

# Is Rum Toxic ?



Jean-Pierre ANGER - Université de Rennes

## What is rum ?

Rum is more than just a drink, it is a culture in itself. Rum-tasting is a ritual that requires a long initiation: to savour its divine flavour, to distinguish between its myriad of varieties and to delight in a particularly fine bottle you need to be taught with an expert !



## A bit of history (1)



- During his second trip to The Americas, Christopher Columbus, at the end of the 15th century, brought sugar-cane, originally coming from Asia. The first plantations were probably located in Santo Domingo from where the first sugar shiploads were sent to Spain.
- During the 17th century, an alcohol coming from sugar cane, or more exactly from molasses, a residue of manufactured sugar cane, seemed to appear in different islands of the Caribbean.
- A text of the middle of the 17th century dealt with this brandy under the name of “wobbler” and “rumbullion” - “keep silent devil” describing the force released by its consumption. At the end of that century, the designation “wobbler” seemed to disappear and the word « rum » - abbreviation of “rumbullion” - became commonly used.

## A bit of history (2)

- **1635** : The French settled in Martinique. The main produce for export was coffee and cotton. The first experiments were being conducted for growing sugarcane. (1638 : Birthday of Louis XIV) □ □
- **1650** : Martinique already exported small quantities of sugar but this was not a profitable activity for only a small proportion of the juice was transformed into sugar.



As production increases, a solution was sought for such waste, that seemed to have been solved by a factory laborer who tasted the juice which had fermented by the heat and natural yeast : sugar mill molasses rum or industrial rum was born.

Arrival on the scene of Father Du Tertre who fabricated a distilling apparatus for processing the scum and rough syrup.



**Le père Labat**

1694 : Father Labat invented the still. A great number of sugar factories then extend the plant to include a rum distillery.

1767 : Syrup became the international currency exchange.  
There were 450 sugar factories in Martinique.

(1769 : birthday of Napoleon I)

1870 : Cane fields covered 57% of all farmland; several traditional sugar works pooled together to form centralized factories.

But, confronted with the collapse of the sugar rates, other markets had to be found: hence appeared the idea of distilling the fresh, fermented cane juice. It is the emergence of Agricultural Rum or Habitant Rum. To meet demand, a veritable rum industry is set up.

**May 8, 1902** : Eruption of the Mount Pelee Volcano that totally destroyed the town of Saint Pierre and reduced production capacity by half.

**First World War** : Revival of the town was well under way, factories were modernized. Rum gave soldiers courage. Rum also entered into the composition of explosives: the production is doubled.

**1918** : Mainland France distilleries became concerned with this competitor with such low and anarchical rates: the metropole limited imports of colonial rum.



Today in Martinique, the Cane - Sugar – Rum sector includes about :

4,000 employees

4,000 hectares planted in sugarcane

During 2005 :

200,000 tons of cane gathered

(0.2 % of the world production)

and have given approximately:

- 8 Millions liters of rum

- 4,000 tons of sugar.

(4.6 M T of cane in Caribbean)

(120 M T of cane in the world)



« Agricultural rum » is the result of the direct distillation of the sugar cane juice as opposed to « industrial rum » which defines the distillation of the by-products of sugar refining .

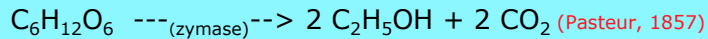
## Manufacturing procedure of Rum in Martinique

- **Agricultural rum** : Sugarcane (*Saccharum officinarum*) is crushed through a press, resulting in a compact biomass referred to as « bagasse ». This is later placed in a grinder composed of three cylinders in order to ensure a tough grinding to extract the maximum juice. Sugarcane must be ground within 36 hours after it has been cut. The cane juice (vesou) is gathered in a drainage system for filtering and pumped on to the fermenting vats.



