



Leader in flour applications.

Flour treatment without chemicals Fad or future?

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Mühlenchemie is a member
of the Stern-Wywiol Gruppe



Agenda

- ◆ Mühlencemie brief introduction
- ◆ The case against chemical oxidants
- ◆ Legal status of oxidants in selected countries
- ◆ Spotlight on
 - ADA
 - BPO
 - Vit C
- ◆ Where do we go from here?



Mühlenchemie – brief introduction



Mühlenchemie have...

- 90 years of experience
- Over 200 employees around the world
- Over 2,000 customized products for flour improvement and flour fortification
- Work with > 1,000 mills globally
- Exports to over 100 countries



1923



Mühlenchemie

1960



Mühlenchemie
makes good flours even better

2013



We think big ...

... when it comes to finding individual solutions for flour, with our affiliates and representative offices in over 100 countries.

Milestones on the way to becoming a global player:

1998 Germany

Opening of the production plant in Wittenburg

2001 Singapore

Establishment of Mühlentchemie Asia (now Stern Ingredients Asia-Pacific)

2008 Mumbai, India

Establishment of Stern Ingredients India

2009 Mexico

Takeover of our competitor Probst Alimentaria, integration as SI Mexico

2010 Sao Paulo, Brazil

Establishment of Stern Ingredients do Brasil

2011 Suzhou, China

Opening of Stern Ingredients (Suzhou) Co., Ltd

2012 Izmir, Turkey

Establishment of Stern Ingredients Turkey



The case against chemical oxidants



“Would you eat your yoga mat?”

SUBWAY: Stop Using Dangerous Azodicarbonamide in Your Bread!



Azodicarbonamide is the same chemical used to make yoga mats and shoe rubber. It's banned all over the globe because it's linked to respiratory issues, allergies and asthma. **This is not eating fresh!**



VS



Subway uses Azodicarbonamide in their 9-Grain Wheat, 9-Grain Honey Oat, Italian White, Italian Herbs & Cheese, Parmesan/Oregano, Roasted Garlic, Sourdough, and Monterrey Cheddar breads.

Subway **does not** use Azodicarbonamide in other countries.



We deserve the same safe ingredients that Subway uses around the world.

