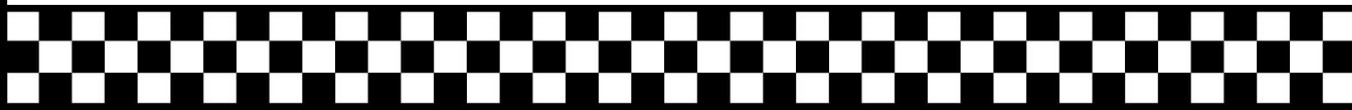




It takes characters to brew beer with character.



SKA BREWING

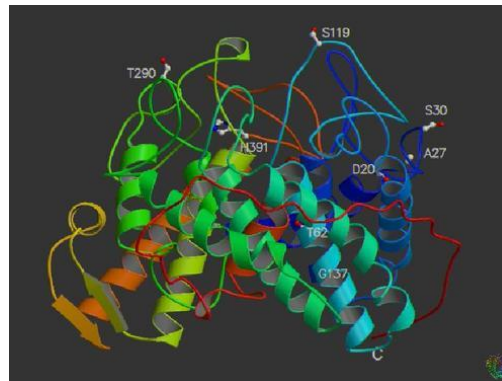
Brute to Brut

A history of glucoamylase in brewing



Amyloglucosidase

Also referred to as “glucoamylase”