## 2nd step : Alcoholic Fermentation

- Rum fermentation process takes approximately 30 hours in big fermenting vats. During fermentation, the sugar present in the sugarcane produces alcohol and carbon dioxide. Rum fermentation media containing yeast and bacterial flora of the « wild » type are natural ecosystems giving rise to flavours in the rum so that it possesses distinctive features linked to the local natural environment.



## 3rd step : Distilling Process

The vesou enters the top of the analysing column and steam is injected at the bottom of the column. Vapour is produced from the boiling wash, then travels up the analysing column through a number of perforated plates and goes through the vapour pipe to the base of the rectifying column where the vapour then condenses. A ton of sugarcane is enough to produce approximately 100 litres of 55° agricultural rum.



## Various qualities of agricultural rum:



- **White rum**, the basis of ti-punch, reveals all the flavour of freshly cut sugarcane. Its alcohol content is about 55 degrees by the addition of distilled or spring water.



- **Aged rum** (rhum vieux) is white rum conserved in oak barrels for three years or more. "Three-year-old" rums are of 45 degrees approximately.



- **Straw rum** (rhum paille) is a type of rum which has remained in an oak cask for 12 to 18 months and has thus been slightly discoloured. It is generally around 50 degrees.

- **Amber rum** (rhum ambré) is obtained by mixing aged rum and straw rum, resulting in a taste with the force of the latter and the perfume of the former. This rum is extremely strong and is often used for pastries, cocktails and crepes.



## Industrial Rum:



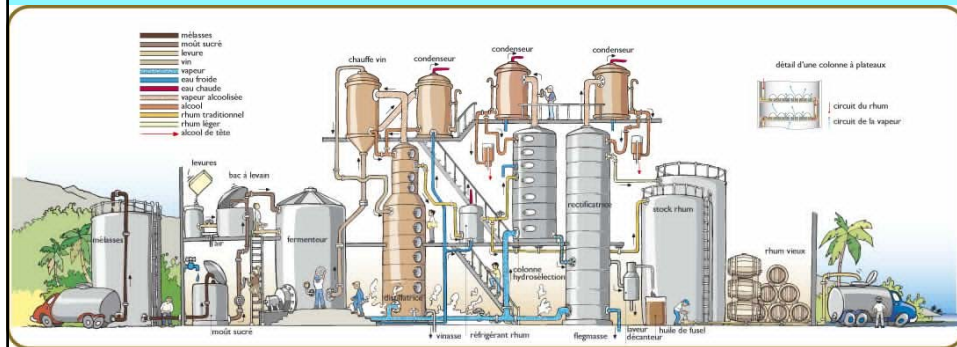
**Industrial rum:** Industrial rum is manufactured by distilleries directly attached to cane-sugar factories. Molasses are fermented with the help of yeast, which gives an alcoholic liquid of around 5 to 6 degrees. Distillery is then continued in similar column stills as for agricultural rum, until the alcohol content reaches 65 to 75 degrees, though legislation does not allow the sale of alcohol of more than 65 degrees. This is compensated for by the addition of water.



### Various qualities of industrial rum:

- **Traditional rum** is the most typical of rums of consumption, containing 40 % of alcohol and a rather strong flavour, most typically used for confectionary, pastry and cooking.
- **Grand aroma rum** has a unique flavour due to its long fermentation period of 8 to 10 days. It is a mixture of molasses and wine blended in wooden casks, used essentially for cocktails, cooking and pastries.

# Manufacturing procedure of Rum in Martinique



Fermentation

Distilling process

Stockage

Distribution

Here you have a complete schema of a « rhumerie ».  
To morrow you will receive more explanations to understand its functioning.

## Some labels of various Rums of Martinique



## Martinique and the french A.O.C label.

As we have seen in the description above, industrial rum is of an inferior quality than agricultural rum, and is often referred to as traditional rum in commerce. The term “agricultural rum”, however, is a serious marketing blunder, which does little to actually reflect the exceptional quality of the beverage concerned.