SIGN THE PETITION: foodbabe.com/subway
#NoWaySubway

FOODBABE.O

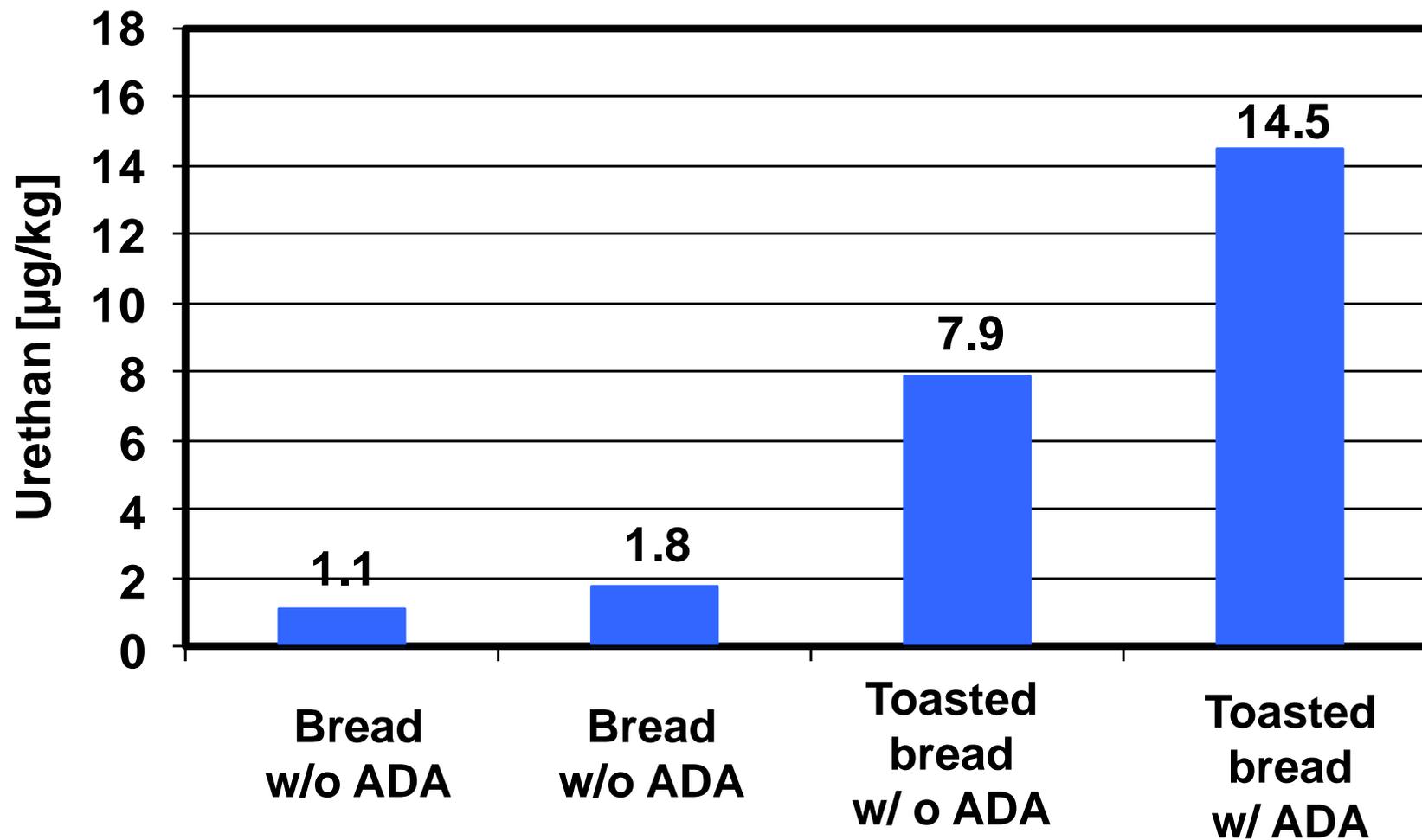
BREA
SUBV

Formation of Urethane from Azodicarbonamide

- ◆ Azodicarbonamide reduced to hydrazo-dicarbonamide (biurea)
- ◆ Biurea decomposes to urea
- ◆ Urea reacts spontaneously with ethanol (from yeast fermentation) to urethane (ethyl carbamate)
- ◆ Urethane potentially carcinogenic

Rather than the 'yoga mat' metaphor, this mechanism represents a more scientifically valid reservation against ADA - albeit with many variables

Formation of Urethane in Bread



Data from Dennis *et al.*, 1997

That scary stuff we call Bread...

UNHEALTHY BREAD THEN AND NOW

What constituted 'bad' bread in 1911?

- Excessive salt
- Cheap fat
- White wheat flour, bleached with chlorine
- Very few vitamins and minerals
- Alum – a toxic chemical used to improve whiteness
- Ground bones or lime powder to supplement the flour

And what is in 'bad' bread in 2011?

- White wheat flour, 80-90 per cent of useful vitamins removed
- Excessive salt
- Sugar

- Hydrogenated and fractionated fats
- Soya flour 'improver', increasing volume and softness of bread
- Flour treatment agents (oxidant chemicals make bread fluffier)
- Reducing agent (makes stretchier doughs for burger buns and baguettes)
- Emulsifiers (chemicals increase softness of bread, giving illusion of freshness)
- Preservatives such as the mould killer calcium propionate, which may cause eczema and behavioural problems in children
- Enzymes, usually from fungus or bacteria. Do not have to be declared on labels. Widely suspected to be linked to allergies such as asthma and to gut diseases

Source: Daily Mail Online (UK), 11th June 2011

(<http://www.dailymail.co.uk/health/article-2003622/Is-bread-making-ill-How-2011s-loaves-bad-you.html>)