Quick biochemistry review

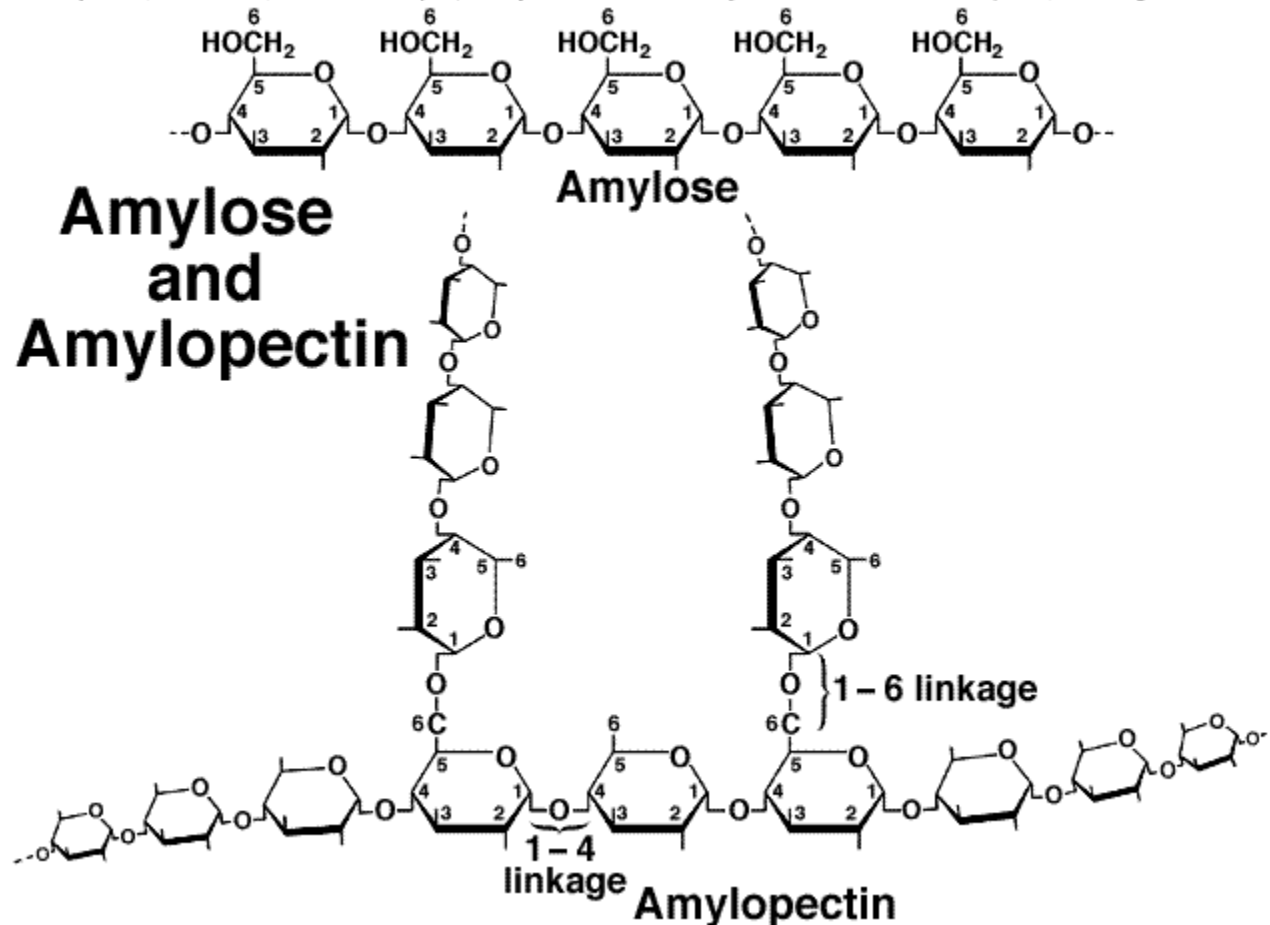


Two starches in malted barley: Amylose and Amylopectin



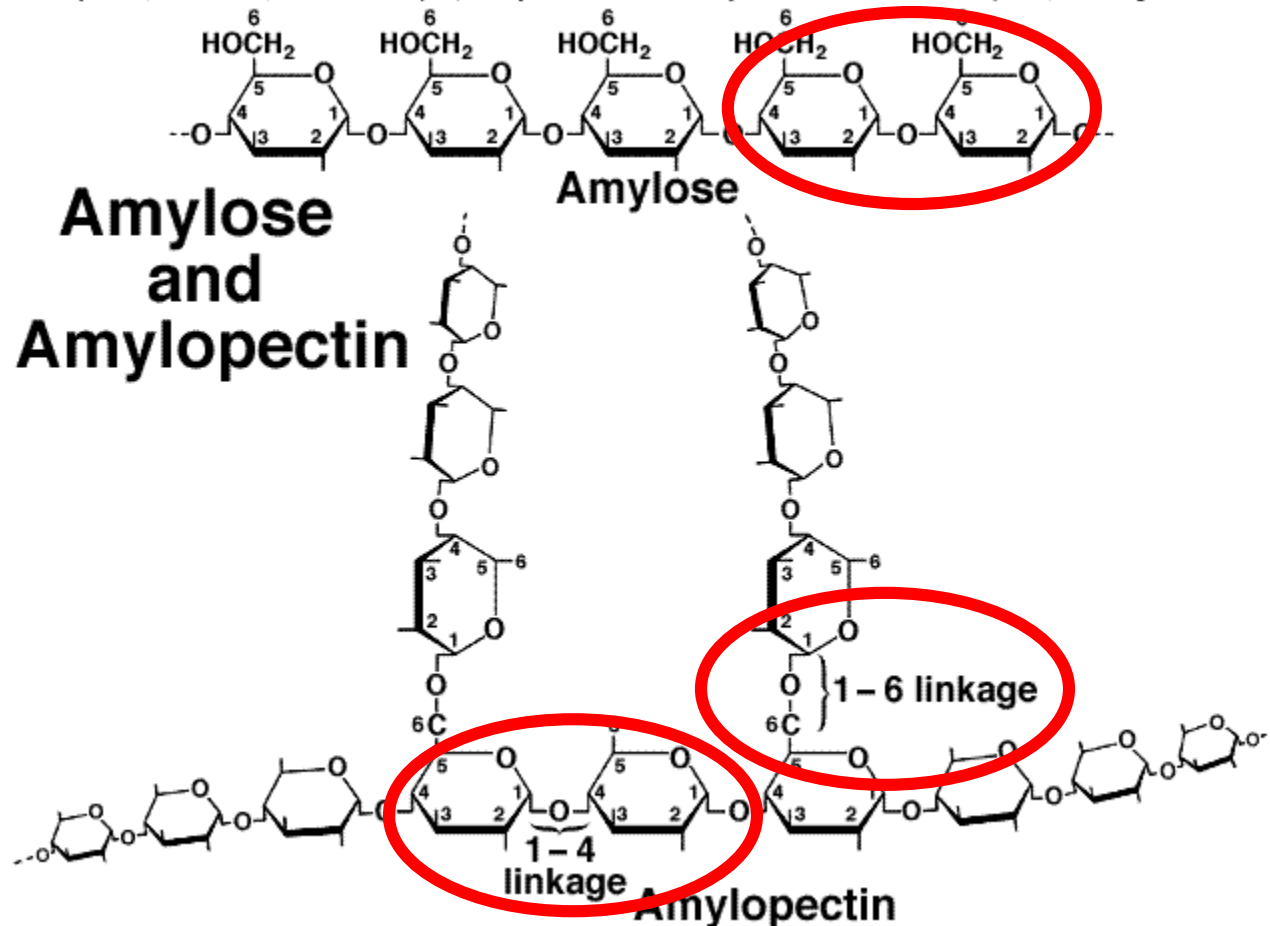
Two starches in malted barley: Amylose and Amylopectin

Randy Moore, Dennis Clark, and Darrell Vodopich, Botany Visual Resource Library © 1998 The McGraw-Hill Companies, Inc. All rights reserved.



Two starches in malted barley: Amylose and Amylopectin

Randy Moore, Dennis Clark, and Darrell Vodopich, Botany Visual Resource Library © 1998 The McGraw-Hill Companies, Inc. All rights reserved.

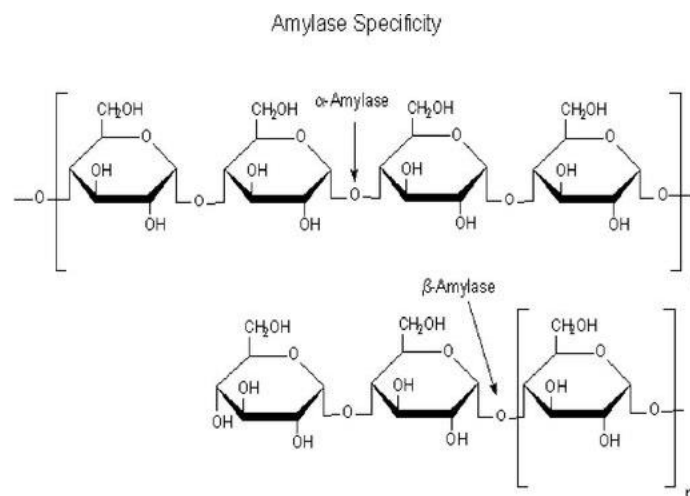


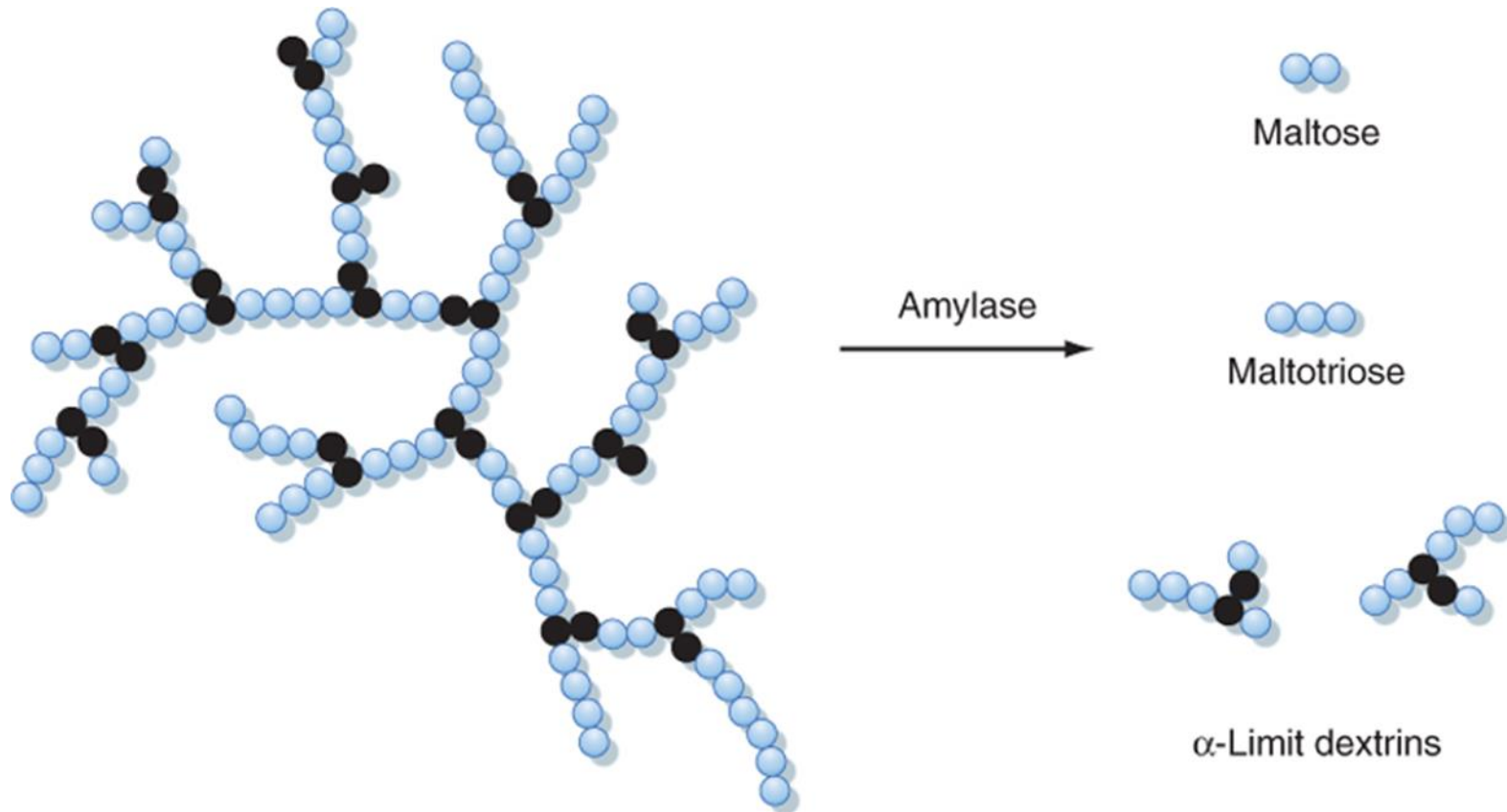
Two main starch enzymes in malted barley:

α -Amylase and β -Amylase

α -amylase hydrolyses amylose molecules by cleaving the α -1,4-linkages between sugars providing smaller chains of amylose termed dextrins.

β -amylase is another enzyme that acts upon the glucan chain releasing maltose, which is a diglucoside.

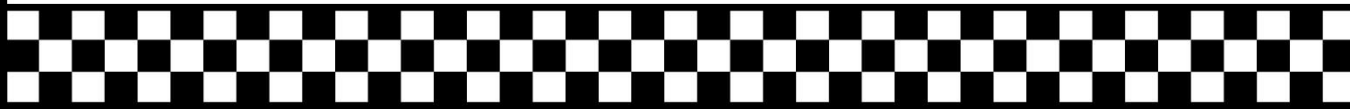




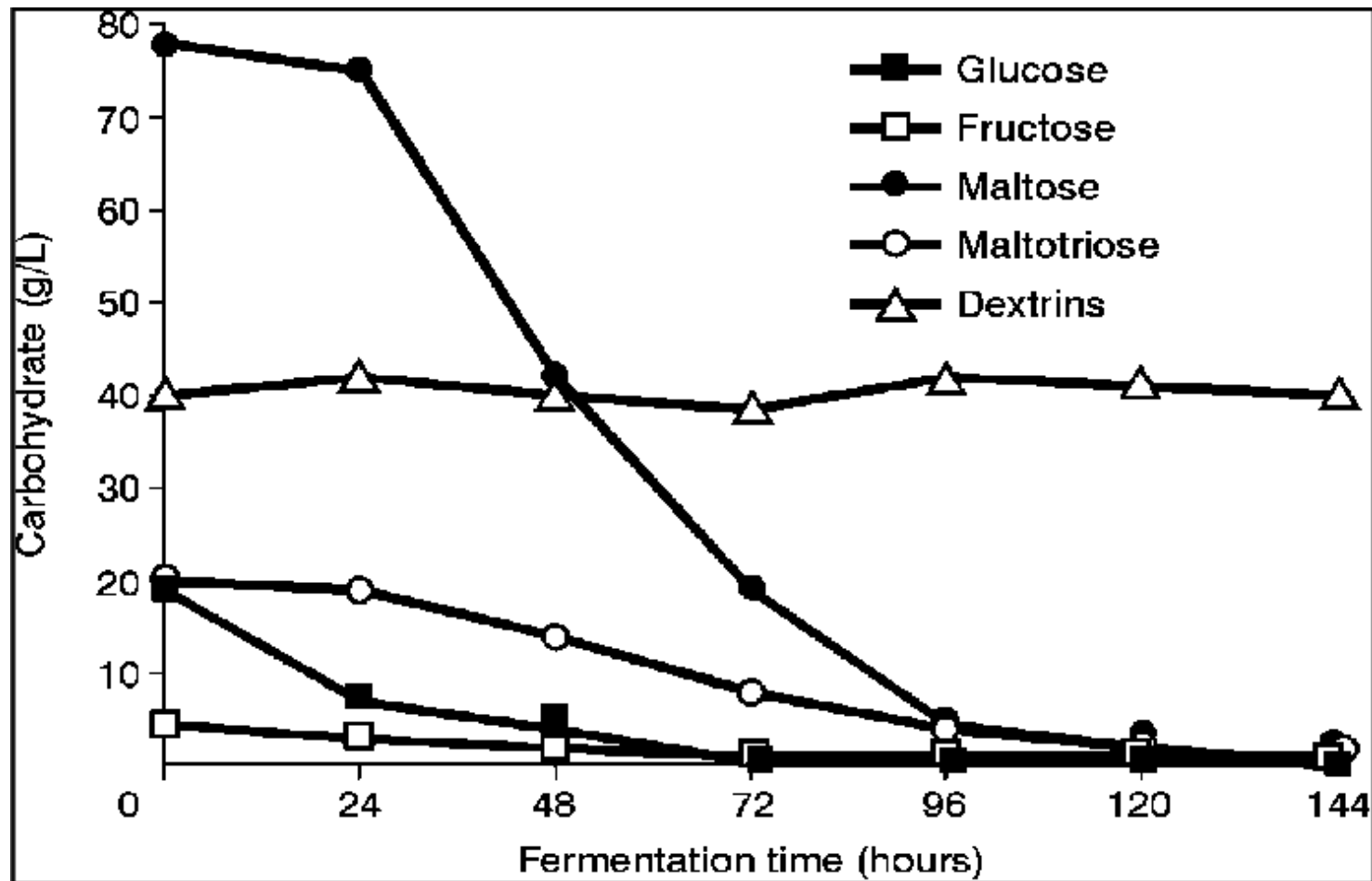
Koeppen & Stanton: Berne and Levy Physiology, 6th Edition.
Copyright © 2008 by Mosby, an imprint of Elsevier, Inc. All rights reserved

Typical wort composition:

Carbohydrate	% of Wort
Glucose	10-15%
Fructose	1-2%
Sucrose	1-2%
Maltose	50-60%
Maltotriose	15-20%
Dextrins	20-30%