The first demand for AOC recognition was formulated in 1970 by Gustave Garnier Laroche, president of the Professional Association for Producers and Bottlers of Agricultural rum in Martinique. It took him over thirty years to obtain this »appellation »

Today eleven rums have been certified.

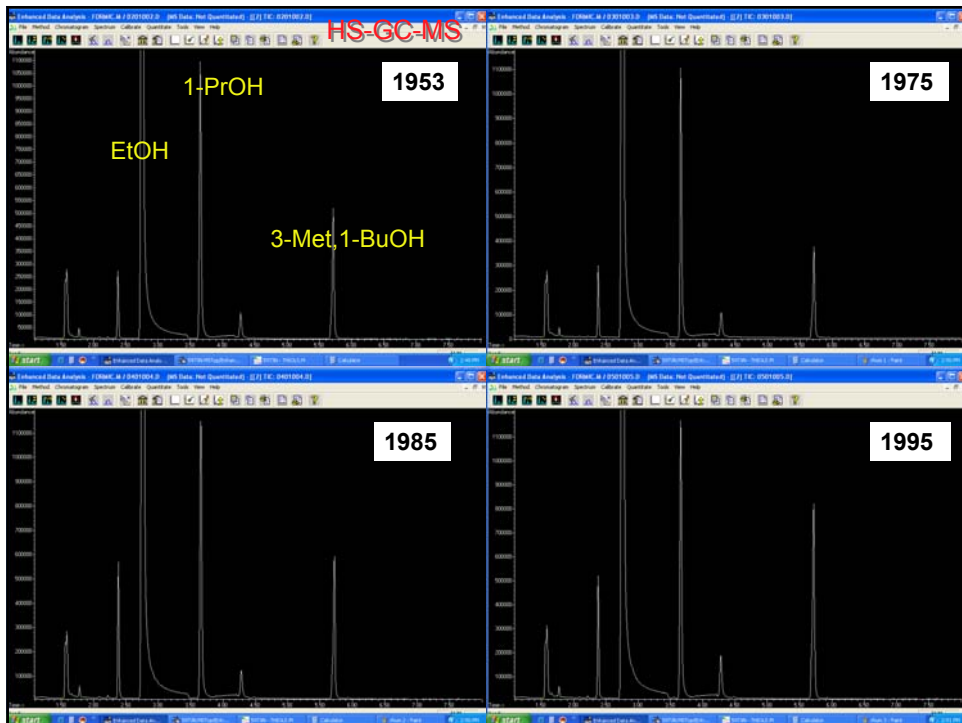


## Criteria for AOC appellation



Specificity is the key, making sure that the product is of such a unique taste, which differentiates it from other similar products. Technically speaking, each step of the process must follow a strict code, from the selection of sugarcane to the process of ageing.

**White rums**, for example, must be aged a minimum of three months, **straw rums** and **aged rums** must have spent at least three months in the production area in oak barrels of a capacity less than 650 litres.



## Legendary Uses of Rum

- At its beginning, rum was the drink of slaves and sailors. In the 1650's, the Royal Navy instituted the daily distribution of rum to the sailors but later it was replaced by a mixture made of two volumes of water for one volume of rum, which was baptized « grog ».
- In the Caribbean, the English had also taken the practice of mixing rum with several other ingredients : tea, sugar, lemon, ... They gave this cocktail the name « punch ».
- Today it is without doubt the islands' national drink: heaven itself for users and hell for abusers !
- Sometimes it may be used as an antiseptic... but that is very rare !.

## A bit of Toxicology, now...

- Rum contains alcohol : it may be dangerous for your health !
- As we know it is drunk pure or as a cocktail with sugarcane syrup and fruit juices : Ti-punch, Planteur, Blue lady, Daïquiri, etc...



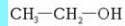
So two types of pathology must be considered : those where **sugar** is concerned and those where **alcohol** is involved !