Legal status of oxidizing agents in selected places

Oxidants - status in selected countries



European Union

- Potassium bromate, calcium peroxide, ADA, BPO not permitted
- Ascorbic acid is the only gluten strenghtener widely used



PR China

- Potassium bromate, calcium peroxide, BPO banned
- ADA permitted up to 45 ppm, but many major mills and bakeries are currently striving to replace it, legal ban a possibility



Indonesia

- Potassium bromate, BPO banned
- ADA supposed to be officially banned and industry trying to avoid it

Oxidants - status in selected countries



Philippines

- Potassium bromate banned
- BPO permitted, ADA has been replaced by most major millers in recent years due to expected ban



Taiwan

- Potassium bromate, ADA not permitted
- BPO permitted, but not widely used due to consumer concerns and mandatory declaration



Malaysia

- Potassium bromate banned, ADA banned in Singapore and hence not used by Malaysian millers in flour for export, or flour for bakeries who export
- BPO, calcium peroxide permitted

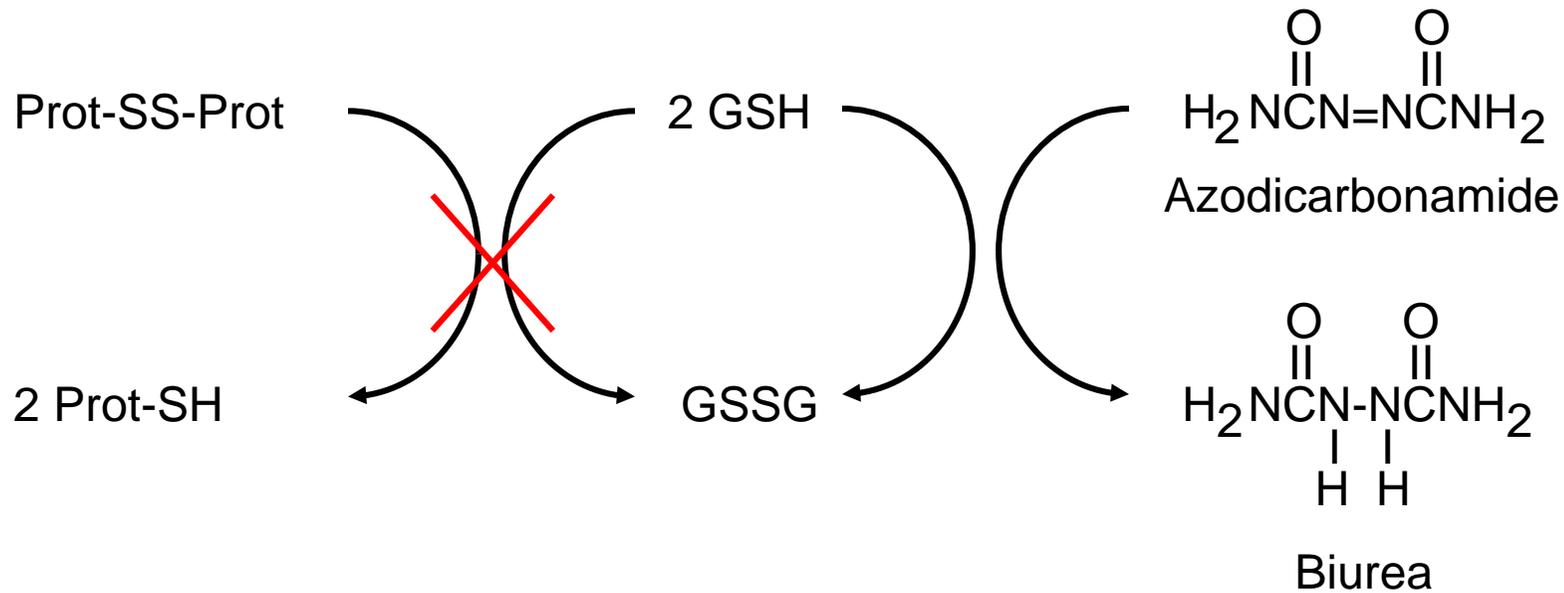


Spotlight on

**ADA
Benzoyl peroxide