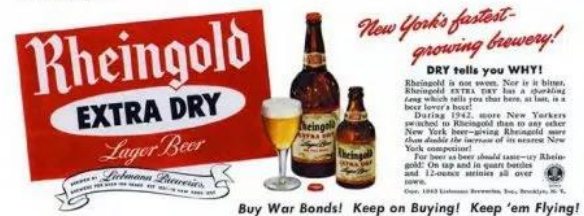
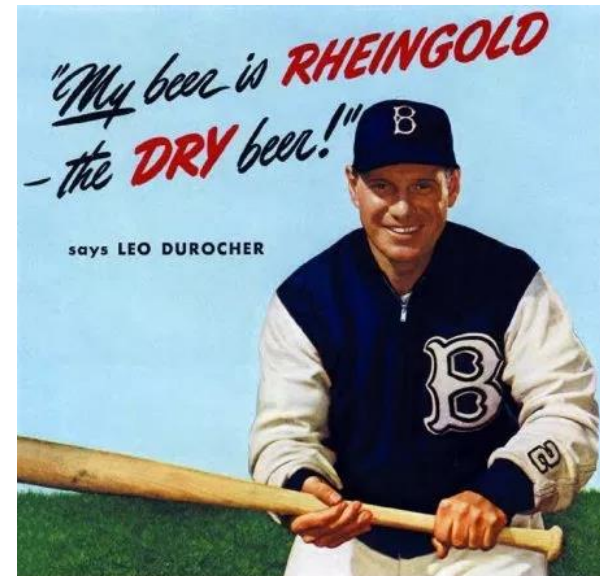
Fermentation



**I WAS GONNA TELL
A TIME TRAVELLING JOKE
BUT YOU GUYS DIDN'T
LIKE IT**



1963 Rheingold brewery Brooklyn, ny



SKA BREWING

Joseph owades and Gablinger's beer

United States Patent Office 3,379,534

Patented Apr. 23, 1968

PREPARATION OF A LOW DEXTRN BEER BY USNG ARMYLOGUCOSIDASE

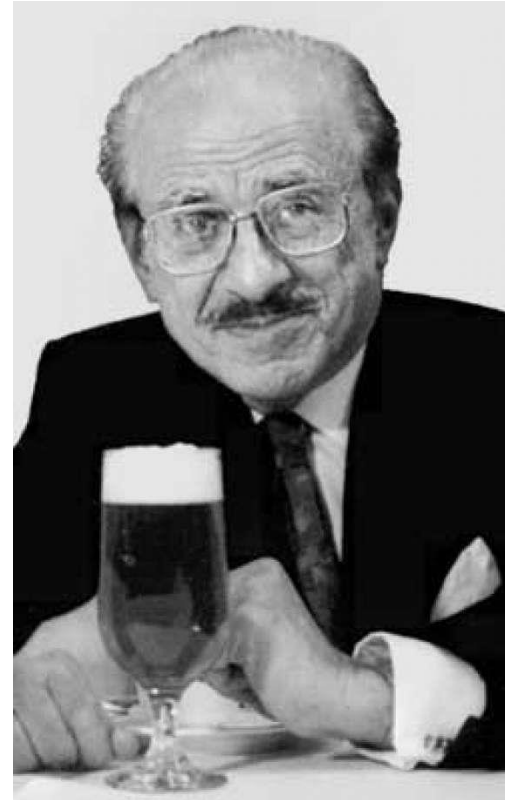
Hersch Gablinger, Base, Switzerland, assignor to Amylase
A.G., Nidwaldea, Switzerland, a corporation of Switzerland

No Drawing. Filed Aug. 17, 1965, Ser. No. 480,502

Claims priority, application Switzerland, Aug. 28, 1964,

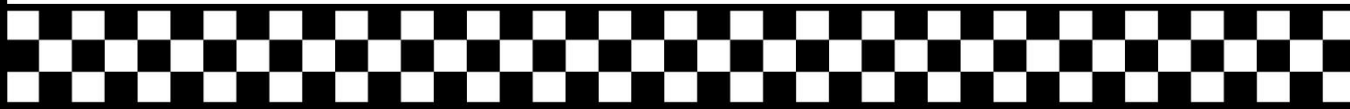
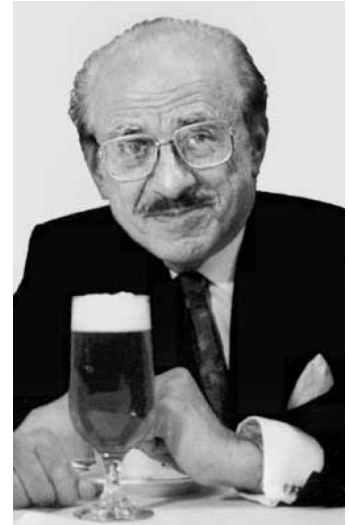
11,271/64

9 Claims. (C. 99-31)



A little more about Joseph owades

- 1919-2005
- Brooklyn polytechnic Institute -Masters (1944) and PhD (1950) in biochemistry
- Fleishcmann's yeast
- Schwarz laboratories (1953-1960) –diacetyl work and stroh's
- Rheingold brewery (1960-1970) – first phd in brewing industry
- Anheuser busch & Carling breweries (1970's)
- Center for brewing studies (1980's)– anchor, sam adams, pete's wicked ale
- https://www.academia.edu/7976122/Brewing_Legacy_A_portrait_of_Joseph_Owades



Joseph owades and Gablinger's beer

United States Patent Office 3,379,534

Patented Apr. 23, 1968

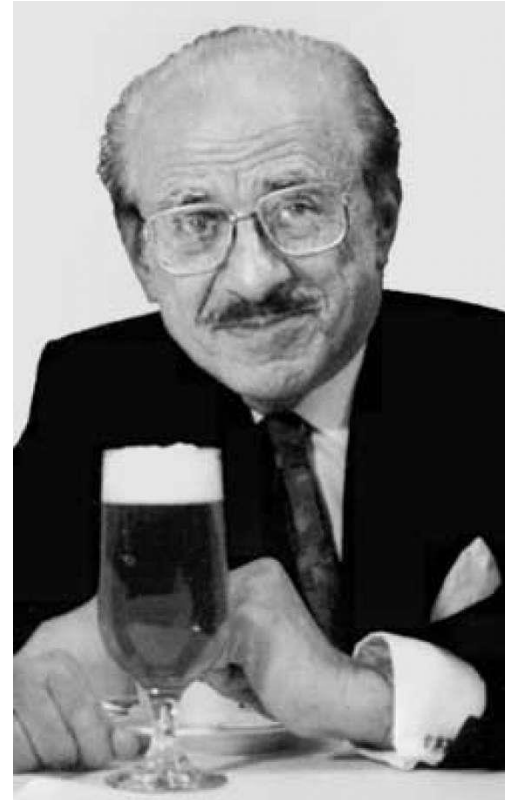
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Glucoamylase

