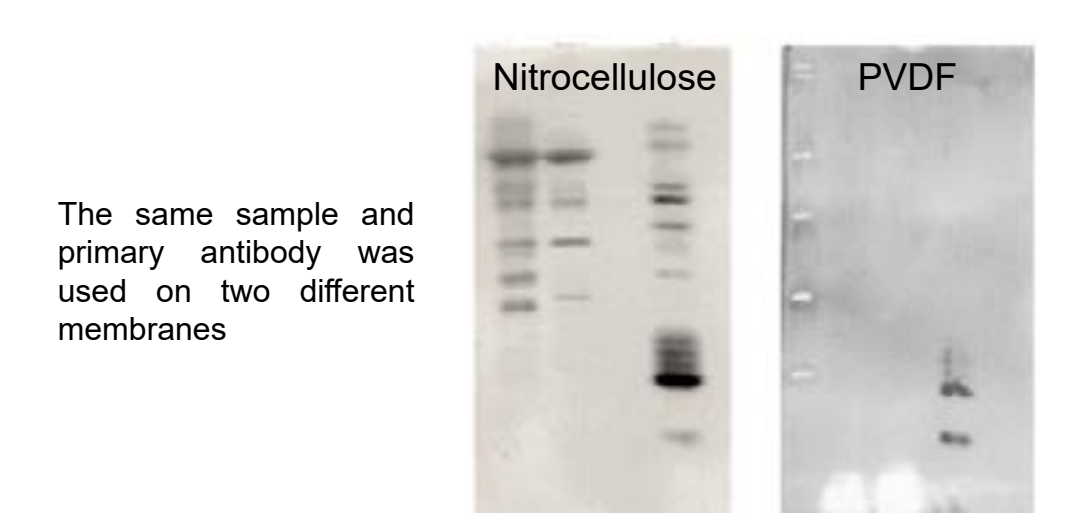


In both cases the same sample, primary and secondary antibodies were used, and the same western blot protocol was applied, except a change in a blocking reagent from 5% BSA to 5% non-fat milk.

In case of background problems, increase incubation time and change percentage and type of blocking reagent.

#### Membrane type

Does it matter?



The same sample and primary antibody was used on two different membranes

Various membranes have different protein retention. PVDF membrane can be dried in air for a few hours to increase protein binding. In case of increased background signal, a change of membrane type is recommended.

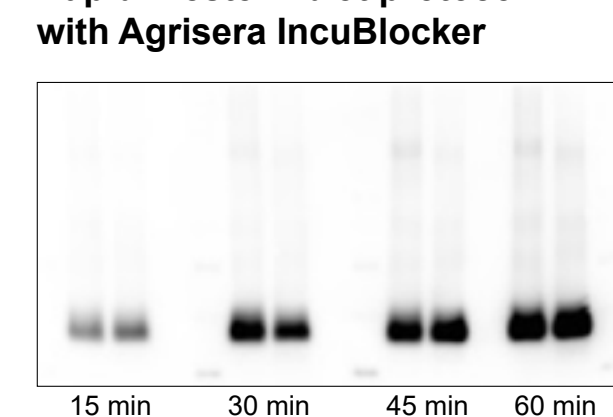
#### Antibodies and Good Laboratory Practice

- Store antibodies in 4°C/-20°C (short-term) or -20°C/-80°C (long-term)
- Store chicken antibodies (IgY) in 4°C with preservative of bacterial growth
- Prepare aliquots
- Primary and secondary antibodies should not be re-used
- Affinity purification is recommended for techniques like ChIP, IP, IHC (should never be done on whole material at once)
- Optimize used protocols. Each antibody-antigen interaction is unique



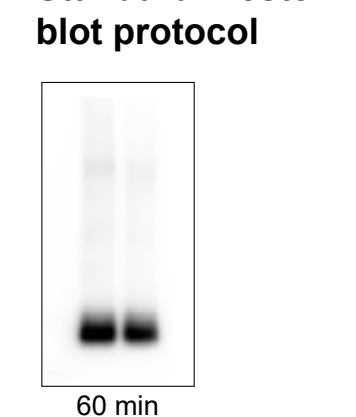
#### Rapid WB - Simultaneous incubation

##### Rapid Western blot protocol with Agrisera IncuBlocker



Primary and secondary antibody incubation time  
Primary antibody used: AS05 084

##### Standard Western blot protocol



Primary antibody incubation time

- Shortens Western blot protocol by several hours
- Blocking, primary and secondary antibody incubations are all done in one step
- Suitable for proteins of high and moderate expression



[www.agrisera.com/rapid-wb](http://www.agrisera.com/rapid-wb)

#### Protocol for not working antibody

- Check sequence used to elicit the antibody you are working with. Is it conserved in your target protein? For catalogue antibodies, contact the supplier
- Include positive and negative controls for Western blot procedure
- Use cellular fraction/organ in which the protein of interest is expressed
- Protein load/well, min. 50 µg
- Blocking: 5-10% non-fat milk, 1h/RT or ON/4°C
- Blocking: non-protein blocker, 0.1-1% PVP40, 1h/RT
- Primary antibody affinity purified
- Primary antibody starting dilution: 1: 500-1:1 000/ON/4°C incubation
- Use sensitive detection: chemiluminescence or fluorescence is preferred over chromogenic
- Overexpose to make sure if a band of interest does not require longer time to become visualized

#### If your antibody DOES NOT WORK

Contact Agrisera support:

Live chat: [www.agrisera.com](http://www.agrisera.com)  
E-mail: [support@agrisera.com](mailto:support@agrisera.com)  
Phone: +46 935 33 000

Check out our technical blog:

[www.agrisera.com/technical-blog](http://www.agrisera.com/technical-blog)

Or use Agrisera's Western blot resources:

[www.agrisera.com/western-blot](http://www.agrisera.com/western-blot)