Ascorbic acid**



Azodicarbonamide



GSH = reduced glutathione
 GSSG = oxidized glutathione
 Prot-SS-Prot = gluteline

Properties of Azodicarbonamide

- ◆ **Fast oxidizing effect**
- ◆ **Results in bucky doughs**
- ◆ **Improves dough stability**
- ◆ **Improves crumb structure, but**
- ◆ **Sometimes a few larger holes**
- ◆ **Max. level in bread 45 ppm (as per Codex Alimentarius)**
- ◆ **Rather inexpensive**
- ◆ **Classified as hazardous cargo in concentrated form**

ADA Replacement



◆ Customer-specific replacement solutions:

Time-consuming due to hands-on baking trials and optimization needed, but typically leads to better solutions in terms of cost / benefit.

ADA Replacement w/ All-in Replacer at 1:10



ADA Replacement



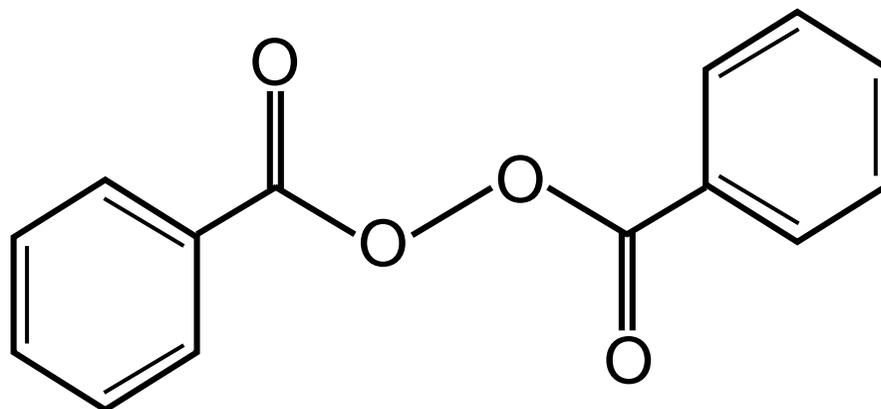
ADA Replacement – Case Study Philippines

Additives		Control	T1	T2	T3
Ascorbic acid	ppm	50	50	50	
α -amylase (5000 SKB)	ppm	100	30	30	
ADA	ppm	20			
BE 16099	ppm		200	160	
ROX	ppm			20	
Poweryzm KH Plus	ppm				200

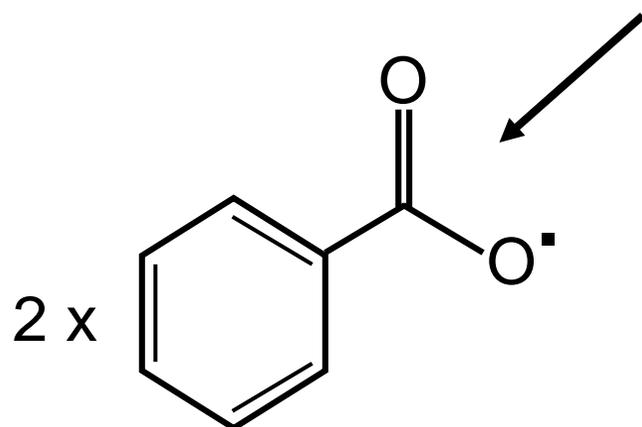
Volume normal proof		2967	2959	2814	2978
Volume drop test		2431	2426	2234	2529