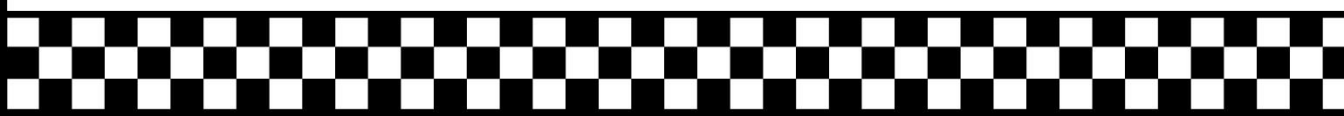
Amyloglucosidase



SKA BREWING

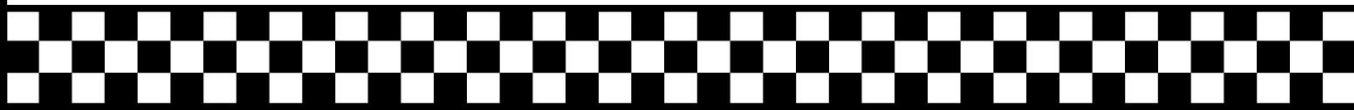
Amyloglucosidase

- Called Gluco-amylase because of it's ability to cleave ALL starches into glucose units



Amyloglucosidase

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- Able to cleave both 1-4, and 1-6 linkages regardless of their locations



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- Optimal temperature range 130 – 150F



Amyloglucosidase

- Called Gluco-amylase because of it's ability to cleave ALL starches into glucose units
- Able to cleave both 1-4, and 1-6 linkages regardless of their locations
- Optimal temperature range 130 – 150F
- Optimal pH 5.0



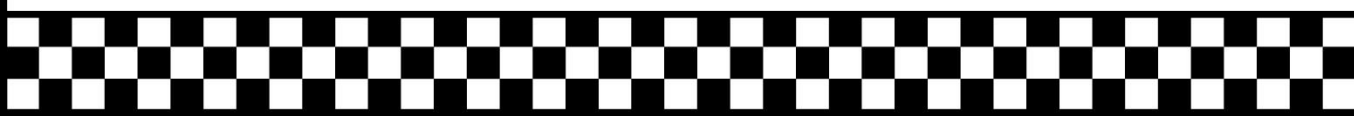
Amyloglucosidase

- Where and when do we use it?



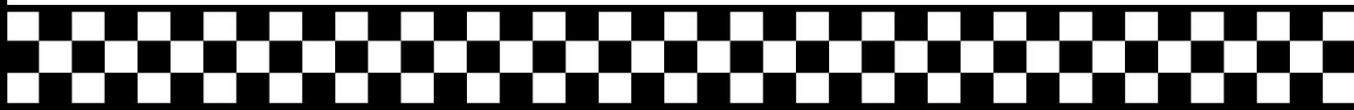
Amyloglucosidase

- Where and when do we use it?
- It can be added to the mash or the fermenter (1-4g/HL)



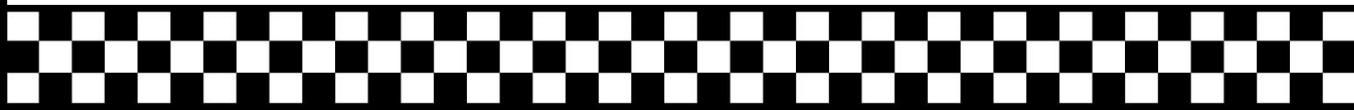
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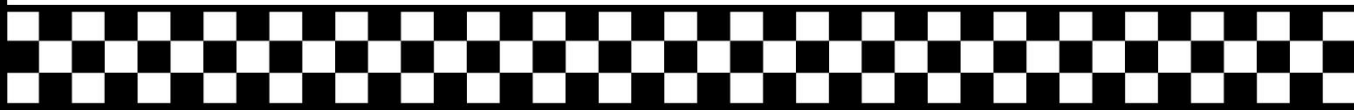
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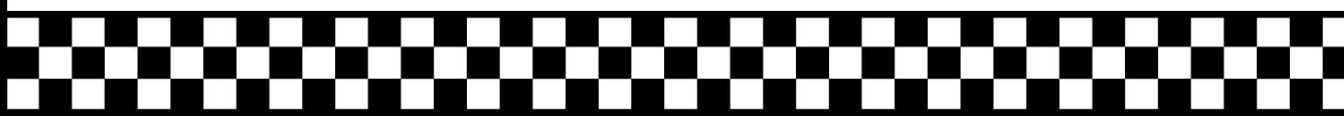
Amyloglucosidase

- Words of caution!



Amyloglucosidase

- Words of caution!
- This enzyme will continue to work if not denatured, and therefore must be used with care. Please isolate where and when it is used, as there are dangers with having it come in contact with “normal” beers.



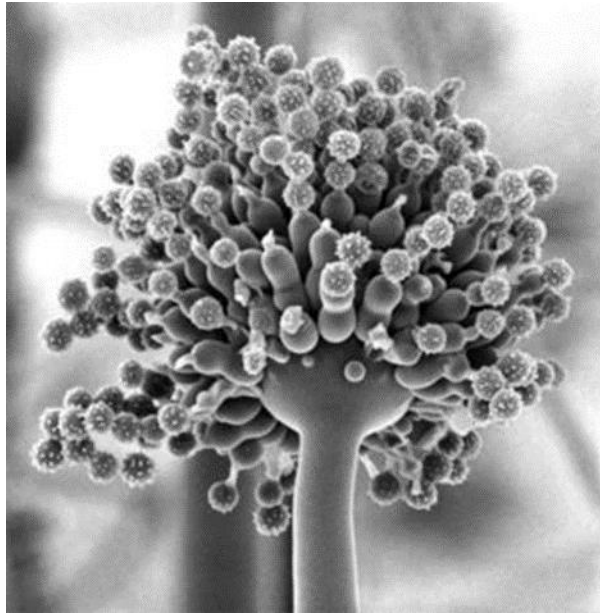
Amyloglucosidase

- How is it made?



Amyloglucosidase

- How is it made?
- Harvested from a broth formed during fermentation of the fungi *aspergillus niger*



The birth of "lite" beer

Joseph owades and Gablinger's beer

**Our only claim is an empty one.
Gablinger's beer doesn't fill you up.**

If you've ever felt like a barrel after a few bottles of beer, this claim may interest you.

Because Gablinger's is the first beer ever brewed with no carbohydrates.

So it doesn't fill you up.

Is Gablinger's brewed any differently than any other good beer?

No.

We take one extra step in the brewing process, but other than that Gablinger's is just a good tasting beer.

It's brewed with a careful blend of the choicest hops and selected grain.

(That phrase may sound familiar, but it's true.)

Gablinger's is lagered (that means aged) and naturally carbonated the same way the German brewers have done it for 600 years.