## Diabetes in Martinique



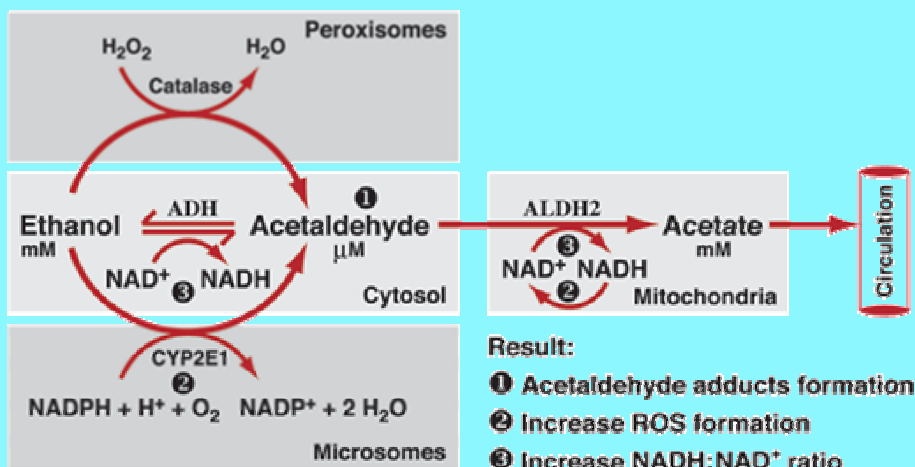
Diabetes is characterized by a growing increase of glucose in the blood (glycemia higher than 1.26 g per liter, without eating anything). **In Martinique the prevalence of diabetes is 8 to 10%, which is 2 to 3 times higher than in continental France and in the whole world.** Type 2 diabetes appearing in adults is the most frequent form. With more than one out of five admitted patients, this represents the second reason for long term cases.

## How and where alcohol goes in the body ?



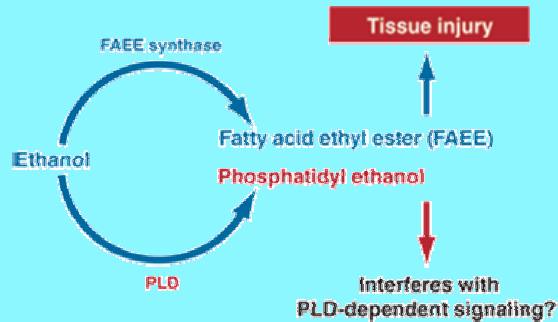
- Ethyl alcohol is a low molecular weight aliphatic compound, which is slightly soluble in lipids and completely miscible with water. Thus it is readily distributed throughout the body and may cross important biological membranes such as the blood brain barrier, to affect a large number of organs and biological processes in the body.
- Absorption of ethyl alcohol into the blood can occur through the skin and via the lungs but the major route of entering alcohol into the body is by drinking alcoholic beverages. So ethyl alcohol is a typically human toxic as it is the normal constituent of most of what he drinks, especially here where it is consumed as pure rum or as cocktails.

### The three oxydative pathways of ethanol metabolism



There are also 2 nonoxidative pathways which have metabolic consequences :

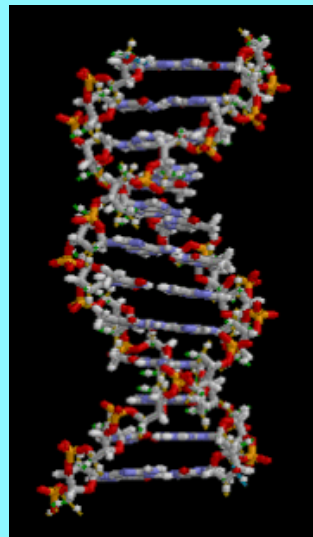
## Nonoxidative Pathways



Oxidative and nonoxidative pathways of alcohol metabolism are interrelated. Inhibition of ethanol oxidation by compounds that inhibit ADH, CYP2E1, and catalase results in an increase in the nonoxidative metabolism of alcohol and increased production of FAEEs in the liver and pancreas

## Some Genetic Aspects of Alcohol Metabolism

- Variations in the rate of alcohol absorption, distribution, and elimination have been mostly attributed to both genetic and environmental factors.
- Class I ADH and ALDH2 play a central role in alcohol metabolism. Variations in the genes encoding ADH and ALDH produce alcohol- and acetaldehyde-metabolizing enzymes that vary in activity. This genetic variability may help explain why some ethnic groups have higher or lower rates of alcohol-related problems.