Crumb		Fine	Coarser	Fine	Fine
Dough		Normal	Normal	Dry Tough	Drier

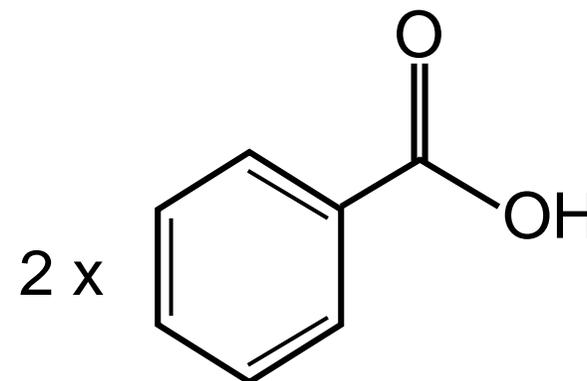
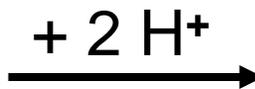
Benzoyl Peroxide



Di-benzoyl peroxide



Benzoyl radical



Benzoic acid

Benzoyl Peroxide

- ◆ **Synonymes: Dibenzoyl peroxide, benzoic acid peroxide, benzoperoxide**
- ◆ **Primarily used as anti-acne agent (e.g. 'Clearasil')**
- ◆ **Bleaches carotinoids and other flour pigments**
- ◆ **Bleaching effect occurs already in the (dry) flour**
- ◆ **Only mild oxidizing effect on gluten sulfhydryl groups**
- ◆ **Decomposes to benzoic acid that**
 - ◆ **- occurs naturally in fruits and spices (cranberry, blueberry, plum, cinnamon, clove)**
 - ◆ **- and is excreted into the urine**

Benzoyl Peroxide Replacement

- ◆ **Low cost-in-use and straightforward action of BPO cannot be matched by any replacer today**
- ◆ **(Legal) replacement based on enzymatic processes, either by adding enzymes directly or by using enzyme-active substances such as soy bean flour**
- ◆ **Best results typically achieved by combination of both (e.g. soy bean flour and esterases), some flour applications yield better results than others, especially Chinese steamed bread and noodles**
- ◆ **But using soy bean flour has certain drawbacks...**

Benzoyl Peroxide Replacement

Soy bean flour

- * allergen
- * organoleptic impact
- * high fat content



Synergistic enzyme systems

Lipases

- * highly specific
- * bleaching effect mild
- * affect performance, not just appearance

Lipoxygenase

- * costly
- * work-in-progress

Benzoyl Peroxide Replacement



Untreated



Lentinovo



EMCEbest LOX Plus

Ascorbic Acid

- ◆ Although synthetic in nature, the ascorbic acid commonly used as gluten strengthener is uncontroversial in the vast majority of places
- ◆ Ascorbic acid bears E-number E300, however, so it needs to be replaced for certain E-number free products, ‚all natural‘ claims etc
- ◆ Alternatives are oxidative enzymes as well as natural ascorbic acid extracted from acerola cherries





Where do we go from here?



Our Expectations

- ◆ Although often caused by unscientific fearmongering, the trend away from chemical oxidants is here to stay - not a passing fad
- ◆ It is currently being driven by consumers and by extension large, industrial flour users (industrial bakers, fast food chains etc) rather than legislators in many countries past a certain development stage
- ◆ Increasing affluence of consumers typically accelerates this trend, as their interest in food composition increases (but their scientific understanding does not necessarily keep pace...)
- ◆ Today, the vast majority of flour millers are reacting to this development rather than shaping it actively.

Our Expectations

- ◆ We believe that potassium bromate will definitely be a thing of the past in the remaining few places in SEA using it (Vietnam, Cambodia, Myanmar) in the not-so-distant future.
- ◆ ADA may remain permitted in some countries for some time longer, especially those whose food regulators look primarily to the USA for regulatory guidance. But having a non-ADA flour treatment formula ready or in the market will be vital, as high-profile bakers may increasingly demand it.
- ◆ BPO less likely to be banned outright, but it is quite probable that having alternatives will become an advantage as some large users may increasingly demand flour free from chemical additives. Also, exports to places not permitting BPO may be attractive.

Conclusion

- **Have a formulation free from certain (or all) oxidants ready, to be implemented at short notice should the need arise**
- **... or take the proactive approach and market some flour products as 'free from'**
- **.. but have realistic goals & do not expect a 100% identical performance and / or cost in use**





Mühlentchemie
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