But the most important difference between Gablinger's and the other great beers is that it has no carbohydrates.

So it doesn't fill you up.

That's our only claim.

Empty as it may be.



No available carbohydrates. No fat. Protein 0.25%.

Imported by Joseph Owades Brewing Co., Chicago, Ill. Gablinger's Beer is available in limited areas.

SKA BREWING

The birth of “lite” beer

Joseph owades and Meister
brau lite



...and then marketing
hit a homerun



The birth of "lite" beer



APRIL 1981



APRIL 1990



1995



PRE-1974



1974



1989



1992



1994



1996



1998



1999



2001



2003



2008



2009

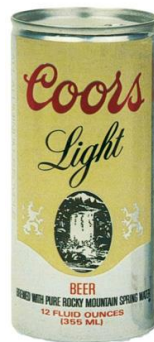


2012



2014

A QUICK VISUAL HISTORY OF COORS LIGHT



1978



1986



1999



2011



2015

SKA BREWING

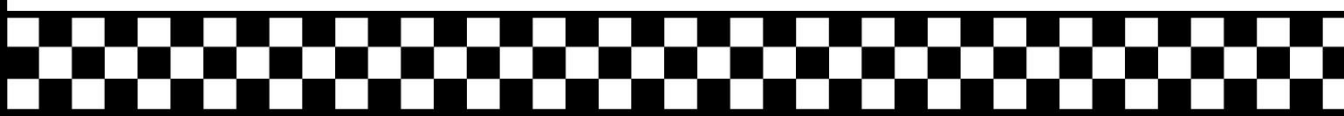
Wtf?