## Psychotropic and physiological effects of alcohol : 1- Beneficial effects



- While it is widely recognized that alcoholism has negative health effects, moderate consumption (1 - 4 alcoholic drinks a day depending on age and gender) has been found in some studies to have a positive effect on longevity (Yuan et al. 1997)
- Medical research demonstrates that, consumed in moderation, alcohol increases HDL ("good cholesterol"), fibrinolysis, coronary blood flow and insulin sensitivity, and decreases thrombosis, reduces fibrinogen and artery spasm from stress,  
--> all good for a healthy heart (Paassilta et al. 1998) !
- Moderate alcohol consumption has been found to be associated with a lower risk of Alzheimer's disease and other dementia (WHO report, 2007)
- In conclusion, moderate drinkers tend to have better health and live longer than those who abstain from alcohol or are heavy drinkers.

## Psychotropic and physiological effects of alcohol : 2 - adverse effects



- Ethanol is primarily a social and psychoactive drug which disturbs the functioning of the brain. It generally decreases the activity of the nervous system. Alcohol disinhibits cells and circuits in the brain which are normally inhibited. This may be responsible for reflexes alteration, sleepiness (road accidents), industrial disputes and destruction of family life, etc.
- Ethanol is also a cellular poison on specific organs (liver, brain, central and peripheral nervous system) and contributes to the risk for developing different cancers.
- Rum is a strong alcoholic beverage, its consumption is not controlled but needs caution and people must be informed of its adverse health consequences.
- As for the question : is rum toxic ? The answer is : it all depends on how you manage it !

## Alcoholism in Martinique (1)



Alcoholism in Martinique is an important health factor as it is in continental France. If 57% of male population and 86% of female population have a “no risk” alcohol profile, on the contrary 14% of male population and 2.7% of female population show an addiction to alcohol. **These results sets Martinique on the 3rd rank among the most affected French regions.**

Concerning the **death rate** related to alcoholism, the High Comity of Public Health considers that 80 to 95% of deaths due to liver cirrhosis, alcoholic psychosis, alcoholism and upper digestive tract cancer are related to an excessive alcohol consumption. **On this basis, 85 to 100 deaths can be attributed to alcohol every year in Martinique** (without taking into account other causes such as road accidents or industrial injuries). These deaths occur in majority to men as the gender ratio is of 4 males to 1 female.

## Alcoholism in Martinique (2)



- **When comparing with the metropolitan France, Martinique shows a lower death rate for the liver cirrhosis and upper digestive tract cancer but a higher death rate for the alcoholic psychosis and alcoholism.** This could be due probably to a genetic predisposition of that population as it was observed in China where cirrhosis was reduced to more than 70% in populations carrying the ALDH2\*2 allele (Nagata 2002). The importance of alcohol on the premature death rate is specially clear in the male population as alcohol is attributable to 10% of male deaths occurring under the age of 65.

# Conclusion

- **Rum may be dangerous:** so use it but don't abuse it. Remember that alcohol metabolism is controlled by genetic factors.
- It is surprising to note that Brasil which is the first producer of sugarcane in the world, has choosen to favour the manufacturing of bioethanol. It is surely extremely profitable, perhaps less fun but more realist to day !



I will finished by reciting you some lines in french :

Oh rhum divin nectar  
De nos îles lointaines  
Que tu sois jeune et blanc  
Ou vieilli par le temps  
Tu nous fais oublier  
Nos tourments et nos peines  
Doux rhum antillais  
Etincelant printemps

**Thank you for your attention and enjoy your stay here !**