 **BIG BEERS**
Belgians & Barleywines
festival
January 10–12, 2019



SKA BREWING

More time travel

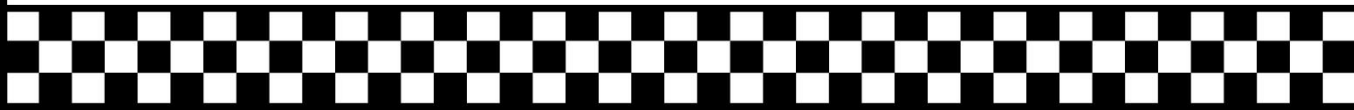


SKA BREWING

The birth of “extreme” beers

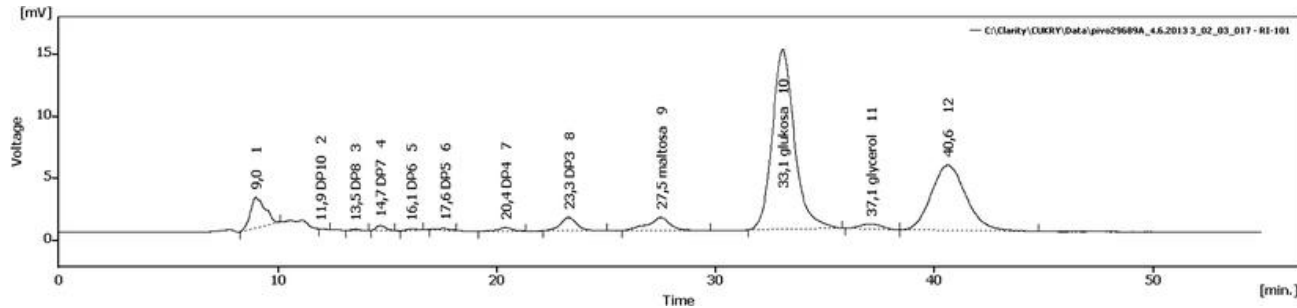




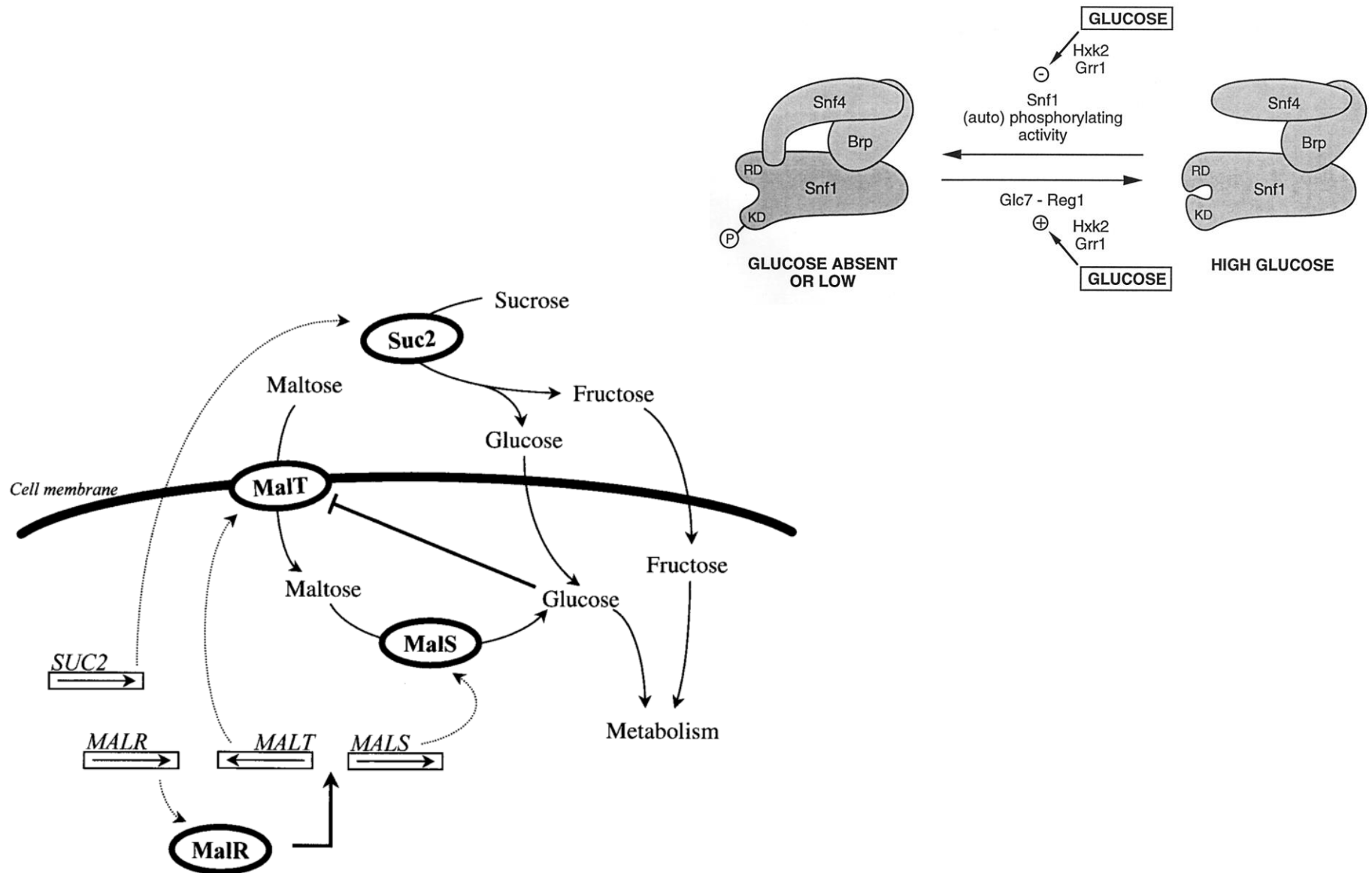




Master Brewers Association of the Americas Rocky Mountain District



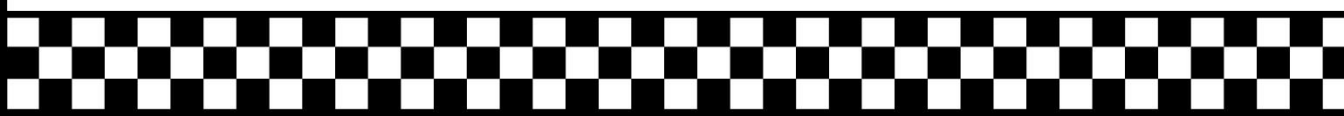
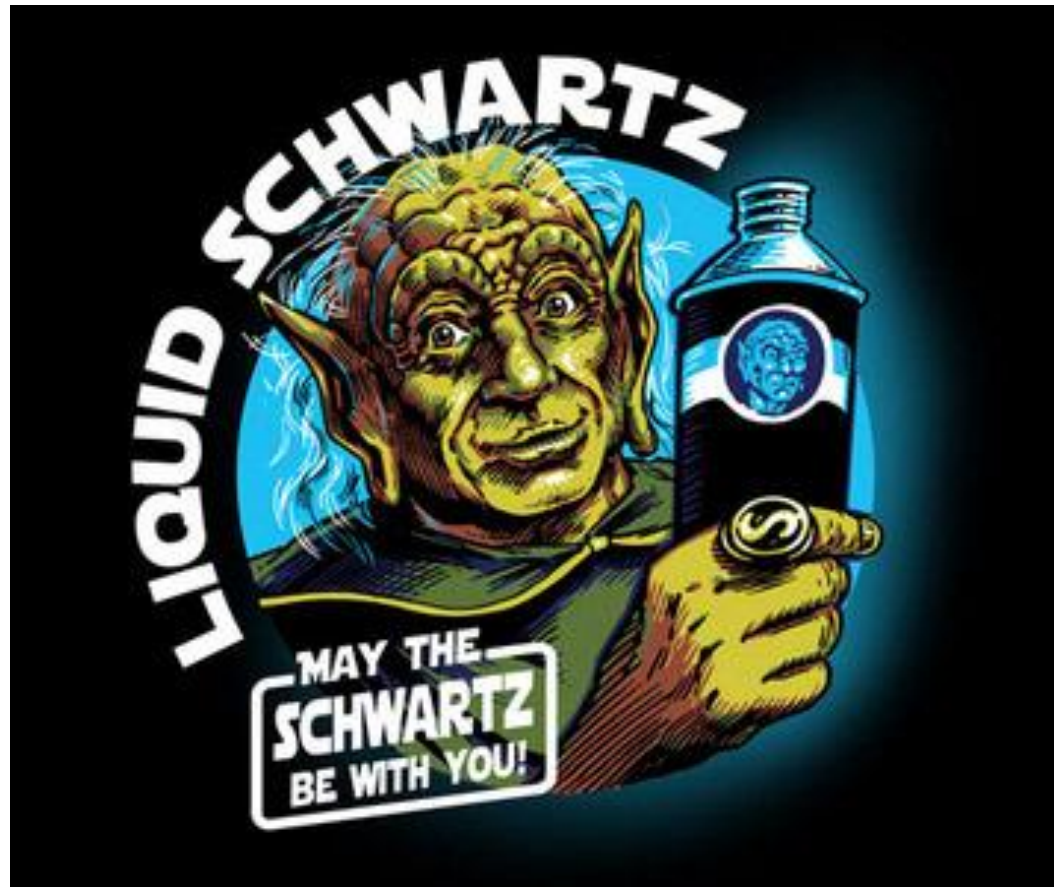
SKA BREWING



*The Beast is my favorite because
the taste and the name matches
how it ends up making me feel.*

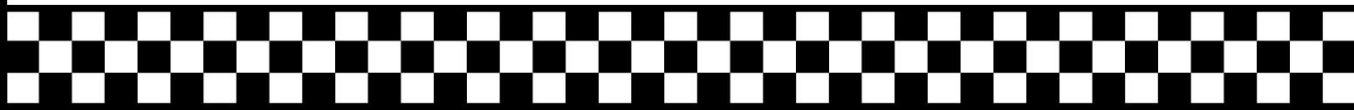
@burger_destroyer • Instagram





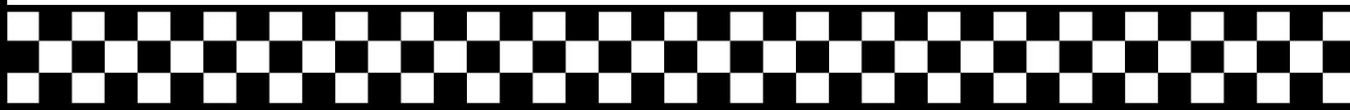
Amyloglucosidase

- Where and when do we use it?
- It can be added to the mash or the fermenter
- It will denature in the boil, so it is limited in its use in the brewhouse
- While in the fermenter it will likely work to completion, eventually breaking down all starches



Amyloglucosidase

- My preferred method of glucoamylase usage:



Amyloglucosidase

- My preferred method of glucoamylase usage:
- Knockout at desired O.g., ferment slowly at cooler temps, and add glucoamylase when attenuation is around 45%



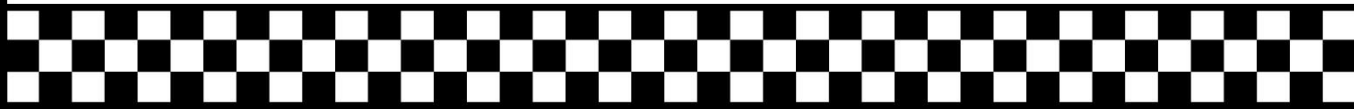
Amyloglucosidase

- Lots of other factors to succeeding:



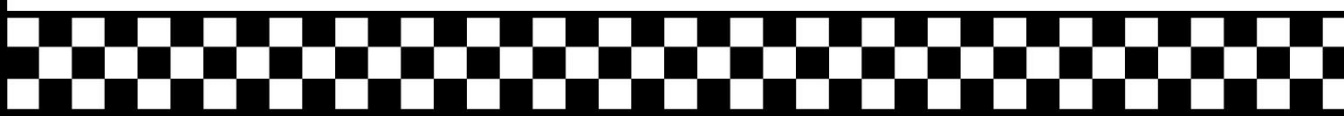
Amyloglucosidase

- Lots of other factors to succeeding:
- Yeast strain and pitch rate



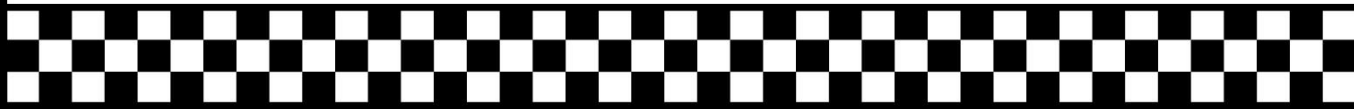
Amyloglucosidase

- Lots of other factors to succeeding:
- Yeast strain and pitch rate
- Osmotic stress and ethanol toxicity



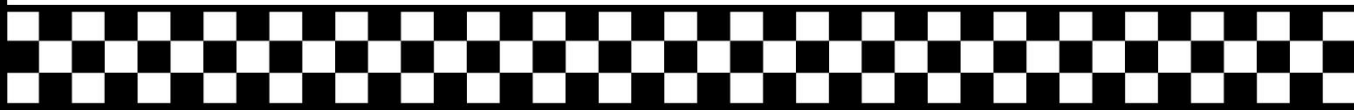
Amyloglucosidase

- Lots of other factors to succeeding:
- Yeast strain and pitch rate
- Osmotic stress and ethanol toxicity
- Adding sugars on the cold side as an alternative



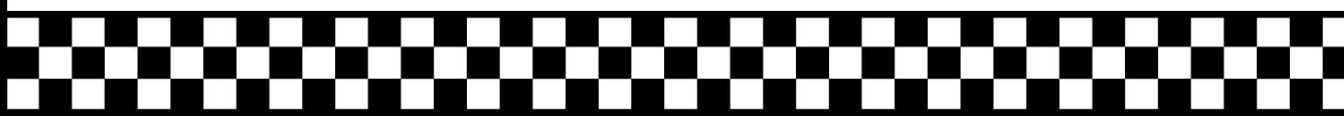
Amyloglucosidase

- Lots of other factors to succeeding:
- Yeast strain and pitch rate
- Osmotic stress and ethanol toxicity
- Adding sugars on the cold side as an alternative
- Yeast nutrients –zinc, fan, etc...



Amyloglucosidase

- Lots of other factors to succeeding:
- Yeast strain and pitch rate
- Osmotic stress and ethanol toxicity
- Adding sugars on the cold side as an alternative
- Yeast nutrients –zinc, fan, etc...
- <https://beerandbrewing.com/over-the-top-brewing-high-gravity-beers/>



Fast forward again...2017

CRAFT **Beer & Brewing**



THE BIRTH OF
THE BRUT IPA



SKA BREWING

Fast forward again...2017



SKA BREWING



Thirty Amazing New or Newish Colorado Beers From 2018

[JONATHAN SHIKES](#) | DECEMBER 31, 2018 | 12:56PM

Moral Panic

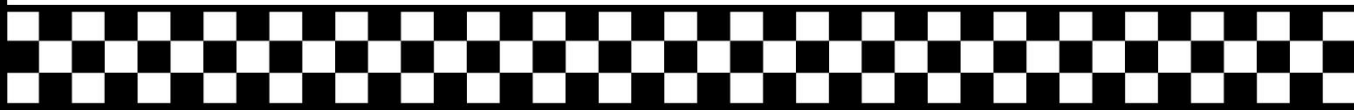
Ska Brewing

Durango

Styles come and go, but few have caught on as quickly as the enigmatic Brut IPA. A difficult style to capture, the worst versions I had this year were overly dry and tasteless, like a stale biscuit. The best, like Ska's style-defining Moral Panic, were less dry, well-hopped and carried just a hint of effervescent sweetness.

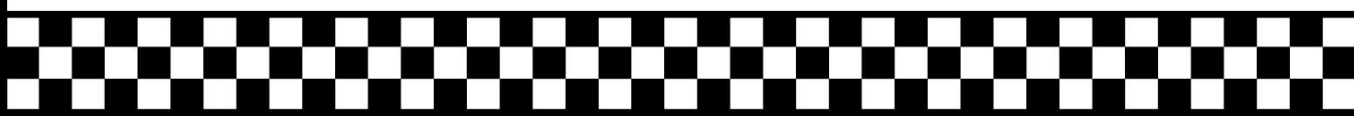
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Amyloglucosidase

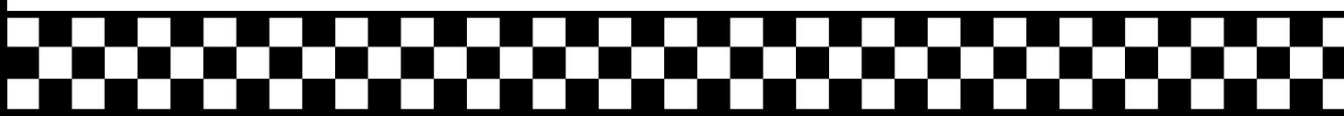
- Ska uses a mash addition -100ml for a 30bbl brew, 149f mash temp, 1 hour rest



Amyloglucosidase

- Ska uses a mash addition -100ml for a 30bbl brew, 149f mash temp, 1 hour rest
- Great youtube:

<https://www.youtube.com/watch?v=oZusMK7HqAU>



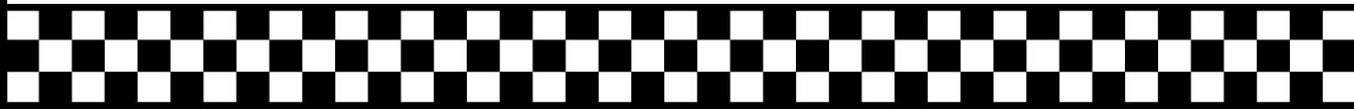


CO Straight Bourbon - Hand Selected Single Barrels

- In Palisade or in store selection tasting
-Sampled at Cask and Proofed Strength
- 1 bbl - @240x750ml bottles
w/ branded barrel
- Custom account label modifier
- Specific Barrel info for posters
and shelf talkers
- Pricing lower than CO Straight!
- In store tastings hosted by
Peach Street Team



2019



SKA BREWING

